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Structure and content in children's concepts of emotion

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September 1990

Thesis submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy of the Council for National Academic Awards

Acknowledgements

For interest, advice, support, friendship, and considerable patience, all of my family, friends, and colleagues, but especially Erica McAteer, Veronica Laxon, Maggie Pool, Veronika Coltheart, Tom Walsh, Paul Wilner, Paul Harris, and Christine Howe.

For making my research possible, the staff and pupils of Herbert Morrison, Bousfield, Woolmore, Laburnam, St. Thomas', and Hyndland Primary Schools.

My thanks to the Economic and Social Research Council for financial support through a postgraduate studentship award.

Andrew Tolmie: Structure and content in children's concepts of emotion

Abstract

Emotional development is defined as the acquisition of knowledge to serve the regulatory activities of identification of state, behavioural prescription and prediction, and causal understanding. This knowledge is held to be organized into concepts which encode information about the relationship between four classes of feature, antecedent situation, behaviour, sensation, and mental state.

Experiment 1 used structured interviews to examine primary school children's knowledge of emotions and non-emotions. Analysis of transcripts showed children's knowledge of the classes of feature to emerge in a consistent order irrespective of feeling, but for emotions, knowledge of the relationship between antecedents and behaviour, and subsequently mental state, was central, whereas for non-emotions, knowledge focused on sensation and behaviour. The data are consistent with encoding of emotional episodes into event schemata, whose activation gives rise to mental states that allow control of reaction or anticipation of the behaviour of others.

On this basis, explicit identification of emotion is held to rest on knowledge of conjunctions between antecedents and behaviour, but evidence suggests children acquire general categorical knowledge of conjunctions and labels independently of event schemata, because it serves the distinct function of causal understanding. Integration of knowledge into overall structures is viewed as a major goal of development. A model of such structures is proposed, consisting of a hierarchy of increasingly abstract representations of emotional events. Active categorization of an episode is argued to depend on activation of event schemata and subsequent criterial activation of the links between ascending levels. Degree of activation is defined as a function of frequency of experience of an encoded event.

Consistent with the model, Experiment 2 found that children between 5 and 11 years recognized emotional labels for antecedents more often than they actively retrieved them, but that the relative frequency with which labels were identified for an item remained constant across task. Experiment 3 showed the relative frequency with which children retrieved specified terms for antecedent and behavioural features was positively correlated with estimates of the frequency of occurrence of relevant conjunctions derived from Experiment 1. Experiment 4 found that children could only retrieve a term for presented antecedents or behaviours if they were also able to identify featural complements for these, supporting the hypothesis of label retrieval through activation of event schemata.

Further support for the hierarchical model is outlined in terms of its ability to account for a range of phenomena, from expansion of the emotional vocabulary, to personalized inferences of emotion. A number of avenues for future research are identified, focused on children's ability to estimate the probabilities of behavioural responses to different situations, and on the development of causal explanations of such responses.

Contents

Chapter 1: Function and content in concepts of emotion

The focus of this thesis is on children's acquisition of knowledge of emotion during the period from infancy to the end of primary school, and on the organization of that knowledge into coherent structures or concepts. These developments are viewed from a functionalist perspective, which stresses the role of the purpose served by knowledge as a fundamental force shaping what is known. Children's knowledge about feelings, and how that knowledge is stored, is seen, not as a by-product of emotional experience, but as a fund of information acquired because it is of use to the child, both in directing his or her own behaviour, and in making sense of the behaviour of others.

This chapter commences with a brief outline of functionalist approaches to emotional development in general, and of the adaptive goals served by the infant's growing application of cognition to emotional experiences. In the following section, the impact of these goals on the wider characteristics of emotion knowledge is discussed, with emphasis placed on the requirement for that knowledge to be both shared and generalizable across self and others. In the light of this, three basic regulatory activities are defined. The relationship of these activities to aspects of the verbal communication of affect is then shown to suggest parallels between organized emotion knowledge and concepts of the physical world. Taking models of object concepts as a point of departure, both dimensional and feature-based approaches to the component properties of the content of emotional concepts are discussed, and assessed in terms of their adequacy to meet the requirements of the regulatory activities. Four basic classes of feature are identified, and the research issues addressed by the main body of the thesis defined in terms of questions about the acquisition and organization of knowledge of these.

1.1 *Functionalism and knowledge acquisition during emotional development*

In a wide-ranging review of research related to affective communication, Bretherton, Fritz, Zahn-Waxler, and Ridgeway (1986) note that contemporary theories of emotion and emotional development have come to be dominated by functionalist approaches, as exemplified by Bowlby (1969, 1973), Izard (1977, 1978), and Plutchik (1980). These authors, amongst others, emphasize the functional, or *adaptive* role of emotional processes in the life of the individual, in contrast to the psychodynamic standpoint, previously dominant in the developmental sphere, which tended to regard emotions as essentially irrational and disruptive, at least within the context of human society (see e.g. Hartmann, 1958).

Bretherton et al. (1986) argue that the adaptive role of emotion finds its primary expression in the regulation of activity at both intrapersonal and interpersonal levels. Intrapersonal regulation, they suggest, takes the form of appraisal (not necessarily conscious) of the meaning of events as, for instance, threatening; and of motivation and guidance of subsequent behaviour.

Interpersonal regulation is provided by the generation and recognition of emotional expression, which serve both to facilitate vicarious appraisal of events, and to elicit behaviour appropriate to the primary reaction. From this perspective emotional development may be broadly defined as the process of emergence and refinement of these regulatory functions.

This places the emphasis of emotional development firmly on some type of knowledge acquisition, since learning is a pre-requisite for all but the least flexible regulation of activity. So, for instance, Izard (1978) contrasts emotional ontogenesis, which is maturational in character, with knowledge acquisition via affect-cognition interactions. The first consists of age-related biological changes which establish within the individual infant specific survival-promoting processes which are the product of phylogenetic evolution. At the intrapersonal level this involves the maturation of neural and sensory receptors which allow recognition of "natural clues" (Bowlby, 1973) or innate releasers, and a contemporaneous maturation of the motor system that permits the instigation of differential responses to each class of releaser. These responses take the form of innately patterned behaviours, which are either directly or indirectly adaptive in relation to the eliciting event. Examples of these are the defensive arm movement to a looming object noted by Cicchetti and Sroufe (1978); and expressive behaviours, such as the distress cry, or disgust expression, which promote caretaker intervention (Emde, Gaensbauer, and Harmon, 1976).

Innately patterned expressive behaviours also facilitate regulation at the interpersonal level, both through the caretaker's responses to the infant's expressions, and through the infant's mirroring of the emotional expressions of others. Simner (1971), for example, found that the distress cry of one neonate tended to elicit a distress cry in others. Charlesworth and Kreutzer (1973) noted that negative facial or vocal expression in adults elicited frowning and crying in 6- to 9-month-olds. This expressive resonance, as Charlesworth and Kreutzer term it, has clear parallels with some aspects of animal communication systems, and could be argued to serve in part the same adaptive functions of signal amplification, and elicitation of behaviour appropriate to a stimulus which has not been directly perceived.

However, whilst early emotional development may be characterised in terms of the maturation of these biological systems, the emphasis rapidly shifts towards a cognitive basis for the regulation of activity. Izard (1978) argues that whilst from birth emotions are the principle source of the wider organization and selection of conscious experience, after 4 to 6 months the *content* of that experience becomes increasingly dominated by perceptual and cognitive phenomena. This results in the occurrence of affect-cognition interactions, in which emotions direct the focus of perception and cognition. This view of the basic relationship between emotion and cognition is very similar to that propounded by Piaget (Piaget, 1951; Inhelder and Piaget, 1958), who regarded emotion as the motivational, or energizing force of behaviour, and cognition as the provider of its structure.

Izard identifies one consequence of these interactions of emotion and cognition as the development of "affective-cognitive structures". These are associations between particular emotions or patterns of emotions and specific representations or symbols, which result from recurring interactions of the same nature, and which give rise to stable motivational and behavioural dispositions towards the object of the structure. The emergence of such structures has wide-ranging implications for the development of both levels of regulatory function identified by Bretherton et al. (1986). At the intrapersonal level, the establishment of a link between a specific pattern of emotional arousal and a representation of an object or event, rather than the event itself, allows the infant to make an anticipatory reaction whenever that representation is activated. In this way cognitive appraisal of an event can result in more immediate or even pre-emptory instigation of behavioural responses to it.

This is most evident in the cognitive anticipation (Sroufe, 1979) of emotion-provoking events that lie at the end of a sequence of external occurrences. Activation of this kind gives rise to a phenomenon which Bretherton et al. term "affective anticipation": "The emotion is experienced and expressed *before* the expected event actually occurs, allowing the infant to guide his or her behaviour in light of 'signal affects'" (1986, p.531). At the same time, examples of this, as for instance Piaget's (1954) report of infant displays of anticipatory distress when an important figure prepares to depart, indicate that affective anticipation is of significance at the interpersonal as well as at the intrapersonal level: through this mechanism the infant can exert an individual and more controlled influence on subsequent events by modifying the behaviour of other participants.

Cognitive anticipation more generally may also facilitate emotional responses to novel situations where there is a departure from previous regularities of experience. Littenberg, Tulkin, and Kagan (1971) cite an example of this, where a mother's disappearance into a closet, an unusual event, elicited distress on the part of the infant, but her departure through a door did not. Sroufe (1979) argues that, in general, by 9 months it is the meaning or implication of an event for the infant that has become responsible for his or her emotional reaction.

Affect-cognition interactions may have a direct, as well as an indirect impact on the nature of interpersonal regulation. The key development here is the ability to recognize the emotional reactions of others. Bretherton et al. (1986) argue that this ability develops out of the phenomena of shared reference (Scaife and Bruner, 1975; Butterworth, 1979) - i.e. the coordination of object-directed attention between infant and caretaker - and social referencing of emotion (Campos and Stenberg, 1981; Klinnert, Campos, Sorce, Emde, and Svejda, 1983), in which the infant's emotional reaction to an object or event is determined by reference to the emotional expression of the caretaker. As the cognitive organization of the infant's activity increases, coordination of attention with the caretaker improves and becomes more targeted. At the same time, earlier expressive resonance on the part of the infant gives way to a more deliberate referencing and imitation of the emotional expression of the caretaker in response to objects in the attentional field.

At this point game-like exchanges may often take place in which shared attention is switched rapidly back and forth between a physical object or on-going event and the expressions of infant and caretaker (see e.g. Trevarthen, 1985; Papousek, Papousek, and Koester, 1986). Such interchanges are crucial because they constitute emotional expressions as perceptual objects in their own right, associated with other elements of the environment, and with other behaviour, to be represented as part of a sequence of events. The 'exchange' of expressions also provides the basis for the infant to recognize the potential identity between his or her own emotional reactions and those of the caretaker.

These developments extend interpersonal regulation in two ways. Firstly, when the caretaker or others display behaviour aimed at the infant contingent upon the latter's emotional expression, this provides a model for reciprocal behaviour when the same emotion is recognized in others. Bretherton et al. (1986) quote an example of this from an unpublished study by Radke-Yarrow and Zahn-Waxler (1973), in which a two-and-a-half-year-old enjoins her concerned-looking mother not to be angry, but to be happy instead, in clear imitation of previous parental responses. More fundamentally, though, once a general recognition of identity of reaction to the same perceived cause is established, this transforms the scope of interpersonal regulatory functions. On the basis of knowledge of his or her own reactions, the child is now in a position to begin to anticipate the emotional reactions of others before they occur, and to respond pre-emptively to modify those reactions.

Again, though, changes in regulation that result from increased awareness of emotional expression are not limited to a single domain. At the intrapersonal level, recognition of the identity between personal emotional reaction and that of others serves to extend the infant's understanding of the meaning of events within the environment. The reaction of another person to an event need not merely determine the infant's reaction at that point. It also denotes a possible personal reaction to subsequent occurrences of the same event. In order to effectively enact this the infant must identify the salient aspects of the event in question, and store these together with the contingent reaction. To the extent that he or she is able to achieve this (perhaps aided by accompanying communications made by the actor), the emotional reactions of others provide opportunities for the acquisition of novel ways of appraising situations, and so enhance the complexity and range of events to which the child is capable of responding.

Such effects also extend to the nature of the response itself. When the caretaker displays other behaviour aimed at the object of the emotion, contingent upon emotional expression, this provides a model for the infant or young child to expand his or her behavioural repertoire along socially-sanctioned lines. Eventually this may include elements of modulation or masking of the emotional expression itself in line with culturally specific display rules (see e.g. Saarni, 1979, 1984), as these are observed to be present in the behaviour of the caretaker or important others.

1.2 *Characteristics of emotion knowledge*

The brief survey above serves to illustrate that although emotion has a biological basis, emotional development in humans quickly becomes dominated by processes of knowledge acquisition, upon which refined regulation of activity is dependent. This is not to suggest that modification of emotional processes through learning is unique to humans. MacDougall (1908), for instance, in detailing his influential comparative model of emotion acknowledged that in other species previously neutral stimuli could acquire the power to elicit emotional responses by association with natural elicitors; and also that new forms of emotional behaviour could emerge through the pleasurable associations of activity that was instrumental in reduction of the strength of instinctive impulses. Emotional learning in other animals may also be regarded as adaptive since it extends the range of environmental occurrences with which the organism can effectively cope.

This type of learning, though, essentially involves nothing more than the transfer of emotional reaction from one stimulus to another via a form of classical conditioning, or the modification of response via a form of operant conditioning. Whilst early learning in human infants may conceivably be of a similar nature, the subsequent development of cognitive representations of sequences of events and emotional responses to them is of a different order. The knowledge encoded in these representations may be accessed prior to the actual occurrence of an event, and so find expression as an anticipation of a future state, as discussed above. The information gained through conditioning, on the other hand, can only be accessed in the presence of the relevant stimulus, and only finds expression through response to that stimulus. The infant, then, does not simply learn new releasers for emotional processes, but begins to acquire knowledge *about* emotion and emotional responses.

This leads to a second point. Animal learning is context-bound in both the sense of being activated only by the presence of a stimulus, and in the sense that such a stimulus is of a more-or-less specific nature. Again, learning in infancy may initially be context-bound in a similar way, but the process of cognitive appraisal that enables the child to respond to the implications of an event (i.e. its meaning) is ultimately geared to the recognition of underlying structures common across specific occurrences. In other words, the emotional knowledge acquired by the child tends towards generalizability.

Most important of all, though, is the fact that the emotional knowledge acquired by children is predominantly *shared* knowledge. Emotional learning in animals is specific to the individual organism in that it occurs as a direct result of that organism's experience of the environment, and is not communicable, save in the sense that an organism's response to a learned stimulus may act in a secondary fashion as a releaser for consonant behaviour on the part of other members of the species. In human infants the emergence of social referencing supplements any direct learning about new events with information about appropriate responses which is mediated by the knowledge held by others.

But social referencing does not just serve as a means of direct transfer of knowledge about events. On subsequent joint encounters with those events, the responses of infant and other are coordinated by the shared cognitive appraisal that results from this transfer of knowledge. In this way emotion becomes an inherently intersubjective experience, because the same knowledge provides the basis for guiding the infant's behaviour and that of others, *and* for each to anticipate the behaviour of the other.

The social constructionist authors (see e.g. Harré, 1986) argue that a shared framework of this type is fundamental to human emotion, whose primary function they consider to be the regulation or coordination of interaction between the members of a community. This regulation is held to be achieved via systems of rules and component roles (see Harré and Secord, 1972) which can be played out interchangeably by the participants in an episode, and which are therefore dependent on a shared framework of knowledge.

Clearly, such frameworks would cut across the distinction between intrapersonal and interpersonal regulatory functions of emotion, since ultimately the same knowledge must serve both. But even a less dramaturgic approach to emotion must hold that there is at least some overlap between the knowledge applicable to regulation at different levels, in order for mutual intelligibility of emotional response to be possible. It was noted previously that as the child's knowledge develops the content relevant to intrapersonal regulation also acquires relevance for interpersonal regulation, and vice versa. This interaction between the knowledge serving apparently different regulatory functions could plausibly provide an early basis for the integration of these, with the shared rule-role systems emphasized by Harré as a potential endpoint.

The argument that emotional development is dominated by the acquisition of a knowledge base that both guides personal behaviour and permits the understanding of the behaviour of others is not without its critics. Damon and Hart (1982), for instance, state that "one simply is emotionally invested in the nature of one's own identity in a different way than in the nature of others' identities, and this may well lead to differences in how personal information on self and other is cognitively processed" (p.844). In support of this position they cite studies by Taylor and Fiske (1975), and Nisbett, Caputo, Legant, and Maracek (1973), on differences between the causal interpretation of personal behaviour (where the focus tends to fall on external factors), and that of others' behaviour (where there is a much greater tendency to invoke factors internal to the individual).

Whilst such evidence is apparently problematic for the notion of an overarching emotional knowledge base, it is, in fact, far from fatal. The extreme obverse position, that individuals hold separate knowledge applicable to their own emotional reactions and to those of other people, encounters much greater difficulties, since it either removes any obvious basis for the mutual intelligibility of such reactions; or alternatively it implies considerable duplication of knowledge in separate stores, and hence an improbable lack of parsimony.

On the other hand, a general emotional knowledge base does not necessarily preclude the possibility of differences between the generation of personal reactions and understanding of the reactions of others. In the first place, there is no requirement to postulate either that there is a total overlap of knowledge applicable to self and to others, or that any such overlap is present from the beginnings of knowledge acquisition. For instance, some separation may be maintained where an individual has experienced an event but has never witnessed others in the same position, or vice versa. It is sufficient for the development of shared frameworks that there should be a convergence of self-knowledge and other-knowledge as each informs the other during the course of interaction, in much the way described above.

Secondly, the existence of the actor-observer differences in causal interpretation referred to by Damon and Hart, or of wider differences in the processing of information about self and others, is not incompatible with a general emotional knowledge base. Apparent divergence may be accounted for in terms of differential access of the same knowledge, and resultant differences in salience of its constituent elements. Lang (1984), for example, proposes a model of emotional knowledge in which affective dispositions are encoded as three types of proposition (stimulus, interpretation, and response) organized into highly interconnected networks, which constitute response programs. In this model, the component propositions are 'double-coded' (i.e. they have both a semantic and a sensori-motor dimension), and because of their interconnectedness, the network can be activated or accessed in different ways, with variable consequences.

The primary method of activation is the input of stimulus information which matches stimulus propositions. This kind of activation produces a 'run' of the response program, with stimulus and response propositions, in their sensori-motor aspect, of greatest salience. Observation of somebody else in the same situation could also activate the network, but in this case the semantic dimension and interpretative propositions would be most salient, and so causality would focus on the individual's interpretations of the event rather than on the event itself.

The specific model referred to is of less consequence here than the general analogy to a program consisting of action-linked propositions, which can either be 'run' or 'listed'. Within this framework, the same organised set of information can be illustrated to serve different functions, one of which tends to focus attention on start- and end-points of a sequence of events, whilst the other gives more prominence to the intermediate connections.

1.3 *Basic regulatory activities and the organization of emotion knowledge*

If the case for the development of a general, shared emotional knowledge base is accepted, then, with regard to function, any separation between intrapersonal and interpersonal regulation is of less interest than the isolation of basic activities common to both levels which make the same use of the same knowledge. Three distinct but related activities can be defined which are fundamental to regulation and which meet, at least potentially, the criterion of reliance on a common knowledge base, irrespective of subject. These are:

i) *Identification of emotion*, which is concerned with implicit or explicit recognition of the nature of the emotional reaction of self or others, and hence its relationship to previously encountered reactions of similar character. Thus identification serves to establish what areas of knowledge will be relevant to the regulation of subsequent behaviour.

ii) *Prediction and prescription*, which in general is concerned with anticipation of the behaviour of others, or with the planning and guidance of personal behaviour, contingent upon emotional reaction. These two activities, whilst superficially distinct, are equated here in terms of the knowledge they call upon, since, broadly speaking, for one's own behaviour to be consistently predictable to others, it must be at some level the product of knowledge related to that which is used to predict it. This is effectively the same position as adopted by Harré and Secord (1972) when they state that "rules can determine expectation for the same reason as they can guide action" (p.177).

The primary regulatory purpose of this activity is to facilitate the production of coordinated behaviour on the part of participants in an emotional episode, and so its focus naturally tends to fall on that which is about to happen, rather than on what has happened; and on the external rather than on the internal. In fact, though, inferences about the unobserved or, from a personal viewpoint, final cause of an emotional reaction; or anticipation of changes in internal state, could also constitute part of the same basic activity, since its defining characteristic is that of the isolation of the most probable set of regularities on the basis of another such set, irrespective of causal direction or temporal flow.

iii) *Causal understanding and explicit causal explanation* are distinguished from prediction and prescription, as defined above, following Piaget's formulation with regard to physical causality (Piaget, 1930, 1972). This is because although these activities are also concerned with the relationship between different regularities within an emotional episode, their focus is on the *mechanism* or *process* by which one set of regularities is transformed into another, rather than on the simple likelihood of a particular contingency.

Since causal principles are usually more generalised than the specific events or sets of events to which they may be applied, one regulatory function served by such activity may be the generation of predictions or inferences in less familiar situations, where direct estimation from experience of the probability of particular events or behaviours is more difficult. Perhaps more importantly, though, causal explanation also provides the means to make explicit the reasons for unexpected contingencies. As Fiske and Taylor (1984) note, causal analysis of social events is most likely to occur in the post hoc examination of failed predictions or expectancies. Under these circumstances causal explanation may serve to adjust expectations generated within the context of future episodes of a similar nature.

In this way, causal understanding and explanation function as means of preserving and extending mutual intelligibility of behaviour during emotional episodes. But, as Piaget (1972) notes, causal understanding is ultimately only of value to the extent that the 'hypothesised' process accurately reflects the actual transformations occurring during causation. Again, then, knowledge of the causal principles which permits the emotional reactions of others to be understood must at some level tend to be isomorphic to the cognitive processes within those individuals that result in specific behaviours; and similarly with regard to others' understanding of personal behaviour.

Further than this, those same causal principles which allow others' behaviour to be understood may also serve as a deliberately employed heuristic for the generation of personal behaviour in unfamiliar situations; indeed, this is a standard technique employed by actors in creating a part, and seems likely to have everyday parallels (e.g. trying to decide what you should feel when bereaved). At the opposite end of the spectrum, 'out-of-character' behaviour by oneself may be subjected to post hoc causal analysis in the same way as that of other people, with the corresponding objective of modifying response to any subsequent events of the same kind.

In defining these three activities, stress has been laid on the fact that they depend ultimately on a shared knowledge base, which is applicable both to self and to others, in order that regulation at the intrapersonal and interpersonal levels can not only take place, but also be broadly consistent, and accurate or effective. Identification, prediction, and causal understanding also all find expression in a fourth activity, verbal communication about emotion, which serves to reinforce the intersubjective character of emotional processes through "the language games of emotional display and ascription" (Harré, 1986, p.12). In particular, the recognition and attribution of common emotional reactions is cemented by the acquisition of an emotional vocabulary, since the application of terms from this vocabulary to both self and others further asserts an identity between the emotions of different individuals, even when in different situations and behaving in different ways (c.f. Wittgenstein, 1953; Merleau-Ponty, 1964).

Perhaps less obvious, but of no less significance, is the role played by an emotive individual's statements of intention and of reason both during and after an episode. Bretherton et al. (1986) note that such statements serve to clarify the nature of the individual's experience to others involved, and in this way they provide a means of checking and modifying both prediction and causal understanding. More importantly, though, as Harris and Olthof (1982) suggest, communication of this kind may be crucial during development in drawing the child's attention to the hidden influence of mental states on overt emotional reaction. Not only would this go some way to redress the asymmetry between the 'observable' elements of personal emotional responses and those of other people's, but it may also provide an interpretative framework which can then be applied back to the child's own mental experience of emotion.

If verbal communication plays an important role in the development of identification, prediction, and causal understanding, and of the knowledge on which they are based, language itself also provides an explicit focal point for the integration of these three activities, via the use and comprehension of emotion terms. Depending on context, these items of vocabulary can be utilised to initiate any one or more of the three activities, and to reference the products that they generate.

For instance, the statement "I'm really angry with you" apparently emphasises the identification of emotion, but tends additionally to prompt anticipation of subsequent behaviour. "She did that because she was angry with him", on the other hand, activates causal understanding as well as identifying the emotion involved. There is a clear implication that the knowledge serving identification, prediction, and causal understanding either is, or during development becomes, highly interrelated, for such multiple references to be understood more or less simultaneously.

The precise nature of the organization of different elements of knowledge that might be necessary to achieve this is a matter that will be taken up subsequently. Putting the points from this and the previous section together, it is sufficient to note the conclusion that emotion knowledge, whilst perhaps initially composed of loosely-related, context-specific elements, becomes integrated during the course of development into tightly unified structures, bringing together the content applicable to different regulatory activities and different individuals, including the self, and with that content readily accessible via language, and via certain terms in particular. In other words, emotion knowledge becomes organised into well-defined, functional *concepts* with corresponding *labels*.

From this perspective questions about the content and organization of emotion knowledge are guided to some extent by questions about what type or model of concept is applicable. To date such models have been predominantly concerned with concepts of natural objects. Lingle, Altom, and Medin (1984), in discussing the extent to which social entities can be examined in terms of models of natural object concepts, advise caution, because of important apparent differences as well as similarities. In particular they note that one frequent characteristic which distinguishes social concepts from natural object concepts, is the presence of a rich set of inference attributes of the kind previously referred to as serving the generic activities of prediction and prescription within emotions.

It would seem possible, though, that differences such as these are as much a result of the function of social concepts and of the contexts in which they are utilised, as of any basic difference in the content of knowledge about the social and physical world. For instance, concepts of emotion would appear to have strong similarities to 'proto-scientific' concepts such as 'heavy', which is used in natural language both to identify a property or class of objects, and also to predict and explain the behaviour of those objects, in a manner parallel to that discussed above for the use of emotion terms. In this case at least the points of convergence which result from the use of concepts to predict and explain events may outweigh any differences that arise from the type of entity to which those concepts are typically applied.

Other, more basic functions of concepts can also be seen to apply equally well to organised emotion knowledge and to knowledge of the physical world. Smith and Medin (1981) isolate two general and fundamental conceptual functions: the taxonomic or categorical function, which divides entities into sets with common characteristics, from which further members or exemplars of the set can be identified; and the relational function, which provides models of the internal relationships between members of a set and their properties, and of the external relationships between members of different sets. In broad terms, the activity of identification of emotion can be seen to correspond to the taxonomic function, whilst prediction and causal understanding correspond to different aspects of both the taxonomic and the relational functions.

The observation that emotion knowledge has structural similarities to physical knowledge is far from novel. Something of this idea is contained, for instance, in Piaget's (1951) discussion of 'affective schemas'. He writes that "when we speak of 'affective schemas' it must be understood that what is meant is merely the affective aspects of schemas which are also intellectual" (p.207). The central point here, though, is that functionalist approaches to emotion and emotional development lead to a focus on behavioural regulation of one form or another, which, in a human context, is dependent on highly organised and intersubjective knowledge structures. If emotional development is equated with the development of such regulatory functions, then it follows from this that it is primarily a form of conceptual development, which has an impact both on actual behaviour and on the interpretation of behaviour. Models of concepts and concept formation, particularly where these relate to causality, therefore provide an appropriate framework for orienting questions about emotional development and the acquisition of emotion knowledge.

1.4 *Components of emotion knowledge*

In the preceding sections a number of different aspects of emotion knowledge have been referred to in order to illustrate general characteristics, but without an attempt to strictly define the component properties of that knowledge. Before any issues relating to the organization of knowledge within emotion concepts can be dealt with, it is necessary to give explicit consideration to the question of what that knowledge is comprised of, and how it might be encoded, given the requirement that it serve the basic regulatory activities isolated above.

Smith and Medin (1981) argue that there are essentially two classes of component that could be used to encode information about the exemplars of a concept: quantitative components or dimensions, and qualitative components or features. Both dimensional and feature-based approaches to emotion knowledge have been used extensively within the literature, and each is considered in turn below.

i) The dimensional approach

Dimensional approaches have been utilized most frequently by authors whose primary concern is to uncover the semantic or taxonomic distinctions that exist between different items of the emotion vocabulary (e.g. Osgood, Suci, and Tannenbaum, 1957; Davitz, 1969; Bush, 1973; Russell, 1979, 1980, 1983; Russell and Ridgeway, 1983; Bullock and Russell, 1986; Conway and Bekerian, 1987; Storm and Storm, 1987; McCoy, 1977; Katz, 1984; De Rivera, 1977; Solomon, 1977; Smolenaars and Schutzelaars, 1988). Typically, such studies have taken a set of terms from the emotion vocabulary as a starting point, and attempted, either empirically or theoretically, to explicate the underlying structure of the relationships between these items.

What these studies have in common further than this are solutions which make use of a number of dimensions, either bipolar or unipolar, which map out the semantic space. Specific terms are described as representing values (either degree or presence/absence) on these dimensions, which in turn make up either cross-classificatory or hierarchical systems. From the perspective of the present discussion such dimensions may be considered to constitute or correspond to different types of component of emotion knowledge.

For instance, studies making use of multidimensional scaling of similarity judgements of emotion terms (e.g. Osgood et al., 1957; Davitz, 1969; Bush, 1973; Russell, 1980; Conway and Bekerian, 1987) have consistently found solutions which indicate two basic bipolar dimensions underlying the emotion vocabulary: arousal-sleep, and pleasure-displeasure. Taken together, values on these dimensions appear to uniquely specify each of the range of terms considered. Russell (1983) has replicated these findings cross-culturally, and Russell and Ridgeway (1983) have done so with children.

Storm and Storm (1987) present similar findings using hierarchical cluster analysis of similarity judgements, although they identify the positive-negative dimension as more fundamental than that of arousal, the latter of which, their results suggest, applies predominantly to more neutral terms, such as "surprise". They also make finer distinctions between sets of terms within broader groupings, using dimensions such as interpersonal-noninterpersonal, cognitive-physical, and control-disorganization.

Writing from the perspective of personal construct theory (Kelly, 1955), McCoy (1977) identifies five basic dimensions or bipolar constructs which operate on awareness of the implications of events. Cross-classification of these is held to define the basic set of emotion terms. The five dimensions are: validation v. invalidation; change to core structure (i.e. those constructs which refer to self) v. change to non-core structure; comprehensive v. incidental change; goodness-of-fit of self to one core role structure; and inside v. outside the range-of-convenience of the construct system. Katz (1984) extends this analysis, but rather than specifying a cross-classificatory system, reduces it to a set of nine individual 'primitive' unipolar constructs, each of which defines a specific class of emotion.

Less obviously dimensional in approach are accounts which specify the semantic properties of emotion words in terms of their values on a number of theoretically-determined attributes or features (e.g. De Rivera, 1977; Solomon, 1977; Smolenaars and Schutzelaars, 1988). These studies are included here because the features or attributes that they identify are, for the most part, highly general in nature, and encompass an implicit continuum. Since the number of attributes or features outlined is large, full detail is not given here, but Smolenaars and Schutzelaars, for instance, define their feature "power" in the following way: "The experiencer of a displeasure emotion may judge that he has little, rather much, or much power to do something about the unpleasant situation he finds himself in." (1988, p.210). Another attribute, "connotation", is broadly the same as the pleasure-displeasure dimension identified by Russell (1980) and others. Again, individual terms are held to be specified by combinations of values across the series of attributes.

Taken together, these approaches suffer from a tendency to yield a multiplicity of component properties for emotion knowledge. Since, in theory, if construct validity is assumed, the term for a specific quality of emotion should be recoverable from information about a particular value or set of values on the dimensions outlined by any of these various authors, each potentially corresponds to a separate component, at least to the extent that they are independent of each other and non-overlapping. However, not only do the various dimensions appear to be too numerous to all be of value in the identification of emotion, but they are also dependent on a variety of conceptual viewpoints, and therefore lack any overarching theoretical coherence.

Worse still, there are no clear criteria to reduce the set of identified dimensions to those which are of greatest importance. All the dimensions dealt with above are implicit in the observed usage of emotion terms, and are only elaborated by means of an external process of interpretation of one kind or another which is at least two stages removed from any direct examination of the knowledge held by members of a wider community. Thus whilst they may define something of the apparent semantic space, it is not evident that individuals in general have direct access to, or make use of, such information as would be conveyed by any of these dimensions.

It is also debatable whether the dimensions do actually constitute components from whose values specific qualities of emotion could be identified. For instance, the two dimensions identified by the scaling studies referred to would require fine judgements of the relative values of experienced arousal and valence; and would be difficult to apply to other people, where there might well be a lack of sufficient information to make such judgements. The dimensions elaborated by McCoy (1977) and Smolenaars and Schutzelaars (1988), have sufficient inherent discriminative power, but seem likely to involve a level of cognitive sophistication which would be outside that available to children, if not adults, since they require as a very minimum a well-elaborated self-concept. Applicability to others would again be problematic since values of many of the components depend on internal evaluations. Further, as Smolenaars and Schutzelaars report, their attributes fail a crucial empirical test: emotion terms recovered by subjects from scenarios devised to express specific values on the attributes showed a only a "moderate" fit to those expected (1988, p.223). They conclude in consequence that the attributes tested are "over-specific" (ibid. p.227).

If dimensional components provide at best a weak basis for the identification of different emotions, it is even less clear how such knowledge could serve the activities of prediction or causal understanding. The problem here is that although dimensional components do constitute types of regularity, such that the values of one component could be inferred from another if the probability of contingency were known, in terms of content such inferences would not yield the type of information (e.g. likely behaviour) necessary for the coordination of activity within emotional episodes, and would have to be further "decoded" to arrive at this. In other words, then, regulation of activity implies a need for knowledge of the more concrete, experiential regularities of emotional episodes, which is to say the qualitative features of these.

If featural components of this type are integral to prediction, and at least in part to causal understanding, it is implausible that identification would be dependent on more abstract or interpretative components. In fact, both Smith and Medin (1981) and Lingle et al. (1984) make a distinction between the more abstract core of a concept, used for evaluating between-concept relations, and that concept's identification procedure, used for categorization, which depends largely on perceptual features. It seems likely that to the extent that dimensional approaches reveal something of the nature of emotion knowledge, this knowledge forms part of a conceptual core, which has been tapped because of the "top-down" character of the methodologies employed. In contrast, a feature-based, "bottom-up" approach, whilst not perhaps addressing all issues, would appear more likely to be successful at isolating the components of emotion knowledge that serve the three basic regulatory activities.

ii) The feature-based approach

For feature-based approaches isolation of the functionally relevant components of emotion knowledge resolves first of all to a question of what distinct types of regularity or classes of feature we are presented with during the course of an emotional episode; and which from amongst these take on differential values that can be used to identify, and discriminate between, different qualities of emotion.

This approach can be argued to derive from the work of William James (James, 1884, 1890). Early writings on emotions as innate responses, particularly within the emergent field of comparative psychology, established broad agreement that these were complex processes composed of discrete stages or components, involving stimulus apprehension, central excitation, and consequent behaviour (c.f. McDougall, 1908, and his three-component model of emotion). The question for James was at what stage, and in what manner, the subjective feeling state of an emotion arose. In what later became known as the James-Lange theory of emotion, James (1884) proposed that the subjective state derived from the apprehension of the visceral sensations accompanying excitation of the nervous system, and of the motor responses consequent upon this excitation (e.g. the individual experiences sadness because of an awareness of certain physiological changes and the fact that he or she is crying).

Despite the tendency of the James-Lange theory to reduce the subjective element of an emotional episode to an epiphenomenon, and also despite problems subsequently encountered by the theory (such as continued report of subjective emotion in the absence of overt emotional behaviour or discriminable physical sensation - see e.g. Cannon, 1927), James' work is significant here because of its portrayal of subjective feeling state as the <u>experience</u> of the emotional process itself, as structured by its various components. It follows from this phenomenological standpoint that to the extent that it is possible to recognize (and so categorize) a particular state, this recognition is inherently dependent on a knowledge of those features of experience that arise directly from the course of an emotion. In order to establish what knowledge is necessary to identify an emotion it simply remains to ascertain which of the components of the emotional process meets the apparent requirement of providing sufficient in the way of consistent, discriminable information to give rise to the perception of specific emotions.

Traditionally, attention here was focused on the perception of different patterns of visceral sensation. In part this was due to the influence of James and his argument that it was uniquely the experience of bodily change that gave an episode its emotional quality: "if we fancy some strong emotion, and then try to abstract from our consciousness of it all the feelings of its bodily symptoms, we find we have nothing left behind, no 'mind-stuff' out of which the emotion can be constituted, and that a cold and neutral state of intellectual perception is all that remains" (James, 1892/1961, p.246). At the same time, there was logically no other clear candidate for determining a specific emotion, either in a causal or a definitional sense, since the same quality of feeling could be provoked by a great variety of ostensibly unrelated stimuli, and could result in many different behavioural responses. The denial of any direct role for cognition in determining the quality of a specific emotion thus apparently left visceral sensation as the only aspect of experience which could remain invariant across the variety of different contexts in which the same emotion might be reported.

In consequence, much effort was applied to attempts to identify the physiological regularities which might lead to unique patterns of experienced visceral sensation. Since sensation itself was presumed to be the direct product of the autonomic discharge which activated the nervous system in preparation for motor response, it was on the nature of this discharge under different conditions of experienced emotion that interest concentrated. However, results proved unpromising. Cannon (1927, 1929), for instance, reported that the autonomic discharge accompanying emotion was too diffuse to form the basis of clearly differentiated states. Wolff and Wolff (1947), and Ax (1953) both reported some differences in the pattern of arousal contingent upon fear and anger, but not of the extent that might be anticipated to underlie such contrasting subjective conditions. Save that the advent of new recording techniques might reveal hitherto undiscovered differences, it seemed improbable that visceral sensation could either cause discrete emotions, or provide the features by which states were differentiated.

In retrospect it may be argued that the problems encountered by this line of research were due largely to a number of misconceptions. Firstly, there was the assumption that subjective experience of an emotion was necessarily reducible to the effect of a unique cause within a fixed sequence. Hinde (1972) argues that it may be mistaken to view any instance of an emotion within a particular context as having a <u>single</u> cause, and prefers to regard emotional response itself as the result of a causal nexus.

Again, recent research tends to suggest that there is no fixed sequence of events within an emotional process, and that factors which appear as responses on one occasion may have a causal role on others (see e.g. Laird, 1974, 1984; Lang, 1984). Parkinson (1987) concludes: "Each of the factors of emotion can serve as either cause or effect, and the syndrome occurs in a structural pattern, with the occurrence of one kind of affective event tending to recruit the other factors" (p.57). If the same emotional experience can occur via different causal routes, as suggested by Parkinson, then this implies that the experienced state is not defined by its direct cause, but rather has emergent properties which are relatively independent of any specific cause.

A further source of confusion arose from the attempt to reduce the content of a set of language categories (i.e. the different terms for emotional qualities) to physiological events. As Wittgenstein (1953) pointed out, these physiological events could not be what was signified by the language terms because of the private nature of experienced sensation compared to the shared, public nature of use of the word. It would otherwise be impossible to apply the word either to oneself or another except on a random basis, in which case the category would logically not exist. But even without this objection, there is no reason to suppose that the boundaries imposed by the meaning of language terms need necessarily correspond exactly to the "real" structure of physical events to which they seem to apply. Popular usage of the word "weight", for example, is not restricted to the interaction between mass and gravity specified by physicists, and even refers to inertia, another phenomenon altogether, in the term "dead weight".

Most of all, though, the various problems noted above stemmed from the application of an essentially <u>classical</u> view of the world, in which the category "emotion" and the sub-categories for the different qualities required definition in terms of necessary and logically exclusive features. In contrast, Fehr and Russell (1984), in considering emotions as categories, argue that they constitute a 'fuzzy set' (i.e. lacking a definable set of necessary features or clear boundary; see e.g. Smith and Medin, 1981, for a discussion of classical v. probabilistic categories). Membership of a category in such cases would be determined by 'family resemblances' (Wittgenstein, 1953) between the features of an exemplar, and those of an abstracted prototype representing the most commonly occurring features across different exemplars (Rosch, 1978).

The probabilistic model of categories addresses the question of which features of what component define a particular quality of emotion by assuming that there are no necessary features or necessary types of information, merely more or less probable features of different classes (Parkinson, 1987). These may serve to imply the likelihood of other features without necessarily requiring their presence in order for a specific emotion to be identified. Thus to the extent that any of the components of an emotional process present different characteristic regularities or features during different episodes, knowledge of these regularities would allow them to be used as cues to recognition or attribution of a particular quality.

Specific, functional components of emotion knowledge could therefore arise from each of the components of the process of emotion itself. However, in spite of much common ground, there is no total uniformity between different authors as to what the various components are, nor even complete consistency within author. Some of the issues involved are surveyed below, in an effort to identify elements or components of the emotional process which meet the criterion of presenting distinct classes of feature within experience.

James (1892/1961) ostensibly identifies three components: the provoking stimulus or object; central excitation and organic change; and behavioural response. He does not treat subjective state as a fourth component since, as discussed above, he considered it to be completely defined by the experience of organic change and behavioural response. This formulation provides the starting point for many other authors, but is not as clear cut as at first sight appears.

The first point that requires elaboration concerns the nature of the provoking object (taken to refer to the general class of emotional antecedents, including both objects and events). James (1892/1961) makes no distinction between a provoking object which is physically present and one which is remembered or imagined. Since he was concerned primarily with the excitatory effects provoked by the object, and considered cognition as independent from emotional effect, it was presumably not an issue of consequence for James as to how the object was apprehended. From the present perspective, though, some separation between the physical presence of an object and the activation of its representation does seem justified.

First of all, in a purely definitional sense, real and imagined or recalled objects cannot be of the same order because their apprehension depends on different processes which arise at different points in development. Whilst perception of a real object involves information processing, aspects of this are encapsulated in the function of organic structures which operate more or less from birth (see e.g. Hubel and Wiesel, 1962, 1968). Recall and imagination on the other hand require the ability to internally manipulate representations, an ability not present, even in its most basic forms, until later in development (see e.g. Schaffer, 1974, on the emergence of cognitive processes mediating infants' fear of the strange). This may not seem on the face of it to be of great importance, but the implication is that there is a class of objects capable of provoking emotion which is not available to infants and possibly young children, and which is therefore in some sense distinct. This is of particular significance in episodes where, for instance, a physical object only provokes an emotional response because of its association with a previously experienced object which is recalled at the point of encounter.

Secondly, objects and their representations may have different properties. The properties of real objects are constrained by physical, temporal, and biological laws, and additionally by social rules where the objects are of a social nature. Imagined, and even recalled objects are not necessarily subject to the same constraints. It is possible to imagine a creature or an event, for instance, that could provoke fear, but which could not physically exist, or that could not take place. Similarly, in recalling a past situation it is possible to edit it in such a way that some of the features of the actual event are absent, enhancing its capability to provoke a particular emotion. Alternatively, events may be juxtaposed in recall in a way that temporally displaces them from their actual form, creating an entirely new object.

The development of recall and imagination may therefore lead to the creation of new "cognitive" objects with features distinct from those of real objects, although awareness that this is the case may be a later development dependent on conscious comparison between external and internal reality. For instance, Piaget (1929) reports statements by children as old as 5 years which indicate that they regard dream images as external to themselves.

The distinction drawn above between cognitive and real objects is one that is also made by Lewis and Michalson (1983), in a comparison between what they term "natural" and "cognitively-mediated" elicitors of emotion. Natural elicitors are defined as "events, either biologically determined or learned in the very beginning of life, that will consistently produce an emotional state" (p.97). For them, though, cognitively-mediated elicitors also include objects that have physical existence in some form, but whose features primarily derive from a process of evaluation and interpretation. In some instances this may be as straightforward as recognition of a discrepancy between actuality and expectation. In others the process of evaluation may be more complex, as in the case of realising the future implications of a social transgression.

Other authors have varied in the extent to which the physical object provoking an emotion is regarded as separable from its cognitive evaluation. One line of argument that has been adopted is that any process of apprehending the object that provokes an emotion involves some type of evaluation. Thus Parkinson (1987) sees "cognitive appraisal of the situation" as a unitary component or variable. Harré (1986) specifies "belief in the existence of a suitable intentional object" (p.8) as one of his conditions of use for emotion words, and although he states that identification of such an object does not always involve cognitive work, the inclusion of the qualifier "suitable" implies evaluation.

On the other hand, Harris, Olthof, and Meerum Terwogt (1981), and Harris and Olthof (1982) distinguish between situational cues to an emotion, and mental cues, which include evaluations. These authors also provide empirical evidence for age-related differences amongst children in the extent to which such mental cues are identified, which lends some support to the argument in favour of a separation between evaluation and object.

In principle, it is possible to argue for a distinction between types of object in terms of the amount of evaluative work required to perceive the features that are relevant to emotion. Natural objects or elicitors, in the sense used by Lewis and Michalson (1983) would require relatively little evaluation (c.f. also Zajonc, 1980, and the idea of affective primacy here). Indeed, these authors propose innate emotion receptors, similar in structure to those outlined by McDougall (1908) in his discussion of the afferent component of emotion. In contrast, most types of cognitively-mediated objects would obviously require greater evaluation.

The central issue in the present context, though, is whether evaluative processes give rise to distinct classes of feature, and, if so, in what way. The crucial distinction, therefore, is whether or not the evaluation takes place at a conscious level, and hence whether the resultant object is perceived to be an <u>interpretation</u> of some event as opposed to the objective event itself. In other words, the evaluative process results in new types of feature when that process itself takes on figural properties. It would appear to be this type of distinction which was exhibited by children questioned by Harris et al. (1981).

Most authors have agreed with James (1892/1961) on the existence of a substantive component of organic change and corresponding experience of visceral sensation, with the latter providing any features relevant to discrimination of feeling state. Thus McDougall (1908) talks of a "complex of sensations that has significance or meaning for the animal" (p. 24), Parkinson (1987) refers to "internal reaction", Harris et al. (1981) to cues of "bodily reaction", Harré (1986) to "bodily agitation", and Lewis and Michalson (1983) to "evaluations of emotional state".

In all these instances the component identified is broadly the same aspect of the emotional process as that noted by James, although there are differences between the authors concerned as to the *content* of the experience. James (1892/1961) follows Darwin in describing in some detail the varieties of sensation accompanying fear, and McDougall (1908) implies the existence of a similarly rich array of features within experienced sensation. Harris et al. (1981) also seem to allow the possibility of a variety of features arising from bodily reaction. Bearing in mind Cannon's (1927, 1929) findings with regard to physiological change within emotion, however, Parkinson (1987) and Lewis and Michalson (1983) focus predominantly on sensation as experienced change in general level of arousal.

What the features of internal sensation associated with a specific quality of emotion consist of is to some extent a matter of empirical research. However, Lewis and Michalson (1983), in introducing a role for evaluation, raise the possibility that some experienced features of sensation owe more to attention and expectation than any direct effect of physical change. Adopting the same criterion as applied above in regard to features of the provoking object, features apparently relating to sensation might be classed as cognitive to the extent that their evaluative aspect is explicit.

A further difference between authors relates to the perceived degree of separation between experienced sensation and motor response. James (1892/1961), in regarding subjective state as arising from the experience of both these elements, tends to blur the distinction between them. Harris and Olthof (1982) also speak of behavioural and physiological reactions as one type of cue, although Harris et al. (1981) report responses in these two categories separately. McDougall (1908), however, makes a clear distinction between sensation and behaviour: the physiological changes which constitute the central or affective component, and which give rise to sensation, are unmodifiable through experience; whereas the behavioural or connative component is adaptable. A similar point is made by Lewis and Michalson (1983), who view behaviour as a distinct component because it is subject to social control.

It is in fact difficult in some ways to make a hard and fast distinction between sensation and behaviour. "Pure" sensation might be defined as that which is not externally visible (such as increased heart beat), and "pure" behaviour as that which is visible and which has no directly correlated sensation other than proprioceptive feedback (e.g. smiling). There still remain, though, instances such as shivering (in the context of fear), which appear to be marked by both internal sensation and visible movement. This does not, however, present real problems for a separation of sensation and behaviour into distinct classes of feature. It is clear for instance in the case of shivering that the behavioural and sensational aspects do constitute separate features, since it is only the former which would be apparent in another person. Thus the problem in such cases resolves to one concerning which class of feature is actually being referred to in usage of these terms.

There are two further issues in the literature with regard to behaviour as a discrete component or class of feature. The first of these is concerned with the question of whether facial expressions constitute a component in their own right, distinct from other types of behaviour. Lewis and Michalson (1983), on the one hand, include facial expression, posture, vocal, and locomotor behaviour within a single component of emotional expression. Parkinson (1987), however, classes "facial expressive response" and "overt behaviour" as separate variables, primarily on the basis of evidence regarding the innate patterning of facial expressions (see e.g. Ekman, Sorenson, and Friesen, 1969; Izard, 1971). Such evidence seems to suggest a distinction in terms of process at least.

Further consideration, however, tends to point to the conclusion that the distinction is ill-founded and of little functional relevance. Firstly, cross-cultural stability is only evident for a limited set of facial expressions, with others therefore presumed to be cultural in origin. Secondly, the use of loud vocalizations and stamping during displays of aggression in gorillas and chimpanzees, might be taken as evidence that behaviours other than facial expressions have an innate pattern. Thirdly, facial expressions and other behaviours characteristic of emotion are usually synchronized and occur at the same point of the emotional process.

Finally, although the micromusculature of the face renders it a source of fine information, there is no real evidence to suggest that it is functionally distinguished from other types of behaviour as regards the attribution of emotion. For instance, when we say that someone "looks upset", we are just as likely to be referring to their posture as to their facial expression. Moreover, the attribution of specific emotions to other species, such as cats and dogs, with much more limited facial musculature, must be based, to the extent that it depends on behavioural information, on grosser features than those of facial expression. The weight of the argument on this issue seems therefore to favour the position taken by Lewis and Michalson (1983).

The second issue regarding the behavioural component relates to the status of impulses towards a behaviour, and the corresponding question as to whether such impulses constitute features of emotional experience separate from those of actual behaviour, particularly where the latter is suppressed. This is not, in fact, an issue that has received much attention in the literature, and is not dealt with by any of the modern authors considered here.

McDougall (1908) makes some distinction between the "instinctive action" that results from an emotion, and the connative element, that consists of the "felt impulse to action" (p.29). In some instances, McDougall seems to regard this impulse as a mere energizing agent, and describes its usual form in animals as a "craving", which, if blocked, leads to intensified striving to perform the action. Impulses of this character, to the extent that they are separable from behaviour, would appear primarily to be a type of sensation, and would have features within this class.

Of a different order, however, are those impulses which McDougall refers to as of "more developed form...properly called desire or aversion" (1908, p.25). In these instances, there is the suggestion of a primarily cognitive condition that may exist prior to action, and which has as content the representation or realisation of a desired course of behaviour. It is exactly this element that is identified by Herbert Spencer, quoted by James (1892/1961): '"Everyone can testify that the psychical state... called anger consists of mental representations of the actions and impressions which would occur while inflicting some kind of pain"' (p.254).

Taking the same line of argument that was adopted above in discussing cognitive objects, evaluations of objects, and evaluations of sensations, these representations of possible behaviour may constitute a class of feature distinct from that of behaviour itself to the extent that their cognitive rather than actual character is made explicit. Such features would presumably be most apparent when, for one reason or another, the behaviour represented cannot be initiated.

Three discrete components of emotion can be isolated, then, each of which provides a corresponding class of features within emotion knowledge: the provoking object or antecedent, internal sensation, and behaviour. For each of these, further sub-sets of distinct features can be identified which relate to the operation of cognitive processes upon the more basic material. These features may be argued to constitute together a fourth class, mental states, comprised, at least in part, of awareness of mental representations of antecedents and of behaviour; and awareness of evaluations of antecedents, sensations, and, plausibly, behaviour, which may also be subject to cognitive appraisal.

The idea of such a class has, of course, been suggested by other authors, but its treatment has tended to be limited. For instance, Harris et al. (1981), and Harris and Olthof (1982), identify mental states as distinctive cues to quality of emotion, but provide little explicit definition of their content beyond a consciousness of specific feeling tone. Lewis and Michalson (1983) provide a more detailed discussion in defining the component they call "emotional experiences", but restrict this to evaluative and interpretative processes and their effects.

Whilst the discussion above serves to indicate more specifically the content of mental states associated with emotion, it may seem at first sight that the aspects identified form a somewhat heterogeneous set. However, they constitute a unified class of feature by dint of their dependency on an emergent awareness of mental processes. The common theme across all the types of mental state outlined is that it is through metacognition that the regularities inherent in the cognitive "underpinnings" of emotional processes gain the status of features in their own right.

This emphasis on awareness suggests one further theoretical extension to the range of sub-types of mental states that may also give rise to characteristic features viz. awareness of overall patterns or sequences of the cognitive activity taking place over time. Awareness of this kind would provide a cognitive parallel to the monitoring of physiological state necessary to perceive change in level of arousal (Lewis and Michalson, 1983). If such awareness could also serve to signal change in state, as a result of change in activity, it would tend to imply the availability of qualitative features within general cognitive activity, some of which at least may be associated with specific qualities of emotion (e.g. the continued reviewing of an eagerly anticipated event).

iii) Featural knowledge and regulatory activity

On this basis, then, we arrive at four classes of feature or components of emotion knowledge, with one of these, mental state, divided into four sub-classes: activation of representations of antecedents, and of behaviour, patterns of on-going mental activity, and evaluations of the significance of all other classes or sub-classes of feature. Knowledge of specific instances of differentiated features within any of the four main classes is presumed for the moment to be sufficient to permit recognition of exemplars of particular types of emotion and emotional episode. In this sense, the components of emotional experience provide discriminatory cues, knowledge of which forms the content of some form of identification procedure.

Before examining whether knowledge of these classes of features is adequate to serve prediction and causal understanding, it is necessary to consider the possibility that they do not entirely exhaust the types of information from which emotions may be identified. Various authors have isolated other aspects of emotional experience in addition to the four basic components already defined, which might also provide cues to specific qualities of emotion. For instance, Harris, Guz and Lipian (1985) examined children's knowledge with regard to the duration and intensity of feeling states; Harter (1983), knowledge of the simultaneity of feelings; and Harris et al. (1981), knowledge of strategies for the control both of expression, and of feeling. A further issue is whether positive and negative evaluations of objects or events have a primacy within experience, as argued by Mandler (1982), which is capable of providing featural qualities.

The question here is whether knowledge of these elements of emotion is reducible to knowledge of specific features within the four basic classes of antecedent, sensation, behaviour, and mental state; or whether they have emergent featural values of their own. For instance, the continuance of a particular emotion or emotional episode is presumably recognised on the basis of the extended presence of cues in any of the four basic classes that had permitted identification at onset. Whilst knowledge of duration implies awareness of continuation itself, and relative duration may in fact be used to differentiate between emotions (e.g. disappointment and grief), it is still dependent therefore on knowledge of the basic cues, and may be argued to be a special case of that knowledge. Knowledge of intensity of emotion may be regarded in the same light since it, too, would be built on knowledge of the basic classes of feature, and could simply be defined in terms of the persistence and temporal density of the various types of cue. Awareness of simultaneity of feelings would also not require any special knowledge, but would reflect the joint presence of cues typically associated with different emotions.

The position with regard to knowledge of control strategies is somewhat more complex. In one sense, such knowledge could be regarded as distinct from emotion knowledge itself, since it relates to activities that occur after the presence of a particular emotional state has been detected, and which are motivated by knowledge of the secondary reactions of self and other to that state. At the same time, there tends to be a complex temporal interaction between behavioural expression of an emotion and attempts to control that expression, either through masking its symptomatic qualities, or directly acting on its causal antecedents.

Possibly because of this contiguity, it is also true that coping responses can yield cues characteristic of the very emotion they are designed to obviate or conceal, such as, for instance, removing oneself from the presence of someone who has provoked anger, or maintenance of rigid posture to conceal the trembling indicative of fear. It is in fact debatable, given culturally prescribed display rules for emotion (Saarni, 1979), whether there is any functional distinction between positively sanctioned behaviours that openly express feelings (such as smiling) and those that conceal feelings; or between activities which maintain a positive emotion and those which curtail a negative one. In all cases, these constitute normative behaviour within an emotional episode. From this perspective, control strategies do not yield a separate class of feature within emotional experience, merely different instances of specific cue within the classes already defined, in particular those of behaviour and mental state.

In view of the fundamental relationship between emotion and valence, the question of whether positive and negative evaluations of events or objects provide a distinct class of feature is perhaps the hardest to answer satisfactorily. From one perspective, to the extent that such evaluations are consciously made, they could be considered to be simply instances of the more general sub-class within mental state discussed previously. This would effectively deny the primacy ascribed to them by Mandler (1982), since in addition to any featural qualities they may possess being dependent on emergent awareness, it would also equate them with the causal attributions that Weiner argues differentiate between shades of emotion <u>after</u> more basic outcome-related emotions, such as happiness and sadness, have been experienced (Weiner, 1985; Weiner and Graham, 1984). From this point of view, one would tend to value something positively because it made one happy rather than vice versa.

This would appear to be an inadequate account on its own, however, because even purely outcome-related emotions seem to be dependent, at least in part, on whether the outcome is positively or negatively valued (c.f. Stein and Jewett, 1986). Mandler argues, though, that such valuations stem from basic perceptions of the congruity or incongruity of an event, and stresses that these are a form of cognition which results from comparison between the event and schemata built up during prior experience. Thus even when positive and negative evaluations are not made consciously, they would be dependent on knowledge of the relevant object or event (except in the case of innate releasers), and so any resultant featural properties could be argued to fall within the basic class of antecedents.

There are good grounds, then, for arguing that the four basic components of emotional experience posited here do exhaust the types of discriminatory cue available for the recognition and identification of emotion. At the same time, though, knowledge of specific instances of each class of feature can be demonstrated to be insufficient in itself to serve any of the three basic regulatory activities. In the case of *identification*, this is because the appropriate category of emotion may be ambiguous on the basis of information about the specific value of a single class of cue (e.g. crying could indicate sadness or happiness, depending upon antecedent).

Similarly, although *prediction* and related inference drawing activities require generation of information of exactly the kind that would be provided by knowledge of the four components (e.g. specific behaviours), such inferences could not occur if that knowledge did not include specification of how instances of different classes of feature were related (e.g. what behaviour goes with what antecedent). Again, *causal understanding* also requires knowledge of the relationship between different features but in this case in terms of the mechanism or process that transforms one class of feature into another (e.g. how a specific antecedent results in a specific behaviour).

In addition to knowledge of the different cue types, then, the three regulatory activities require, as a minimum, knowledge of the established contingencies between different instances of featural regularity. In particular, the basic need to predict or guide the behavioural consequences of an event suggests that knowledge of relationships between antecedents and behaviour would be likely to be of high priority. Similarly, to the extent that the nature of intervening evaluations and other mental states can serve to account for why a person behaves in a specific way in reaction to an event, knowledge of the contingencies between antecedents, mental states, and behaviours should also be of importance.

It may be noted in addition that knowledge of the featural conjunctions that would serve prediction and prescription could further aid identification by disambiguating specific antecedents or behaviours, and providing a basis for differentiation between otherwise apparently similar emotional episodes. The closely related knowledge requirements of identification and prediction suggest that these two activities may become integrated simply as different stages in the type of schema-driven perceptual cycle of expectation and sampling described by Neisser (1976). More generally the functional necessity of encoding the conjunction between features, as well as the features themselves, indicates that emotion knowledge should be likely to be organised even at its lowest levels.

Finally, it must be noted that a problem arises with regard to questions of the relationship between feature-based emotion knowledge and use or comprehension of the emotional vocabulary. On the one hand, integrated knowledge of the discriminatory cues provided by the component experiences of an emotional episode would appear to provide a better basis for the regulatory activities than dimensional types of knowledge. However, its dependency on specific featural values makes it less clear what could be abstracted and generalised from this knowledge in order to allow the same emotion term to carry the same intension across a variety of different episodes. Thus any serious attempt to provide a feature-based account of the development of emotion concepts needs to address the issue of the nature and origin of the conceptual core, as well as detailing the acquisition and organisation of the more concrete aspects of emotion knowledge.

Smith and Medin (1981) suggest that the core content of different concepts may in fact vary in its degree of reliance on perceptual features. In the case of emotion concepts this indicates that either of two abstractive processes could apply. If the conceptual core tended to be more concrete in content, it would be likely to be built up via the abstraction of the prototypical features of episodes relating to different qualities of emotion.

If, on the other hand, it tended to be less reliant on perceptual features, the core content would be more likely to derive from the abstraction of relational values such as degree of congruity of episode to expectation, or level of behavioural activation, more in keeping with the dimensional approaches discussed previously. The evidence from studies of the latter type notwithstanding, the fact that emotion knowledge is likely to be organised to serve the three regulatory activities well in advance of any extensive process of abstraction suggests that the content of the conceptual core would be influenced by the structures that emerge from that organisation, and so would more probably be of a concrete, prototypical nature than a relational.

1.5 *Research issues*

The preceding sections outline something of the content and organisation of fully-developed emotion concepts that would be required by the three regulatory activities of identification, prediction or prescription, and causal understanding and explanation. Many aspects of such concepts, particularly those relating to organisation, remain subject to verification through empirical investigation. The conduct of this investigation from a developmental perspective is especially apt, not only because, as the general developmental philosophy has it, the process of change elucidates the character of the end product (Vygotsky, 1978); more specifically, such an approach allows the postulated functional influences on the acquisition of emotion concepts to be traced and unravelled with much greater ease.

From the developmental standpoint, then, espousal of the feature-based approach to the content of emotion concepts points to two research issues of priority:

i) What knowledge do children acquire during the course of development about the different classes of feature, and, more particularly, about the relationship between them? Given the emphasis on a functionalist theoretical perspective, one issue of importance within this global question concerns whether the progress of knowledge acquisition evidences direction by, or conformity to, the requirements of the regulatory activities identified above. An additional question relates to whether any general sequence of development that can be isolated informs models of how emotion knowledge is encoded from emotional experiences. Also of interest is the issue of whether there are aspects of the knowledge apparent at different stages of development which could form the basis for the distinction between emotions and non-emotional feeling states.

ii) What does children's usage of terms from the emotional vocabulary under controlled conditions reveal about the nature of the relationship between featural knowledge and those terms? Of particular interest here are questions with regard to the relationship between the knowledge organised to serve regulatory activities and any more abstract conceptual core indexed by emotion terms.

The next chapter addresses the first of these two issues, and reports data from a survey of children's knowledge about selected emotions and non-emotions between the ages of 5 and 11 years. Subsequent chapters outline some of the theoretical issues with regard to the relationship between featural knowledge and the comprehension and use of emotion terms, and report the results of a series of studies designed to test a model of this relationship in greater depth.

Chapter 2: The development of children's knowledge about emotions and non-emotions.

The feature-based approach to isolation of the components of emotion knowledge yields four fundamental classes of feature which define an emotional experience: the situational antecedents that provoke a reaction; the behavioural response to those antecedents (including expressive behaviours); patterns of bodily sensation that result from changes in physiological state; and accompanying types or patterns of mental activity. These last are divided into four sub-classes according to their focus of attention: activation of representations of situational antecedents; activation of representations of behavioural responses; global patterns of mental activity; and evaluations of the meaning of other classes of feature. Each class of feature is held to have, at least potentially, a value as a set of discriminatory cues, such that knowledge of which specific features within one or more of the classes are associated with different qualities of feeling permits the emotions of self or other to be recognised or actively identified.

At one level, questions about children's emotion knowledge at different ages could appropriately focus on which instances of specific feature within a class they have acquired knowledge of at what point in development. Such a detailed approach to the content of acquired emotion knowledge has, in fact, rarely been pursued: even in the case of facial expressions there has been a widespread tendency to focus on generic knowledge of, for example, "happy" expressions, or "sad" expressions, irrespective of the specific features of which these are comprised (e.g. Oster, 1981; Caron, Caron, and Myers, 1982; Michalson and Lewis, 1985). In studies which have dealt with knowledge of a variety of different antecedent situations (e.g. Gnepp, 1983; Reichenbach and Masters, 1983) emphasis has usually been placed on global measures of apparent knowledge across a series of items, and on age differences in these measures, rather than on differences between specific items.

One reason for the seeming lack of interest in knowledge of detailed features within the four classes is the methodological problem, encountered in many tasks, of a confound between the child's actual knowledge on the one hand, and the representativeness of an exemplar on the other, in determining whether knowledge of the quality of feeling signified will be evident in the child's responses. This problem is compounded by individual and cultural variability both in terms of what is known, and in terms of what might constitute a good exemplar of a known type of feature. Thus, in the interests of interpretability and generalizability of data, attention has typically been focused on children's knowledge of the broad classes of feature: i.e. on the point in development at which some knowledge of each of these emerges, and, further, on which is given greatest weight at different ages.

This approach has, in fact, proved revealing, and so, without losing sight of issues concerning knowledge of specific instances of feature, it is also taken as the basis for the principal questions addressed by this chapter, and by the study reported within it. Interest here is not, however, restricted simply to which classes of feature from emotional episodes children evidence knowledge of at different ages, but extends to their knowledge of how different types of feature interrelate to make up an episode, in line with the conjunctive emphasis required by the regulatory activities of identification, prediction, and causal understanding. It also encompasses the question of what emergent basis there might be in knowledge of the classes of feature, or of the relationships between them, for the universally appreciated, but ill-defined distinction between emotions and non-emotional feelings.

2.1 *Developmental change in emotion knowledge*

A number of studies have successfully demonstrated, using various methodologies, that children as young as 2 to 3 years have at least a rudimentary knowledge of the qualities of emotion associated with different situational antecedents (e.g. Trabasso, Stein, and Johnson, 1981; Bretherton and Beeghly, 1982), and with different facial expressions or other behaviours (e.g. Michalson and Lewis, 1985; Trabasso et al., 1981). Consistent with this, at least in part, Harris, Olthof, and Meerum Terwogt (1981), and Carroll and Steward (1984), using interview techniques, both found that children of 5 or 6 years of age tended predominantly to claim identification of personal emotional state via situational antecedents. In contrast, both these studies found that by the end of their first decade, children were more likely to identify the quality of their own emotional reactions by noting characteristic mental activity.

On this basis, Harris and Olthof (1982) conclude that somewhere between 6 and 11 years children become aware of the role of mental states in emotional experience, and start to regard it as a more reliable cue for the discrimination of feelings than either situations (which can be ambivalent) or behaviour (which is subject to social display rules). The implication, then, is that children's emotion knowledge is not built up simply by accrued experience of the specific instances of any type of feature associated with different emotions, but rather that knowledge of different broad classes of feature is acquired at different points during the course of development.

Unfortunately, if this is the case, then studies employing exactly the same methods as Harris et al. (1981), or Carroll and Steward (1984), may tell us little about the actual point at which knowledge of mental states emerges because children's responses here were made to a single question, or to a single question plus probe. Thus they might only indicate the class of feature which those at a particular age appear to regard as most important for identification. It is possible on this evidence, for instance, that younger children do have some knowledge of mental states in connection with emotion, but do not make much use of it, and so do not refer to it first.

On the other hand, though, the functionalist perspective suggests that children would tend not to be aware of mental states unless that awareness served some purpose, and, as noted above, Harris and Olthof (1982) provide good reasons why knowledge of mental states might indeed be of immediate use. From this it could be argued that if young children did hold knowledge of mental states they would quickly reveal this when questioned.

Both lines of argument are, in fact, problematic, because, as was outlined in Chapter 1, the basic regulatory activities entailed by functionalist approaches all require emotion knowledge that deals not just with instances of one specific class of feature, but also with the conjunctions between classes. In other words, to talk about the "most important" or "most dominant" type of cue with regard to identification of emotion may in itself be misleading. This is a point illustrated well by comparison of the findings of Gnepp (1983) and Reichenbach and Masters (1983) in a slightly different context.

Both the studies reported by these authors incorporated attempts to isolate whether children at different ages (4-, 7-, and 12-year-olds in Gnepp's study; 4- and 9-year-olds in that of Reichenbach and Masters) placed greater reliance on situational or expressive cues in making judgements of emotion. This was achieved by presenting information about episodes where the values of situational and expressive features were in apparent conflict (e.g. a child with a broken bike who is smiling). Cue preference was established by measurement of the number of judgements which were consistent with the situational features, and the number consistent with the expressive features.

Superficially, both studies revealed the same trend towards increased reliance on situational cues as children get older. Within this, though, there were some striking points of departure in the detail of the results. Gnepp found that 4-year-olds showed a significantly greater reliance on expressive cues, whereas older children revealed no significant preference one way or the other. Reichenbach and Masters, however, found no significant preference amongst their 4-year-olds, but a significantly greater reliance on situational cues amongst the older children.

Whilst Reichenbach and Masters admittedly used a sample which was broader-based in terms of social background, there is at least a suggestion that apparent preference for different classes of feature in the identification of emotion is as much a function of context and of the experimental material employed as of any shift in the knowledge held by children at different ages. This would further serve to explain the potentially contradictory dominance of situational cues in younger children's identification of personal emotion, as reported by Harris et al. (1981) and Carroll and Steward (1984), but reliance on expressive cues for their identification of the emotion of others, as reported by Gnepp.

It would be wholly consistent with these findings if, under more natural circumstances where different types of cue were congruent in value, children used multiple sources of information to confirm the emotional state indicated by each separate class of feature that they recognise, and in fact build up a more integrated comprehension of the sequence of events within an emotional episode. Tellingly, Gnepp (1983) found that, when asked, even 4-year-olds were usually able to reconcile apparently contradictory situational and expressive cues, and she concludes that this alone undermines the view that children centre on one kind of cue to emotion. The integrationist argument is also supported by studies reported in Borke (1971), and Michalson and Lewis (1985), which have shown children as young as 3 years to be capable of making appropriate matches between antecedents and facial expressions.

In fact, the data from a large-scale study summarised by Scherer (1986), which employed more extensive questioning with regard to emotional experience, show adults to hold and make use of knowledge of all the four basic classes of feature and of interrelationships between these. Similarly detailed questioning of children would seem to be called for in order to obtain a more balanced picture not just of which cue types they typically have knowledge of at different ages, but also of what they know about how each class of feature fits into the structure of an emotional episode.

As discussed above, previous studies tend to indicate that children possess knowledge of antecedents and behaviour from a relatively early age, and that knowledge of mental states is acquired at a later point in development. The point at which knowledge of internal sensations emerges is less clear. Harris et al. (1981) did find, though, that 6-year-olds referred to bodily sensations of this kind less often than 11- and 15-year-olds, where frequency of reference was second only to that of mental states. The implication is that children acquire knowledge of internal sensations later rather than earlier in development.

The precise characteristics of any order of acquisition of knowledge about the four broad classes of feature can, of course, be established by empirical investigation. If this research is to be more than merely descriptive, however, some theoretical account of the basis for any such order is required. From the perspective of this thesis it would also be desirable to construct and test an account which took into consideration the potential influences of the regulatory activities on knowledge acquisition.

One account, or more properly, set of accounts that meet this criterion is outlined by Harris and Olthof (1982), as an extension of an idea proposed by Skinner (1971). It is assumed here that the child is actively engaged, firstly, in attempting to understand the referents of emotion words, and secondly, in trying to understand or explain behaviour, both of self and of others. From this viewpoint, children first of all acquire knowledge of the two external classes of features, antecedents and behaviour, because these are the most obvious referents of the emotion terms used by other people. It is argued that antecedent and behaviour are, at this point, understood as a type of stimulus-response sequence. Attention becomes focused on mental states at a later stage after various inadequacies in externally-based understanding become apparent, in particular the presence or persistence of emotional behaviour in the absence of any appropriate antecedent.

Harris and Olthof suggest three related models of ways in which awareness of mental states could become more central. The first of these, the <u>solipsistic</u> model, is based on self-observation, which leads the child to a gradual consciousness of mental activity accompanying antecedents and behaviour. This consciousness becomes focal when the child realises that his or her thoughts about an antecedent are more reliably associated with emotional behaviour than the antecedent event itself. In the <u>behaviouristic</u> model the child focuses on observation of others, and, noticing emotional behaviour to occur sometimes without an obvious provoking situation, realises that it must be the result of a persisting mental state. In the <u>sociocentric</u> model the community at large makes verbal references to emotional states, some of which references, the child begins to notice, occur when no external referents are apparent. Here, then, discussion of emotion, some of which explicitly mentions patterns of thought, gradually focuses the child's attention on inner mental states as more consistent referents for emotion terms than a variety of antecedents and behaviours (c.f. also Nelson, 1983, and the derivation of stable mental objects from variable experiences). Harris and Olthof draw no firm conclusions on which of these three models is operative, but present indirect evidence that favours a conjunction of the solipsistic and the sociocentric.

An alternative account, based on Piaget's work on causality (Piaget, 1972), focuses not on the child's attempts to find referents for emotion terms, but on a more basic organisation of experience via observation of the regularities and contingencies that the child is presented with day to day. An additional element central to this account is the idea of a differential availability of information about different classes of feature, not just across external and internal classes, but also at different points in development, as a direct outcome of regulatory requirements.

Following Piaget, it is assumed that causal understanding or explanation is a development that rests on prior isolation of the key coincident regularities within an event, since it is the apprehension of a process which connects these that constitutes any notion of causality. Thus, in the context of emotion, as elsewhere, it is knowledge of the basic regularities that define an episode, and the contingencies between them, which children will acquire first. This inevitably results in a priority for knowledge of antecedents and behaviour, for three reasons. Firstly, information about regularities in these two classes of feature is present externally, hence it provides the objective signs which mark out that an episode has actually occurred. Secondly, such information is available from both self and others, whereas direct information about internal sensations or mental states could only come from oneself. Knowledge will tend to be built up most quickly in the areas where relevant information is most frequently encountered. Thirdly, and most importantly, it is exactly knowledge of the contingencies between antecedents and behaviour which is of greatest salience for the child, since it is pertinent both to prescriptive control of personal behaviour and to prediction of the behaviour of others.

As described in Chapter 1, the infant begins life in a condition where innate releasers trigger arousal and, through this, innate behavioural responses. Within the first year, though, a point is achieved where arousal is triggered instead by activation of representations of antecedents contained in affective-cognitive structures, this activation occurring on apprehension of related stimulus information. In this way reactions to an event are guided by previous reactions to that or similar events. Subsequently, representations of behaviour, associated with known antecedents via social referencing and more general observation of the responses of self and others, become capable of being directly activated through the activation of the representations of those antecedents. To the extent that antecedent-behaviour sequences built up in this way generalize, their activation allows both anticipation of the behaviour of others, and cognitive determination of personal behavioural response, depending on context. Such activation is presumed to still trigger arousal as well, but in the case of personal response this would now serve to energize behaviour rather than influencing its form.

At this stage, then, there are for the child three "knowable" components of emotional experience, or three classes of feature: antecedents, behaviour, and arousal, or rather the subjective internal sensation that it produces. All of these, and the contingencies between them, can be represented mentally, although, as argued above, the focus of attention will tend to fall more on antecedents and behaviour than on internal sensation. However, since these representations, particularly those of antecedents and behaviour, have now effectively begun to control personal emotional experience, they must be activated during the course of an emotional episode. This activation of representations therefore becomes potentially a further knowable component of the experience of emotion viz. mental state.

This component, or class of feature, can be divided into three sub-classes depending on the type of activation of which the child is aware: i.e. representations of antecedents, representations of behaviour, and wider patterns of internal activity, such as recurrent activation. One obvious function facilitated by this metacognitive awareness of mental activity is the deliberate comparison between representation and actual experience, and selection of appropriate behavioural response. But once this type of conscious evaluative function is established, it too becomes a potentially knowable fourth sub-class of mental state.

There are two main differences between this account and that put forward by Harris and Olthof (1982). The first is that here no precise set of circumstances triggering awareness of mental state is postulated. It is presumed that the socialization of emotional experience will, in our culture at least, tend inevitably to produce some degree of such awareness during the course of development, because of its adaptive value. Emergence of awareness might be accelerated, though, under circumstances where the child encounters and is compelled to acknowledge a considerable mismatch between reality and the content of mental activity.

The second difference relates to predictions about the order in which knowledge of each class of feature is acquired. Both accounts suggest knowledge of antecedents and behaviour is acquired first, with knowledge of mental states coming later. However, they depart from each other over the point in the sequence at which knowledge of internal sensation should become evident. Whilst not a position they explicitly adopt themselves, all three of Harris and Olthof's models imply that awareness of internal sensation should arise in the same way as awareness of mental state. Thus knowledge of the two components should tend to be acquired at the same time, or with internal sensation later than mental state in the case of the sociocentric model, since physiological activity would be less likely to be explicitly discussed than mental activity.

The Piagetian account, on the other hand, suggests that knowledge of internal sensation would arise after knowledge of antecedents and behaviour, because it is less salient and information about it is only available from personal experience; but <u>before</u> knowledge of mental states, because it is present in experience from infancy, whereas mental states only emerge as knowable aspects of emotional experience at a later point. The Piagetian account also provides a specific prediction about the relative point of emergence of knowledge of the different sub-classes of mental state. Knowledge of the activation of representations of antecedents and behaviours, and of general mental activity should arise prior to knowledge of evaluative activity since the first three stem from metacognition, but awareness of evaluations is, in this account, meta-metacognitive.

As regards knowledge of the contingencies between different classes of feature, both accounts suggest an early focus on the links between antecedents and behaviour, with older children showing a greater tendency to consider mental states and possibly internal sensations as intervening variables in more extended sequences. Both types of sequence would not only support the regulatory requirements of unambiguous identification and prediction, but would also constitute the most parsimonious method of encoding information about emotional episodes which preserves this in a form isomorphic to the actual nature of the majority of experiences. Moreover, since mental states and the physiological activity that produces sensation constitute processes that connect antecedent and behaviour, questions arise regarding the relationship of knowledge of sequences that contain these cues to causal understanding. Detailed consideration of this issue is left for the moment, however, to be dealt with at a subsequent point.

2.2 *Differences between knowledge of emotions and non-emotions*

Thus far attention has been restricted to the issue of what types of knowledge might go into the make-up of developing concepts of emotion. Four basic classes of feature have been identified, and a possible order of acquisition of knowledge of these, and of their interrelationships, outlined. However, Bretherton and Beeghly (1982), in a study of 2-year-olds' verbal references to internal states, isolate six different types of state, of which emotion is only one. It is a question of no small degree of interest as to whether emotions and emotion knowledge are in some way uniquely specified that enables them to be distinguished from other internal states, particularly other types of feelings.

As Hinde (1972) notes, there is a widely understood distinction between emotions and feelings such as tiredness or hunger, which Bretherton and Beeghly class as physiological states, but which will be referred to subsequently as non-emotions. Rating studies, for instance, have found that these feelings are generally scored as poor exemplars of emotions (see e.g. Tiller, 1984), which indicates a considerable degree of consensus as to the judgement that they are a different type of state. Yet the basis for the distinction has proved difficult to pin down.

The difficulty may be attributed in part to a confusion between whether what was sought was a classical scientific definition of emotions and non-emotions, or a probabilistic lay categorization scheme with fuzzy boundaries. However, even when the focus is placed clearly on the basis for the distinction understood by people in general, problems remain, because, in particular, knowledge of the four classes of feature which have been argued to define emotions could equally well define non-emotions (e.g. yawning after staying up late identifies tiredness, in the same way that smiling after being given a present identifies happiness).

Accepting this to be the case, the question becomes one of whether there are perhaps more subtle differences between knowledge of emotions and of non-emotions which give rise to the perceived distinction. One possibility of course is simply that there are differences in the content of the features of each class which are associated with emotions on the one hand, and non-emotions on the other. At some level this is certainly true, otherwise there could not be any basis at all for discrimination. This is unlikely to be the sole difference, however, since it would not provide any more distinction between emotions and non-emotions than between different qualities of emotion, unless one is prepared to argue that there is a greater similarity between, say, smiling and crying than between smiling and yawning.

A more promising possibility is that different classes of feature are of differing degrees of salience within knowledge of emotions and non-emotions. Bretherton and Beeghly (1982) provide evidence that is not only consistent with this, but which also suggests that it may be so from a very young age. These authors report that, at 28 months, children make significantly more causal statements (i.e. references to antecedents) about emotions than about non-emotions, although they make roughly equal use of words for each type of feeling. This is, of course, well before the term "emotion", as a superordinate category, is likely to be known.

Whilst it must be acknowledged that this difference could simply be a short-lived reflection of different adult usage of feeling terms (see Dunn, Bretherton, and Munn, 1987, on the relationship between mother and child speech with regard to feelings), it could also stem from genuine experiential differences between emotions and non-emotions. One difference which could give rise to the findings reported by Bretherton and Beeghly, and which is particularly plausible in the light of previous discussion of the knowledge required by the regulatory activities, relates to the degree of direct contingency between antecedents and behaviour.

In the case of emotion, changes in state tend to be marked by sudden shifts of behaviour contingent upon some event. The need to be able to rapidly anticipate such behavioural shifts places a very high salience on knowledge of the typical conjunctions between antecedent and behaviour. Non-emotions, on the other hand, tend to be more gradual changes in state which result from a situation that obtains over a period of time (e.g. sustained activity, or not eating). Thus behavioural markers would be less directly contingent upon antecedents, which would, in turn, be of less salience for identification of the feeling because of their weaker relationship to onset.

Since identification at onset would still be of personal regulatory importance, though, the implication is that other classes of feature may have correspondingly enhanced salience. This may be especially true of internal sensations, which, during an episode, would provide the only fine source of information about state which would be available prior to spontaneous behavioural expressions such as yawning.

A further corollary of differences in feature salience would be that knowledge of the relationships between features would be expected to emphasise different types of sequence to reflect differences in the structure of emotional and non-emotional episodes. For non-emotions, knowledge of the contingency between sensation and behaviour could provide an important basis for prescriptive control of personal response.

If this account is correct, then, on the basis of Bretherton and Beeghly's evidence, there should be indications of greater reliance on antecedents as a cue for emotions than for non-emotions throughout the period between 5 and 11 years when the fundamentals of adult emotion knowledge seem to be established. There should also be correspondingly greater reliance on internal sensation as a cue to non-emotions, and greater focus here on its relationship to behaviour. To date, however, little attention has been paid to knowledge of non-emotions at any age, let alone to a direct comparison with emotion knowledge, and so these possibilities await empirical investigation.

Experiment 1

Taking the issues raised in the preceding sections as a point of departure, the study reported below was designed to gather evidence relevant to the predictions that have been outlined with regard to, firstly, the order in which knowledge of the four basic classes of feature is acquired; secondly, the development of knowledge of the relationship between those features; and thirdly, differences between knowledge of emotions and non-emotions in the emphasis on specific classes of feature. Using an extended version of the structured interview employed by Harris et al. (1981), children aged 5, 8, and 10 years, from a wide range of social and ethnic backgrounds, were questioned as to their knowledge of the antecedents, behaviours, internal sensations, and mental states associated with each of three emotions and three non-emotions.

The three age groups used were selected to cover the range during which, on the basis of previous studies, the greatest changes in emotion knowledge appear to occur. All children were questioned with regard to the same three emotions ("happy", "sad", and "scared"), and the same three non-emotions ("wide-awake", "tired", and "hungry"). This choice of feelings permitted a representative range to be covered whilst maintaining a balance between emotions and non-emotions in terms of positive ("happy" and "wide-awake"), diffuse negative ("sad" and "tired"), and focused negative ("scared" and "hungry") feelings. "Focused" and "diffuse" are used here to define a distinction between feelings which have more specific or less specific adaptive goals.

Tiller (1984) provides evidence that all three emotions are considered by adults to be very good exemplars of that general category of feeling states (all were ranked within the top ten out of 418 feelings), and that all three non-emotions are considered to be very poor exemplars (all were ranked within the bottom thirty). Ridgeway, Waters, and Kuczaj's (1985) receptive and productive norms for feeling terms show that five of the six items used ("happy", "sad", "scared", "tired", and "hungry") are almost universally known and used by children at age 5 (on average 99% of children know these terms, and 92% use them). Corresponding data are not available for the sixth term, "wide-awake".

For each feeling, the objectives of the interviews were threefold: firstly, to ascertain whether a child had any knowledge at all of instances of each class of feature; secondly, to see what knowledge of the connections between different classes of feature were revealed by his or her responses; and thirdly, to record the content of all instances of feature referred to by the child. Interview transcripts were subjected to a rigorous content analysis to identify any consistent patterns across feelings in terms of which cue types were mentioned by different age groups, and how these were related to each other; and also any consistent differences between emotions and non-emotions. This material provided the basis for tests of the main predictions.

Whilst the focus of the study was on these more general questions, detailed inspection of the content of references to features in each class was also carried out. This was done in order to ascertain whether there were any emergent sample-wide patterns in knowledge of specific features which could further inform models of the acquisition and organization of emotion knowledge.

Method

Subjects

A total of 96 children participated in the study. These were in three age groups, 5-, 8-, and 10-year-olds, with 32 children (16 girls, 16 boys) in each. Mean ages for each group were 5 years 6 months (range 4,11 to 6,6), 8 years 4 months (7,10 to 8,8), and 10 years 11 months (10,2 to 11,7) respectively.

In order to sample as wide a range of backgrounds as possible, children were taken from three primary schools, one in an affluent area of West London, a second in a mixed area of Glasgow, and the third in a relatively deprived area of South London. Each school contributed roughly equal numbers to each of the three age groups.

The ethnic composition of the sample was also varied: although the majority of children were from West European backgrounds, each age group also included a number of Afro-Caribbean and Asian children. It was established beforehand from class teachers that all children participating in the study had a good command of English.

Material

The interview schedule was an extended version of that used by Harris et al. (1981). Children were asked the same six basic questions for each of the three emotions ("happy", "sad", and "scared") and the three non-emotions ("wide-awake", "tired", and "hungry") in turn. The form of these questions was as follows:

(1) Can you think what it's like to feel x?

(2) Can you tell me about a time when you feel x?

(3) When you feel x, how do you know you feel x? What makes you notice it?

(4) Do you feel anything inside you when you feel x? What do you notice?

(5) Suppose that you're with a friend or someone else, could it ever happen that you feel x, but they don't know that you feel x? How could that happen? *OR* Why not?

(6) How would someone else know that you feel x? How would you know that they were feeling x?

The six questions were asked in the order given above for all feelings, with follow-up questions, where necessary, in order to clarify responses.

Of these questions, three were the same as those used by Harris et al. (questions (3), (4), and (5))[1]. The additional three questions were selected on the basis of pilot work to complement these and extend the scope of the information elicited. The intention was to provide a range of opportunities for the child to retrieve knowledge about the different types of cue, by asking a mixture of general and more targeted questions. Thus questions (1) and (3) constituted general probes for knowledge of features, whilst question (2) focussed more explicitly on antecedent situations, question (4) on internal sensations, question (5) on mental states, and question (6) on behavioural expressions.

1 NB Harris et al. used a question of the same form as question (4) as a probe after their main identification question, which had the same form as question (3) here. Their parallel to question (5) was subsidiary to identification, and was used to explore knowledge of the link between state and expression.

Specific questions with regard to knowledge of the contingency between classes of feature were not asked because of difficulties in finding a form of words that would be comprehensible to the younger children without being leading. Instead, knowledge in this area was to be gauged from spontaneous reference to the relationship between cues during the course of responses to other questions.

Whilst the six basic questions provided the structure for each interview, it was anticipated that children might sometimes express knowledge of the different classes of feature in response to any of the questions asked. In general the aim of each interview was to conduct a relatively comprehensive survey of the child's most accessible knowledge about each feeling. With this end in mind, children were encouraged to talk freely in response to all the questions.

Procedure

Children were interviewed separately in a quiet location within schools. Due to the length of time taken to run through the interview schedule for all six feelings, the 5- and 8-year-olds were questioned in two sessions to prevent fatigue. These sessions dealt with three feelings apiece, and took place one or two days apart. The 10-year-olds were questioned on all feelings within one session.

The order in which feelings were discussed was systematically varied across children, with two restrictions:

(i) all three emotions or non-emotions were never blocked together;

(ii) the two positive ("happy" and "wide-awake"), diffuse negative ("sad" and "tired"), or focused negative feelings ("scared" and "hungry") were never dealt with consecutively.

At the outset of the first (or for the 10-year-olds, only) session, children were told that they would be asked some questions to do with different feelings, but that there were no right or wrong answers to these questions, and they were just to reply with what made sense to them. The 5- and 8-year-olds were told that because there were quite a few questions they would be seen twice in order to get everything done.

Each child was then asked to give some examples of feelings in order to establish an understanding of the general area for discussion. Children who failed to respond appropriately at first were told that what was meant were "things like feeling happy, or feeling tired"; they were then encouraged to give other examples of feelings. After this, children were informed of the name of the first feeling they were to be questioned about, and the interview proper began.

The 5- and 8-year-olds' second session began with a reminder of the type of things they had been questioned about in the first session. They were then told that they were going to be asked some more questions, this time about different feelings, and the interview proceeded as before.

For the 5- and 8-year-olds, each of the two sessions lasted between 10 and 15 minutes. The single session for the 10-year-olds lasted for 25 to 30 minutes. All sessions were tape-recorded using a portable cassette recorder with built-in microphone. Children were told that this was to give the interviewer something to remind him afterwards of what they had said, and that they should just try to forget it was there. Each child's interview was transcribed in its entirety for subsequent analysis.

Missing data

There were no instances of children refusing to complete any of the interview sessions. However, due to a tape-recorder malfunction, the responses of one 10-year-old girl to the questions for "scared" were lost.

Coding of data

The transcripts of children's responses for each feeling were scored separately on the basis of coding schemes detailed in the following sections. As a check on the reliability of the scoring procedures, a randomly selected 25% of transcripts from each age group were independently coded by two trained judges. Inter-judge agreement was uniformly high, at 98% overall, with a range between 96% and 98%.

Results and Discussion

Analyses

Analysis of the data focused in turn on each of six areas. These are briefly outlined below in the order in which results from each set of analyses are subsequently reported:

(a) The first stage of analysis examined the percentages of children in each age group who showed knowledge of some instance of each of the four basic classes of feature (antecedent situations, behavioural expressions, internal sensations, and mental states) associated with the six feelings. The object here was to identify any stable age-related patterns of response consistent with acquisition of knowledge of different classes of feature at different ages; and also to pinpoint any differences in patterns of response between emotions and non-emotions.

(b) Following this, the observed frequencies of the different possible combinations of known cue types found within individuals' responses were tested more rigorously, to ascertain whether these were in line with the order of acquisition predicted by the Piagetian account and the distribution this entails.

Subsequently, the content of children's references to the four cue types for different feelings was inspected in more detail in order to identify any emergent patterns:

(c) References to antecedents and behaviours were examined for any age or distributional effects on the frequency with which specific instances arose; and also for any qualitative differences between emotions and non-emotions.

(d) References to internal sensations for emotions and non-emotions were analysed with respect to differences in the extent to which specific patterns of autonomic activity were described.

(e) The mental states referred to for emotions and non-emotions were coded in terms of the sub-classes previously defined, and then analysed with regard to differences in the frequencies of each of these across age groups and feeling types. Of specific additional interest here was the question of whether these frequencies were consistent with the order of emergence of different mental cues that the Piagetian account predicts.

(f) Finally, the frequency and characteristics of children's spontaneous descriptions of the contingencies between different cue types were analysed in the light of the predicted age-related changes in knowledge of the structure of emotional episodes, and differences in contingency salience between emotions and non-emotions.

Statistical analyses of the data were in general item- rather than subject-based. The decision to use item analyses was taken because subject's scores essentially took the form of a record of the presence or absence of different categories of response for each of the six feelings; in other words, the data were both nominal scale, and consisted of multiple observations within-subject. The assumption of independence of each observation required by conventional approaches to the analysis of nominal data, such as the chi-square test, would have precluded direct comparison between different feelings or categories of response, and necessitated unwieldy multiple analyses.

This constraint was avoided by the use of procedures in which each specific feeling was taken to constitute an item, and the cross-sample frequencies of responses within the categories of interest formed dependent variables on which those items were measured. For these analyses Feeling Type (emotion or non-emotion) was a between-item factor, and Age Group and Category Type (as appropriate) were within-item factors.

A further advantage of this approach was that it treated the feelings as random rather than fixed effects, so enhancing generalizability, and avoiding the "language as fixed-effect fallacy" detailed by Clark (1973).

Knowledge of the basic classes of feature

For each feeling children were credited with knowledge of one of the four basic types of feature or cue if they had made at least one reference of an appropriate kind at any point during the course of questioning for that feeling. The criteria which responses had to meet in order to be counted as a reference to a given cue type are outlined below:

1) **Antecedent situations (A)** - The child had given a description, full or partial, of a situation likely to provoke or lead to the feeling, or in which the feeling might be likely to occur. References to dreams were included here, on the basis of younger children's tendency to regard dreams as external (Piaget, 1929), unless specific mention was made of their mental aspect (see below).
2) **Behavioural expressions (B)** - The child had referred to any behaviour associated with the feeling, including facial

expressions, which could serve to communicate that feeling to another. Included here were references to sensations which would have a visible element (e.g. shivering); behaviours which would, although part of a strategy for control of the feeling, indicate its nature (e.g. splashing water on one's face when tired); references to verbal communication of the feeling; and references to "tummy rumbling" where communication to another was explicit.

3) **Internal sensations (I)** - The child had described, or referred to, any bodily (as opposed to mental) sensation or change associated with the feeling which would <u>not</u> be externally visible. Statements which indicated awareness of bodily organs (e.g. heart, stomach) were given credit whether or not they elaborated the nature of the sensation that provoked such awareness. References to the brain or head which did not specifically mention mental states or processes were included here.

4) **Mental states (M)** - The child had referred to patterns of thought or mental processes associated with the feeling e.g. "thinking about good things", "you know that you've done something bad", "you can't stop thinking about it", "feel like..." or "want to..." followed by a behaviour, "wish that..." followed by a situation. Included here were bald references to "mind", and references to dreams if their mental aspect was explicitly mentioned.

As well as simply noting whether or not a child had demonstrated knowledge of each cue type for a feeling, a record was kept of the content of all the codable references to cues which they had made during the course of questions for that feeling. This provided the basis for the subsequent more detailed analyses of knowledge of the different cue types.

Table 2.1 shows the mean percentage of children in each age group who were credited with knowledge of each cue type across the three emotions and across the three non-emotions (raw percentages for each feeling are presented in Appendix 1.1). Values for the emotions in the 10-year-old age group are weighted to take into account missing data from one subject (see p.75).

The percentages of children credited with knowledge in each category for the different feelings were analysed using a mixed-model ANOVA, with Feeling Type as a between-item factor, and Age Group and Cue Type as within-item factors. This analysis revealed significant main effects for Age Group ($F = 264.09$, d.f. = 2,8, $MSe = 22.97$, $P < .001$), and for Cue Type ($F = 39.36$, d.f. = 3,12, $MSe = 154.43$, $P < .001$), but not for Feeling Type.

The significant effect of Age Group confirmed the presence of a general trend, apparent in Table 2.1, towards an increase with age in the percentage of children referring to all types of cue, for both the emotions and the non-emotions. Pairwise comparisons of overall means for the three age groups were made using Dunn's Multiple Comparison procedure, which adjusts the significance level in a conservative direction, in line with the Bonferroni inequality (see Kirk, 1968, pp.79-81). These comparisons showed that the overall mean percentage of 8-year-olds referring to the different cue types was significantly higher than for the 5-year-olds (70% and 47% respectively; tD (2 comparisons; 8 d.f.) = 16.87, $P < .01$); and also that the mean for the 10-year-olds (77%) was in turn

Table 2.1 Mean percentage of children in each of three age groups (n = 32) credited with knowledge of each of four cue types, for emotions (E), non-emotions (NE), and across all feelings.

	Cue Type											
	Antecedent Situation			Behavioural Expression			Internal Sensation			Mental State		
Age Group	E	NE	All	E	NE	All	E	NE	All	E	NE	All
5-year-olds	77	61	69	56	61	59	42	49	45	17	13	15
8-year-olds	92	75	83	86	91	90	64	77	70	44	35	40
10-year-olds	87*	72	80*	87*	91	89*	67*	86	77*	66*	60	63*
Mean across Age Groups	85	69	77	77	81	79	57	71	64	42	36	39

*Weighted to take into account missing data from 1 subject for 1 feeling

significantly higher than for the 8-year-olds (tD (2;8) = 5.09, $P < .01$).

Similarly, the significant main effect for Cue Type confirmed the existence of overall differences in the percentages of children who had demonstrated knowledge of each cue. Multiple comparisons revealed that whilst the cross-sample mean percentage of children with knowledge of antecedent situations was not significantly different from that for behavioural expressions, the combined mean across these two cue types was significantly higher than those for both internal sensations (tD (4;12) = 3.90, $P < .01$) and mental states (tD (4;12) = 10.85, $P < .01$). The mean percentage for internal sensations was found in turn to be significantly higher than that for mental states (tD (4;12) = 6.02, $P < .01$).

The analysis of variance also revealed a significant interaction between Age Group and Cue Type ($F = 5.37$, d.f. = 6,24, $MSe = 77.87$, $P < .005$). Follow-up tests of simple main effects showed a significant effect of Age Group within all four types of cue (for antecedent situations, $F = 20.81$, d.f. = 2,8, $MSe = 16.22$, $P < .005$; for behavioural expressions, $F = 27.56$, d.f. = 2,8, $MSe = 66.44$, $P < .001$; for internal sensations, $F = 26.63$, d.f. = 2,8, $MSe = 61.86$, $P < .001$; and for mental states, $F = 31.27$, d.f. = 2,8, $MSe = 112.06$, $P < .001$). Significant effects of Cue Type were similarly found within all three age groups (for the 5-year-olds, $F = 38.42$, d.f. = 3,12, $MSe = 85.92$, $P < .001$; for the 8-year-olds, $F = 24.60$, d.f. = 3,12, $MSe = 118.36$, $P < .001$; and for the 10-year-olds, $F = 6.63$, d.f. = 3,12, $MSe = 105.89$, $P < .01$).

Further examination of mean percentages indicated that the significant interaction of Age Group and Cue Type was attributable in general to non-uniform increases with age in the percentage of children who demonstrated knowledge of each cue type. Multiple pairwise comparisons found the difference between the 5- and 8-year-olds to be significant for all four cue types (for antecedent situations, $tD\ (8;32) = 3.10$, $P < .05$; for behavioural expressions, $tD\ (8;32) = 6.45$, $P < .01$; for internal sensations, $tD\ (8;32) = 5.33$, $P < .01$; and for mental states, $tD\ (8;32) = 5.30$, $P < .01$). In contrast, of the differences between the 8- and 10-year-olds, only that for mental states was significant ($tD\ (8;32) = 5.15$, $P < .01$).

The implication of these results is that the percentages of children with knowledge of antecedent situations, behavioural expressions, and internal sensations, in general reached a peak by

8 years of age, but that the percentage with knowledge of mental states continued to rise until at least 10 years. This is borne out for the most part by comparison of the mean percentages for each cue type within the separate age groups. Amongst the 5-year-olds a clear majority of children showed knowledge of antecedent situations and behavioural expressions across the six feelings, a sizeable minority showed knowledge of internal sensations, but only a small percentage revealed knowledge of mental states. In the last instance, the mean is in fact inflated by the percentage of children who referred to mental states for "scared", which at 37% (see Appendix 1.1) amounted to more than three times the mean percentage across the other five feelings (11%). Within this age group significant differences were found between the mean across antecedent situations and behavioural expressions (combined in view of the lack of overall differences between these cues) on the one hand, and those for both internal sensations ($tD\ (12;36) = 3.62$, $P < .05$) and mental states ($tD\ (12;36) = 9.62$, $P < .01$) on the other. The difference between the means for internal sensations and mental states was also significant ($tD\ (12;36) = 5.19$, $P < .01$).

Amongst the 8-year-olds the size of the majority who showed knowledge of antecedent situations and behavioural expressions increased to near ceiling levels, a sizeable majority showed knowledge of internal sensations, but still only a minority exhibited knowledge of mental states. In this group there were again significant differences between the combined mean across antecedents and behaviours and that for mental states ($tD\ (12;36) = 9.15$, $P < .01$); and between internal sensations and mental states ($tD\ (12;36) = 5.22$, $P < .01$). The difference between the combined antecedent/behaviour mean and that for internal sensations just achieved statistical significance ($tD\ (12;36) = 3.11,\ P \approx .05$).

Within the 10-year-olds there was no real change from the 8-year-olds in the mean percentages of children who showed knowledge of antecedents and behaviours, and there was a marginal increase in the percentage who revealed knowledge of internal sensations. A majority now showed knowledge of mental states, but not at the level of the other three cue types: the only significant difference found here was between the combined mean for antecedents and behaviours and that for mental states ($tD\ (12;36) = 4.21,\ P < .01$).

In general, then, most 5-year-olds have knowledge of antecedents and behaviour, whereas somewhat fewer have knowledge of internal sensations, and even less have knowledge of mental states. By 8 years of age the number of children with knowledge of internal sensations has almost caught up to the number with knowledge of antecedents and behaviour, which is at ceiling. The number with knowledge of mental states lags behind, however, and has still not reached ceiling at 10 years. This data can be viewed as a series of snapshots of the development of a heterogeneous population that progresses in the same way, but at different rates. From this perspective it is clearly consistent not only with the basic idea of acquisition of knowledge of different classes of feature at different stages of development, but also with the order of acquisition predicted by the Piagetian account of this process.

This pattern of increase across the age groups in the percentage of children with knowledge of the different cue types can be seen from Table 2.1 to hold broadly for both the emotions and the non-emotions, but with some differences between the feeling types, centred in particular on antecedent situations and internal sensations. For both emotions and non-emotions the percentages of children who made references to these two cue types rose to more-or-less stable levels by 8 years of age, but at a higher level for the emotions in the case of antecedents, and for the non-emotions in the case of internal sensations.

The initial analysis of variance confirmed the presence of these differences. The lack of an overall main effect of Feeling Type, or interaction with Age Group, indicated that there was no tendency for the percentage of children credited with knowledge of cues in general to rise at a different rate, or to different levels, for the emotions and non-emotions. In other words, children at all ages had approximately the same amount of knowledge about emotions and non-emotions. Cross-sample differences in emphasis between the feeling types on specific cues were signalled, however, by a significant interaction between Feeling Type and Cue Type ($F = 4.66$, d.f. = 3,12, MSe = 154.43, $P < .025$). Tests of simple main effects showed significant differences between the cues for both the emotions ($F = 22.39$, d.f. = 3,12, MSe = 154.43, $P < .001$) and the non-emotions ($F = 21.63$, d.f. = 3,12, MSe = 154.43, $P < .001$), but also revealed a significant effect of Feeling Type within antecedent situations ($F = 34.60$, d.f. = 1,4, MSe = 34.22, $P < .005$).

Further comparison of means for the different cue types within the emotions and the non-emotions showed that in neither case was there a significant difference between the means for antecedents and behaviours, and that in both cases the combined mean across antecedents and behaviours was significantly higher than that for mental states (for the emotions, tD (8;12) = 7.75, P < .01; for the non-emotions, tD (8;12) = 7.60, P < .01). It was also found, though, that whilst for the emotions the combined antecedent/ behaviour mean was significantly higher than that for internal sensations (tD (8;12) = 4.69, P < .01), this was not the case for the non-emotions. Conversely, the mean for internal sensations was significantly higher than that for mental states amongst the non-emotions (tD (8;12) = 5.86, P < .01), but not amongst the emotions.

Taken overall, then, there was tendency for children to refer to antecedents less often for non-emotions than for emotions, but to refer to internal sensations more often, in both instances as predicted. Moreover, the data in Table 2.1 suggest, and the lack of a significant three-way interaction between the factors confirms, that this trend is consistent throughout the age range examined here. That the percentage of children who refer to antecedents for non-emotions and to internal sensations for emotions remains roughly constant between 8 and 10 years also suggests that differences between the feeling types here do not reflect any slower rate of acquisition of knowledge of these types, but rather a difference in salience that simply reduces the likelihood of children referring to those cues for those feelings. This is, however, an issue that remains open to more rigorous assessment.

Order of acquisition of knowledge of the basic classes of feature

As noted above, the overall pattern of differences in the percentages of children who exhibited knowledge of the four basic cue types within each age group is consistent with the order of acquisition of each type of knowledge predicted by the Piagetian account: viz. antecedent situations and behavioural expressions, then internal sensations, and then mental states. However, since it is conceivable that such a pattern of effects could arise in other ways, it cannot be taken as outright support for the existence of this order of acquisition. In addition, whilst the data are suggestive, if there is a fixed acquisition order it is not clear that this remains the same for both emotions and non-emotions, and that differences with regard to antecedents and internal sensations are those of emphasis and salience only. A more decisive test of both issues is required.

If there were an order of acquisition in line with prediction, then in general, and irrespective of age group, children should not have made reference to internal sensations for a feeling without also having referred to antecedents and behaviours; similarly they should not have referred to mental states without also exhibiting knowledge of the other three cue types. Scalogram analyses were conducted in order to examine whether the data bore this out, firstly for all six feelings taken together; and secondly for the emotions and the non-emotions taken separately, as a check on whether any positive finding overall was consistent across feeling types.

Such analyses essentially measure (via an estimate of the "coefficient of reproducibility") the extent to which the pattern of individuals' positive and negative responses to a series of items conforms to an expected monotonic scale of item difficulty. This is then compared with the extent to which such patterns might occur by chance. In the present context knowledge of the four basic cue types for a feeling constituted the series of items, and the expected scale of item difficulty was defined by the order of acquisition outlined above. On this basis, a count was made of the number of children who, for instance, referred to antecedents, behaviours, and internal sensations for a feeling (i.e. in line with prediction), and of the number who referred to antecedents and internal sensations, but not behaviours (i.e. counter to prediction).

Values of the reproducibility coefficient essentially rest on the ratio of the proportion of cases in line with prediction to the proportion of those counter to it. Chance reproducibility estimates the probable value of reproducibility that could be obtained simply on the basis that there were more positive responses to some items than to others. For the purpose of the present analysis, Green's (1956) method was used for the computation of estimates of the coefficients of reproducibility (RepB) and chance reproducibility (RepI), and the statistical tests used to measure departure from chance effects were those suggested by Chilton (1969).

A significant trend towards the suggested order of acquisition was found to be present when responses to all six feelings were analysed together (RepB = .91, RepI = .88, standard error of RepB = .006, $Z = 4.17$, $P < .001$, one-tailed). Similar results were found when responses to the emotions and non-emotions were analysed separately (for the emotions, RepB = .92, RepI = .89, standard

Table 2.2 Frequency of different patterns of reference to four cue types for emotions and non-emotions across age groups (as percentage of total for feeling type).

	Number of Cues Mentioned															
	None	1 Type				2 Types						3 Types				4 Types
Feeling Type		A	B	I	M	A + B	A + I	A + M	B + I	B + M	I + M	A + B + I	A + B + M	A + I + M	B + I + M	A + I + B + M
Emotions	3	7	2	1	0	18	5	3	4	0	1	18	9	3	3	22
Non-emotions	3	4	4	3	0	11	5	0	9	2	1	24	3	2	8	20

Key: A Antecedent Situation
B Behavioural Expression
I Internal Sensation
M Mental State

error of RepB = .008, Z = 3.12, P < .001; for the non-emotions, RepB = .90, RepI = .87, standard error of RepB = .009, Z = 2.81, P < .005, both tests one-tailed). At the same time, there was some indication that the strength of the trend was somewhat greater for the emotions, where the value for RepB was found to be significantly larger than that for the non-emotions (pooled standard error = .006, Z = 3.00, P < .005, two-tailed).

Table 2.2 shows the percentage occurrence of each possible combination of cue types referred to that could arise within discussion of a feeling, summed separately for the emotions and the non-emotions across the three age groups. In each block here for a specific number of cues mentioned, the first column (or first two in the case of the block for 1 type) corresponds to combinations of known cues which are in line with prediction. Examination of these frequencies indicates that approximately two-thirds of responses conform strictly to prediction, but also that the weaker trend towards the mooted order of acquisition amongst the non-emotions is attributable to a greater number of instances of children having made reference to behaviours and internal sensations for those feelings without also referring to antecedent situations. This is consistent with the reduced emphasis on antecedents for the non-emotions noted in the previous section. Similarly, the greater number of cases of children having referred to mental states for the emotions without also having made mention of internal sensations bears out the apparent tendency for less importance to be attached to internal sensations for the emotions.

In general, the data support the existence of an order of acquisition of knowledge about the four different classes of feature which corresponds to that predicted by the Piagetian account. This order does seem broadly to hold good for both emotions and non-emotions, which suggests that the differences between the feeling types are more those of the salience and emphasis of what is known than the result of different processes of knowledge acquisition.

Content of references to antecedents and behaviours

Analysis of the percentages of children in each age group who were credited with knowledge of the four basic cue types showed the majority of 5-year-olds to have at least minimal awareness of antecedent situations and behavioural expressions associated with the six feelings. Knowledge of these cues appears not only to be acquired first, as predicted, but also to be present from early in development. This does not mean, however, that there are no differences in the content of what children know about antecedents and behaviour at different ages. For example, knowledge of some instances of feature in these classes may be acquired earlier than others, or some instances may be considered more salient at one age than at another, in which case the content of references will differ. Again, some antecedents or behaviours may be considered, either within or across age groups, to be more representative exemplars for a feeling than others, resulting in differences in the frequency with which different specific instances are mentioned.

Leaving such potential age and distributional differences aside, previous analysis also showed that children tended to refer to antecedent situations more often for the emotions than for the non-emotions. Subsequent scalogram analyses appeared to confirm that antecedents have less importance as cues for the non-emotions, as had been predicted on the basis of the argument that, for these feelings, antecedents are more general and less specifically associated with onset. Again, if this is the case, it should be evident in the content of children's references.

In order to investigate these issues, a record was made of the various specific instances of antecedent and behaviour which had been referred to for each feeling across the sample of children, and the number of children in each age group who had cited each instance was counted. This data was then examined for evidence of any of the three effects outlined above.

It was noted immediately that for all six feelings certain specific antecedents and behaviours were indeed referred to substantially more frequently than others. As an illustration of this, Table 2.3 details the four most common antecedents and behaviours for each feeling, together with the number of children in each age group who mentioned these. A full list is presented in Appendix 1.2. As can be seen from Table 2.3, the uneven distribution of the frequencies of the different cues appeared to be roughly consistent across the age groups: although the absolute frequency tended to fluctuate, the relative frequency of a specific cue often remained constant.

A precise measure of the stability of these relative frequencies across the age range sampled was provided by computation of values for Kendall's coefficient of concordance, W, between the ranks of the frequencies of specific cues in the three age groups. Separate values were calculated for antecedents and for behaviours for each of the six feelings. In each instance all specific cues which had been referred to by more than one child were included in the analysis (see Appendix 1.2). The remaining cues were excluded in order to prevent the introduction of a positive bias into the outcome of each analysis: cues which were mentioned only once would necessarily have low rank frequencies in all three age groups, and so would artificially inflate the value of W.

The twelve values of W derived in this way are presented in Table 2.4, together with their associated probability values on the chi-square distribution (see Siegal, 1956, pp. 229-238). With the single exception of the antecedents for "wide-awake", significant concordance was found between the rank frequency of the specific

Table 2.3 Most frequently mentioned antecedent situations and behavioural expressions for each of six feelings, with frequency, by age group, and overall.

		Frequency					Frequency			
Feeling	Antecedent Situation	5	8	10	All	Behavioural Expression	5	8	10	All
Happy	Playing with friends	11	11	10	32	Smile	18	23	19	60
	Being given a present	5	8	13	26	Laugh	4	8	9	21
	Being taken out	4	11	7	22	Jump around	0	6	9	15
	Going to birthday party	4	4	4	12	Be silly	2	5	7	14
Sad	Death of a relative	4	8	11	23	Cry	11	14	11	36
	Being hurt by someone	4	8	7	19	Turn down head/mouth	7	3	8	18
	Being told off	8	4	5	17	Not do anything	2	3	9	14
	Not having anyone to play with	3	8	4	15	Not say anything	1	2	9	12
Scared	Strange noises	16	12	6	34	Shake	3	13	15	31
	Being in the dark	7	8	6	21	Run away	2	12	9	23
	Horror films on TV	5	7	7	19	Say about feeling	0	9	5	14
	Nightmares	5	6	2	13	Seek adult comfort	4	6	1	11
Wide-awake	Morning	11	4	4	19	Have eyes open	7	16	14	37
	Daytime	4	7	1	12	Be lively	3	11	17	31
	Being woken by noise	5	3	1	9	Get up	2	3	4	9
	Being active	0	5	3	8	Play	2	3	4	9
Tired	Bedtime	5	7	3	15	Sleep	9	13	13	35
	Being active	3	5	7	15	Close eyes	6	14	15	35
	Nighttime	6	5	3	14	Yawn	9	7	11	27
	Staying up late	3	3	8	14	Sit down	3	11	10	24
Hungry	Not having eaten	7	4	8	19	Eat	6	18	10	34
	Waiting for meal	3	4	6	13	Say about feeling	5	15	13	33
	Mealtime	6	2	4	12	Get food	2	4	6	12
	Someone else eating	1	6	3	10	Ask for food	2	5	1	8

Table 2.4 Values for concordance (Kendall's W) between the rank frequency of specific cues across age groups.

Feeling	Cue Type	No. of instances where f > 1	W	Chi-square	d.f.	P
Happy	Antecedents	24	.55	37.95	23	< .05
	Behaviours	12	.81	26.73	11	< .01
Sad	Antecedents	18	.72	36.72	17	< .005
	Behaviours	14	.69	26.91	13	< .025
Scared	Antecedents	18	.71	32.21	17	< .005
	Behaviours	20	.52	29.64	19	= .05
Wide	Antecedents	15	.38	15.96	14	n.s.
-awake	Behaviours	16	.60	27.00	15	< .05
Tired	Antecedents	20	.57	32.49	19	< .05
	Behaviours	31	.67	60.30	30	< .001
Hungry	Antecedents	14	.65	25.35	13	< .025
	Behaviours	14	.60	23.40	13	< .05

cues across the three age groups in all cases, indicating a high degree of consistency.

Such stability across the age groups in the relative frequency of reference to specific cues is not consonant with any general shift in the content of the cues typically mentioned or perceived as salient. This is further borne out by inspection of the raw frequencies for each specific cue. In 85% of instances where both 5- and 8-year-olds referred to a cue the frequency either increased in the older group, or remained the same. The corresponding figure for the 8- and 10-year-olds, whilst lower, at 63%, is still indicative of the same general trend.

Any overall increase with age in the number of children who exhibited knowledge of antecedents and behaviours was therefore expressed, at least in part, simply through an increase in the number of children who referred to the same set of specific cues for each feeling, with the relative frequency of each of these tending to remain constant.

At the same time there was also a tendency for the range of specific antecedents and behaviours referred to by children to increase with age. Table 2.5 shows the mean number of different antecedents and behaviours referred to by children in each age group for the emotions and for the non-emotions (including those only referred to once). A two-way (Feeling Type and Age Group) mixed-model ANOVA on the number of antecedents referred to for each feeling showed that the increase across the age groups approached conventional levels of significance ($F = 3.19$, d.f. = 2,8, $MSe = 9.64$, $P < .1$). There was also a significant main effect of Feeling Type ($F = 7.56$, d.f. = 1,4, $MSe = 22.22$, $P \approx .05$), with more different antecedents referred to for the emotions than for the non-emotions. The increase with age in the number of different behaviours referred to was more pronounced, and an analysis of variance on these values showed a significant main effect of Age Group ($F = 11.01$, d.f. = 2,8, $MSe = 21.22$, $P < .01$), but in this case no effect of Feeling Type.

It should be noted that there is no inconsistency between the previously detailed tendency for the relative frequency of specific

Table 2.5 Mean number of different specific antecedents and behaviours referred to by each age group, for emotions and non-emotions.

Cue Type	Feeling Type	Age Group		
		5-year-olds	8-year-olds	10-year-olds
Antecedents	Emotions	19.67	22.33	25.00
	Non-emotions	13.67	19.00	16.00
Behaviours	Emotions	10.00	16.00	24.00
	Non-emotions	11.67	22.67	22.00

cues to remain stable across age groups, and this increase in the number of different cues referred to by the 8- and 10-year-olds. On the whole the additional cues cited by the older age groups were referred to by substantially fewer children than those which were common across the age groups, even when differences in the size of the base sample are taken into account. This is apparent from Table 2.6, which shows the overall mean frequency of citation, and the mean frequency per age group, of those cues which were referred to by all age groups, by just the 8- and 10-year-olds, and by the 10-year-olds only. On average, cues which were mentioned by all three age groups received nearly four times the number of references within an age group as those which were mentioned by the

Table 2.6 Mean frequency of reference, overall and per age group, to specific antecedents and behaviours cited by
(a) all three age groups;
(b) 8- and 10-year-olds only;
(c) 10-year-olds only.

Age groups referring to Cue	Number of Cues	Number of References	Mean Frequency Overall	Mean Frequency per Age Group
5, 8, 10-year-olds	79	1191	15.08	5.03
8, 10-year-olds	52	205	3.94	1.97
10-year-olds	115	160	1.39	1.39

10-year-olds alone.

In general then, the pattern which emerges with regard to the content of both the antecedent and behavioural cues cited by the sample is one of marked variation in the frequency with which specific instances of a cue are referred to, and considerable developmental consistency within this variation. There is a strong implication not just that some cues are perceived to be more representative than others, but also that there is an implicit scale of representativeness which remains uniform across this age range. In addition, those cues which are referred to most frequently overall tend to be mentioned by all age groups, whereas those referred to less frequently are more likely to be mentioned by older children only. On this basis it seems plausible to characterize the development of childrens' knowledge about the antecedents and behaviours associated with feelings in terms of an initial acquisition of information about the most representative cues, and a subsequent gradual expansion to encompass more diverse (i.e. less representative) instances.

This pattern holds for both emotions and non-emotions, although there are again indications of a reduced scope for the antecedents associated with non-emotions as compared to those associated with emotions. Comparison of the content of these cues for the two feeling types suggests the presence of qualitative differences of the kind predicted previously. As is evidenced by the four most frequently mentioned antecedents for each feeling detailed in Table 2.3, those for emotions tended, almost without exception, to be specific events upon which the feeling would be contingent. In contrast, antecedents cited for non-emotions often tended to be either general contexts within which the feeling might occur (e.g. "daytime", "nighttime"), or circumstances which might gradually provoke the feeling over an extended period of time (e.g. "being active", "not having eaten"). Once again, the evidence suggests not so much that children have different knowledge about non-emotions, or that this knowledge is acquired or structured in different ways, but rather that it differs from emotion knowledge in salience.

Degree of specificity of references to internal sensations

Examination of the content of children's references to antecedents for the emotions and the non-emotions revealed the predicted qualitative differences between the feeling types that serve to account for a reduced emphasis on knowledge of antecedents for the non-emotions. The greater emphasis on knowledge of internal sensations for these feelings that was noted previously could be regarded as a compensatory enhancement of salience for this cue type that reflects the need for information which permits anticipation of state and behaviour. It is also possible, though, that it is not so much that internal sensation has enhanced salience for non-emotions, as that it has reduced salience for emotions. This consideration provoked the question of whether more detailed inspection of the content of children's references to internal sensations for the various feelings might uncover differences consonant with a lesser emphasis on knowledge of this aspect of experience for the emotions.

The key element which characterized references to antecedents for the non-emotions was a lack of specificity: the circumstances most commonly associated with the onset of these feelings tended, as noted above, to be ones which would be present over a period of time, and which would, in consequence, have a low level of discriminability between the presence or absence of the relevant feeling. Whilst the aspect of extended temporal presence might not be paralleled in the case of internal sensations, this did suggest that one possible source of differences between the emotions and the non-emotions might be the degree of discriminability or specificity of associated bodily sensations. Low specificity of the bodily changes perceived to accompany emotion was certainly predicted by early studies such as those described by Cannon (1929), who argued that such changes were generally diffuse in nature. Conversely, Cannon and Washburn (1912) found a high correlation between stomach contractions and subjective reports of hunger, although Davis, Garafolo, and Kveim (1959) suggested that this finding was artefactual in origin.

Further analysis of children's references to internal sensations focused, then, on the extent to which these had provided descriptions of specific patterns of bodily sensation, as opposed to merely indicating an unelaborated awareness of bodily organs (in the initial coding children were credited with knowledge of internal sensation if they had made responses of either type). However, differences in the raw values for the number of specific descriptions provided by the sample of children for each feeling could simply reflect, in part, differences between the feelings in terms of the overall number of references to internal sensations. Analyses were therefore based on the percentages of children credited with knowledge of internal sensation for a feeling who had provided a description of at least one specific pattern of sensation. Means of these percentages for emotions and non-emotions within each age group are presented in Table 2.7 (values for each feeling are shown in Appendix 1.3).

As can be seen from Table 2.7, there was a marked increase with age in the percentage of children who referred to internal sensations via descriptions of specific patterns of bodily change, across both emotions and non-emotions. At the same time the percentages were lower for the emotions in all three age groups, although this difference was not sizeable amongst the 5-year-olds. A two-factor (Feeling Type and Age Group) mixed-model ANOVA on the percentages within each age group for each feeling confirmed the presence of an effect of Age Group ($F = 21.12$, d.f. = 2,8, MSe =

Table 2.7 Mean percentage of children credited with knowledge of internal sensation who described a specific pattern of activity, by Feeling Type and Age Group.

	Age Group			
Feeling Type	5-year-olds	8-year-olds	10-year-olds	All Age Groups+
Emotions	33	49	68	50 (52)
Non-emotions	36	68	87	64 (68)

+ Unweighted means - weighted means are given in parentheses

121.53, $P < .002$), but found no significant effect of Feeling Type, nor interaction between the two factors.

The lack of an overall effect of Feeling Type is attributable to wide variability between individual feelings in the percentage of children who referred to internal sensations in terms of specific patterns of change. Taken across all three age groups, the values for "happy", "sad", and "scared" were 26%, 56%, and 71% respectively, and for "wide-awake", "tired", and "hungry" the values were 52%, 62%, and 85%. Thus, although the general trend is towards proportionately fewer specific descriptions of sensations for the emotions, there is substantial overlap between the range of values for the emotions and that for the non-emotions.

This does not in fact rule out a general effect of perceived specificity of sensation on knowledge or salience of this type of cue for different feelings. In the first place the increasing incidence of specific descriptions across the age groups parallels the growth in the percentage of children who indicated awareness of internal sensation at all. The number of children per age group who referred to internal sensations for each feeling was strongly positively correlated with the percentage of these who described specific patterns of sensation ($r = .81$, $n = 18$, $P < .001$).

But more importantly perhaps, variation across feelings in the weighted percentages of children who gave specific descriptions of sensations was also found to be highly correlated with differences between feelings in the total number of children across the age groups who referred to internal sensations in any manner ($r = .82$, $n = 6$, $P < .025$). As was hypothesized then, any general tendency towards fewer children referring to internal sensations for the emotions would appear to be associated with a lower perceived specificity of these sensations.

The lack of a net significant difference between the emotions and the non-emotions in this respect can be seen as due to variability in the status of internal sensations for different individual emotions: where, as with "happy", perceived specificity was low, fewer children referred to this type of cue (52% overall); but where there was greater perceived specificity of sensations, as with "scared", more children (65% overall) made reference to them. As was the case for the antecedents of non-emotions, the apparently consistent order of acquisition of knowledge of the four basic classes of feature across emotions and non-emotions implies that any lower discriminability of the sensations associated with emotions reduces the salience of knowledge of this cue type rather than affecting knowledge acquisition per se.

Types of mental cue referred to for emotions and non-emotions

Interest in a sub-categorization of mental cues stemmed from two sources. The first of these was the general issue of whether the theoretical sub-classes of mental state identified previously provided a workable basis for a finer-grained analysis of reports of the mental experiences accompanying feeling states; and, if so, whether the frequencies of each of these at different ages was consistent with the order of emergence predicted by the Piagetian account.

A second issue of importance was whether, in view of other differences between emotions and non-emotions, there might not also be differences in the types of mental experience characteristic of the two classes of feeling. Although no differences were found between emotions and non-emotions in terms of the percentages of children in each age group who had exhibited some knowledge of mental cues (other than the apparently anomalously high percentage of 5-year-olds who referred to mental states for "scared"), this did not preclude the possibility of systematic differences in the content of the references which children had made. Given the evidence in support of reduced salience for antecedents in knowledge of non-emotions, activation of representations of antecedents might be expected to play a much smaller role in controlling the course of these feelings than would be the case for emotions. As a result, then, awareness of representations of antecedents in particular should be a substantially less frequent element in the experience of non-emotions.

In order to investigate these issues all recorded references to mental states were assigned to one of the categories detailed below. The first four of these categories were based on the theoretical distinctions between sub-classes of mental state put forward in Chapter 1, and discussed further in the opening section of this chapter. The remaining category emerged at an early stage of inspection of children's responses, which revealed the presence of attempts to express subjective aspects of feeling states in figurative terms. The five categories were:

1) **Representations of antecedents (M/A)** - mental representations of external situations that would provoke the feeling (e.g. "think about good things that would happen next", "imagine that it's coming after you");

2) **Representations of behaviour (M/B)** - representations of behavioural goals stemming from the feeling (e.g. "feel like playing out", "want to smile");

3) **Mental activity (M/MA)** - changes in the normal pattern of mental activity (e.g. "my mind goes blank"), or on-going sequences of thought with no external parallel (e.g. "thinking about when I was a child", "can't wait to eat", "can't stop thinking about it");

4) **Evaluations (M/E)** - internal evaluations of other cues, usually the situation leading to the feeling, or of personal state (e.g. "think that's not very nice of him", "think I'm hungry");

5) **Figurative evaluations (M/FE)** - either mental evaluations of the source of the feeling, couched in figurative terms (e.g. "feel like you're beginning a new world", "feel like you're standing on a lonely plain"); or mental evaluations of personal state described in this way - (e.g. "tongue feels guilty").

Table 2.8 Mean frequency of reference to each of five types of mental cue by Feeling Type and Age Group.

Age Group	Feeling Type	Type of Mental Cue					All Cue Types
		M/A	M/B	M/MA	M/E	M/FE	
5-year-olds	Emotions	4.00	0.00	0.33	2.00	0.33	6.67
	Non-emotions	0.33	2.67	1.00	0.00	0.33	4.33
8-year-olds	Emotions	8.67	5.67	4.67	4.67	1.67	25.33
	Non-emotions	0.67	14.67	4.00	3.00	0.33	22.67
10-year-olds	Emotions	14.33	14.00	10.67	9.00	1.67	49.67
	Non-emotions	1.33	19.67	6.67	7.67	0.33	35.67
All Age Groups	Emotions	9.00	6.56	5.22	5.22	1.22	27.22
	Non-emotions	0.78	12.34	3.89	3.56	0.33	20.89

Key: M/A Representations of Antecedents
M/B Representations of Behaviour
M/E Evaluations
M/MA Mental Activity
M/FE Figurative Evaluations

The mean number of references made by the sample of children in each age group to each type of mental cue, across the emotions and the non-emotions, is shown in Table 2.8, together with corresponding means for the total number of references to all types of mental cue (raw frequencies for individual feelings are given in Appendix 1.4).

As a preliminary check to ensure that the distribution of actual references to mental cues across feelings and age groups (irrespective of type) did not differ markedly from the percentages of children who had been credited with knowledge of mental cues in general, total frequencies for each feeling within the separate age groups were analysed using a two-way (Feeling Type and Age Group) mixed-model ANOVA. This analysis found a highly significant effect of Age Group ($F = 64.53$, d.f. = 2,8, MSe = 32.11, $P < .001$), but no effect of Feeling Type. Comparison of means using the Dunn-Bonferroni procedure found significant increases in frequency both between the 5- and 8-year-olds ($tD\ (2;8) = 5.67$, $P < .01$) and between the 8- and 10-year-olds ($tD\ (2;8) = 5.71$, $P < .01$), paralleling the differences found between the age groups in the mean percentages of children credited with knowledge of mental cues.

Examination of the data in Table 2.8 reveals pervasive increases in the frequency of reference to all types of cue between the 5- and 8-year-olds, and again between the 8- and 10-year-olds. These increases were present for both the emotions and the non-emotions. The only exception to this pattern occurred with the figurative evaluations, which were low in frequency overall, and which only showed a marginal increase between 5 and 8 years for the emotions. It is not clear, in fact, that this category constitutes a valid sub-class of feature so much as an alternative way of expressing the other aspects of experience. It may be noted here that the vast majority of references to mental states made across the sample were readily categorizable in terms of one of the four theoretically defined sub-classes, illustrating that, at the very least, these provided an effective framework for detailed analysis of the content of mental states.

Despite the general trend towards increased frequency with age of all four main cue types there were, nevertheless, differences apparent between individual cue types in overall frequency, and between emotions and non-emotions in the frequency of specific cues. Overall, references to representations of antecedents and behaviour occurred most frequently, but these also showed the greatest disparity between the feeling types, with the former occurring substantially more frequently for the emotions, and the latter being referred to more often for the non-emotions.

However, primary interest in the analysis of mental cues focused on the question of whether there were different emphases on specific cue types at different ages, and for the two feeling types. Whilst suggestive of the existence of such differences, values for the actual frequencies of reference to the various cue types may tend to obscure at least some differences in the <u>relative</u> importance of specific cues because of overall variation in frequency between the age groups, and to a lesser extent between the emotions and the non-emotions.

In consequence, more rigorous analysis of the pattern of reference to mental cues was carried out, not on the raw frequencies, but on the percentages of the total number of references to such cues within age group and feeling which dealt with a specific type of cue. This procedure effectively standardized overall frequencies for each feeling to the same value both within and across the age groups, and so highlighted any differences in the relative frequencies of reference to individual cue types. Table 2.9 presents the means of these percentage frequencies for each cue type by Age Group and Feeling Type (values

Table 2.9 Mean percentage frequency of reference to each of five types of mental cue by Feeling Type and Age Group.

		Type of Mental Cue				
Age Group	Feeling Type	M/A	M/B	M/MA	M/E	M/FE
5-year-olds	Emotions	82.22	0.00	2.22	13.33	2.22
	Non-emotions	6.67	57.78	28.89	0.00	6.67
	All Feelings	44.44	28.89	15.55	6.66	4.44
8-year-olds	Emotions	33.17	23.44	18.52	18.52	6.37
	Non-emotions	3.42	63.52	17.85	13.53	1.67
	All Feelings	18.29	43.48	18.18	16.02	4.02
10-year-olds	Emotions	29.19	28.05	21.41	18.12	3.23
	Non-emotions	4.29	54.21	18.86	21.82	0.81
	All Feelings	16.74	41.13	20.13	19.97	2.02
All Age Groups	Emotions	48.19	17.16	14.05	16.66	3.94
	Non-emotions	4.79	58.50	21.87	11.78	3.05
	All Feelings	26.49	37.83	17.96	14.22	3.49

Key: M/A Representations of Antecedents
M/B Representations of Behaviour
M/E Evaluations
M/MA Mental Activity
M/FE Figurative Evaluations

for each cue type within individual feelings are included in Appendix 1.4).

Values for each feeling of the percentage frequencies of cue types within the three age groups were analysed using a three-way

(Feeling Type, Age Group, and Cue Type) mixed-model ANOVA. Figurative evaluations were excluded from this analysis because of their uniformly low values across both age groups and feeling types. The transformation of cue frequencies to percentages, coupled with the lack of systematic variation in the percentage frequencies of the excluded figurative evaluations, necessarily entailed the absence of any main effect for Feeling Type or Age Group in the results of the analysis, but there was a significant main effect of Cue Type ($F = 6.91$, d.f. = 3,12, MSe = 287.05, $P < .01$). Multiple comparisons of means showed the overall mean percentage frequency of representations of behaviour to be significantly greater than the combined mean across the other three cue types ($tD\ (4;8) = 3.96$, $P < .05$), but found no other significant differences.

The analysis of variance found, in addition, significant two-way interactions between Age Group and Cue Type ($F = 3.35$, d.f. = 6,24, MSe = 211.80, $P < .02$), and between Feeling Type and Cue Type ($F = 19.22$, d.f. = 3,12, MSe = 287.05, $P < .001$). There was also a significant three-way interaction between all the factors ($F = 3.23$, d.f. = 6,24, MSe = 211.80, $P < .02$).

Examining the interaction between Age Group and Cue Type first of all, tests of simple main effects found significant differences between the cue types amongst the 8-year-olds ($F = 8.61$, d.f. = 3,12, MSe = 118.50, $P < .005$), and amongst the 10-year-olds ($F = 19.63$, d.f. = 3,12, MSe = 38.42, $P < .001$), but not amongst the 5-year-olds, where there was greater variability in the pattern of differences across feelings. Comparison of means amongst the 8-year-olds and 10-year-olds showed that in both cases the mean percentage frequency of representations of behaviour was significantly greater than the combined mean across the other three cue types ($tD\ (2;36) = 3.58$, $P < .01$; and $tD\ (2;36) = 3.06$, $P < .01$, respectively), paralleling the overall trend. Simple main effects of Age Group within Cue Type failed in all four instances to achieve significance at the conservative level of $P = .01$ determined by control of the per family error rate (see Kirk, 1968, p. 181), although differences between the age groups for representations of antecedents, where there was a sharp drop in the percentage frequency between 5 and 8, did achieve conventional levels of significance.

Tests of simple main effects carried out to clarify the nature of the interaction between Feeling Type and Cue Type showed significant effects of Cue Type within both the emotions ($F = 8.23$, d.f. = 3,12, $MSe = 287.05$, $P < .005$) and the non-emotions ($F = 17.90$, d.f. = 3,12, $MSe = 287.05$, $P < .001$). Comparison of means showed that for the emotions, the mean percentage frequency of representations of antecedents was significantly greater than the combined mean across the other three cue types ($tD\ (4;12) = 4.95$, $P < .01$). By contrast, within the non-emotions it was the mean for representations of behaviour which was found to be significantly greater than the combined mean across the other cue types ($tD\ (4;12) = 7.01$, $P < .01$), whilst that for representations of antecedents was significantly smaller ($tD\ (4;12) = 3.96$, $P < .01$).

Differences between the emotions and non-emotions in the relative frequencies of reference to these two types of cue were confirmed by significant main effects of Feeling Type found within both categories (for representations of antecedents, $F = 54.29$, d.f. = 1,4 MSe = 156.44, P < .005; for representations of behaviour, F = 24.68, d.f. = 1,4, MSe = 311.44, P < .01). No differences between emotions and non-emotions were found for the remaining two cue types.

This pattern of differences between the emotions and the non-emotions with regard to which types of mental cue received greatest emphasis was not, however, uniform across the age groups, as is indicated by the significant interaction between Age Group, Feeling Type, and Cue Type. Further tests showed significant simple interactions between Feeling Type and Cue Type within each age group (for the 5-year-olds, F = 8.97, d.f. = 3,12, MSe = 553.72, P < .005; for the 8-year-olds, F = 10.55, d.f. = 3,12, MSe = 118.50, P < .005; and for the 10-year-olds, F = 17.44, d.f. = 3,12, MSe = 38.42, P < .001), confirming that the emotions and non-emotions differed at all ages in the pattern of references to mental cues. At the same time, though, a significant simple interaction between Age Group and Cue Type was found within the emotions (F = 5.73, d.f. = 6,24, MSe = 211.80, P < .005), but not within the non-emotions, which indicates that the pattern of reference to mental cues changed with age for the emotions, but remained stable for the non-emotions.

Tests of simple main effects and comparison of means established more precisely the patterns of reference in each case. For the non-emotions, there were significant simple main effects of Cue Type amongst the 8-year-olds (F = 17.95, d.f. = 3,12, MSe = 118.50, P < .001) and amongst the 10-year-olds (F = 34.84, d.f. = 3,12, MSe = 38.42, P < .001); amongst the 5-year-olds, the effect failed to achieve the conservative significance level of P = .01, but was significant at conventional levels. Comparison of means showed that in all three age groups the percentage frequency of representations of behaviour was significantly greater than the combined mean across the other three cue types (for the 5-year-olds, $tD\ (4;36) = 4.46$, $P < .01$; for the 8-year-olds, $tD\ (4;36) = 5.06$, $P < .01$; for the 10-year-olds, $tD\ (4;36) = 3.84$, $P < .01$).

By way of contrast, within the emotions, there was only a significant simple main effect of Cue Type amongst the 5-year-olds ($F = 8.24$, d.f. = 3,12, $MSe = 553.72$, $P < .005$), where comparison of means showed the percentage frequency of representations of antecedents to be significantly greater than the combined mean across the other cues ($tD\ (4;36) = 7.51$, $P < .01$). Early emphasis on this type of cue was not maintained, as was indicated by a significant effect of Age Group within representations of antecedents for the emotions ($F = 10.81$, d.f. = 2,8, $MSe = 243.19$, $P < .01$). Comparison of means showed a significant drop in the percentage frequency of this cue type between 5 and 8 years ($tD\ (2;32) = 4.76$, $P < .01$). The difference between the 8- and 10-year-olds was not significant.

To summarize, a general growth with age in the frequency of reference to the four main types of mental cue was found to be accompanied by marked differences between the emotions and non-emotions in the content of those references. For the non-emotions there was a consistently high degree of emphasis on representations of behaviour, and an almost total lack of reference to representations of antecedents. For the emotions, there was a high degree of emphasis on representations of antecedents amongst the youngest children, but by 8 years of age the trend was towards more-or-less equal frequency of reference to all four cue types.

The difference between emotions and non-emotions in frequency of reference to representations of antecedents is consistent with the predicted consequences at the mental level of the reduced salience of antecedents amongst the basic cue types. That the disparity is much more extreme in the case of mental cues perhaps underscores the importance of situational antecedents in emotional processes, particularly in terms of the role played by activation of pre-existing internal representations in determining the course of experience. It may also be argued to highlight the corresponding lack of importance of this type of cue for non-emotions, not only as regards discrimination of state, but also in terms of influences on the immediate selection or anticipation of subsequent activity.

The pattern of references found amongst the emotions, of an age-related shift away from the predominance of representations of antecedents towards more equal emphasis on all types of mental cue can be seen as partially consistent with the predicted differences in the point of acquisition of knowledge of the different types of mental cue. In particular, early awareness of mental states for emotions does seem to focus more on representations of antecedents, whilst awareness of evaluations appears to arise later in development. Contrary to prediction, however, for the emotions awareness of representations of behaviour and of more general patterns of mental activity seems, on the evidence here, to emerge at the same point as awareness of evaluations. Whilst the temporal element involved in awareness of much general mental activity could be argued to be a complicating factor which delays explicit apprehension of this aspect of experience, the later emergence of awareness of representations of behaviour is harder to explain.

This is especially true in view of the early dominance of representations of behaviour for the non-emotions. In fact, taken across feeling type, the percentage frequencies of the different cues within the 5-year-old age group are more or less consistent with prediction. More rigorous examination of the data via scalogram analyses is not possible in this context, however, because children were not explicitly presented with the opportunity to show whether or not they had knowledge of each type of mental cue as they had been with the four basic classes of feature, and so the former cannot be validly treated as items in the same way. The statements on which the data here are based must therefore be considered more as a form of diagnostic.

However, much of the apparent difficulty in interpretation of the data with regard to the point of emergence of awareness of different aspects of mental states can be attributed to the assumption that the knowledge evidenced by the 5-year-olds is necessarily part of the more general process of development. If, on the contrary, their performance were demonstrated to be unrepresentative in a way that the responses of older children were not, then the pattern of percentage frequencies of the different mental cue types amongst the 8- and 10-year-olds, for the emotions at least, is much as might be anticipated from the Piagetian account.

There is, in fact, reason to consider that many of the responses made by the 5-year-olds were exceptional insights into the role of mental states brought about by particular circumstances. First of all, the number of references to such states amongst this age group was relatively small. Secondly, there was substantial variability across feelings in both the number and type of references made, and approximately two-thirds of all references were given in one of two contexts.

For the emotions, the preponderance of descriptions of mental states dealt with representations of antecedents and evaluations of antecedents for "scared" (see Appendix 1.4), reflecting the anomalously high number of 5-year-olds previously noted as having shown this category of knowledge for this feeling. Closer inspection shows this precocious awareness to be unsurprising because, as a number of children recognized, a central element in the experience of fear is consciousness of what <u>might</u> happen (i.e. activation of representation of antecedent), rather than interpretation of something that actually has happened. Since (to put it graphically) more often than not the bogey man does not leap out from behind the door of the darkened room, the child is frequently presented in this context with striking disparities between mental experience and the real world. These are exactly the circumstances previously suggested as likely to accelerate awareness of mental activity because it stands in contrast to other aspects of experience. Indeed, for "scared" only, a number of 5-year-olds had achieved the point of being able to describe the conscious comparison of real context and mental activity.

There were no references to representations of behaviour in association with emotions amongst the 5-year-olds. For the non-emotions, on the other hand, more than half the references to mental cues in this age group dealt with representations of behaviour in the context of tiredness or hunger. It may be noted that representations of behaviour essentially constitute *plans* or *intentions* for subsequent behaviour, which, as far as more physiological states are concerned, are often aimed at dealing with the bodily condition indicated by the feeling. The dominance of these representations for the non-emotions may possibly result from this type of mental activity having a primary functional value in determining the action necessary to satisfy a physical need which does not exist to the same extent for the emotions. For some 5-year-olds the urgency associated with an initially dimly perceived need to rest or eat may result in an earlier explicit awareness of mentally framed goals than would be the case in other contexts, although in this case it would appear that such anticipation of general development is more in keeping with the subsequent emphasis for the non-emotions.

Frequency and characteristics of children's descriptions of the contingencies between different classes of feature

The codings for antecedent situations, behavioural expressions, internal sensations, and categories of mental cue were used as the basis for the measure of knowledge of the relationship between different types of cue. Such knowledge was defined in terms of awareness of the contingency between cues, and was gauged from children's unsolicited descriptions of such contingencies. First of all, a note was made of all instances of responses in which children had spontaneously referred to two or more different basic and/or mental cue types in unbroken sequence (e.g. "you're feeling all hot and you're not playing" [I + B]; "if I'm going to the

Table 2.10 Frequency of occurrence of dialogues combining in sequence two or more cue types, by Feeling and Age Group.

Age Group	Feeling						Mean for Emotions	Mean for Non-emotions	Mean for all feelings
	Happy	Sad	Scared	Wide-Awake	Tired	Hungry			
5 y.o.	5	4	10	5	7	4	6.33	5.33	5.83
8 y.o.	33	19	41	17	47	27	31.00	30.33	30.67
10 y.o.	43	55	62	48	67	38	53.33	51.00	52.17
Mean across Age Groups	27.00	26.00	37.67	23.33	40.33	23.00	30.22	28.89	

dentist I keep thinking about horrible things" [**A + M/A**]). The frequency and type of these (i.e. which cues had been combined, irrespective of order) within each of the three age groups was then recorded for each feeling.

Table 2.10 shows the overall frequency of occurrence of these "cue sequences" in each age group's responses for the six feelings,together with mean frequencies for the emotions and the non-emotions, and across all feelings. Mean values across age groups for each feeling, and for the two feeling types, are also given.

A two-way (Feeling Type and Age Group) mixed-model ANOVA on the frequencies showed the differences between the age groups to be significant ($F = 49.80$, d.f. = 2,8, MSe = 64.78, $P < .001$). There was a relatively even increase in number of cue sequences across the three age groups, and comparison of means found significant differences both between the 5- and 8-year-olds ($tD\ (2;8) = 5.35$, $P < .01$), and between the 8- and 10-year-olds ($tD\ (2;8) = 4.63$, $P < .01$). As Table 2.10 indicates, the overall difference in frequency between the emotions and the non-emotions was small, in spite of some variability between individual feelings, and was not found to be significant.

Subsequent analysis focused on the question of whether there was any evidence of systematic patterns across the age groups, and for the emotions and the non-emotions, in the types of cue contingency referred to by the sample of children. Overall, 49 different types of cue sequence were described, and frequencies for each of these, by feeling and age group, together with totals across emotions and non-emotions, and across age groups, are presented in Appendix 1.5.

As was the case for specific instances of antecedent and behavioural cues for individual feelings, there was a highly uneven distribution of frequency across the specific sequence types. For example, the four most frequently occurring sequences (antecedent and behaviour, behaviour and internal sensation, behaviour and representations of behaviour, and behaviour and mental activity) accounted for more than 50% of all instances. A further parallel was found in an increase with age in the number of different sequence types described, from 7 amongst the 5-year-olds, to 30 amongst the 8-year-olds, and 43 amongst the 10-year-olds.

Again, though, there was also a marked tendency for the additional sequence types described by each successive age group to be lower in frequency than those which had been introduced at an earlier stage. The mean frequency per age group of the 7 sequence types found in all three age groups was 16.29; whereas that for the

17 types described by the 8- and 10-year-olds only was 4.41, and that for the 19 referred to by the 10-year-olds alone was 1.74.

In general then, the types of sequence which emerged earliest also tended to be those which were described most frequently by children in all age groups. In order to establish more specifically whether the relative frequency of different individual sequence types remained constant across age group, the value of Kendall's coefficient of concordance, W, between the rank frequency of sequence types within each age group was computed. Sequences which had only been described on one occasion were excluded from this analysis in order to obviate the positive bias on outcome which would result if some instances necessarily had the lowest possible rank in two out of the three age groups. Overall, 31 sequence types had a frequency of greater than 1, and the concordance between the age groups in the rank frequency of these was found to be both sizeable and highly significant ($W = .69$, chi-square = 62.10, d.f. = 30, $P < .001$). This confirmed the stability of the relative frequencies of specific sequence types as the actual number of occurrences increased.

Outside this pattern of an increase with age in the range of sequence types described by children, coupled with a consistent profile of relative frequencies, two other age-related developments were noted. The first of these was a tendency for the older children to describe more complex patterns of contingency between different cues. Sequences described by the 5-year-olds in all cases dealt with the simple contingency between two cues. This may be contrasted with the 8- and 10-year-olds, where, taking the full range of 49 sequence types into account, 14% and 15% of instances respectively described the contingency between three or even four cues.

There was also, as had been predicted, an age-related increase in the number of descriptions of sequences which referred to internal cues (i.e. internal sensation and the four types of mental cue) in conjunction with external cues (i.e. antecedents and behaviour). Amongst the 5-year-olds 11% of instances detailed contingencies between sensation and the external cues, and 29% dealt with contingencies between mental states and the external cues. Amongst the 8-year-olds this rose to 20% and 45% respectively, and amongst the 10-year-olds to 24% and 50%.

Broadly speaking, then, and consistent with previous evidence, young children's knowledge of the relationships between different classes of feature appears to focus predominantly on the simple contingency between antecedents and behaviour. With increasing age there is a greater awareness of such relationships per se, and within this a growth in knowledge of more complex contingencies, including, as anticipated, those between external features and sensations or mental states. At the same time, early knowledge of the contingency between antecedents and behaviour tends to remain dominant.

However, this encapsulation may gloss over differences between feelings. The 31 sequence types which had a frequency of greater than 1 are listed in Appendix 1.6, together with their overall frequency for the emotions and the non-emotions, and examples of each taken from the interview transcripts. Frequencies per feeling for each of these, totalled across age groups, are also presented in Table 2.11. Analysis of these frequencies indicated that the

Table 2.11 Total frequency of occurrence across age groups of dialogues combining in sequence two or more specific cue types (minimum f > 1) by individual feeling and by Feeling Type (sequences in order of descending rank for total frequency).

Cues Combined in Sequence	Feeling/Feeling Type							
	Happy	Sad	Scared	<u>Emotions</u>	Wide-awake	Tired	Hungry	<u>Non-emotions</u>
A + B	29	19	37	85	12	24	13	49
B + I	5	7	7	19	11	20	6	37
B + M/B	3	7	6	16	16	20	3	39
B + M/MA	7	9	3	19	6	6	6	18
A + I	2	1	3	6	4	11	10	25
I + M/B	3	2	1	6	4	10	5	19
A + M/B	2	5	2	9	1	8	6	15
A + M/E	5	4	9	18	1	1	3	5
A + M/A	6	5	8	19	0	0	0	0
B + M/E	1	2	3	6	3	3	0	6
A + M/MA	4	2	4	10	1	0	0	0
A + B + I	0	0	3	3	1	4	2	7
A + B + M/B	0	2	0	2	2	3	2	7
B + M/A	2	2	4	8	0	0	0	0
A + B + M/A	0	1	4	5	0	1	0	1
I + M/E	0	0	3	3	1	1	1	3
I + M/MA	1	0	1	2	0	2	2	4
A + B + M/E	1	0	3	4	0	0	0	0
M/B + M/E	0	2	0	2	2	0	0	2
A + I + M/E	0	0	2	2	0	2	0	2
B + I + M/E	0	0	0	0	1	1	2	4
M/E + M/MA	1	0	2	3	0	0	0	0
B + M/A + M/MA	2	0	1	3	0	0	0	0
A + B + M/MA	2	0	0	2	1	0	0	1
B + M/E + M/MA	1	0	0	1	0	1	1	2
B + I + M/B	0	0	0	0	2	0	1	3
B + I + M/MA	0	0	0	0	0	2	1	3

cont'd...

Cues Combined in Sequence	Feeling/Feeling Type							
	Happy	Sad	Scared	Emotions	Wide-awake	Tired	Hungry	Non-emotions
M/A + M/E	0	0	2	2	0	0	0	0
M/A + M/MA	1	1	0	2	0	0	0	0
A + M/A + M/B	1	1	0	2	0	0	0	0
B + M/B + M/E	0	1	0	1	0	0	1	1
Total	79	73	108	260	69	120	65	254

Key: A Antecedent Situations
B Behavioural Expressions
I Internal Sensations
M/A Representations of Antecedents
M/B Representations of Behaviour
M/E Evaluations
M/MA Mental Activity

overall stability of relative frequencies across age groups was coupled with differences in the types of cue sequences which tended to be most prevalent for the emotions and the non-emotions.

Firstly, significant concordances were found between the three emotions ($W = .73$, chi-square = 66.06, d.f. = 30, $P < .001$) and between the three non-emotions ($W = .81$, chi-square = 72.99, d.f. = 30, $P < .001$) in the relative frequency of each type of sequence. In contrast to this, relative frequencies for the different sequence types, totalled across the emotions, were found not to be significantly correlated with the corresponding relative frequencies for the non-emotions (Spearman's rho = .35, $N = 31$, P (two-tailed) n.s.). High intercorrelations between the emotions, and between the non-emotions, were not, therefore, matched by correlations between the two feeling types.

Attempts to characterize more precisely the nature of the differences between the types of cue sequence which were most frequent for the emotions and non-emotions were hampered to some extent by overlapping patterns of occurrence; in other words, such differences were largely those of emphasis rather than clear-cut distinctions. For instance, sequences which described the contingency between antecedents and behaviours were the most frequent type for both emotions and non-emotions. At the same time, such sequences occurred nearly twice as often for the emotions, although there was no difference in total frequency of sequences between the two feeling types. In addition, whereas for the non-emotions combinations of behaviour and internal sensation or representations of behaviour were nearly as frequent, for the emotions combinations of antecedent and behaviour were more than four times as frequent as the next most common sequence types, and accounted for nearly a third of all instances on their own.

Differences between the feeling types are clarified by an examination of the percentage incidence of sequences which involved each type of cue. Table 2.12 shows the relevant values separately for the emotions and non-emotions. As can be seen, for the emotions, sequences which described instances of the contingency between antecedents and/or behaviour and other cues were by far the most prevalent (overall, 92% of instances referred to at least one of these two cues).

For the non-emotions also, antecedents and behaviours were involved in descriptions of sequences more often than other cue

Table 2.12 Number and percentage of instances of cue sequences which involved each of seven cue types, for emotions (N = 260) and non-emotions (N = 254).

	Cue Type						
Feeling Type	A	B	I	M/A	M/B	M/MA	M/E
Emotions	167	174	41	41	38	42	42
	(64%)	(67%)	(16%)	(16%)	(15%)	(16%)	(16%)
Non-emotions	113	178	107	1	86	29	25
	(44%)	(70%)	(42%)	(0%)	(34%)	(11%)	(10%)

Key: A Antecedent Situations
B Behavioural Expressions
I Internal Sensations
M/A Representations of Antecedents
M/B Representations of Behaviour
M/E Evaluations
M/MA Mental Activity

types. However, the incidence of descriptions which involved antecedents was lower here than was the case for the emotions, whereas the number of instances of sequences which involved internal sensations and representations of behaviour was higher, and approached the level of antecedents. The greater emphasis on the contingency between sensations and/or representations of behaviour and other cues, notably behaviour, would seem to be the crux of the difference between the non-emotions and the emotions: sequences which involved solely the contingency between two or more of these three cues accounted for 39% of instances for the non-emotions. For the emotions the corresponding figure was 16%.

On this evidence, the general developmental progression of knowledge of the relationships between classes of feature which was outlined above modifies according to feeling type. In particular, different types of contingency or sequence appear to be paradigmatic for the emotions and the non-emotions, reflecting, as anticipated, differences in cue salience and episode structure. For the emotions, the antecedent-behaviour sequence is paradigmatic, and knowledge of this is apparent from an early age. Although older children show knowledge of complexities overlaying the basic sequence, especially with regard to the intervening role of mental states, this perception of the structure of emotional episodes remains dominant throughout the age range sampled here. As discussed previously, knowledge of instances of sequences which fall into this pattern meets exactly the fundamental requirements of the regulatory activities of identification and prediction.

For the non-emotions, on the other hand, the paradigmatic sequence appears to be sensation-behaviour, or, in modified form, sensation-representation of behaviour and behaviour-representation of behaviour, although these do not seem to become established until 8 years of age, when they begin to supplant an earlier emphasis on antecedent-behaviour sequences (see Appendix 1.5). This later development can be seen as a reflection of the later acquisition of knowledge of sensations and mental states, perhaps coupled with an increased awareness of the inadequacies of antecedents for predicting or prescribing behaviour appropriate to the feeling.

There is an implication here that the higher salience of internal sensations in knowledge of non-emotions does little to accelerate acquisition of knowledge of this cue type. This suggests in turn that limited availability of information places considerable restrictions on knowledge acquisition, in this case in spite of the greater perceived specificity of the sensations accompanying non-emotions. Once this knowledge is available, however, it is used as an integral component in a perceived structure which may have considerable functional value, since it can encapsulate a more reliable signal for the onset of feeling (either in terms of sensation or spontaneous behaviours) and knowledge of an appropriate behavioural response to deal with it (either in terms of direct activity or representations of desirable activity).

Conclusions

To summarize the main findings of the study:

1) Children's references to different types of cue during responses to the interview questions showed a pattern consistent with the following order of acquisition of knowledge about the four basic classes of feature argued to define feelings: first, antecedent situations and behavioural expressions; then internal sensations; and finally mental states. Most 5-year-olds appeared to have knowledge of antecedents and behaviours; by the age of 10, the majority of children showed knowledge of internal sensations and mental states as well. With some slight variation this pattern was present both across the three emotions, and the three non-emotions.

2) There was also some evidence to suggest that awareness of different types of mental state emerges in a particular order, with representations of antecedents and behaviours being referred to more frequently at earlier points of development than global patterns of mental activity or evaluative processes. An unusually high incidence of references to mental states by 5-year-olds in discussion of "scared" indicates that the growth of awareness of such activity can be accelerated under some circumstances.

3) Older children not only showed more diverse knowledge about feelings, but also referred more often to the links between the different features of those experiences. Parallel with this development was a tendency for early references to the conjunction between antecedents and behaviour to be supplemented with descriptions of more complex contingencies which included internal sensations and mental states.

4) Although knowledge about the four basic classes of cue for the emotions and the non-emotions appeared to grow at the same rate, and in the same way, for the emotions there was a greater emphasis on antecedent situations, and for the non-emotions, on internal sensations. Associated with these differences was a tendency to describe antecedents of non-emotions which were more general and less contingent upon onset than was the case for the emotions, but to detail internal sensations for non-emotions which were more specific. Amongst mental cues, the trend for the emotions was towards equal emphasis on all four major types, whilst for the non-emotions awareness of representations of behaviour was predominant.

5) Again, although no differences were found between the emotions and the non-emotions in the extent to which contingencies between different types of cue were described, the feeling types did differ in terms of which conjunctions were most characteristic. Sequences of antecedent and behaviour were dominant for the emotions across the age range, whereas by 8 years of age descriptions of the contingency between internal sensations, behaviour, and representations of behaviour were established as most typical for the non-emotions.

6) For each of the six feelings there were markedly skewed distributions in the frequency with which different instances of antecedent and behaviour were mentioned. In all but one case the relative frequency of the various examples was consistent across the age groups, suggesting the existence of implicit scales of perceived representativeness that remain more-or-less uniform throughout at least the age range sampled here.

Some preliminary interpretations of the findings have already been suggested, but in the following sections the wider implications of each of the points above are considered in more detail.

2.3 *Accounts of the order in which knowledge of different cue types is acquired*

In the opening section of this chapter Harris and Olthof's (1982) outline of the possible influences on children's acquisition of knowledge about the different types of cue to emotional state was contrasted with an account derived from Piaget's (1972) work on the development of concepts of causality. The former was noted to emphasize an age-related shift in the focus of the child's interest from external to internal features of emotional experience. This shift is guided by the child's search for stable referents of emotion terms, and by the increasing sophistication of his or her attempts to understand the causes of emotional behaviour, supported by observation of self (the solipsistic model) or of others (the behaviouristic model), or by the communications of those with whom the child comes into contact (the sociocentric model).

The Piagetian account, on the other hand, stresses the role played by simple observation of relevant regularities within characteristic episodes, and the order in which knowledge of the various classes of feature becomes apparent is seen as a result of differential availability of information about each. In particular, knowledge about internal sensations and mental states is held to be a later rather than earlier acquisition because it can only be gathered directly from self-observation, whereas the features of antecedents and behaviour are publicly accessible. The point at which knowledge of mental states appears is argued to be further constrained by the later emergence of these as knowable aspects of experience.

Evidence from the current study that knowledge of antecedents and behaviour is acquired first, and that for common feelings the majority of 5-year-olds can describe some features from within these classes, is both in line with previous research (e.g. Bretherton and Beeghly, 1982; Trabasso, Stein, and Johnson, 1981), and with the two accounts of acquisition that have been detailed. Again, the indication of some limited early awareness of mental states is also consistent with the literature (e.g. the knowledge of intensity and duration effects found in 6-year-olds by Harris, Guz, and Lipian, 1985, which is suggestive of mental awareness; or the knowledge of the desires associated with different feelings found amongst 5-year-olds by Stein and Trabasso, 1989). Whilst this awareness appears to be present somewhat earlier than anticipated by Harris and Olthof, it does not in fact run contrary to the processes that they detail. The enhanced level of reports of representations of antecedents for "scared" by the 5-year-olds is, in particular, explicable in terms of the solipsistic model: because a genuine external cause for young children's fear is often absent, they may quickly recognize in these cases that it is the products of their imagination which are responsible for engendering the feeling.

At the same time, this piece of evidence is not inconsistent with the Piagetian account either. Heightened awareness amongst younger children of the mental states associated with fear need not necessarily be directed by the need to explain resultant behaviour: the existence of such activity may simply be more apparent in these instances because of the previously noted contrast that it frequently offers to external reality. Under these circumstances, mental states may take on figural qualities against the background of more commonplace physical events, whereas the mental activity involved in other feelings may be much more consonant with the external world (as for example in wanting a special toy for your birthday, being given a present, thinking as you unwrap it that it is the toy you wanted, and finding that it is), and so correspondingly more difficult to distinguish from it.

More generally, the three models of the growth of awareness of mental states suggested by Harris and Olthof may be viewed simply as representing a selection of possible routes to this knowledge rather than as strict alternatives, with all of them operative at different times or for different individuals. Within this set of influences there must, however, be some degree of primacy for self-observation: as Harris and Olthof note, verbal references to mental states by other people could not be meaningful, and nor could such states be attributed to others, unless the child had noted these in his or her own experience first. The implied pattern of factors in the acquisition of knowledge about mental activity (i.e. self-observation, heightened by specific foregrounding of content or requirements of explanation and comprehension) is, in fact, entirely consistent with the Piagetian account.

As suggested initially, the crucial difference between the

Piagetian account and that of Harris and Olthof is over the factors which determine the point of emergence of knowledge of internal sensations. The present study provides good evidence that this knowledge is acquired after that of antecedents and behaviour, but before that of mental states. This position in the order of acquisition is problematic for Harris and Olthof's account, since, assuming equal availability of information, it is not clear why knowledge of sensations would not arise at the same time as that of mental states, or even after it.

There are in fact several points which suggest that this should be the case. Firstly, the internal character of sensations and mental states means that neither provides initially obvious referents for emotion terms in the way that antecedents and behaviour do. Secondly, in their description of the solipsistic model, Harris and Olthof suggest that awareness of mental states would be greatest when not directly related to the immediate situation. It seems probable, though, that awareness of sensation would also be at a peak under the same circumstances, as a result of similar contrastive effects. Finally, there would be some reason for awareness of sensations to be further delayed relative to awareness of mental states: if the child is actively seeking to explain emotional behaviour, he or she would be more likely to attend to mental states if external antecedents appeared inadequate, since the content of these is of essentially the same character (i.e. both relate to events and actions), and they are more likely to be referred to by others as reasons for behaviour than sensations.

In the face of this contradiction between evidence and theory it is logical to proceed by questioning the assumption that information about sensations and mental states is equally available. Since both are internal, and both covary with feeling state, in adults at least, inequality could only arise through later emergence of mental states as apprehendable aspects of experience. This, of course, leads back to the Piagetian account. This explanation further has in its favour the point that differential availability of information about the classes of feature provides a plausible reason why the order of acquisition tends to remain constant across the emotions and the non-emotions, despite the fact that in both cases earlier cue types (i.e. sensations in the case of emotions, antecedents as regards non-emotions) appear to be less salient than later (i.e. mental states for emotions, sensations for non-emotions).

2.4 *Processes of acquisition of functional knowledge and the emergence of mental states*

The data on the order of acquisition of knowledge about the four basic classes of feature are broadly in line, then, with the operation of the factors pinpointed by the Piagetian account. However, the description of this account provided thus far has not gone beyond an outline of the basis for the differential availability of featural regularities in each class, and, within this, definition of the mental states accompanying feelings as products of the activation of knowledge integral to the selection of appropriate responses during an episode. In view of the favourable evidence for this approach, a more in-depth examination of the processes implied by the account is apposite. In particular, consideration needs to be given to the nature of the mechanisms through which featural regularities are encoded, stored, reactivated when appropriate, and modified as experience changes. Also of central interest is the question of how the operation of these mechanisms might relate to the generation of mental activity and apprehendable mental states.

A point of departure for the definition of a more detailed framework of knowledge acquisition is provided by Piaget's notions of schemas and interiorization. From the Piagetian standpoint, because affective schemas have intellectual characteristics, their development should be subject to the influences of the same mechanisms as intellectual schemas. For the present discussion the most relevant of these mechanisms is that of conceptualization, or the interiorization of action (Piaget, 1972), since it is this that actually defines the content of a schema in the first place. Interiorization is seen as a gradual process, however: "...the schemes of sensori-motor intelligence are not yet concepts, since they cannot be handled in thought and only come into play at the moment of their practical and material utilization...Upon the simple actions ensuring the direct interdependence between subject and objects, there is in certain cases superposed a new type of action which is interiorized and more precisely conceptualized; for example, the subject is not only able to move from A to B, but becomes able to represent conceptually the movement AB and to evoke in thought other displacements" (Piaget, 1972, p.25).

There are clear parallels between Piaget's description of conceptualization as the representation of different points in a sequence of activity, and the representations of events and behavioural reactions to them that permit the occurrence of affective anticipation and the wider guidance of emotional behaviour. Also implicit in this passage, though, is the idea that precise, manipulable representations of activity are built up over time via a kind of layering or superimposition of newly encoded information on existing schemes or basic maps of activity as the set of actions in question is repeated. As a result, available knowledge passes through varying degrees of complexity and retrievability. For instance, initial knowledge in the form of schemes can guide action when activated in context, but is not consciously accessible. Repeated use of these schemes, though, leads to a consolidation of the detail contained within them, and an increasing awareness of that content as it guides action. Ultimately, schemes become transformed into schemas, which are accessible without the activity that they describe actually occurring.

Karmiloff-Smith (1988) extends these ideas in her outline of a process by which genetically shaped activities could become transformed into knowledge-based procedures via the mechanism of re-description. The key element in this formulation is the notion that all activity leaves behind a more-or-less veridical sensory record, and that successive repetitions of an activity both consolidate and elaborate the record pertaining to that activity. It is this development that is characterized as re-description. As with the schemes and schemas detailed by Piaget, re-description gives rise to constructs which both represent and inform the performance of a sequence of actions, and which also tend towards increasing explicitation of the features of that sequence.

Re-description is seen as an on-going process, however, that can act recursively on its own products. So, for example, a sequence of activity consisting of the movement from A to B becomes represented via re-description as the conceptualized movement A'B'. Activation of this representation when position A has been attained allows control of the shift from A to B by means of matching actual movement to the represented movement. As the representation becomes more explicit, though, and conscious awareness of its activation grows, the experienced sequence of activity effectively begins to consist, not of A,B, but of A,A'B',B. Higher level re-description can then start to occur, with all the characteristics of this modified sequence, including activation of the previous representation, being encoded within the representation A'A"B"B', and so on.

This model can be directly applied to the development of the child's knowledge about the sequence of events that comprise an emotional episode or the occurrence of a non-emotional feeling state. For instance, early re-description of an emotional antecedent-behaviour sequence (some examples of which would be genetically constrained in the same way as the activities considered by Karmiloff-Smith) would result in the encoding of an implicit knowledge structure whose unconscious activation within context would provide a measure of experience-based control over reaction. Products of this kind would closely resemble the affective-cognitive structures described by Izard (1978).

Repetition of the episode, and greater explicitation of the representation of the sequence, would produce more conscious control over reaction, but would also result in awareness of the activation of that representation, leading to the creation of new features within the experience of the relevant episode viz. mental states, and more specifically the sub-classes defined previously as representations of antecedents and behaviour. Information about these features would be encoded via higher level re-descriptions.

On subsequent occurrences of the relevant episode, it would be the representation generated by higher level re-description which would be activated. This would yield control, not only of behavioural response, but also of mental activity, since the child would begin to become aware that certain antecedents tended to provoke particular mental associations or images of other situations and actions within them that determine interpretation of the antecedents in a specific direction. This awareness would permit more deliberate comparison between present antecedents and representations of related prior experiences, and more conscious decision as to whether the interpretation of events that has been effectively primed in this way is appropriate. In other words, the child begins to make more deliberate evaluations. The presence of these within experience of an episode would be encoded in turn by even higher level re-descriptions.

This outline is, of necessity, something of a simplification of a complex series of developments. Broadly speaking, however, it does fit in well with the observed changes in children's reports of the characteristics of feeling states. Early knowledge acquisition would tend to focus on antecedents and behaviour because they are the most available features of experience, partly in the sense that they are publicly observable and so objects of shared attention; partly because they are more discrete and hence sooner defined within representations derived from a series of similar episodes than private sensations would be; but perhaps most of all because, as Piaget stresses, the child first encounters the world through physical activity, and so his or her knowledge of any aspect of the world is first and foremost knowledge of activity and of the conditions under which it is performed.

Since re-description encodes all aspects of sensory experience, though, information about internal sensations would also be present in the earliest representations concerning feeling states. However, the comparatively low sensory status of somatic feedback, coupled with any tendency for that feedback to be diffuse or variable in pattern, would mean that it would take longer for overlaying information within representations to build up any precise featural detail. This serves to explain why feelings (particularly the non-emotions) where sensation could be described in more specific terms had more (and to some extent earlier) references made to this class of feature.

Knowledge of mental states would be apparent last of all because, as previously described, these are not apprehendable aspects of experience until the child has begun to be consciously aware of the activation of relatively well-defined representations within the context of an episode. The suggestion from the data that younger children with knowledge of mental states are more likely to be aware of representations of antecedents and behaviour, whereas older children will tend to include more references to explicit evaluations in their descriptions, is also as would be predicted from the notion of higher and higher levels of re-description, with each encompassing the representations generated by the level below.

Somewhat more problematic here is the later emergence of descriptions of wider patterns of mental activity, since the content of these seems to be primarily definable in terms of repeated activation of representations of antecedents and behaviour. This would suggest that awareness of this aspect of experience ought to occur at roughly the same point as awareness of single activations. However, in the same way as outlined for internal sensations, greater variability in the general pattern of mental activity from instance to instance of an episode might result in a longer period being required in order for precise, explicit featural values to be built up. Such variability is plausible, given that repeated activation of representations might, for example, be a result of chance factors affecting the possibility of instigating an implied behavioural response.

The earlier awareness of mental states associated with episodes of fear is also not inconsistent with this outline. In general, awareness of the activation of representations has been argued to be a function of these representations acquiring relatively explicit featural values. Early mental awareness therefore implies that certain fearful episodes are either more defined in terms of their antecedents and behaviour, or that they are experienced more frequently than other types of episode.

The fact that in the present study the most common antecedents and behaviours for "scared" were mentioned no more frequently in general than those for the other feelings (see Table 2.3) would seem to weigh against either of these alternatives. A further possibility, however, is that awareness of the activation of representations is enhanced in the case of some fear-inducing episodes without the normal degree of featural precision having been achieved. The contrastive effects of, for instance, imagining the presence of ghouls and monsters in a dark but otherwise familiar room, has already been argued to heighten awareness in this way. It may not be coincidental that, although young children may show such awareness, the exact nature of <u>what</u> they imagine is often ill-defined.

A further point of consistency between this outline and the data on the development of awareness of mental states is provided by the indications of apparently piecemeal change. The most striking example of this is again the considerably higher number of early reports of mental states for fear than for any other feeling. There is a clear implication from this that the development of awareness of such aspects of experience in one context does not automatically lead to the emergence of this awareness in another, contrary to the predictions of accounts which suggest more global shifts in conceptualization. This is entirely in line with the outline presented here, however, since re-description has been argued to operate on an episode-by-episode basis.

Thus the Piagetian account, augmented by Karmiloff-Smith's (1988) suggested mechanism of re-description, is consistent with the basic data on the development of children's knowledge of feelings; it explains the emergence of the mental states associated with feelings in terms of the activation of context-related knowledge, encoded in representations of activity; it provides, through that direct encoding of sequences of activity, the basis for knowledge of the conjunction of different elements within an episode; and in this way it defines the basis of a link between conceptual development and one of the three main regulatory functions, prescriptive control of reaction. There are yet other parallels, though, between elements of this account and observed phenomena concerning feeling states, one of which, the relationship between language and experience, is of particular interest here.

A number of authors have shown an interest in the correspondence between the development of children's narrative structures and their acquisition of knowledge about emotions (see e.g. Trabasso, Stein, and Johnson, 1981). More generally, Averill (1988) comments that "most phenomenological analyses of specific emotional experiences strongly resemble linguistic analyses of the corresponding emotional concepts" (p.86). One reason why close parallels between knowledge about emotion and linguistic expression would be apparent is of course simply that since statements about emotional experiences are a major source of data about emotional knowledge, the knowledge that is evident is constrained by the ability to express it. If this were the case it would, in fact, severely hamper interpretation of the data generated by the present study.

However, the current data provides strong indications that this is not the basis for these parallels. If, as was observed to be so, children can describe internal sensations or mental states for one feeling, but not for another, then it is clearly not a lack of expressive ability which has led to any failure in reporting, but an actual lack of knowledge, or at least an inability to retrieve it. Thus parallels between language and emotional knowledge would appear to be either the result of Whorfian style constraints of language on experience (the position towards which Averill tends), or of direct encoding of experience into linguistic forms. In fact, Karmiloff-Smith (1988) argues that one of the most basic stages of explicitation of the features of a sequence of activity encompassed by re-description is unfiltered encoding into language.

Once this element is included, the functional representations of sequences of activity that would be developed via re-description begin to strongly resemble the action sets controlling emotional responses proposed by Lang (1984), and briefly referred to in Chapter 1. These consist of associative networks of stimulus, meaning, and response propositions, which are double-coded as afferent or efferent impulses and as verbal formulations. Activation of the network, which can occur as a result of the perception of elements related to any of the propositions that it contains, can either produce behavioural response, or verbal description. From this perspective, there may be a slight lag between the beginnings of acquisition of knowledge about a particular set of experiences and ability to express this knowledge, but otherwise language use directly reflects what is known about those experiences.

If there is any limitation exhibited by the account of acquisition of knowledge about feelings presented above, and by the structures held to be generated by the processes described, it is that there is too exclusive a focus on the translation of personal experience into knowledge, and on the use of this knowledge for intrapersonal regulation. As discussed in the opening chapter, in the human context the regulatory potential of knowledge about emotions, if not other types of feeling, is ultimately dependent on that knowledge being both shared and mutually applicable. The structures that re-description is argued to produce show in many respects a good fit to available data, but must be more generalized across the subject or agent of the activity they embody than provided for so far.

One possible mechanism which may result in more generally applicable event representations being acquired from early on in development is social referencing (Klinnert, Campos, Sorce, Emde, and Svejda, 1983), and concomitant intersubjective experience of an episode and socialization of response to it. Under these circumstances, especially when an episode is repeated, there may be a greater tendency for encoded antecedents and behaviour to have weaker featural values for subject. This might also happen when other people are witnessed to be involved in episodes which closely resemble those previously experienced by the child.

A further potential source of generalization is provided by encoding into language. In the first place, such encoding may not always be carried out by the child directly, but by the parent or caretaker (see Dunn et al., 1987), who may implicitly express an intersubjective viewpoint. Again, once language encoding is generally established, the applicability of episode descriptions to a variety of individuals is emphasised by the fact that a given instance can be described in the same basic terms irrespective of the subject involved. After this point, language may provide the means by which personal and vicarious experiences are fused into wider event representations.

The present study did yield some evidence that children had incorporated features from indirect experiences into their knowledge about feelings, in the form of references to particular antecedents and behaviours which were unlikely to have been personally encountered by the sample. This was most obviously the case for "scared", where the range of antecedents that were described extended beyond the gamut of probable 10-year-old experience, even in a deprived inner city area (e.g "betting all your money", "when someone's about to shoot you").

Perhaps even more striking was the number of references to "shaking", which although a fairly extreme behavioural reaction, and not likely to have been often directly experienced, was the most frequently mentioned expression of fear. It is, however, a standard cartoon technique for the illustration of a character's fearful reaction, and in this form would be very familiar to most children. This suggests television may be an important source of information about the characteristics of feelings for children, a point explored by Dorr (1985), who concludes that "television programming seems quite able to provide children with many different examples of how to express anger, dismay, fear, chagrin, happiness, and humour" (p.74). It seems probable in fact that it is not just behavioural expressions that children would note, but whole sequences of antecedent and behaviour, which may often be re-enacted during the course of games.

These examples are simply the most detectable instances of the influence of vicarious experience on knowledge of feeling states which may have resulted in more unified representations of episodes affecting self and others. It may be assumed that similar examples, derived from direct observation of others as well as from television, are present for other feelings, but that these are less obvious simply because their content is more mundane. One consequence of the use of such "external" sources of information is, of course, that it would emphasis any already existing tendency for knowledge of antecedents and behaviours to develop more rapidly than that of internal sensations because of the multiplicity of available information sources.

2.5 *Sequential knowledge and episode structure within emotions and non-emotions*

The picture that emerges, then, with regard to the development of knowledge about feelings is of representations of contexted personal activity, which are built up through the process of re-description, being generalized into more widely applicable event representations. Such structures would have much in common with scripts (Schank and Abelson, 1977; Nelson, 1981) of repeated sequences of actions, which serve to provide both plans for subsequent performance of the relevant activity, and expectations about the behaviour of others. Lewis (1989), for example, explicitly discusses the idea of culturally universal scripts for emotions, which would be both shared and mutually applicable in the way defined above. There are, however, some important distinctions between this and various other constructs of this kind that have been proposed by different authors. A brief consideration of these will be useful in pinning down more precisely the type of structure that might be most appropriate in the context of knowledge about emotions and other feeling states.

Scripts, for instance, as defined by Schank and Abelson (1977), are goal-directed structures i.e. they specify, with varying degrees of generality, the actions to be taken in order to achieve a particular goal, and are accessed through the representation of that goal. Although it is possible to conceive of emotions or other feelings being used to achieve particular ends, this would seem to be a secondary aspect of knowledge about them, with the primary emphasis on what behaviour is possible and/or appropriate in a given context, which has not usually been personally chosen. This knowledge may, in fact, define goals to be achieved once in that context (such as, for instance, eating when hungry), but the feeling state and expression does not exist, except perhaps in some evolutionary sense, to serve the attainment of those goals. In other words, one does not become hungry in order to eat.

Absence of this goal-based element seems to suggest a structure more akin to the memory organization packets (MOPs) outlined by Schank (1982a), whose primary function is to provide expectations or predictions about future events, and the consequences of actions within them. In common with the current discussion, the shift from personalized knowledge to more generally applicable structures is an issue of importance for Schank, who argues that MOPs have restricted functional value until such generalization has been achieved. MOPs essentially operate to serve scripts (in the sense defined above), but exist separately from them as representations of general sequences of events.

However, this formulation is again unsatisfactory as regards knowledge of feeling states, since it excludes the element of prescriptive control of behaviour which is central to intrapersonal regulation (c.f. also the use of "script" in Russell, 1989, solely as a knowledge schema). The type of structure in which knowledge of feelings is contained would seem to be closest in character to an event-related version of the perceptual schema defined by Neisser (1976), which, depending on point and source (internal or external) of activation, can both guide behaviour and serve as a framework for the interpretation of incoming information and the generation of expectations.

Within such structures, which may be termed event schemata, there would be a cyclical relationship between afferent and efferent impulses, with each tending to result in the other, as activation is channelled in either direction through a series of interconnected traces (see Hintzmann, 1986). In this way great flexibility of function could be achieved, since, for instance, incoming information about another's action that has antecedent characteristics would tend to produce a behavioural response, whilst personal antecedent actions would lead to anticipation of the behavioural response of others.

What all these constructs have in common, however, is their emphasis on sequential or episodic knowledge, both in terms of what that knowledge relates to, and with regard to how it is represented and organized. This, it is argued, is the key characteristic of knowledge about feeling states, evident from the extent of spontaneous references to the conjunction between different classes of feature. It is important to stress, though, that this type of structure is not an imposition on experience, but a veridical reflection, achieved via re-description, of the structure implicit in emotional and non-emotional episodes. The functional value of this knowledge is dependent on the fact that this is actually the case.

Hence for emotions, there was found to be a paradigmatic emphasis on descriptions of events that contained sequences of antecedent and behaviour, which can be argued to be a direct result of the natural contingency between these classes of feature within emotional episodes. Since both the predictive and prescriptive aspects of regulation rest on knowledge of these conjunctions, it is likely that their salience is heightened relative to others that may be experienced, but this in itself is a consequence of the typical episode structure.

Again, it was observed that with increasing age there was also a tendency to describe more complex patterns of contingency involving, either implicitly or explicitly, the interposition of mental states between antecedent and behaviour. This is explicable, though, as noted above, in terms of the activation within an episode of representations of antecedents and behaviours from previous experiences of a similar nature. In addition, this trend was not associated with any significant shift away from the basic pattern of responses. The antecedent-behaviour paradigm is not restricted to children, either: both McAteer (1987) and Conway and Bekerian (1987) report the same emphasis to be present in adult descriptions of emotional experience.

In contrast, for the non-emotions the most typical descriptions of the sequence of events focused on the conjunction of sensation and behaviour, although these did not become widespread until eight years of age, and, as with the emotions, early descriptions dealt with the relationship between antecedents and behaviour. As suggested at the outset, this difference in the perceived structure of non-emotional episodes would seem in part to reflect a weaker contingency between the antecedents of non- emotions and the underlying physiological conditions that they indicate. It may also, however, be a result of a more fundamental distinction in episode structure and the significance of the elements of which it is comprised.

To be specific, many of the behaviours associated with the non-emotions, especially tiredness and hunger, would seem to be much more directly concerned with moderation of state than is the case for the emotions, and only have secondary expressive characteristics. If this is so, then there would be clear adaptive value in establishing more precise signals for the appropriate instigation of these actions than are provided by antecedents. Some spontaneous behaviours such as yawning, for instance, may serve this purpose, but as awareness of internal sensations develops this class of cues may provide more reliable information. Even so, however, appropriate behavioural responses for the moderation of state will need to be actively connected with perceived sensations, since there will not be a natural contingency between them to capitalize on in the same way as there is between antecedents and behaviour for emotions.

In other words, then, the typical sequence of events that is described for non-emotions may indeed veridically reflect actual episode structure, but a structure that is <u>acquired</u> because of its adaptive value, not one which is inherent. Appreciation of this paradigmatic structure may be a later development, therefore, partly because it rests on knowledge of a class of feature, sensation, about which less information is available, but also because the structure itself takes time to become established. Parental use of routines for mealtimes, bedtimes, and so forth may be of crucial importance in building up such structures because they can bring sensation and behavioural response into closer proximity than might otherwise be the case, at the same time as providing a model for the nature of that response. Kopp (1982), and Wertsch (1985) both argue that parental scaffolding of regulatory activities of this kind is a fundamental step in the development of self-regulation.

In general, the distinction between emotions and non-emotions, embodied in this difference in perceived episode structure, can be encapsulated in the following way. Emotions are essentially <u>interpersonal</u> feeling states, which arise primarily as a result of the effects of one person's actions on another. Emotional behaviour tends to act back upon the causes of the feeling, or at least the agent of the cause, if only by instigating in others behaviour which is consonant with personal state. Non-emotions, on the other hand, are essentially <u>intrapersonal</u>, and derive from changes in physical condition. The behaviour accompanying such feelings tends to act upon the effects of those changes rather than directly upon their causes, which are not modifiable in the same way as the causes of emotions. In consequence, there is a heightened emphasis on prescription of behaviour for non-emotions, and correspondingly reduced emphasis on prediction and possibly understanding.

2.6 *Functionalism, knowledge, and regulatory activity*

In the two preceding sections an account has been given, firstly, of basic mechanisms that would result in the observed characteristics of acquisition of knowledge about feeling states, and, secondly, of the kind of structure within which that knowledge appears to be encoded. Whilst something of the relationship between these structures and the functions served by knowledge has been outlined, it is appropriate to return to more formal consideration of the operation, within this framework, of the key regulatory activities of identification, prediction, and causal understanding, particularly with respect to emotions.

As discussed above, knowledge of sequences of featural regularities, embodied in event schemata relating to different instances of feeling state, serves to provide a basis, according to the demands of the situation, for prescription or prediction of behaviour, since apprehension of the presence of any features that match those contained in a schema will result in activation of the whole structure. Thus, for emotions for instance, perception of a known antecedent will lead to activation of behavioural representations, which can either be translated into actual activity, or stand as anticipation of another's actions. Recognition (as distinct from explicit identification) of an instance of an emotional or non-emotional episode will be achieved by means of the same mechanism of schema activation, and in this sense recognition and prescription or prediction can be considered to be merely different stages in the same overall process.

Depending on feeling and context, though, knowledge of each class of feature may be of variable status for recognition, prescription, and certainly prediction, where there is an implicit reliance on external cues. Although it has been suggested previously that event schemata for emotions and non-emotions eventually encompass regularities from each of the four main classes of feature, the data suggest, for example, that for emotions internal sensations often tend to be less defined, and that for non-emotions antecedents are less contingent upon onset of change in physical state. In both cases the reduced discriminatory potential of these particular types of feature would seem to leave them with little value for either recognition or prescription and prediction. This supposed lack of salience has been argued to account for the lower number of children in each age group who made reference to such cues when compared to contrasting feeling types. The apparent redundancy of such knowledge, however, could be held to be somewhat problematic for strict functionalist approaches to the development of feeling, since these stress the role of adaptive salience in shaping the content of what is known.

Closer examination, though, points to the conclusion that knowledge of the sensations associated with emotions, and of the antecedents of non-emotions, is not necessarily without its uses. To take these in turn, the sensations that accompany emotions may be considered to be in large part the subjective experience of changes in level of arousal, as argued by Lewis and Michalson (1983). Leaving aside the evolutionary value of such changes in preparing the organism for subsequent activity, their experience may serve as a general marker of the adaptive salience of the event _as a whole_. At a biological level this may serve as a learning mechanism that strengthens memory traces, as would be indicated by the strong reinforcing properties of pain and arousal in other animals.

Sensations of this kind may also have a psychological function, though, in terms of distinguishing emotional episodes from more routine activity. Thus while knowledge about sensation may not allow specific episodes to be recognized, since many event schemata would contain the same information, and all of these would tend to be activated if sensation was all that had been perceived, it may permit recognition of the fact that there has been a break in routine. This may result in turn in greater effort to obtain information which would allow the nature of the episode to be more precisely determined. This would clearly be consistent with the findings of Schachter and Singer's classic study of the role of situational characteristics in the interpretation of epinephrine-induced arousal (Schachter and Singer, 1962). Conversely, the performance of emotional behaviours in response to perceived antecedents, but with sensation absent, might allow mock emotional episodes to be distinguished from genuine. This global role of experienced sensation could account for the prevalence of arousal as an emergent element in dimensional approaches to the study of emotional knowledge.

Knowledge of the antecedents of non-emotions may also have some broad functional value despite the weaker association between these and actual onset of feeling, since it would permit likely needs, which may arise at some unspecified point in time, to be anticipated, and general provision made for them (e.g. taking sandwiches on a long train journey). Again, whilst prediction of the specific point at which another person would exhibit behaviours associated with non-emotional feelings might well be impossible without their report of experienced sensation, knowledge of antecedents would allow a broad anticipation of those behaviours and of underlying needs. Indeed, parental regulation of children's requirements for food and rest, for example, would be dependent on such knowledge. Finally, knowledge of antecedents could serve to provide a framework within which experienced sensations are intelligible. For instance, having aching legs after walking ten miles would provide a good match to a schema for an episode of fatigue; the same sensation after spending a day sitting in the sun would be more likely to be interpreted as a symptom of illness.

Turning to consideration of the development of causal understanding, it was argued previously that the basic requirement for this activity was knowledge of the mechanism or process by which one set of regularities is transformed into, or gives rise to another set. To take the simplest instance in the case of an emotion, this would suggest that the child needs to acquire knowledge of the process by which particular antecedent situations lead to particular behavioural responses. More or less explicit in the description of the function of event schemata in prescriptive control of emotional behaviour was the idea that a primary process linking antecedent and behaviour is the activation of knowledge about previously experienced antecedents of a similar nature and the behavioural responses to them. From this point of view it would seem that if a child is aware of such activation (i.e. they have knowledge of the mental states associated with a particular episode), they would possess basic causal understanding.

This may, however, be too simplistic an account of even the most straightforward examples. Firstly, knowledge of mental states in themselves is not enough. To have understanding of process it would be necessary to have linked relevant mental states to both antecedent and behaviour, as would be the case with well-constituted higher level re-descriptions. In other words, the child must possess as a minimum a structure that can effect a series of mental transformations that are parallel to those which happen within the episode itself. Further to this, though, in his discussion of development of the understanding of physical causality, Piaget (1972) argues that true causal conceptualization is defined by two characteristics in addition to such knowledge of process or mechanism.

The first of these is that the mentally constructed process is not merely imposed on experience, but genuinely corresponds to the transformations that are, in some objective sense, taking place. This condition is not in itself necessarily problematic for an account of the understanding of emotional causation that rests on knowledge of mental states interposed between antecedent and behaviour. Whilst it may be argued that emotional processes have a biological stratum that such knowledge fails to consider, there is a very real sense in which this is subordinated to the influences of mental activity as knowledge-based control of response develops, and hence in which mental states do actually constitute the primary causal mechanism, Wittgenstein's distinction between reason and cause notwithstanding (Wittgenstein, 1958). By the same token, though, causal understanding of non-emotions, which rest to a much greater extent on biological processes, might be anticipated to be much poorer, and to remain so apart from a loose recognition of the role of sufficient antecedent conditions such as not having eaten for a number of hours. As far as emotions are concerned, another point of importance is that the child with knowledge of mental states may have a basis for accuracy of understanding that she or he would be denied in many other cases, because of being, in this instance, actually privy to the operation of causal mechanisms in a manner impossible in the context of, say, the forces determining the motion of a bouncing ball.

This may still not be sufficient to be defined as mature causal understanding, however, particularly as regards the emotions of other individuals. Piaget's remaining criterion here is that mental "models" of the transformation effected by a causal process are not merely applied to the relevant objects, but <u>attributed</u> to them, such that there is a "convergence between what the objective operators do physically and what the subject is able to effect in his deductive reasoning" (Piaget, 1972, p.81). Such attributions are not to be confused with the causal attributions (e.g. reasons for success or failure) that Weiner (1985) suggests are responsible for determining the quality of emotion ascribed to self and others, and neither is this simply a restatement of the criterion of accuracy. Attribution in this sense is an investment of mental transformations in other objects such that the causal process is actually <u>experienced</u>, although only the regularities present at start and end of that process may be directly observable. This is qualitatively different from the <u>application</u> to an event of a mentally constructed series of transformations, a type of operation which would be mechanistic in nature, and more characteristic of post hoc deductions or reconstructions.

In fact, despite Piaget's principal concern with the understanding of physical causality, other authors have emphasized a role for attributions, similar to those outlined above, in the context of social understanding, particularly with regard to emotion. In general terms, causal attribution of this kind, when applied to other people, might be considered equivalent to the condition defined by the symbolic interactionists as "taking the role of the other" (Mead, 1934), although in the deepest sense of this. The solipsistic model (Harris and Olthof, 1982) of the development of awareness of the mental states associated with emotions provides the basis of an account of how the child, having observed the relationship between his or her own mental activity and emotional reactions, could attribute these connective mental processes to others, ultimately to the point of 'perception' of their on-going thoughts within a situation. Shantz (1975) suggests that in general "the child's attributions of his own thoughts and feelings are...important means of understanding others" (p.313). Harris (1989) takes this further, arguing that children come to understand and anticipate the emotional reactions of others by imagining their own mental experiences in a situation and then projecting these onto those others.

Whilst this indicates ways in which mature causal understanding, in the form of attribution of mental processes, might develop in the context of emotions, what is not clear, however, is the point at which this begins to occur. Shantz (1975), for instance, distinguishes between, on the one hand, children's descriptions of the mental states of others, which could be argued to be applications in the Piagetian sense, and which she suggests start to emerge between eight and ten; and, on the other hand, explanatory attributions (i.e. with transformational properties and causal force), which are seen as the products of adolescence. Harris (1989), though, presents evidence that preschool children not only have knowledge of mental states associated with emotions, such as beliefs and desires, but also that they can use this knowledge to make accurate predictions about the future behaviour of other people (see also Stein and Trabasso, 1989).

The data presented by Harris are consistent with the results of a number of other studies which have examined what has come to be termed the child's "theory of mind" (see e.g. Wellman, 1985; Astington, Harris, and Olson, 1988). There is some conflict with the data from the present study, however, which found that although some five-year-olds had knowledge of mental states experienced during emotional and non-emotional episodes, this was limited in scope, apparently not for expressive reasons as such. Also, as has already been pointed out, knowledge of mental states is not in itself equivalent to causal understanding and attribution.

One reason for discrepancies in estimates of the extent of young children's awareness of mental states between studies of emotion and investigations of other aspects of cognitive activity could simply be that there are differences in the complexity of the operations involved, and so in the point of emergence of awareness. This does not account for differences between studies within the domain of emotions or feeling states more generally, however. It seems more likely that discrepancies here are the result of variable task characteristics, and in particular of the degree of explicit knowledge required to make an appropriate response. Thus studies of accuracy of prediction would yield earlier estimates for the point at which children possess extensive knowledge of mental states than would be the case with interview studies because the former can rely more on implicit knowledge, whilst the latter require such states to have acquired more explicit figural qualities. This would explain why the current study and that of Harris et al. (1981), who also used an interview methodology, found similarly limited knowledge of mental states amongst five- and six-year-olds.

But this account reflects back in turn on the nature of the knowledge held by preschool children, since implicit awareness of the mental states interposed between antecedent and behaviour, even if it can be used to make judgements about the likely actions of another person, would not constitute causal understanding in the sense of representation, let alone attribution, of the process of <u>transformation</u> from one condition to another. If, as Piaget (1972) argues, the development of causal understanding begins with the observation of regularities, then before knowledge of mental states can acquire any explanatory function it must first of all define a set of features or properties that covary with other types of feature (i.e. antecedent and behaviour). Sequential or episodic knowledge expressing such covariation implicitly, or even explicitly as in Stein and Trabasso (1989), might be sufficient to permit accurate anticipation of the reactions of others, consistent with the causal influences of mental state, without actual possession of any real causal understanding.

Moreover, even when children begin to explicitly describe relationships between mental states and actions, caution is required in making judgements as to whether such statements form evidence in favour of understanding of the causal role of mental states. Both Dunn et al. (1987) and Bretherton, Fritz, Zahn-Waxler, and Ridgeway (1986) suggest that parental communications about emotions have a powerful influence on children's statements, and it is possible that on at least some occasions causal descriptions are 'received' rather than constructed. The situation is further complicated by the fact that task requirements may lead children to spontaneously construct causal transformations that they might otherwise not have arrived at. Piaget (1972) states that it is not the case that causal structures "are formed in complete autonomy and are then merely attributed to reality. On the contrary, it is often when searching for a causal explanation that there occur simultaneously both operational synthesis and its attribution to objects. . ." (pp.40-41).

In general, these points tend to suggest that well-formed causal structures which are both accurate, and attributed to others in the sense defined, are a later rather than earlier development. Some hard evidence that this is the case is provided by what are otherwise relatively inexplicable failures on certain kinds of tasks made by children up to nine or ten years of age. For instance, understanding of the causal role of mental states in determining emotional reaction should lead to recognition of the fact that in certain equivocal situations, reaction will depend on interpretation of that situation, and therefore various different reactions might be possible. However, Gnepp, McKee, and Domanic (1987) found that whilst the majority of children between five and nine years recognized the dependency on appraisal, even at the top end of this age range barely half the children indicated that more than one response was possible. Similarly, Harter (1982) found that recognition that it is possible to have simultaneous mixed feelings as a result of conflicting interpretations of a situation did not emerge until about nine years of age. Donaldson and Westerman (1986) found that it was not until ten years of age that the majority of children described mental states as the primary cause of changes in feelings.

One explanation of why younger children may have problems with tasks such as those used by Gnepp et al. or Harter is suggested by Flavell (1988). He argues that preschool children have a good understanding of variation in others' cognitive connections (e.g. differences in individual perspective in seeing, or in the fact of knowing something), but poor understanding of variation in others' mental representations. One consequence of this is a tendency to be able to distinguish whether or not someone else knows something (such as whether there is anything in a Smarties box), but to fail to differentiate between personal knowledge and that of others (such as knowing that the box contains a pencil, but someone else thinking it contains Smarties). Typically, young children will believe that other people's knowledge or representations are an exact duplicate of their own.

Placing this in the context of emotional episodes, there is an implication that children might in some sense assign their experience of mental activity to others from a relatively young age, as Harris (1989) argues, but that this would be an inaccurate and inflexible operation, perhaps more of the order of a tacit assumption than an active projection, and some way removed from attributions of causation in the Piagetian sense. The type of rigidity suggested by the tendency only to be able to conceive of a single mental frame, that which is experienced personally, is clearly of a piece with the effects reported by Gnepp et al. and Harter.

It is also consistent with what might be anticipated if assignment of mental states to others were a product of schema activation in exactly the same way as predictions of behaviour were suggested to be, since if only one schema were activated or attended to, only information about the mental states associated with that specific episode would be immediately available. The content of that information would reflect the child's own mental activity as experienced in the relevant context, since this would have been its original source, and it would be as inflexible with regard to possible alternative patterns of thought as that activity had been. In other words, whilst the child's awareness of mental states is restricted to activations of particular representations of antecedents and behaviour, any mental activity assigned to others will be similarly constrained.

However, once the child has acquired still higher level re-descriptions, and characteristic mental activity has begun to include more conscious appraisal and evaluation (and hence alternative interpretations of situations), then such alternatives will form part of any application of mental states to others. Moreover, since the child capable of evaluations of this kind will be more aware of the extent to which reaction is dependent on whichever interpretation is considered valid, it would be at this stage that self-observation would start to yield more accurate and mature ideas about mental causation that could be subsequently attributed to others. It may be noted that in the present study references to mental evaluations only became widespread amongst the ten-year-olds, which is the age when Gnepp et al. (1987), Harter (1982), and Donaldson and Westerman (1986) all suggest more flexible and sophisticated description and usage of emotional causality becomes prevalent.

To sum up, it would appear that causal understanding of emotions gradually develops during the period up to early adolescence, passing through a series of distinct phases en route, characterized by different degrees of awareness of mental states and through this, corresponding levels of sophistication in the content of processes attributed to other people. The emergence of tacit knowledge of mental activity during the preschool years marks the beginning of this development, but although the child may assume such activity to occur in others even at this stage, assignment of this kind is more akin to the prediction of behaviour (i.e. it is simply a reflection of knowledge of covariation), and is argued to carry little or no causal force.

Subsequent re-description of episodes will result in increasingly explicit awareness of mental states, and a growth in the precision of descriptions of the likely mental activity of others. Such descriptions are still more applied than attributed, however, in the sense that they are constrained to the child's own experiences and so can exhibit only sporadic convergence with the diverse mental conditions which may obtain for other people. Moreover, at this point explicit attempts to frame the mental activity of others may tend to be solely a product of specific situational contexts, such as requests for explanations as to why "Johnny is crying" or "Daddy is angry", and spontaneous "mind-reading" in any developed sense may be rare.

Mature causal understanding and attribution only begins to be possible when the child becomes aware of evaluation as a multifaceted process that specifically leads from antecedent to a particular behavioural response. Furthermore, if, as has been argued, structures which effect mental transformations in the appropriate manner are, initially at least, identical with episode re-descriptions, then this level of causal understanding will tend to be specific to context at first, and will only gradually become widespread.

The one remaining issue which has not received full attention here is that of identification. At the beginning of this section a distinction was drawn in passing between recognition of instances of emotional or non-emotional episodes, and explicit identification of these. Whilst both processes are seen as coming under the general classification of identification within the three main regulatory activities, there are nonetheless fundamental differences between them that require emphasis at this point.

Recognition may be specifically defined as the activation of stored representations of events closely related to those which are being currently experienced. The principal effect of this is to prime appropriate event schemata, which then provide a basis for prescriptive control of personal behaviour and anticipation of the behaviour of others. Whilst continued monitoring of the progress of the episode may occur, as a check on the accuracy of initial judgement, the implication is that recognition involves low-level, partial processing only.

Explicit identification, on the other hand, implies the categorization of an overall episode as an instance of, for example, happiness or sadness. As such it rests on knowledge of a taxonomy of feeling states, and of a vocabulary which serves to label different classifications within that taxonomy. Judgements of this kind will require more extensive, and possibly more active, processing than recognition, simply in order to connect a schema with the taxonomy. Recognition may, however, be subsumed to categorization as a first stage in that activity. The concluding section of this chapter examines the types of information that might be necessary for making such categorizations of emotions, before proceeding to consider the issue of variation in the representativeness of different exemplars, and how this might arise as a product of the process of identification.

2.7 *Exemplification and identification of emotion*

It may be noted first of all that, despite the distinctions drawn above between recognition and explicit categorization of emotional episodes, in both cases accuracy of judgement will be dependent on knowledge of the features that discriminate one episode, or type of episode, from another. In broad terms, then, it would be expected that the features which allow unambiguous recognition of an episode would be, at the very least, included amongst those which permit definite categorization of that episode, and that the two types of judgement might often rest on the same information.

Of the four main classes of feature about which information might be available within any given episode, it has already been suggested that whilst internal sensation may be of use in distinguishing the fact of an emotional experience, it is usually too general to allow recognition of a specific instance. Thus, the implication is that, whether for recognition or categorization, fine degrees of judgement will tend to depend on knowledge of antecedent, mental state, and behaviour.

However, closer consideration points to the conclusion that mental states may also contain little unique information about emotional episodes, or little that is used for either recognition or identification in the age range considered here. In the first place, mental states have been defined as experience of the activation of event schemata similar in character to an on-going episode. Since such activation has been argued to be in effect the process of recognition, it follows that mental states cannot logically provide the informational basis for subsequent recognition, at least until the highest level re-descriptions have been acquired. After this the activation that results from the presence of a particular antecedent might lead in turn to the activation of representations of previous sequences of mental activity, which could be regarded as a type of secondary recognition.

If, of course, identification occurs at a later stage in an episode and so can rest on a wider base of information, then these kind of limitations on the role of mental states in recognition of emotional episodes need not imply any similar restrictions on categorization. There are related issues, though, which point in the same direction. The first of these is that mental states could not be involved in the identification of emotion until the child has become aware of their existence and their characteristics, and for the most part such awareness appears not to become explicit before five or six years of age at the earliest, whilst the emotional vocabulary begins to be acquired from the age of two onwards (Bretherton, McNew, and Beeghly-Smith, 1981; Bretherton and Beeghly, 1982).

Secondly, even when explicit awareness of mental states has emerged, the extent to which this provides any new and unique content to the experience of emotional episodes is debatable. Whilst there is a clear distinction between a real event and its representation, the content of a representation remains largely of the same form as the discernible content of the real event from which it derives. Thus whilst it may in fact be the case that an emotional episode could be identified on the basis of activated representations of antecedents and behaviour, such identification might reasonably be argued to rest on the features of the original antecedents and behaviour and not the mental state itself.

This point remains broadly true even when the child has begun to become aware of wider patterns of mental activity or of more conscious interpretations. For instance, recurrent activation of a representation is not in itself characteristic of any specific feeling, whereas recurrent thoughts about going to a special party might be characteristic of excitement, or recurrent thoughts about the window you broke might be characteristic of fear. Again, evaluations of, say, whether a particular action by another person was intentional might determine whether or not a specific emotional reaction occurs, but this effectively qualifies an existing antecedent rather than creating altogether new content. Put succinctly, then, the main distinction between antecedents and behaviour on the one hand, and mental states on the other, is one of location and manipulability of activity, not its surface form.

From this perspective, then, recognition of an emotional episode, and identification of the category of emotion of which that episode is an instance, will both rest predominantly on the nature of the antecedent and behavioural features which it contains or might be anticipated to contain. This emphasis on the external classes of feature serves, in addition, to allow recognition and identification to proceed on the basis of primarily the same information for both self and others.

At the same time, though, the main function of recognition has been argued to be the priming of event schemata in order to access information about appropriate behavioural responses or the likely behaviour of other people. This would suggest that recognition of an episode relies principally on the characteristics of its antecedents. The question arises, therefore, as to whether this type of information is also sufficient to permit categorization of an episode, bearing in mind that Harris et al. (1981) found this to be effectively the claim made by younger children at least.

At first sight, examination of this issue suggests that in practice there is no general answer to whether or not category of emotion is identifiable from antecedent alone, since this will be dependent on both the individual and the nature of the antecedent involved in any particular instance. In order for identification to be possible on the basis of this information, the antecedent would have to be first of all known to the individual, but it would also have to be a reliable exemplar of one specific category. As far as individual knowledge is concerned, it may be argued that this is likely to vary as a function of both age and culture, due to differential exposure to particular instances (Gordon, 1989).

More importantly, though, the present study provided strong evidence of considerable but stable variation in the perceived representativeness of different instances of antecedent for each of the three categories of emotion discussed. Whilst a low degree of representativeness does not necessarily equate with ambiguity as such, there remains an implication that some antecedents are better or more prototypical exemplars of a specific emotional category than others, and therefore more likely to permit identification. In general the issue of identification is inseparable from that of exemplification.

The nature of exemplification is not straightforward either, however, since in this context it is not immediately apparent what determines a good exemplar, nor how different exemplars might be related to an overall category structure. Harris (1985), for instance, argues strongly against the idea of prototypical antecedents for different feelings, with representativeness of an exemplar defined by its degree of correspondence to prototype. As he points out, some antecedents are inherently ambiguous, being cited in connection with two or more emotions by the same individual. Whilst this in itself would not necessarily undermine the notion of prototypical antecedents, it is also often the case that these instances do not appear to be borderline for one feeling and more central for another: they can be amongst the most frequent exemplars mentioned for several different feelings (e.g. "fighting with another child", which may be cited for sadness, anger, and fear). This fact is damaging to the prototypical approach because it would imply that there is sometimes little to differentiate the core of one category of emotion from another.

On the face of it, this piece of evidence is highly problematic, not least because it implies that children should often experience confusion when asked to categorize different exemplars of antecedents, a task which has been used in many studies (e.g. Barden, Zelko, Duncan, and Masters, 1980; Gnepp, 1983; Reichenbach and Masters, 1983). Yet this does not seem to be so, and, in fact, as already noted in the discussion of causal understanding, the obverse effect seems to hold, that it is frequently difficult to get children to generate multiple categorizations for a situation that has been described to them (Gnepp et al., 1987).

In that previous context such fixity of judgement was accounted for in terms of a restriction of activation or attention to a specific event schema. A further appeal to such structures in the present case serves, in fact, to provide a way round any apparent contradiction between an antecedent being associated with different categories of emotion and yet eliciting single classifications, and at the same time yields an answer to the question of whether categorization is possible on the basis of antecedent alone.

The nub of the argument here is that any notion that explicit identification of emotion rests predominantly on antecedents, or on any other single class of feature, is misleading, since, taken individually, instances of any of these can be ambiguous. Instead, emotions are seen as being exemplified, and hence identifiable, by sequences or conjunctions of different cue types, particularly antecedents and behaviour, of the same form as that in which knowledge about episodes is encoded. Thus the same antecedent, in conjunction with different behaviours (or impulses towards those behaviours), could be part of an exemplar for various feelings, as has been observed to be the case. Categorization tasks involving only antecedents tend to yield single classifications, though, because the process of recognition primes a specific event schema in which the antecedent is linked to a particular behaviour. Individual schemata, and the conjunctions which they capture, each exemplify a unique category of emotion.

The argument that instances of emotion are defined in terms of entire event sequences, as well as bypassing a potential impasse, has a number of points, both theoretical and empirical, in its favour. At a theoretical level, such holistic representations are predicted by Piaget's definition of conceptualization as the interiorization of sequences of actions (Piaget, 1972), and Karmiloff-Smith's outline of the acquisition of knowledge-based procedures via re-description of sequences of activity (Karmiloff-Smith, 1988). Taken together, these perspectives have been demonstrated to suggest not just a basic mechanism whereby the knowledge required for prescriptive and predictive regulation of emotion (i.e. antecedents and behaviour) could be encoded, but one which also serves to explain a number of other observed aspects of the development of emotional knowledge.

Similarly, Nelson (1983) argues that holistic representations of repeated sequences of events, and the syntagmatic relations that are encapsulated within these, are the basic form of conceptual representation, from which more complex relationships and mental objects are subsequently derived. Categories (which may be taken to include the different types of emotion) are viewed by her as consisting, initially at least, of collections of instances of these basic concepts. Also of significance here is Mead's definition of meaning as the relationship between an action or gesture and the response that it calls forth (Mead, 1934). From this perspective the essential meaning of an emotional episode, and hence what kind of episode it was, would lie in the conjunction between antecedent (i.e. the first action) and behavioural response to it (i.e. the completing action).

Some empirical evidence from the present study that children use both antecedent and behaviour to identify a particular emotion, comes not just in the form of the frequency with which such conjunctions were referred to, but more specifically from examples in which a behaviour or antecedent was used more-or-less explicitly to disambiguate the significance of the complementary class of feature:

"I'm happy playing with them, but I'm not sad 'cos I haven't got a sad face." [M 5,6]

"If you wasn't crying on a sunny day, that means you're happy" [M 8,1]

"When I'm happy, you know, I'm pleased, and like sometimes

say, when I would shout at my wee sister, I wouldn't"
[M 11,3]

Less direct, but equally suggestive evidence is provided by the responses of children in the conflicting cues condition of the study reported by Gnepp (1983). These children, aged four, seven, and twelve, were asked first of all to identify the emotion of a character portrayed pictorially as displaying a specific facial expression in the context of a particular situation. The combination of situation and expression used in each instance was conflicting from a normative point of view (e.g. a character looking sad as a spider drops down beside him or her). After the emotion had been identified, children were asked to tell a story about the picture to say why the character felt that way. On the majority of occasions (64% of responses) children's stories managed to explain why the character would have the given expression in the context described, but of these 84% did so by tying the expression to appropriate additional antecedent features. In other words, the predominant method employed to make the facial expression into a meaningful exemplar of a category of emotion was to put it into conjunction with an inferred antecedent.

A final point is that an implicit definition of emotions as both antecedent and contingent behaviour would explain some observations that have been made about the development of children's awareness of the simultaneity of different emotional states. Harris (1983, 1985) reports that six- and ten-year-olds who were read descriptions of situations that could provoke both positive and negative emotions tended, when asked, to identify only one or other of these. This was particularly the case for the younger children. However, children of the same age, when read descriptions of situations that could result in <u>successive</u> positive and negative emotions, predominantly identified both.

Whilst apparently contradictory, these findings are not surprising if children, especially when younger, do understand emotion terms to signify both concrete antecedent and behaviour. Only one outcome would be possible in the case of the situation that simultaneously provokes positive and negative feelings since it would only be possible to behave in one way at a time in response to the situation. Harris (1985) reports a comment by one of the children who took part in this section of the study which expresses exactly this idea: "You can't make your mouth go up and down at the same time". When the relevant antecedents are successive, however, the responses can be so as well, and since no behavioural incompatibility is produced, both positive and negative emotions can be identified as present. As children get older and the conjunction between antecedent and overt behaviour is to some extent supplanted by that between interpretation and impulses to behaviour, it will begin to be possible to identify simultaneously experienced emotions, since the activation of conflicting representations can occur, if not contemporaneously, then in rapid succession.

To return to the issue of exemplification, if emotions are identified on the basis of conjunctions between antecedent and behavioural features (or the representations of these), then it may be presumed that it is the different combinations of these that vary in degree of representativeness for a category of emotion, rather than the individual features themselves. The variation in frequency of reference to different antecedents and behaviours observed in Experiment 1 could therefore come about in two ways. Firstly, the same feature could occur in conjunction with differing numbers of alternative examples of the complementary class (e.g. "smiling" could form combinations with "playing with friends", "being given a present" and so on); and secondly, a specific combination of antecedent and behaviour could vary in the extent to which it was cited, either partially or completely.

This being the case, the question remains, however, as to what determines whether a particular sequence is regarded as a good or a poor exemplar, as more or less representative of a category of emotion. One possible factor that has a degree of theoretical support would be the frequency with which a given exemplifying sequence occurred. The mechanism of re-description has already been stated to imply the encoding of all experiences, but in the form of an over-laying of traces where the detail of a sequence of activity is close to that of previous instances. Thus where a relatively specific sequence of events is repeated this ought to have the effect of increasing the strength of the trace encoded as a direct function of frequency. An effect of a similar kind to this is implicit in Nelson's description of the acquisition of event representations (Nelson, 1981, 1983).

Other possibilities would be the degree of arousal accompanying a particular type of sequence, and the discriminability or regularity of the features contained within them. As far as arousal is concerned, it was suggested previously that there might be a biological mechanism which would translate degree of physiological activation into trace strength. Apart from evidence from animal studies consistent with this, there would be a clear adaptive advantage to possession of such a mechanism, since, if arousal is a function of the implicit significance of an event, this would serve to produce the strongest traces for the most important experiences, and thus to make these the most central exemplars of the different categories of emotion.

However, whilst such a mechanism may indeed operate and have some impact on trace strength, as an overarching account this suffers from several weaknesses. First of all, there is no indication of such effects in the reports of children interviewed for Experiment 1, where the most frequently mentioned antecedents and behaviours were not especially those which would be likely to be associated with higher levels of arousal. Secondly, and more crucially, unless the significance of a particular event is defined by prior experience (in which case the effect of the mechanism would simply be self-reinforcing), it carries the implication that perceived salience is innately determined. But if this were the case then it would be anticipated that there would be a large measure of cross-cultural stability in the types of events which are considered most representative of the different categories of emotion.

In fact, apparently innate mechanisms of emotional expression notwithstanding, there appears to be sizeable cross-cultural variability in the events seen as characteristic of different emotions (Harré, 1986; Harris and Olthof, 1982). This seeming absence of any episodes which are inherently better exemplars of specific categories of emotion also tends to undermine the notion of discriminability or regularity as factors of influence in determining perceived level of representativeness, except in so far as these characteristics are themselves an emergent function of event frequency.

In general, then, the frequency of occurrence of an antecedent-behaviour sequence appears to be the factor most likely to decide whether or not that sequence is regarded as a good exemplar of a particular emotion. The stability of relative frequencies of reference across age groups to specific antecedents and behaviours, coupled with an age-related increase in the range of examples mentioned, is consistent both with this and with the idea of a change in the types of event to which older children would be exposed. The most frequently occurring events during early childhood would be seen by younger children as most representative and would be referred to most often. As experience shifts the frequency with which those events occurred would tail off, and that of other events would increase. It would, however, be some time before these other events had surpassed the earlier ones in the frequency with which they had been experienced, and so the first events would still tend to be seen as most representative and to be referred to most often.

As it stands, though, this glosses over the fact that to explicitly exemplify any labelled category of emotion it would be necessary for a sequence to be specifically associated with that label. It follows from this that it would be the strength of that association which would define how good an exemplar any given episode would be perceived to be. However, Collins and Loftus (1975), in outlining a spreading activation theory of semantic processing, argue that the strength of such linkages between category label and exemplar is itself a function of the frequency with which they are activated. Broadly speaking, then, event frequency may still be the primary underlying factor which determines representativeness, since the more often an event occurs, the more likely it is to be explicitly categorized, so activating the link between representation and vocabulary term.

The points made above sketch out something of the issues involved in the explicit identification or categorization of instances of emotional episode. Two tacit conclusions in particular should be stressed here. The first is that identification occurs subsequent to recognition and prescription or prediction, with initial schema activation most commonly stemming from input of information about an antecedent. Schema selection (which may be taken to imply multiple parallel processing and a requirement for above-threshold activation) provides the information about antecedent and behaviour, if the event has not already done so, which allows identification. The second point is that different instances of event schemata appropriate to a category of emotion appear to be clustered around the category label, with the strength of association between that label and each schema being a function of the frequency with which the link between them is activated. It is these two points in particular, and the relationship between event representation and vocabulary in general, which form the focus of subsequent chapters.

Summary

An emotional experience typically contains four elements or features. These are: an antecedent or precipitating event (e.g. being hit); a behaviour that follows that event (e.g. hitting back); an accompanying physical sensation (e.g. increased heart beat); and a mental state (e.g. imagining hurting the other person). One approach to the study of people's understanding of emotions focuses on what they know about these features and the relationships between them.

Previous work with children has found that they can talk knowledgeably about which antecedent goes with which behaviour from as young as three years (Trabasso, Stein, and Johnson, 1981). Awareness of mental states, on the other hand, is limited before the age of ten (Harris, Olthof, and Meerum Terwogt, 1981). It is not clear when knowledge of internal sensation appears.

Since emotional episodes involve cause and effect, theories about the wider development of causal understanding may shed light on age-related changes in emotion knowledge. In particular, Piaget (1972) provides a clue as to why references to one feature might appear later than another. He argues that children do not see causation as a *process* until relatively late in development. At first they simply use their experience to build up "maps" or representations of features that consistently seem to go together. Whilst this knowledge is not sufficient in itself for *explanation* of a causal relationship, it does allow accurate *predictions* of outcome to be made. Not all features characteristic of an event will have the same status, however. Some are less observable or

less salient than others. These would tend to be incorporated into representations more slowly.

This idea is relevant to knowledge of emotion because there are grounds for distinguishing between the four different kinds of feature in exactly this way. Associated antecedents and behaviour plainly ought to be noted by the child first of all. These are both publicly observable and highly salient: the guidance of personal reaction to an antecedent event, or anticipation of the reaction of others, depends on knowledge of such associations (Bretherton, Fritz, Zahn-Waxler, and Ridgeway, 1986).

Knowledge of internal sensations and mental states would be added to representations later because both are private. These would not appear at the same time, though. Mental states ought to be later, since analysis of their content suggests that, unlike physical sensations, they are not present in experience from birth. Instead, it has been argued that they arise as individuals call to mind knowledge of past antecedents and behaviour, perhaps as part of the process of guiding or anticipating reactions (see e.g. Lewis and Michalson, 1983). If this is so, mental states would not be apparent until representations of the other two types of feature had become established. As a result, younger children in particular will have had less opportunity to "observe" them than would be the case for sensations.

This approach to knowledge of feelings may also explain why emotions and non-emotions (e.g. tiredness) come to be thought of by adults as distinct from each other (Tiller, 1984). In emotional episodes antecedents and behaviour are strongly associated because they usually occur in rapid succession. Non-emotions, in contrast, reflect an underlying physical capability or need (e.g. for recuperation) which often emerges only gradually. These differences in episode structure may lead children to represent two separate types of feeling. For non-emotions, behaviour (e.g. resting) is not immediately contingent upon an antecedent (e.g. running about). Knowledge of an association between the two features, even when apparent, will not be very useful for guiding behaviour because the appropriate time for action will be unclear. Internal sensation (e.g. aching legs) is likely to be temporally closer to behaviour, and so these features, and the relationship between them, may become most salient. Since antecedents and sensations differ in observability, this may not necessarily alter the actual order in which knowledge is acquired in the first place. Once awareness of both features is established, however, children should tend to refer more to sensations for non-emotions, and less to antecedents.

Experiment 1 investigated these points, and had two main aims. The first was to examine the order in which children acquire knowledge of the features of feeling episodes. The second was to determine whether there are indeed differences between children's reports about emotions and non-emotions. Using clinical interview techniques, children aged 5, 8, and 10 were questioned about their experience of both the observable and private aspects of three emotions ("happy", "sad", and "scared") and three non-emotions ("wide-awake", "tired", and "hungry"). It was predicted that:

a) Most children would be able to describe antecedents and behaviour for the different feelings, irrespective of age; but references to internal sensations and mental states would increase as children got older, with sensations being mentioned the more often of the two amongst the younger pupils.

b) In all age groups internal sensations would be referred to somewhat more often for non-emotions, and antecedents somewhat less, when compared with emotions.

The data were in line with both these predictions. Averaged across the different feelings, a substantial majority of 5-year-olds referred to antecedents and behaviour. This level of response was maintained throughout the rest of the age range. At 8 years the number of children who referred to internal sensations also reached a majority. References to mental states increased steadily with age, but it was only amongst the 10-year-olds that the majority of children described examples. In addition, children tended not to mention sensations unless they also referred to antecedents and behaviour. Those who referred to mental states usually detailed all the other kinds of feature. Both sources of evidence are consistent with the hypothesized order of knowledge acquisition.

This pattern was the same for both the emotions and the non-emotions. However, comparing these, it was still the case that significantly fewer children in each age group referred to antecedents for the non-emotions, whilst correspondingly more referred to sensations. As anticipated, the antecedents that were mentioned for non-emotions were typically general contexts in which the feeling might occur, rather than actual precipitating events.

It was also noted that as they got older, increasing numbers of children spontaneously described associations <u>between</u> features (e.g. "When *x* happens, I do *y*"). For the emotions the most commonly described association in all age groups was that between antecedent and behaviour. For the non-emotions, though, older children referred more often to associations between sensation, behaviour, and *planned* behaviour (e.g. "I'd feel like going to bed"). This suggests that children not only tend to be more aware of sensation as a feature of non-emotions, but that with age they do indeed focus more and more on its potential as a cue to action that could be used to modify bodily state.

Several points are indicated by these responses. The first is that within the constraints of what is observable children attend not so much to the individual features of an episode, but to the relationships between them. The second is that they concentrate on those relationships where knowledge might be useful. This serves to define what salience means in the present context. So for emotions, relationships between antecedent and behaviour were referred to most often, even when awareness of other features had increased. These associations remain salient because knowledge of them is central to the purpose of guiding or anticipating reaction (e.g. if "hit", then "hit back"). Both these points are consistent with Piaget's description of the first stages of causal understanding, which yielded successful predictions about the order of acquisition of knowledge of feeling states.

Finally, the spontaneous emphasis on the relationship between features suggests that the development of children's knowledge about feelings may best be seen in terms of the acquisition of "scripts" or event schemata (Nelson, 1983) for different types of episode. Such schemata would build up a picture of the typical sequence of features contained within repeated experiences. In other words, they would encode both observed associations between features, and the temporal order in which they occurred. Retrieval of the information contained in these schemata would thus allow guidance and anticipation of behaviour. It could also provide the content of emergent mental states.

From this perspective, perceived differences between emotions and non-emotions reflect genuine differences in episode structure, as captured by a general, functionally oriented process of representation. Non-emotions are encoded as responses to bodily state, whereas, for children at least, emotions are primarily defined by co-occurrences of antecedent and behaviour.

Chapter 3: The relationship between emotional knowledge and vocabulary: some evidence for a schema-based hierarchical model

In considering the results from Experiment 1, children's acquisition of knowledge about emotions was characterised as a process of re-description (Karmiloff-Smith, 1988) of the regularities inherent in the experience of emotional episodes at different stages of development. The basic experience was viewed as that of a species of event in which particular types of behaviour are contingent upon an antecedent situation. Mental aspects of emotional experience were argued to emerge from re-description of situational and behavioural regularities (whether involving self or others), and subsequent in situ activation of the knowledge encoded within event schemata built up through this re-description. Activation was seen as a function of the similarity between an actual event and a schema.

This knowledge activation provides a means for some level of evaluation of situations and guidance of behavioural responses, but it also gives rise to new types of regularity within experience. A further level of re-description codes these as characteristic features accompanying, or intervening between, particular situations and behaviours. Activation of knowledge at this level can further facilitate conscious management of situational evaluation and selection of behavioural response. Experience and awareness of internal sensation, primarily change in level of arousal, has a more background role according to this account, and serves less to mark the quality of an emotional event than to signal its salience, and facilitate its retention in memory.

On this basis it was argued that knowledge of emotion has as its primary content features of antecedent situations and behavioural responses, whether it refers to these directly, or to the mediating activation of such direct knowledge in the course of an emotional event. Further than this, though, the data from Experiment 1 suggest that it is the conjunction between situation and behaviour that provides both an essential distinction between concepts of emotion and those of other types of feeling state, and also the basic means of identification of the emotional category of an episode. It is on knowledge of these classes of feature and their contingency that attention will subsequently be focused, therefore, particularly as regards the organization and use of this knowledge vis à vis the emotional vocabulary.

3.1 *Relationships between featural knowledge and vocabulary*

The account of the development of emotional knowledge presented thus far is only partial. Experiment 1 examined the nature of the emotional knowledge base that children can access at different ages by asking them questions apropos states signified by terms for different qualities of feeling. Whilst some issues concerning the identification of episodes were examined in discussion of the data obtained, the role of the emotional vocabulary in organising and retrieving knowledge was only tacitly addressed.

Although some attention has been paid to the relationship between knowledge and vocabulary within the developmental literature, many researchers have implicitly assumed an equivalence between children's knowledge about the features of emotional experiences and their understanding of what terms for emotions refer to. So, for instance, studies designed to investigate aspects of the development of emotion knowledge, such as consensus with regard to the emotional quality signified by specific cues (e.g. Barden, Zelko, Duncan, and Masters, 1980), which cues are given greater weight when information about the state of another is conflicting (e.g. Reichenbach and Masters, 1983; Gnepp, 1983), or awareness of individual variation in emotional reaction to the same situation (e.g. Gnepp, McKee, and Domanic, 1987), have all used paradigms in which children are required to make forced-choice judgements of emotional quality to match the material presented. The patterns of judgements are then used to infer the nature of developmental change in the relevant area of knowledge. However, these studies fail to give any detailed consideration to the processes by which such judgements are made, and are silent on the issue of whether forced-choice paradigms (i.e. those where the appropriate response is recognized rather than produced) have any influence on these processes.

The picture is further confused by a widespread tendency to implicitly regard selection of schematized facial expressions (as in tasks used by Borke, 1971; Chandler and Greenspan, 1972; Light, 1979; Michalson and Lewis, 1985) as a comparable mode of response to the selection of emotion terms. In some studies this has resulted in either mode of response being allowed within the same task (e.g. Gnepp, Klayman, and Trabasso, 1982; Gnepp et al., 1987). This is in spite of evidence that younger children in particular may be unsure of the appropriate terms for some instances of facial expression (see Izard, 1971).

From a different direction, studies which, in common with Experiment 1 above, have attempted to gauge children's knowledge of emotions by questioning them with regard to specific named qualities of feelings (e.g. Harris et al., 1981; Trabasso, Stein, and Johnson, 1981; Carroll and Steward, 1984) have also failed to address the question of whether this approach might have an influence on the knowledge retrieved. Observational studies which have focused on the use of emotion terms as an indicator of the development of children's understanding of emotion (e.g. Bretherton and Beeghly, 1982; Dunn, Bretherton, and Munn, 1987) have similarly tended to gloss over the issue of the specific relationship between vocabulary and knowledge.

There are in fact both theoretical and empirical grounds for questioning the validity of any assumption that all emotional knowledge is automatically subsumed to the understanding of emotion terms. From a theoretical viewpoint, identification of emotion has been defined as one of the major regulatory functions of emotional knowledge. But this generic process has already been argued to have different manifestations, and therefore different characteristics, dependent on where it occurs relative to the sequence of an emotional event. In particular, a distinction has been made between <u>recognition</u>, which occurs <u>within</u>-event, and explicit identification or <u>labelling</u>, which, it is suggested, occurs primarily <u>post</u>-event.

In the first case, the object is to accurately anticipate the behaviour of another, or, as regards oneself, to select behaviour that is appropriate to the situation. In other words, the function of recognition is to prime knowledge for prediction and prescription. In this context, although labelling of the emotion of self or others is not precluded, it is only meaningful (i.e. functional) to the extent that it signals a specific range of behavioural possibilities within the situation.

Knowledge organized purely at the level of the relationship between specific antecedent and behavioural outcome would be functionally sufficient for the process of episode recognition within-event, and no reference needs to be made to items within the emotional vocabulary. This seems to square with actual experience, where a situation is often recognised, and behaviour executed or anticipated, without any explicit labelling being made.

Where identification takes place post-event, however, its object will be tend to be to facilitate explanation, to make intelligible particular actions in response to a situation. The function of categorization, then, is to prime knowledge relevant to causal understanding. In this case, the process of labelling, which may be based on a wider range of cues than recognition, serves to emphasise the continuity between the specific event in hand, and others of the same class, and thus may be argued to enhance the explanatory value of the construct through its generalization across events and consequent focus on intra-individual constancies, especially interpretative cognitions.

It may be noted here that Weiner (1985) argues that specific qualities of emotion are only differentiated on the basis of evaluations of e.g. responsibility, which take place <u>after</u> initial responses to a situation have been made. Whilst Weiner's focus is primarily on causal attribution rather than identification per se, his approach does imply some distinction between the emotional knowledge activated at different stages of an event, consistent with that made above.

In itself differences in the extent to which emotional knowledge is used in connection with items in the emotional vocabulary under different conditions need not imply any separation in the knowledge base. Indeed, the antecedent features that would provoke initial schema activation in recognition form one part of the information used in the identification of a specific quality of emotion post-event. Furthermore, operation of the major function of recognition, priming of predicted or prescripted behaviour, would result in availability of the information that defines emotional category, the antecedent-behaviour conjunction. As long as each conjunction for which the individual holds a schema could potentially be categorized there is no implication that the knowledge serving recognition is not synonymous with that which serves labelling.

There is, however, empirical evidence to suggest that this is not necessarily the case, with children at least. Pilot work carried out by the author with children aged between five and seven, found knowledge of links between antecedent situation and subsequent behaviour to be present in some instances without ability to actively provide an appropriate emotional term for the episode. This suggests that the process of re-description previously outlined may encode features of emotional events into schemata independently of any knowledge structures organised around the emotional vocabulary, or without any necessary connection between them.

Other evidence which implies some fragmentation of emotional knowledge amongst younger children is provided by a study reported by Glasberg and Aboud (1982). These authors noted that children between 5 and 8 years were, in general, able to appropriately produce the term "sad" as applicable to schematised pictures of other children crying or exhibiting a sad posture. These same children, however, often subsequently denied having felt sad themselves. This effect was interpreted as indicating a distancing of self from the feeling of sadness. However, the pilot work referred to above tends to suggest that the problem is one of retrieval, and in particular specificity of cue. It was found that children in this age range often claimed to be unable to remember a specific occasion when they had felt happy, sad, angry, or scared, but that recall was enhanced if they were asked if they could remember occasions when they had laughed, cried, shouted, or screamed.

Overall, a degree of function-related separation between different types of knowledge about emotional events is indicated. But, unless this separation, whatever its source, maintains into adulthood, it must be hypothesized that an important part of the development of children's emotional knowledge involves the coordination and integration of featural information into structures which allow more direct access via the emotional vocabulary, and vice versa.

3.2 *Models of knowledge structures encompassing emotion terms*

At this point, in order to gain a clearer perspective on the processes by which development of integrated knowledge structures might take place, it will be useful to give some consideration to the nature of the end result and the constraints upon its characteristics. The starting point for this discussion is determined by three key assumptions about such structures and their operation. These are:

i) *That the knowledge that they contain is feature-based, and these features are predominantly those of antecedent situations and the behaviour contingent upon them.* The application of an emotion term to an episode constitutes a form of categorization, which in turn implies isolation of the features appropriate to the member of a category. Not only are there good theoretical reasons to hold that identification rests on qualitative features (see Chapter 1), but the statements of the children in Experiment 1 indicated that it was specifically antecedent and behavioural features which were most associated with terms for emotions.

ii) *That the structures must be applicable to new as well as old exemplars of the quality of emotion denoted by the term;* i.e. they must possess generalizability to specific instances of antecedent and behaviour not encountered previously.

iii) *That the structures must be applicable to a variety of antecedents and behaviours:* there are no specific examples of either type of feature contained in all events for which denotation by a particular emotion term is appropriate.

Within the field of concept representation in general, none of these assumptions is out of the ordinary (see e.g. Smith and Medin, 1981, on probabilistic models of concepts). They do, however, have some implications which are particular to any hypothetical knowledge structures that might underpin emotion concepts.

One point to note is that the third assumption above constrains the structure to be more general, or generalizable, than the event schemata considered so far. Although it was argued in Chapter 2 that the process of re-description results in schemata which generalize across single instances of a particular event, these would still encode relatively specific values for context, nature of antecedent, and behavioural response. This level of representation would not in itself, therefore, meet the requirements of all the assumptions. Two points follow from this. The first is that to the extent that event schemata constitute part of the knowledge structures, some form of hierarchical organization with increasing levels of abstraction is implied.

The second point relates to the mechanism by which such abstraction may occur. The third assumption clearly precludes any classical model of emotion concepts which rests on necessary features contained in all exemplars. Prototype models (e.g. Rosch, 1978) have in general come to be regarded as the standard alternative to the classical model. In the present context the prototype model would imply that all specific features of emotional events within a category are encoded, and that abstraction from these is in the form of a prototype representing the values of the most commonly occurring features (Parkinson, 1987). Exemplars would be recognized by their degree of fit to the prototypical values.

However, the basic prototype model, whilst applicable to many other areas of knowledge representation, is in this case subject to the objection that it fails to preserve the integrity of events exemplifying a particular emotion term as a conjunction between an antecedent and a behaviour made in response. One reason for this is that the model provides no basis for distinguishing between different types of feature. Since the most commonly occurring features may all be of one type, the prototype could effectively ignore the contingent relationship between antecedent and behaviour which appeared to be important to the children in Experiment 1. Even if this were not the case, the separate antecedents and behaviours which occurred most frequently might form an unlikely or even impossible conjunction, especially in view of social constraints on which behaviours are appropriate under which circumstances. Thus any prototype formed in this way might actually be of little functional use.

A final objection to the prototype model is that, unless it is based on features at a considerably higher level of abstraction, it is not clear how the values of any specific event would be matched to a prototype. If, for instance, the first two objections are left aside, and we hypothesize prototypical values for "anger" of "being insulted" and "shouting", how would an event with the values "television set stops working" and "kicking it" be evaluated?

The key point here is that any model which suggests a simple "pooling" of features of the events denoting a specific emotion term misses out a crucial organizational element, namely that episodes which exemplify a feeling retain their individual identity. "Anger", for instance, does not stand in the same relationship to one of its exemplars as does "chair"; the relationship is more properly analogous to that suggested by "furniture". Extending the comparison, a simple prototype model of "anger" is as potentially unworkable as such a model of "furniture" would be, and for the same reasons.

It should be noted here that some attempts to define emotional knowledge in terms of prototypical representations associated with emotion terms have in a sense managed to avoid these objections. For instance, Harter and Whitesell (1989), extending an approach employed with adults by Shaver, Schwartz, Kirson, and O'Connor (1987), identify prototypical causes of four basic emotion terms ("happy", "mad", "sad", and "scared") which were described during the course of open-ended interviews with children aged between 3 and 11 years of age. Examples of these were "getting what was wanted", and "experiencing task success" for happiness; "physical or psychological pain" for anger; "an undesirable outcome", and "loss of a valued relationship" for sadness; and "threat of harm", and "threat of social rejection" for fear.

Whilst these instances do not take into account behavioural responses to antecedents, and show some variability in their level of abstraction, they do effectively preserve in some form the identity of the events which they represent. However, the fact that multiple representations of this kind were isolated for each feeling (this is in fact necessary to maintain event identity) removes them from more standard definitions of prototypes. Harter and Whitesell's terminology notwithstanding, then, the knowledge structures that they identify are closer in form to the event schemata that have been defined here, albeit with a greater degree of abstraction. On this latter point it should be stated that such abstraction was not provided by the children interviewed, as far as can be ascertained; rather these classes constituted overall categories of event derived from Shaver et al., of which children described more specific instances.

Nelson (1983) provides a clearer basis for definition of the type of integrated structure which would be required by emotion knowledge. In common with Rosch and Mervis (1975), she distinguishes between basic concepts and categories as follows: "The instances of a concept that appear in the world do not ordinarily retain their individuality in the head but are assimilated to the general concepts. Their identity is merged with the whole. The concept may have internal structure, but this internal structure is the intension of the concept: it specifies the conditions under which the concept applies - its functions, properties, and relationships...The exemplars of categories do retain their individual identity as part of the mental representation. Indeed, categories in this sense are composed of basic concepts..." (p.132).

Applying this to emotional knowledge structures allows a resolution of the problems of the prototype approach. Emotion terms would stand as category labels, with these categories comprised of collections of event schemata. These schemata, as basic concepts, would generalize over individual instances in the way already described. At the level of schemata prototype effects might operate to abstract the most typical features of a given kind of event, which would imply representations comparable to those defined by Harter and Whitesell (1989), and hence a level of organization intermediate between basic event schemata and emotion terms. Such prototypes would serve to maintain discrete event identity. Frequency of activation of the link between these prototypes and a term could then determine degree of representativeness in the way suggested by Collins and Loftus (1975).

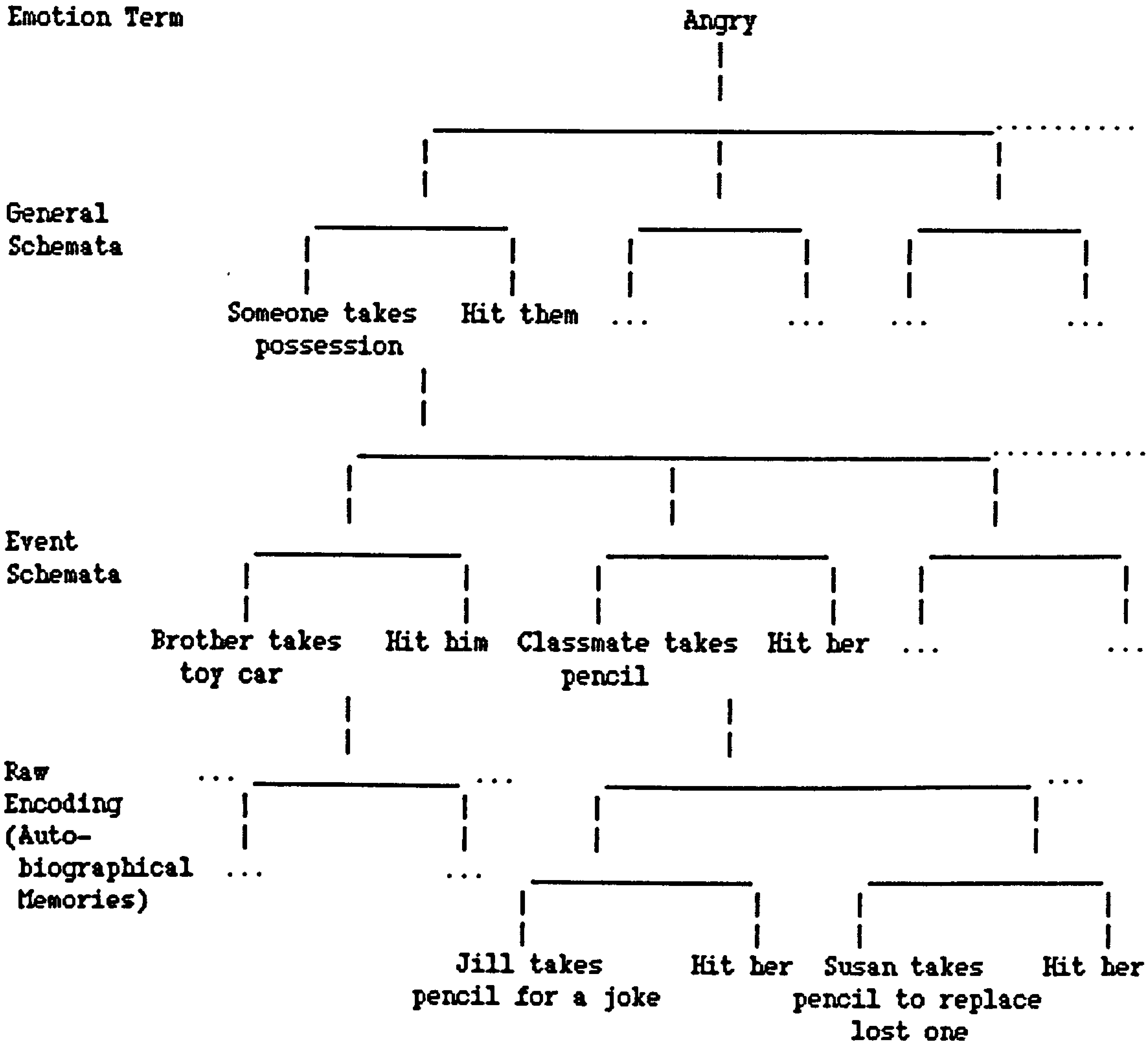
Within this framework, a further point of interest relates to the status of memories of specific events (i.e. autobiographical memories). Nelson (1983) takes the view that the event representations which initially form basic level concepts are holistic and that individuation of the elements of these (i.e. features, but also possibly individual instances) is a positive cognitive achievement. Consistent with this, Rosch, Mervis, Gray, Johnson, and Boyes-Braem (1976) found that the basic level term in a hierarchy of abstraction (as defined by speed of categorization response and age of acquisition) tended typically tended to be in the middle rather than at the lowest level of abstraction (e.g. of the terms "furniture", "chair", and "kitchen chair", "chair" is basic). These points suggest that access to memories of specific instances of emotional episodes may be a later development that takes place within an emergent hierarchy of relations and abstractions.

Hierarchical structures of emotional knowledge similar to those implied by this discussion have been proposed by Conway and Bekerian (1987). In their model such structures would effectively have three levels, specific knowledge, basic level knowledge, and context-free knowledge. Specific knowledge would consist of both scripts (c.f. event schemata) and autobiographical memories, basic level knowledge of more abstract representations of events (similar to the definition of "scenes" given by Schank, 1982b), and context-free knowledge of any features which generalize across events, associated with basic emotion terms.

From the developmental perspective, this model makes insufficient distinction between script-like knowledge and autobiographical memories, and it may further be argued to confuse scripts with contexts, since the examples given refer solely to antecedents. It also supposes a different relationship between prototypical representations and emotion terms than that outlined briefly above. However, some hierarchical framework of this kind is clearly implied by both theory and evidence, and a model of the suggested form that this might take is illustrated in Figure 3.1.

As indicated previously, the basic level concept within this hierarchy is formed by event schemata, which encode information from repeated instances of similar events within similar contexts. These serve to provide readily accessible information for the control of personal behaviour and anticipation of the behaviour of others within these episodes. Traces of at least some of the individual instances superimposed on each other in event schemata may be preserved as "raw encodings" or autobiographical memories. At an intermediate level of organization, between event schemata and emotion terms, are what will be termed general schemata. These maintain the basic relationship between antecedent and behaviour contained in event schemata, but generalize across particular values for context, participants, and so forth, and thus permit some degree of identification of new exemplars of a particular class of episode. The representation of an emotion term consists in turn of a collection of these general schemata, in the same way as "furniture" might be considered to be represented by a collection

Figure 3.1 Diagrammatic representation of a schema-based hierarchical model for the organization of emotion knowledge



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of schemata for "chair", "table", "wardrobe", and so on.

However, although this structure meets a basic requirement of retention of all levels of informational detail, any functioning model of this kind must go beyond the structural properties of the hierarchy to the mechanisms which constrain the encoding and retrieval of the knowledge that it contains. So, for instance, it must be able to account for the fact that some events seem to constitute better exemplars of an emotion than others, and are more likely to be referred to in requests for such (as in Experiment 1), and, conversely, that some events appear to be more easily labelled with an emotion term than others. Recent approaches to neural networks and distributed processing suggest that the hierarchy could be formed from a network of interconnected nodes representing features at each level of organization, with these nodes subject to excitatory and inhibitory activation, depending on the activation of connecting nodes, as in the pattern recognition system proposed by Rumelhart and McClelland (1981).

If this were the case, it would imply that within both event and general schemata and, at a higher level, the category of emotion signified by a term, information would consist of activation strengths or weightings for particular feature values, derived on the basis of the frequency of occurrence or prior activation of these (c.f. the distributed model of memory outlined by McClelland and Rumelhart, 1985). Thus, for instance, within a general schema, these weightings would reflect the frequency of specific values for features relating to context, participants, and actions across instances combining the same general antecedent and behavioural response, and would so define the probability of occurrence of each of these. At the level of emotion terms, the weightings would define the frequency or probability of association between the term and each general class of event (i.e. conjunction of antecedent and behaviour) within the collection of schemata.

At both these levels the degree of prototypicality or representativeness of an exemplar can be further defined in terms of these frequency weightings. In general, the higher the frequency weighting, the greater will be the degree of prototypicality. The representativeness of a specific event for an emotion term will thus be determined by two measures, the frequency weighting of the specific event within the relevant general schema, and the frequency weighting of that schema for the term.

Finally, the knowledge structure outlined by this type of model is seen as dynamic in character. Presentation of information relevant to any level of the hierarchy is hypothesized to activate the other levels to an extent proportional to the degree of prototypicality of the features contained in the level below. This mechanism accounts for both the variable retrieval of emotion terms given a particular event, and the tendency to generate some descriptions of events in preference to others to exemplify a particular term.

For instance, presented with the term "angry", different general schemata would be activated with a strength determined by the past frequency of activation of the term in association with events within each class. Activation of the general schemata spreads down to activate in turn specific examples of each class of event, again to an extent determined by past frequency. Conversely, presented with a specific event, or part of an event, general schemata are activated to the extent of the degree of prototypicality of that event within each (given that some events, or more properly parts of events, such as antecedents, may connect to more than one schema). Terms are activated in turn according to the prototypicality of the activated general schemata.

It is also assumed that activation within the structure operates within fixed bounds, in a manner analogous to signal detection models (e.g. Tanner and Swets, 1954). In other words, activation at a particular level of the hierarchy must be above a criterial value in order for it to spread to the next level, irrespective of the direction in which the spread would occur. This restriction is necessary in order to account for failures of response, and also to facilitate the discrimination between more and less likely responses, a process which may be supplemented by some kind of decision procedure, such as direction of attention to the node of greatest activation (c.f. the decision demon in the pandemonium model, Selfridge and Neisser, 1960).

3.3 *The acquisition of two types of emotion knowledge*

As it stands, the hierarchical model outlined above implies a structural and activational continuity between knowledge at the levels of autobiographical memories, event schemata, general schemata, and emotion terms. However, the evidence from pilot work, and from Glasberg and Aboud (1982), was previously seen to imply the existence in younger children of at least a partial separation between different types of knowledge about emotional episodes.

A reconciliation of this apparent inconsistency is possible if the continuity between levels is considered to be the product of an integration of two different types of knowledge structure, associational, and categorical. These, it will be argued below, are acquired in different ways, and are relatively uncoordinated in the first instance due to the distinct functions of within-event recognition and post-event categorization of emotion.

Within-event recognition was argued to have as its primary objective the prediction or selection of specific features (usually those of behavioural response) appropriate to a specific context (usually defined by a particular antecedent). As noted previously, this predictive process must take place rapidly in order to be effective, and so is likely to be of a low-level, associational, character.

Superficially, this might seem to create problems of a trade-off between speed and accuracy of judgement. The acquisition of relatively reliable associations between specific antecedents and behaviours will be greatly facilitated, however, by the existence of routines within a stable environment, which will tend to lead to repeated occurrences of more-or-less similar events, even those of an emotional quality. It is exactly the featural regularities of such recurrent specific sequences which appear to be encoded in the event schemata identified in Chapter 2, whose activation was argued to provide the means of anticipation or guidance of behaviour within an emotional episode.

In contrast, post-event categorization was suggested to have as its principal goal the appropriate application of an explanatory construct to a particular event, in order to render it intelligible. However, whilst a statement of the form "X did Y because he was angry" may have such explanatory value for an adult, as was seen in Chapter 2 understanding of the nature of the implied causal relationship is acquired gradually during the course of development, and all that is initially signified by emotion terms may be the observable event of antecedent and the behaviour contingent upon it. In this sense, though, learning which events go with which words (i.e. acquiring the appropriate categorical knowledge) constitutes the first step towards causal understanding.

Dunn et al. (1987), in reporting on the relationship between early parental use of emotion terms and their subsequent use by children, indicate the role that labelling by others may have in the acquisition of this categorical knowledge. However, as there are no fixed antecedent or behavioural features which will be evident across all events to which a particular emotion term may be applied, and since parental use of a term is unlikely to be restricted to a single fixed context, the child will therefore be exposed to a range of events with different features which are indicated to be exemplars of that term.

Thus from early on the categorical knowledge acquired by the child will consist of a set of representations of conjunctions between antecedents and behaviours, which to some extent generalize across specific contexts. These representations, it is argued, form the basis for general schemata associated with emotion terms within hierarchical knowledge structures of the type outlined above. Post-event identification and labelling of emotion by the child will rest on the extent to which a particular event activates a general conjunction which falls within those categorized as belonging to a term.

The above discussion indicates something of how associational knowledge (event schemata) and categorical knowledge (general schemata and emotion terms) might come to be acquired. That such acquisition could result in structural separations is perhaps, at first sight, less obvious. After all, both types of knowledge must be presumed to be derived from the child's experience of emotional events.

The crucial point, however, is that, even for adults, there is likely to be a substantial imbalance in the frequency with which within-event recognitions and post-event categorizations of emotion are made. In essence, any emotional event in which we are involved will call for the use of within-event recognition, but only in a limited number of these events will explicit post-event labelling be made, for instance where there is some ambiguity or difference between individuals as to the precise nature of an event, or where justification of a response is required.

This imbalance is assumed to be the same for children, but with an additional difference, which stems from the fact that they are still in the process of acquiring the knowledge on which recognition and categorization rest. The regularities of all experienced emotional events which are signalled to be salient by changes in arousal may be argued to form part of the associational knowledge contained in event schemata. The acquisition of categorical knowledge, on the other hand, will be limited initially to that sub-set of experienced emotional events which happen to be labelled by adults. Thus whilst there will be <u>some</u> overlap in the experiential basis for associational and categorical knowledge, there will also inevitably be areas of the former not covered by the latter.

3.4 *The retrieval of emotion knowledge*

This hypothetical tendency towards a separation of associational and categorical knowledge of emotion provides the basis for a detailed and internally consistent account of the failure of children to retrieve particular types of information in different tasks.

For instance, when the child is presented solely with a description of a specific antecedent situation, this would activate associational knowledge (since the context created is analogous to within-event recognition), and hence allow the behavioural complement to that antecedent to be retrieved. If, however, the child is asked to produce an emotional term for the antecedent, they will only be able to do so if the specific conjunction of antecedent and associated behaviour which has been retrieved is recognized as an instance of a more general class of event which forms part of the category signified by a term.

Conversely, if the child is requested to provide an instance of a specific event appropriate to a particular term (as in Glasberg and Aboud, 1982), they will find this difficult to achieve. Leaving aside issues of younger children being less able to individuate traces that comprise event schemata, in this kind of task the knowledge activated will be that contained in the set of general schemata connected with the term. This knowledge is, by definition, that of the features present across a number of different specific events. However, as was found in pilot work, retrieval of information about a specific event should be facilitated if the child is presented with details of a behaviour, since again, this will tend to activate the more specific associational knowledge contained in an event schema.

A further point within the same explanatory framework serves both to account for children's <u>success</u> on the kinds of task examined above, and more generally to suggest how integration of associational and categorical knowledge might first occur through the accretion of experience over time. The initial separation of the two types of knowledge was argued to result primarily from the fact that only some of the emotional events experienced by children are labelled by others. It follows from this, however, that simply on a chance basis, the more frequently a relatively specific sequence of antecedent and behaviour occurs, the more likely it is to be so labelled.

Once brought within the ambit of categorical knowledge in this way, the features of the sequence, already encoded as an event schema, will form part of the sub-structure of an appropriate general schema. As described previously, within this general schema the sequence will have an associated degree of prototypicality, defined by its frequency of occurrence. Subsequent activation of the event schema will then also activate the general schema to an extent proportional to its degree of prototypicality. The more frequently this sequence is experienced, the greater the probability of this activation being above the criterial value necessary to fully activate the general schema. At the same time, since the specific sequence will also add to the frequency weighting of the general schema, the more frequent the sequence, the greater the likelihood that that schema will have above criterial activation for the term, allowing it to be retrieved.

For the child presented with the task of actively retrieving an emotional term appropriate to a described antecedent, success would therefore depend on the completion of three stages of processing:

1) Activation of an event schema which defines the most probable behavioural complement for the antecedent - the associational stage;

2) Activation of a general schema which encompasses the specific feature values contained in the event schema - i.e. recognition of the sequence as an instance of a more general class of event;

3) Activation of the emotional term which encompasses the general schema - i.e. categorization of the general class of event.

The first stage will be likely to be achieved if the child has encountered any similar antecedent previously. However, as discussed above, successful achievement of the second and third stages will be a function of the frequency of the specific sequence in prior experience. Thus retrieval of an emotion term for a specific antecedent will tend to be limited to those instances which have been experienced comparatively frequently.

In general, success will be more restricted in the task of retrieving a specific event which exemplifies an emotion term. Activation of general schemata for the term may spread down to activate event schemata encompassed by these (i.e. those which have been labelled), but these event schemata will, as noted above, tend to be those for events which have been experienced more rather than less frequently. Thus although outlines of events with specific featural values may be given by the child, these are unlikely to refer to any <u>single</u> instance of such an event. This characteristic of children's responses was apparent in Experiment 1.

Exceptions to this may arise in two ways. McClelland and Rumelhart (1985), in their distributed model of memory, suggest that new inputs to this kind of knowledge structure will for a time weight feature values to an extent greater than that derived from simple frequency. In time the values would stabilize according to a decay rule that they propose. In the interim, however, responses would be expected to be biased by this effect of recency. Applying this idea to the hierarchical model put forward here, similar "recency" weightings could temporarily enhance the degree of prototypicality of feature values from a specific instance of an event to above criterial level for activation within a general schema. Activation of the schema via the emotional term could then spread to activate these feature values, allowing the specific instance to be retrieved.

A similar, but longer term bias on feature weightings might also be proposed to derive from <u>intensity</u> of experience. In this context intensity could be defined as dependent on arousal level at the time of an actual event. It has already been suggested that arousal marks the salience of an event and prompts its encoding within an event schema. High levels of arousal could serve to signal heightened salience, and give rise to a stronger initial trace of the event. One way in which this might be achieved is through continued reactivation (i.e. recall) of the same encoded sequence in a short space of time, a phenomenon reported by children in Experiment 1 (e.g. "you can't stop thinking about it"). Although this sequence might subsequently be subject to the same decay as any other trace, the higher starting point would give it the same potential level of activation within a general schema as a sequence which had occurred on a number of occasions. If this level is above criterion, activation of the general schema would again allow the retrieval of the specific event encoded in this way.

3.5 *Implications of the hierarchical model for tasks involving judgements of emotional quality*

To come full circle, it was noted at the beginning of this chapter that although many studies have focused on the use of items in the emotional vocabulary as an index of the development of emotional knowledge, little explicit attention has previously been given to questions of how the relationships between knowledge and vocabulary might influence the findings of such studies. The hierarchical model, as viewed from the developmental perspective of the preceding section, provides a basis for the examination of such questions.

Accounts, derived from the model, have already been presented for the retrieval of event information from emotional terms, and the retrieval of emotional terms from features of events. In both cases these are consistent with previous findings, and also suggest how the accretion of experience can lead to improved performance with age on such tasks (as found by Glasberg and Aboud, 1982, for instance). At the same time these accounts also carry more general implications for the use of tasks of these types to investigate emotion knowledge.

Firstly, the model suggests that the examination of emotion knowledge at different ages via named qualities of feeling will tend to underestimate both the breadth and depth of this knowledge. Whilst studies which use this method (such as Experiment 1 above) may provide an idea of the order in which, for instance, new features of emotional knowledge appear, failure to access the more detailed associational knowledge of younger children may to some extent give a false impression of the timing of such developments. This was a point raised in Chapter 2 when a distinction was drawn between studies which call for implicit knowledge, and those which require its explicit expression.

On the whole, however, the implications of the model are more serious for tasks where children are required to make judgements about the quality of emotion indicated by presented material, the most commonly used paradigm in this area of the developmental literature. The central point concerns the fact that the model predicts differences in ability to make judgements of this kind dependent on the manner in which the task is constituted. Three basic approaches can be identified here:

1) "Production" tasks in which the child is requested to suggest, unaided, the named quality of feeling appropriate to an antecedent and/or behaviour (e.g. the first part of the task used by Glasberg and Aboud, 1982);

2) Verbal forced-choice or "recognition" tasks, in which the child is requested to select a named quality of feeling from a presented list (e.g. Stein and Jewett, 1986; Reichenbach and Masters, 1983; Gnepp, 1983);

3) Non-verbal recognition tasks, in which the child is requested to select a facial expression (usually presented as a schematized drawing) from a presented set (e.g. Borke, 1971; Gnepp et al., 1987).

The retrieval of emotion terms within a production task has already been examined from the perspective of the hierarchical model. Under these conditions, judgements of emotional quality were predicted to be subject to an effect of familiarity (i.e. frequency of prior experience of the presented antecedent or behavioural features). Judgements of emotional quality would be predicted to be made more easily in a verbal recognition task, however.

In both types of task judgements of this kind would depend on the occurrence of above criterial activation of a general schema associated with the term which encompasses the presented event features. In the production task, the level of this activation would be solely dependent on the frequency weightings of the presented features, provided these had been linked to the general schema at a prior point. In the recognition task, however, activation of the general schema would come from both feature frequency weightings, and from presentation of the emotional term, in the way described previously. Thus the list of terms would create a kind of priming effect, which could result in above criterial activation of the general schema by features which would not achieve this on their own.

If this account of processing in verbal recognition tasks is correct, then it raises questions about the comparability of results obtained from studies which have used this method, and those from studies which have used production tasks. Since the latter are few in number, this is not perhaps an issue of major importance. However, a further point which may be made is that the previous widespread use of verbal recognition tasks may have led to an over-estimation of the strength of the connection between children's knowledge of emotional events and their understanding of the emotional vocabulary. Facilitation of judgements of emotional quality may also have tended to obscure the existence of differences between associational and categorical knowledge, which might have been a profitable object of further investigation in their own right.

An additional masking of differences between types of knowledge might have resulted from the previously noted tendency to regard responses to verbal and non-verbal recognition tasks as directly comparable. The model outlined in this chapter would suggest that these responses are in fact based on totally different processes. The former, as described above, would involve activation at all levels of the knowledge structure. Appropriate selection of facial expressions, however, would be dependent solely on the associational knowledge contained in event schemata. Although as far as the child is concerned none of the presented expressions might be the most probable behavioural complement to a described antecedent, the association between that antecedent and one of the expressions might only require to be stronger than for the other expressions in order for a selection to be made.

This account serves to provide a foundation for Borke's (1971) assertion that selection of facial expressions facilitates the responses of younger children. At the same time, it also also explains the otherwise apparently inconsistent finding that children may often be quite poor at making a verbal judgement of the quality of emotion denoted by a facial expression (Izard, 1971; Reichenbach and Masters, 1983, amongst others).

Various limited aspects of the hierarchical model developed in this chapter have been seen to fit well with previous findings from studies of children's knowledge of emotion. In addition, the model may be argued to constitute a coherent theoretical framework which takes into account the detail of processes involved in children's performance on tasks designed to explore such knowledge.

However, much of the model remains to be validated. To focus on one particular issue, the predicted differences in children's ability to make judgements of emotional quality in production and verbal recognition tasks have received little attention in previous research. This prediction is both of methodological importance, and provides a first test for the model. Experiment 2, described below, was therefore designed to investigate whether such differences do exist when children are requested to make judgements of the emotional qualities signified by antecedent situations; and, if so, whether the characteristics of these differences are consistent with the model.

Experiment 2

A direct comparison between children's performance in making judgements of emotional quality within production and verbal recognition tasks has not been reported in the literature to date. Previous studies do, however, provide some indirect evidence for the existence of differences consistent with the predictions of the hierarchical model.

Stein and Jewett (1986), for instance, using a recognition task, found that 6-year-olds were able to make appropriate selections from the terms "mad", "sad", and "afraid" when presented with descriptions of antecedent situations which were negative in quality. Barden, Zelko, Duncan, and Masters (1980), in a study of the degree of consensus exhibited by children of different ages in judgements of the emotional quality signified by eight types of antecedent situation, requested their subjects to select terms from the list "happy", "sad", "mad", "scared", and "OK". These authors make no report of the youngest children in the study, 4- and 5-year-olds, experiencing any difficulty with this task, and found that they exhibited a significant tendency to choose the same terms for each situation type. Reichenbach and Masters (1983) found that 4-year-olds presented with descriptions of antecedent situations made appropriate selections from the list "happy", "sad", "mad", and "OK" on 72% of occasions.

In contrast, pilot work by the author which used a production task with antecedent situations derived from those used by Barden et al. (1980), found that in this case only 54% of responses made by 5- and 6-year-olds named a specific quality of feeling at all.

Of these, only just over two-thirds provided terms which were rated as appropriate to the situations. Since Barden et al. required children in their study to justify the terms they selected, the difference between the two studies cannot be accounted for by subjects' use of a guessing strategy when confronted with recognition tasks. However, the possibility that the production task left children uncertain as to what type of response was required cannot be discounted. The apparent problems that children had in in the pilot study might also be attributable to differences in story difficulty, which was not controlled.

However, studies of children's ability to produce and recognize terms for facial expressions of emotion indicate the existence of differences of the same kind as those outlined above. Children as young as two years have been found to be capable of selecting appropriate terms for facial expressions when choosing between two alternatives (Smiley and Huttenlocher, 1984). Camras (1986) reports that by four years they are able to choose accurately from a wider range. On the other hand, Izard (1971) found that 5-year-olds could only spontaneously label 49% of a range of facial expressions, although some of these were of types not used in the recognition tasks. Improvement in performance by 9 years was found to be minimal.

The findings in these two areas suggest the desirability of a direct comparison between production and recognition tasks under controlled conditions, in order to establish whether the apparent differences are artefactual in origin, or result from genuine disparities in processing, as predicted by the hierarchical model. The study reported below made such a comparison in the context of children's judgements of the emotional qualities indicated by antecedent situations.

Children in two age groups, 5- to 7-year-olds and 8- to 10-year-olds, were read descriptions of situations which contained features appropriate to three positive or three negative emotion terms. These terms ("happy", "excited", and "surprised"; and "sad", "angry", and "scared"), were shown by Trabasso, Stein, and Johnson (1981) to reliably elicit references to antecedents in children as young as three years, and so could be expected to be known to all children taking part in the study.

It was decided to embed multiple antecedents in the descriptions so that each would contain features likely to vary in the frequency with which they had previously been encountered. According to the hierarchical model, these would, as a result, activate to different degrees various general schemata connected with different terms. This provided a basis for individual children to make multiple responses to the same description. Whilst children at 6 years have been found to deny the possibility of simultaneous multiple emotions (Harter, 1983), and to tend to suggest single qualities of emotion when unprompted (Gnepp et al., 1987), Stein and Jewett (1983) report that they can give multiple responses when specifically prompted to consider these as alternatives.

It was predicted that this approach would highlight differences between the production and recognition tasks if they were in fact due to the priming of general schemata when emotion terms are available. In both tasks, the same *single* response to an antecedent could be made on the basis of the feature with the highest activation potential for a schema, provided this activation is above criterion when the schema is unprimed. Single responses might therefore mask differences in processing. Further alternative responses, however, would tend to depend on features which have lower activation potentials. It is in these instances that the facilitatory effect of priming would be most evident, since it would raise the activation of some of the more marginal features to above criterion.

In both age groups all children heard all the narrative descriptions. Half of these were presented as part of a production task, where the child was simply asked to suggest as many feelings as he or she could for each situation, up to a maximum of three. The other half were presented in a separate session as part of a recognition task, where a list of the six emotion terms was read between narrative and response. Again the child was asked to suggest up to three feelings for each situation.

The order in which children took part in the two tasks was counterbalanced within age groups. If the reduced performance on the production task found in pilot work was due to children failing to understand the nature of the required response, this ought to be revealed by the presence of order effects here: participation in the recognition task first should serve to signal the appropriate type of response for the subsequent production task.

In order to control for effects of variation in narrative difficulty, the descriptions heard by half of the children in each age group for the production task were heard by the other half for the recognition task, and vice versa. All narratives were therefore heard by the same number of children in each task.

Finally, children were also asked to give reasons for any term that they suggested for a narrative. This served as a control on children simply guessing responses in the recognition task, although the use of this procedure used by Barden et al. (1980) indicated such a strategy to be an unlikely source of differences between production and recognition.

On the basis of the hierarchical model four specific predictions were made with regard to outcome:

1) That children in both age groups would identify more terms in the context of the recognition task.

2) That the older children would identify more terms than the younger children in both the production and recognition tasks, since the increase in frequency with which features have been experienced, and thus in their basic activation potential, should tend to be strongly related to age.

3) That, on average, the proportion of produced to recognized terms would be roughly invariant across age group. Discounting recency and intensity effects fewer additional experiences of a feature would be necessary to raise the overall frequency of these to a level adequate to effect criterial activation of <u>primed</u> schemata. Thus in a fixed period of time more features would be expected to attain this level than would attain the level required for the activation of unprimed schemata. Since the total amount of experience would also be fixed, the <u>rate</u> of increase in the number of features at or above either level of frequency should tend to be a constant. This would yield a ratio for the number of features capable of causing above criterial activation within each of the two tasks which is constant over time.

4) That narratives will vary in the same way in both tasks in

the frequency with which a term is identified for them by the sample of children. The features within the different narratives appropriate to a specific positive or negative term may be expected to vary in their frequency of occurrence within the environment experienced by the children. As a consequence the narratives will tend to vary similarly in the extent to which a term is identified for them in the production task, since the more frequent a feature is, the higher its average activation potential will tend to be across the sample, and thus the greater the probability will be that a child will identify the relevant term. In the recognition task, the effect of priming is predicted to increase the frequency with which a term is identified for a particular narrative. However, the amount of additional activation of a general schema that occurs in the recognition task will be a function of the frequency weighting of that schema. This in turn will be a function of the frequency of specific features that exemplify that class of event, including those contained in the narratives. Thus in general the effect of priming would be likely to be greatest for the most frequent features, and weakest for the least frequent, so resulting in corresponding sizes of increase in the frequency of identification of the relevant terms. The net outcome of this is that the recognition task should tend to preserve the monotonic order of narratives derived from the frequency with which a specific term was identified for them in the production task.

Method

Subjects

A total of 48 children from two schools in East London took part in the study. These fell into two age groups, 5- to 7-year-olds (range 4 years 10 months to 7 years 6 months, mean 6 years 0 months), and 8- to 10-year-olds (range 8 years 6 months to 10 years 3 months, mean 9 years 7 months). There were 24 children, 12 boys and 12 girls, in each age group.

The children were predominantly from working-class backgrounds, and the great majority were native speakers of English, although 8 spoke English as a second language. Sufficient fluency to participate in the experiment was established from raw scores on the British Picture Vocabulary Scale (BPVS) Short Form (Dunn, Dunn, Whetton, and Pintillie, 1982), administered in a pre-test session. A raw score of 7 was taken as a minimum qualification. This score has a normalized age equivalent of 3 years 6 months, which was the average age of the children shown previously (Trabasso et al., 1981) to have knowledge of the six target emotion terms employed in the study. All 48 children who went on to participate in the experimental sessions had scores at or above this level. A further 5 children were excluded at the pre-test stage. For the younger age group the mean BPVS raw score was 11, and for the older, 17. The majority of children had standardized scores in the low average range.

Material

The information from which children were to make judgements of emotional quality consisted of 8 brief narratives (3 or 4 sentences each) describing situations likely to provoke an emotional response. Each situation contained features appropriate to three different positive or three different negative emotion terms ("happy", "excited", and "surprised"; and "sad", "angry", and "scared"). "Surprised" was included amongst the positive emotions as Trabasso et al. (1981) found that this was the predominant quality of antecedents associated with the term by younger children.

Selection of the features appropriate to the different negative emotions was guided by some observations made by Stein and Jewett (1986). These authors noted that situations which provoke sadness or anger both commonly involve a mismatch between wanting something and attaining it. They argue that further differentiation of these feelings is dependent on whether the cause or the negative consequences of this mismatch are more salient. If the cause is more salient, then anger results; if the consequences are more salient then this leads to sadness. Within the same framework, Stein and Jewett also argue that fear is the result of situations which imply imminent personal harm.

Taking these points as a basis, narratives for the negative emotion terms were constructed so that they all contained one feature of each of the following general types:

a) an action by another person which prevented a stated goal from being achieved by the central protagonist;
b) an implied negative consequence of failure to achieve that

goal;

c) a potential threat to the protagonist arising from the situation.

If Stein and Jewett are correct, features of the first type should tend to be associated with "angry", those of the second type with "sad", and those of the third type with "scared".

Corresponding general types of feature were outlined to provide a similar basis for the construction of narratives appropriate to the positive emotion terms. These were as follows:

a) an action by another person which facilitated the achievement of a stated goal by the central protagonist;

b) unexpected achievement of that goal;

c) an implied positive consequence of achievement of the goal.

It was held that features of the first type should tend to be associated with "happy", those of the second type with "surprised", and those of the third type with "excited". All narratives for the positive emotions contained one feature of each general type.

Once this framework for the narratives had been established, specific instances of the general feature types were chosen according to two criteria. The first was simply that they should be commonplace and likely to occur with variable frequency in the context of school or home, so that all children could be expected to have encountered them previously, but to different degrees. No precise estimate of feature frequency was made, since the likelihood that all features within one narrative would have been experienced equally often by a child was presumed to be small. The second criterion was that the features within a single narrative should plausibly form part of one overall event.

Four positive and four negative narratives were constructed in this manner. Each was phrased in such a way as to place the listener in the role of central protagonist. This approach was adopted in order to encourage children to focus on their own experience as the basis for their responses, although Barden et al. (1980), in a direct comparison, found virtually no difference between the responses of 4- and 5-year-olds to self-referent and other-referent narratives. As a further adaptation to the child's experience, the sex of peers involved in the events described by a narrative was either left unspecified, or adjusted to that of the listener. Examples of the positive and negative narratives respectively are given below:

"Suppose that you've been off school ill, and it's the day before your friend's birthday party. Your mum has said that you won't be able to go to it because of being ill. But when your mum takes you to the doctor's to see how you are, the doctor says that you're better. Your mum says, 'I think you can go to the party tomorrow after all then.'"

"Suppose that you're working hard on a drawing at school one day, and you want to get it finished so that it can go up on the wall. Just when you're finishing, another boy/girl, bigger than you, comes over and scribbles all over it. They tell you that you'd better not tell anyone what they've done or they'll punch you."

All eight narratives used in the study are presented in Appendix 2.1. These were divided into two sets of four, with two positive and two negative narratives in each. All children heard one narrative set for the production task, and the other for the recognition task.

Design

The study design manipulated four experimental factors, each with two levels. These were Task Type (Production or Recognition), Age Group, Task Order (Production first or Recognition first), and Combination of Narrative Set and Task Type - i.e. which of the two narrative sets was heard for the production or recognition task - (subsequently referred to as Narrative Set). As implied, Task Type formed a within-subjects factor. Task Order and Narrative Set were manipulated between subjects, with the levels of both fully crossed with each other and with levels of Age Group. This gave a total of 8 experimental groups, 4 within each age level.

To fill these, the 24 children within an age group were sub-divided into 6 blocks of 4 each, matched within block for sex, age in months, and BPVS raw score. Children from a block were then assigned at random, one to each of the four experimental groups for that age level. This procedure ensured the maximum degree of comparability between groups.

Two of the experimental groups within an age level received the Production Task first, and two the Recognition Task first. Within the particular ordering of tasks, one group heard Narrative Set 1 for the Production Task and Narrative Set 2 for the Recognition Task. This combination was reversed for the other group. The order of presentation of the four narratives within each task was systematically varied across individual children.

Procedure

Children were presented with the Production and Recognition Tasks in separate sessions a couple of days apart, each conducted on a one-to-one basis in a quiet room at school. At the start of each session children were told that they were going to hear some stories, which were all about things which might happen to them sometimes. They were requested to try to imagine, as they listened to each story, how they would feel if those things happened, and told that after each story they would be asked some questions about how they thought they would feel. For the Recognition Task only, children were told that they would hear a list of some feelings from which to choose an answer. For both tasks they were told that there were no right or wrong answers to the questions, that the experimenter was just interested in what different children thought. After this introduction, children were read the first narrative.

In the Production Task, children were asked the following question after they had heard each narrative:

Q.1) How do you think you'd feel if that happened?

If an emotion term was stated in response to this question, they were then asked:

Q.2) What would it be about what had happened that would make you feel that way?

Regardless of response to this question, children were then asked:

Q.3) Do you think there's another feeling that you might have if that story happened? Instead of feeling [answer to Q.1], or as well as that?

Again, if an emotion term was stated in response to this question, children were asked (Q.4) what the cause of that feeling would be, in the same words as used in Q.2. Provided two emotion terms had been identified, children were asked:

Q.5) Do you think there's still another feeling you might have if that story happened? Instead of feeling [answers to Q.1 and Q.3], or as well as them?

Children were again asked (Q.6) to indicate the cause for any label given. The session then proceeded to the next narrative.

The same sequence of questions was used for the Recognition Task. The only difference was that for Q.1 children were asked in addition:

Do you think you would feel happy, sad, excited, scared, angry, or surprised?

If a term was chosen, this list was repeated for Q.3, minus the selected item; and similarly for Q.5. The order of terms in the list was systematically varied across children and across narratives, but was kept constant (barring the deleted items) for all questions with regard to the same narrative.

A single repeat of each narrative was allowed if children requested it. For questions in both tasks regarding the identification of emotion terms, the prompts detailed below were used as circumstances required:

a) When Q.1 elicited no response, or no relevant response, children were asked "Would you like it if that happened? How would you feel if you did/didn't like it?"

b) Where responses only described actions indicative of an emotion (e.g. "I would hit her", "I would run and hide"), children were asked what kind of feeling they would have if they wanted to do that.

c) Where responses were justifications (e.g. "he doesn't like me"), or other statements relating to the content of the narrative (e.g. "I like going to parties") , children were asked to think of a word, or choose one from the list, that would tell the experimenter how they would feel about what had happened.

d) Where questions elicited responses which used vague or indeterminate terms (e.g. "good", "bad", "horrible"), children were asked to give a word that said more about the feeling.

e) When children stated a term that was a close synonym of one already given for that narrative (e.g. "cross" following "angry"), the similarity of the feelings was pointed out, and they were asked if there was any other different kind of feeling that they might have.

When questions as to the causes of stated feelings elicited responses that were vague or related to other events, children were asked to say what it was in the story that would make them feel that way.

All sessions were tape-recorded in their entirety for subsequent transcription and analysis.

Scoring

The principle measure for analysis was the number of emotion terms identified and accounted for by each child across narratives in the separate tasks. Transcripts of children's responses in the two tasks were both scored according to the same criteria:

i) The emotion terms counted as valid were those in the target set for the positive or negative narratives ("happy", "excited", and "surprised"; or "sad", "angry", and "scared") or close synonyms of these (i.e. terms which could be used interchangeably with the targets, such as "mad" or "cross" for "angry", "frightened" for "scared", "unhappy" or "miserable" for "sad", and so on). Other terms were accepted, however, if they had been justified in an appropriate manner.

ii) Explanations for an identified term were considered acceptable if they made reference to a relevant feature in the narrative in hand (e.g. for "sad", "because my picture's ruined"), or to a plausible evaluation of a feature in that narrative (e.g. for "scared", "because I might get ill again").

The maximum possible score for a child was 12 explained terms per task.

Reliability

As a check on the reliability of the scoring procedure, 25% of children's transcripts for both tasks were selected at random from amongst those in each age group, and scored by two independent judges. Overall rate of agreement was 94.1%. Discussion resolved all differences, and no change to the scoring criteria for the remaining transcripts was necessary.

Results

Children's scores in the Production and Recognition Tasks were examined using a mixed-model analysis of variance, with Task Type as a within-subjects factor, and Age Group, Task Order, and Narrative Set as between-subjects factors. This analysis showed no significant main or interaction effects of Task Order and Narrative Set. The analysis of variance was therefore re-computed with these two factors excluded. Results from this second analysis are reported below.

<u>Effects of Task Type and Age Group on the number of explained emotion terms</u>

Table 3.1 shows the mean number of terms identified and explained by children in the two age groups in the Production and the Recognition Task, together with values for the mean difference between the two tasks, and for the proportion of produced to recognized terms. The analysis of variance revealed significant effects of both Task Type ($F = 50.02$, d.f. = 1,46, MSe = 2.52, $P < .001$) and Age Group ($F = 17.20$, d.f. = 1,46, MSe = 13.99, $P < .001$). As predicted, more terms were identified in the Recognition Task, and more by the 8- to 10-year-olds.

The analysis also found a significant interaction between Task Type and Age Group ($F = 5.97$, d.f. = 1,46, MSe = 2.52, $P < .02$). Tests of simple main effects showed the difference between the Production and Recognition scores to be significant in both the younger age group ($F = 10.71$, d.f. = 1,46, MSe = 2.52, $P < .005$)

Table 3.1 Mean number of Explained Terms by Age Group and Task Type (n = 24), with mean differences between Recognition and Production, and proportions of produced to recognized terms in each Age Group

	Production Task	Recognition Task	Recognition - Production	Production/ Recognition
5 to 7 y.o.	2.58	4.08	1.50	.63
8 to 10 y.o.	4.96	8.04	3.08	.62

and the older age group ($F = 45.27$, d.f. = 1,46, $MSe = 2.52$, $P < .001$). Corresponding tests also showed that the older age group identified significantly more terms in both the Production Task ($F = 11.25$, d.f. = 1,46, $MSe = 6.02$, $P < .005$) and the Recognition Task ($F = 17.91$, d.f. = 1,46, $MSe = 10.50$, $P < .001$). As can be seen from Table 3.1, the interaction effect is attributable to the fact that the absolute difference between the Production and Recognition scores increased in the older age group to approximately twice the size of that in the younger age group. In line with prediction, the proportion of produced to recognized terms across children is almost identical in the two age groups.

Frequency of specific terms for individual narratives in the Production and Recognition Tasks

In addition to the predictions of overall differences in performance between the Production and Recognition Tasks, which were examined in the previous section, it had been predicted that the monotonic order of narratives, derived from the frequency with which a specific term was identified for each, would tend to be the same in both tasks. In order to investigate this, the data from children's scored responses were re-cast into a form appropriate for an item analysis. For each narrative a count was made of the number of children across age groups who had identified and explained each of the six specific terms in the target set, or close synonyms of these. Separate counts were taken for the Production Task and the Recognition Task.

On the basis of the frequency measures generated in this way, narratives were assigned two rank values for each specific term, according to how often that term had been identified in the Production Task, and how often in the Recognition Task. One constraint was applied here. As would be expected, in both tasks positive terms were rarely identified for the negative narratives, and vice versa. It was therefore considered that to include narratives of the opposite valence in the rankings for each term would unfairly bias the subsequent analysis.

In consequence, assignment of the rank values was restricted to the four narratives of the appropriate valence in the case of each of the five terms "happy", "excited", "sad", "angry", and "scared". An exception was made in the case of the sixth term, "surprised", since its perceived ambivalence had led it to be more commonly

Table 3.2 Rank values of same-valence narratives on frequency of each of six specific emotion terms for the Production Task (P) and the Recognition Task (R) (raw frequencies for each term in parentheses)

		Rank Values				Rank Values	
Term	Narrative	P	R	Term	Narrative	P	R
Sad	Negative 1	4 (5)	2.5(10)	Happy	Positive 1	4(11)	2(15)
	Negative 2	3 (7)	1(14)		Positive 2	3(15)	3.5(13)
	Negative 3	2(11)	4 (3)		Positive 3	1(19)	1(16)
	Negative 4	1(12)	2.5(10)		Positive 4	2(16)	3.5(13)
Angry	Negative 1	1(10)	1(17)	Excited	Positive 1	4 (2)	3.5(10)
	Negative 2	3 (5)	4(12)		Positive 2	1 (6)	2(11)
	Negative 3	2 (9)	2.5(13)		Positive 3	3 (3)	3.5(10)
	Negative 4	4 (4)	2.5(13)		Positive 4	2 (5)	1(12)
Scared	Negative 1	3 (3)	2.5 (8)	Surprised	Positive 1	1 (6)	2(12)
	Negative 2	4 (1)	4 (7)		Positive 2	3 (3)	1(13)
	Negative 3	1 (8)	1(13)		Positive 3	3 (3)	4 (9)
	Negative 4	2 (6)	2.5 (8)		Positive 4	3 (3)	3(10)
Surprised	Negative 1	3 (1)	2 (3)				
	Negative 2	2 (2)	3.5 (2)				
	Negative 3	4 (0)	3.5 (2)				
	Negative 4	1 (3)	1 (5)				

identified for the negative narratives. All eight narratives were assigned rank values for this term, but on the basis of separate sets of ranks for the positive and negative narratives, in order to maintain the same scale of values across all terms.

This procedure yielded 7 sets of 4 paired narrative rank values each, one for each of the five terms with a clear positive or negative valence, and two for "surprised", one for the positive, and one for the negative narratives. These sets of values, and the raw frequencies from which they were derived, are presented in Table 3.2. As a measure of the extent to which narratives had elicited specific terms with the same relative frequency in both tasks, correlation coefficients were calculated between the Production and Recognition rank values in each of the 7 sets.

In five of these moderate to high positive correlations were found ($r = .32$ for "happy", .63 for "surprised" (negative), .63 for "angry", .74 for "excited", and .95 for "scared"). Of the two remaining sets, there was a low positive correlation for "surprised" (positive) ($r = .20$), and a negative correlation for "sad" ($r = -.32$). The overall trend towards the different narratives yielding the same relative frequency of a term in both tasks was confirmed by the significant positive correlation found between the pairs of rank values across all 7 sets ($r = .46$, $n = 28$, $P < .01$, one-tailed).

All four substantive predictions derived from the hierarchical model were found to be met under the tightly-controlled conditions imposed by the study. The following points are of particular importance:

i) The same children were shown to be able to identify members of a small set of familiar emotion terms as appropriate to antecedent situations more frequently within a recognition task. Although these children did not as individuals make responses to the same material in both tasks (this level of control might have given rise to confounding practice effects if it had been used), the improved recognition performance was constant across different matched experimental groups. Half of these made responses to the same narratives in the recognition task as the other half responded to in the production task. This central effect was not found to interact with the order in which the tasks were attempted, nor with the specific set of narratives responded to for a task type.

ii) Children in the older age group identified terms more often than those in the younger age group in both types of task. However, this all-round improvement in performance was coupled with an increase in the extent of the absolute difference between the production and recognition of terms. The size of this increased difference was exactly sufficient to maintain the proportion of produced to recognized terms at a constant value across the two age groups.

iii) Increases in the frequency with which specific terms were identified for a narrative in the recognition task were not random, but were, at least in part, systematically related to the frequencies of those terms for each narrative in the production task.

Although these findings provide good support for the hierarchical model, there may be plausible alternative explanations of the three main points noted above. In a sense, the existence of differences between production and recognition tasks in this area is unsurprising. A parallel could be drawn, for instance, with the case of expressive and receptive tests of vocabulary, where the size of vocabulary measured by receptive tests always tends to be larger than that measured by expressive tests. On the face of it, this analogy suggests a more general framework within which to view differences between the production and recognition of emotion terms: that of performance and competence in child language.

Closer examination indicates, though, that the analogy is of limited validity. Differences between expressive and receptive vocabulary can be argued to be in part a reflection of differences in the tasks used for their assessment. To take two representative examples, the expressive sub-test in the Reynell Developmental Language Scales (Reynell, 1972) requires children to provide as full a description as they can of pictures presented to them. Items in the British Picture Vocabulary Scale (BPVS) (Dunn et al., 1982), on the other hand, require children to simply select one of four pictures as appropriate to a single word. The greater degree of structure and targeting of response present in the latter seems likely to yield evidence of knowledge of a wider range of words than the former.

An expressive test which was structurally more similar to the

BPVS (such as a series of items which required children to provide a single word for a picture) might also find knowledge of a narrower range of words if children failed to understand that they should give responses to the expressive items beyond those which are most immediately obvious. However, neither case provides a close parallel to the production and recognition tasks used in the current study, since these were structurally very similar, the target terms for both tasks were words which are in common usage, and children were specifically requested to think of alternatives to their most immediate responses.

More generally, a classification of the differences between production and recognition as simply a further instance of the opposition of performance and competence is open to the criticism that this provides not an explanation of the differences, but merely an alternative, albeit wider-based, description. An explanation of differences between performance and competence in a particular context must ultimately depend on the identification of specific mechanisms, and an examination of how these operate to give rise to certain patterns of results. In the present instance, if production underestimates recognition under comparable circumstances, this must be either an effect of artefactual or non-artefactual task constraints, or else the outcome of inherent patterns of processing of the information available in the task. These possible sources of the observed differences are explored in turn below.

Artefactual task constraints

There is no evidence to support an explanation of production-recognition differences which is based on experimental artefact. If differences were attributable, even in part, to a failure of children to understand what type of response was required in the production task, then, as noted previously, this would be expected to result in an interaction between task type and task order. No effect of this kind was found in the data. This explanation is further undermined by the fact that virtually all children were able to identify and account for at least one term in the production task.

Conversely, the differences would not seem to be attributable to the use of a trial-and-error response strategy in the recognition task. It would be expected that children would often find it difficult to account for terms identified in this way. Since the difference between production and recognition reported here was for terms that had been explained, it should be relatively uncontaminated by any effects of this kind of response strategy.

Non-artefactual task constraints

Two possible types of non-artefactual task constraint can be proposed to explain production-recognition differences. The first of these is based on the notion of vocabulary search. In this account children are regarded as utilizing the same basic strategy for response selection in both the production and recognition tasks. For each narrative emotion terms are considered one-by-one, and the knowledge associated with each is compared with the information presented in the narrative until a reasonable fit is found. The term which provided the fit is then selected. The difference between production and recognition is seen as deriving from the fact that in the recognition task alternative terms for consideration are provided externally, whereas in the production task these have to be generated by the children themselves. Thus the production task entails a process of vocabulary search which may fail to turn up all the possible alternatives available in the recognition task, due to the lack of a basis for the direction of the search.

This account could serve to explain differences between production and recognition under certain circumstances, but it fails on a number of points of detail in the present case. The first of these is that it would tend to predict the presence of effects of task order. The relatively small set of familiar target terms was defined, and repeated on at least four occasions, in the recognition task. Children who received the production task after the recognition task should therefore have found it somewhat easier to retrieve appropriate terms for consideration than those who received it before, especially in view of the structural cues to recall provided by the similarity between tasks. As noted above, no order effects were found.

A second point is that this account would also predict diminished rather than increased differences between production and recognition in the older age group. Ridgeway, Waters, and Kuczaj (1985), in a large scale survey of the understanding and use of emotion terms in younger children, found that by 6 years of age, on average 99% of children understood the six emotion terms used in this study, and 92% made active use of them. Although data from older children are not available, the trend for all six terms was towards increased parity of comprehension and use with age. The older children in the current study would therefore be expected to be more able to actively retrieve the same terms as they selected in the recognition task, not less. Improved memory organization would also be expected to result in greater capitalization on task order by the older age group, but again there is no evidence for this.

Finally, this account provides no clear basis in itself for an explanation of why, in the recognition task, children failed on occasion to select some terms which were appropriate to a narrative. Nor does it explain why there should appear to be systematic variation between narratives in the frequency with which specific terms were selected. In order to explain these aspects of the data it would seem necessary to give greater emphasis within the account to effects of knowledge and/or narrative content. This serves to further weaken the case for effects of vocabulary search. In general some form of direct knowledge link would seem to provide a more efficient, and therefore more plausible, basis for the production of items of vocabulary, and effects of knowledge are otherwise strongly implicated in the data. At most, children's use of vocabulary search as a strategy seems likely to be restricted to those occasions when direct knowledge has failed to identify a response. Even then, there is little evidence of its influence, as discussed above.

The second type of non-artefactual task constraint that might serve to explain production-recognition differences is more knowledge-based in character. This relates to the encoding of information in the two tasks. Stein and Jewett (1986), in the context of a discussion of the apparent differences between the production and recognition of terms for photographs of facial expressions of emotion, suggest that children might find production tasks more difficult because of uncertainty as to which aspects of the complex range of available information to encode. In a recognition task, they argue, judgements are made more easily because the presented terms generate expectations of characteristic patterns of features which then serve to guide the encoding of relevant information, if this is available. Some indirect evidence for the flexibility of encoding that this would imply is provided by Gnepp (1983), who found indications that facial expressions are susceptible to re-encoding when apparently conflicting situational information is provided.

An extension of this account to the present context is appealing. Not only does it provide an explanation of production-recognition differences, but it also implicitly assumes that different antecedent situations could vary in the degree to which their features matched characteristic patterns associated with the different emotion terms. This presents a basis for the systematic variation in frequency of terms across narratives, since the more characteristic features would also tend to be more familiar. They would therefore be more likely to be encoded without aid in both the production and the recognition task. The primary effect of the recognition task would be to facilitate encoding of less characteristic features in each narrative.

In terms of the underlying knowledge structures which provide the basis for a response, this account has much in common with that derived from the hierarchical model. The distinction between the two positions is primarily that of the stage at which differences between production and recognition are seen as arising. The encoding account does imply, though, that once appropriate features have been encoded from a narrative, identification of the relevant emotion term will follow. This seems to leave no basis for the increased size of the production-recognition difference noted for the older age group, since as performance in encoding less characteristic features improves, the facilitatory effects of the recognition task ought to become more marginal.

The precise structure of the recognition task used in this study also reduces the likelihood that differences in encoding provide the main source of discrepancy between children's performance in the two tasks. In studies of children's judgements of facial expressions which use verbal recognition tasks (e.g. Gnepp, 1983; Reichenbach and Masters, 1983), the material to be judged is typically available to the child throughout the presentation of emotion terms. Encoding can therefore take place after the terms have been heard. In the present study encoding could only happen in this way if a narrative was repeated after the list of terms had been presented, which was an infrequent event. This suggests that in general responses in both the production and the recognition task were dependent on information already encoded by the child, although facilitation of encoding via terms presented for the <u>preceding</u> narrative remains a theoretical possibility. Further evidence in favour of this position is provided by Gnepp (1983), who tested the information from antecedent situations that had been encoded by children prior to requesting judgements of emotional quality. She found no indication that this was incomplete, even amongst 4-year-olds.

Content-related constraints

If distinctions between the encoding of information in the production and the recognition task can be discounted, this leaves open the option that the observed differences are content-based. The key finding here is that of related systematic differences between narratives in the frequency with which specific terms were identified in the two tasks. This strongly implies that responses were at least in part dependent on the representativeness of information contained in the narratives. This representativeness cannot be defined as a property of the general relationships between features of the antecedent situation, as Stein and Jewett (1983) argue, since these relationships were held constant across all narratives of the same valence. This points to the conclusion that representativeness in the present case was a function of specific features, which leads back in turn to the effect of experienced feature frequency proposed in the hierarchical model.

That the relative frequency of identification of specific emotion terms for a narrative did tend to be the same in both the production and the recognition task also indicates that the facilitatory effects within the latter take the form of a boost to the strength of association between all features and their relevant terms. In itself, this only yields indirect evidence for the activation effect described by the hierarchical model. Convergent support is provided, though, by the constant proportion of produced to recognized terms in the two age groups, which was predicted on the basis of hypothetical differences in the criterial level of feature-derived activation necessary for the retrieval of terms in the two tasks. This latter finding in particular seems hard to account for in any other framework.

A final additional detail serves to furnish some further evidence in favour of the hierarchical model. It was argued in the description of the model's functions under different conditions of information retrieval that when the child is only presented with specific information about a situational antecedent, the knowledge activated first is that of the likely behavioural consequences of that antecedent (i.e. associational knowledge). Activation of an emotion term, if it occurred, was viewed as taking place at a later stage of processing. In the present study just under 7% of children's responses to the question "How would you feel...?" spontaneously described subsequent behaviour first of all. These responses occurred proportionately more than twice as often in the production task (10%) as in the recognition task (4%). Since the number of these responses was comparatively low, they were not subjected to further analysis, but the pattern of their occurrence is in line with the expectations of the hierarchical model, and is especially suggestive in view of their spontaneous nature.

If an associational stage does form the initial phase of processing in the production task, it may place an additional constraint on the activation of emotion terms. According to the model this could only take place through the activation of a general schema which encompassed the specific conjunction of antecedent and behaviour derived from the associational stage. The provision of emotion terms in the recognition task, on the other hand, should serve to activate a range of general schemata, more than one of which may encompass antecedents of the type which have been described to the child. This may have the effect both of short-cutting the associational stage, since each activated general schema appropriate to the antecedent would suggest a behavioural complement in its own right; and of allowing the antecedent to influence the activation level of more than one schema. This would provide a wider range of opportunities for the achievement of above-criterial activation of a schema, and thus more routes to the selection of a term.

Additional facilitation of this kind could explain the only point on which there might be considered to be some degree of discrepancy between the data obtained in the study and the predictions of the hierarchical model. Although overall the relative frequency of specific terms for each narrative in the two tasks was found to be significantly correlated, a large proportion of the variance remained unexplained (with $r = .46$, $1 - r^2 = .79$). But if multiple schema activation does take place in the recognition task, this could allow features to be interpreted in a more variable way than would tend to be the case in the production task, and may even, on occasion, result in different judgements of emotion being made. This would be most likely to happen where a specific antecedent is both a good (i.e. frequent) exemplar of a moderately common class of event linked to one emotion term, and a poor (i.e. infrequent) exemplar of a very common class of event linked to another emotion term. In a production task, activation of the first emotion term would be highest, but in a recognition task it would be possible for activation of the second term to be greater.

In the current study it would not necessarily be the case that both terms would be given as alternatives in the recognition task, since from the child's point-of-view selection of one term might be seen as constituting the response for that feature. In this context it may be noted that the most anomalous aspect of the responses made in the recognition task was the presence of decreases in frequency from the production task for the terms "happy" and "sad" (see Table 3.2). Bearing in mind the hypothetical overlap between the antecedents of sadness and anger, and happiness and excitement, it is of particular interest that one of the two decreases for "sad" is associated with an above-average increase in the frequency of "angry" (negative narrative 4), and two of the three decreases for "happy" are associated with above-average increases for "excited" (positive narratives 3 and 4).

Conclusions

Overall, the observed differences between the production and recognition of emotion terms are consistent with the proposed hierarchical model of the organization of emotional knowledge and vocabulary, and do not appear to be amenable to explanation in terms of either general task-related or artefactual effects. Whilst this is suggestive, though, data from further direct tests of the model are required before a clearer assessment of its validity can be made. Two particular issues can be singled out as both central to the model and in need of more detailed evidence:

1) <u>The effects of feature frequency on judgements of emotion</u> - The model defines three levels of representation, at each of which knowledge is encoded as features or sets of features, with activation potentials determined by the frequency values of those features. This central parameter of the model predicts strong effects of feature frequency on judgements of emotional quality, for which Experiment 2 provided only indirect evidence. Although it seems hard to account in any other way for the systematic variation in the frequency with which specific terms were identified for different narratives, no actual measure of the frequency of occurrence of the features used in the study was taken. This relationship remains to be clearly demonstrated.

2) <u>The existence of an associational stage in the processing of information about emotional events</u> - The hypothesized associational stage is of importance both because of the constraints it may place on judgements of emotional quality, and because of its theoretical basis in the loosely-organized store of experience constituted by event schemata. The spontaneous description of behavioural responses to the situations presented in the narratives does suggest an almost automatic triggering of such knowledge, consistent with expectation. Experiment 2 made no systematic test of the presence of an associational stage in processing, though, and did not demonstrate that if it was present it had any effect on

the identification of emotion terms.

The following two chapters take up these issues in more depth, and report studies which attempted to provide direct evidence for these two elements of the proposed model.

More generally, Experiment 2 established that differences in the ease of identification of appropriate emotion terms within production and recognition tasks do exist, at least in the context of judgements of antecedent situations. This finding lends support to the previous assertion that the use of recognition tasks may have resulted in an over-estimation of the strength of the relationship between children's knowledge of emotional events and of the emotional vocabulary.

At the same time, this study also indicated that the use of recognition tasks does not in general lead children to make <u>different</u> judgements as to specific qualities of emotion than they would make in a production task. At worst, recognition tasks may have tended to obscure limitations on children's ability to make active judgements of emotional quality, and so drawn attention away from other aspects of the organization of emotion knowledge. From a methodological perspective, perhaps the most important implication of this is that the use of production or recognition tasks within this area of research should be a matter of more explicit justification than has previously been the case within the literature.

Summary

Experiment 1 indicated that children may hold knowledge about emotional episodes in the form of event schemata. Nelson (1983) stresses that such schemata are not memories of individual events, but encode and store information about episodes that the child has encountered on a number of previous occasions. In the context of emotion, an event schema would detail the nature of the antecedent, behavioural, and other features typically contained in an episode, along with the order in which these occur. Primary school children appear to focus their attention on the external features in particular. These are easily observed, but also more salient to the child at this stage: knowledge of which behaviour goes with which antecedent allows guidance and anticipation of reaction when involved in an episode.

Knowledge of the relationships between antecedents and behaviour can serve another purpose, however. This is because these features define the quality of emotion embodied in an episode (e.g. having a toy taken, and hitting the person who took it, denotes anger). As Harris (1983) points out, antecedents or behaviours on their own are usually ambiguous as to emotional quality (as can be seen in the example above). Taken together, though, they disambiguate each other, and publicly identify a specific quality or category of emotion.

Which category this is in any instance is marked out by the label applied by the language community (e.g. "happy" or "angry"). Different combinations of antecedent and behaviour form exemplars of the category that they identify. Knowledge of what combinations go with which label must constitute part of what children learn during the course of development.

This categorical knowledge can be distinguished from the event schemata which encode the combinations themselves. Children clearly have some categorical knowledge at the end of their second year, since they are able to make appropriate use of emotional labels (Bretherton and Beeghly, 1982). However, pilot work shows that children aged between five and six can often describe the behaviour that goes with an antecedent, without being able to label the overall episode. Possession of an event schema does not necessarily presuppose knowledge of the category to which that schema belongs.

This raises the question of how categorical knowledge is organized. Rosch's prototype model of concepts and categories (Rosch and Mervis, 1975) provides the basis of an answer. According to this, for any concept we build up a representation of the ideal exemplar or "prototype". This indicates the features which an exemplar is most likely to possess, based on their frequency in past experience. New objects are identified as exemplars by their "family resemblance" to the prototype. The prototype is then updated in the light of this information. So, for instance, the prototype for "table" might contain the features "wooden", "flat surface", "oblong", "four legs". An object with the features "wooden", "flat surface", "round", "four legs" would be recognized as a table because in most ways it resembles the prototype. If round tables became prevalent, this feature might eventually replace "oblong" in the prototype.

Concepts are distinguished from categories by the fact that information about individual exemplars is not retained in the case of concepts, but is for categories. The concept "table" combines information from many different exemplars. The category "furniture" retains "table", "chair", and so forth as separate types of exemplar. In other words, concepts make use of prototypes, but categories consist of collections of distinct concepts.

Application of Rosch's ideas to emotion suggests a category structure which consists of three interconnected levels of representation. Event schemata encode features that are common across instances of a particular episode. They are specific to place and participants (e.g. brother taking toy car, and hitting him), and so contain enough detail to be useful in directing behaviour. What may be termed general schemata form prototypes of episodes, which are more context-free. These emerge from a convergence of the information contained in similar event schemata. As at the lower level, a general schema profiles the probable form of an episode type. This profile reflects the frequency with which detail about features has recurred across what are essentially different versions of the same episode. Location, actor, precise form of action, and so forth tend to vary most of all. Effectively, then, general schemata may reduce to representations of the basic antecedent and behavioural response contained in a type of episode (e.g. having something taken, and hitting the taker).

Finally, emotional labels categorize sets of general schemata. A general schema initially becomes associated with a category of emotion when an episode of the relevant type is referred to in conjunction with the label for that category. The subsequent strength of the association between schema and label varies according to how often that association is invoked. In fact, the more frequently a type of episode occurs, the more likely it is to be labelled in the first place; and once this has happened, the more likely it is to be so labelled again.

This provides the basis for a working model of categorical emotion knowledge. At all levels within the proposed hierarchy the key factor which determines the content and organization of knowledge is event frequency. This same factor is held to be the major influence on the processing of incoming information. First of all, input about the features contained in an episode is assumed to "find" the schemata and label that it best matches by the spread of activation from level to level of the hierarchy (Collins and Loftus, 1975). Secondly, the degree to which new information activates different schemata within a level varies according to how well it corresponds to each. But the information already encoded by a schema is determined by prior frequency. As a result, the fit between input and an individual schema is best, and activation strongest, when features are closest to those experienced most often in past instances of an episode. Thirdly, it is assumed that for activation to spread from one level of the hierarchy to the next it must be above a minimum criterial value.

So, for example, information about an episode that has been experienced often before will provoke near-maximum activation in the relevant event schema. This spreads upwards to activate the general schema. The extent of activation at this level depends on how frequent an instance of that episode type the specific event has been in the past. If it has been sufficiently frequent, the general schema is activated above the criterion value. The label for the overall category of emotion is then activated in turn. The degree of this activation again depends largely on the frequency with which that episode type has occurred previously. Putting these three stages together, it can be seen that the likelihood of an episode being successfully labelled will tend to vary according to the prior frequency of similar episodes.

It is also assumed that over time (i.e. during the course of development, if the model is applied to children's acquisition of emotion knowledge) there will be an increase in the range of episodes that can be categorized. In part this is because new episodes and episode types will be brought into the category structure. Some of these will be experienced often enough to become associated with, and successfully activate, labels. In addition, some infrequent episodes may eventually recur sufficiently often to become capable of activating a general schema and a label. In this way the model accounts for both processing of information at any one point in development, and the gradual expansion of children's knowledge.

As it stands, both "bottom-up" and "top-down" activation can take place within the structures defined by the model. Bottom-up activation occurs when input information consists of single or multiple features of an episode, as described above. Top-down activation occurs when the input consists of a label. This results in activation of general and then event schemata to an extent that reflects the frequency of the episodes they encode.

This is an important point because it implies that children's apparent ability to categorize emotional episodes will vary depending on the type of task used to assess that ability. The central distinction here is between tasks that require children to choose appropriate labels for an episode from a list (i.e. recognize them); and those where they are asked to produce the labels themselves. According to the model presented here production should be more difficult than recognition, because it depends on bottom-up activation only. Recognition makes use of simultaneous bottom-up and top-down activation. Production will fail when an input antecedent, for example, activates a schema for an episode that has not been experienced often enough to activate in turn a general schema or a label. In some of these cases recognition will succeed because the ascending and descending activations added together are now above criterion at all levels of the structure. This would serve to link labels with antecedents which are part of less frequent episodes.

Experiment 2 tested this hypothesis with children in two age groups, 5- to 7-year-olds and 8- to 10-year-olds. All heard brief narratives, which contained antecedent features appropriate to either three positive or three negative emotions. After each narrative they were asked to suggest, and justify, as many labels as they could for how they would feel in the situation, up to a maximum of three. Each child heard half the narratives under production conditions, and half under recognition, where labels were selected from an orally presented list. The two task conditions were presented in separate sessions, with order counter-balanced within age group. The narratives used for each task type were systematically varied, so that all were heard by the same number of children under each condition. From the model it was predicted that:

a) *Children would identify appropriate labels for the narratives* *more often in the recognition task than in the production task.* This is the basic effect of differences in activation between the tasks.

b) *Older children would identify more labels than younger in either task.* Over time more and more episodes come to have been experienced sufficiently often for information about them to activate a label successfully.

c) *The ratio of produced to recognized labels would remain roughly stable with increase in age.* In the recognition task top-down activation of schemata supplements bottom-up activation. This effectively means that an episode does not have to have been experienced so often for information about it to be successfully linked to a label. It also means that, compared to the production task, fewer additional experiences of any episode will be necessary for it to acquire this potential. One consequence of this is that the number of successful recognition responses will generally grow faster with age than the number of successful production responses. The ratio of one to the other will therefore tend to be constant.

d) *Whilst the two tasks would differ in the frequency with which labels were identified, variations from narrative to narrative would be positively correlated.* Some of the antecedents associated with a category would occur more often than others. These would therefore be more likely to be successfully labelled. The extra top-down activation provided by the recognition task increases the overall chance of each antecedent being labelled, but in both tasks total activation is a function of the same episode frequency. Thus the <u>relative</u> likelihood of an antecedent being labelled should stay the same across task. Taking the responses of the sample as a whole, then, the frequency with which each label is identified should vary from one narrative to another, but in the same way for both tasks.

Children's responses were scored for the total number of labels both suggested and justified within each task condition. All four predictions were found to have been met. Significantly more labels were recognized than produced. The ratio of produced to recognized labels remained constant across age group. This was in spite of the fact that both conditions showed significant increases with age in the number of acceptable responses. Changes from narrative to narrative in the relative frequency with which a label was identified were positively correlated across task for the majority of the six emotions.

The data provide all round support for the proposed model. Not only was its main prediction borne out, but there was no observed influence of task order or narrative. Practice effects or variation in item difficulty cannot therefore account for the results. Older children failed to close the gap between performance on production and recognition tasks (in real terms differences in the number of identified labels <u>increased</u>). This presents problems to any skill-based explanation, which must typically assume that production would improve vis à vis recognition. The tendency for variation in label frequency to correlate across task points to exactly the kind of content effect assumed by the model.

Chapter 4: Feature frequency, feature combination, and the retrieval of terms for emotions

Experiment 2 served to establish the existence of differences between the active retrieval of terms for emotions appropriate to antecedent situations, and the selection of terms under forced-choice conditions. Both children's lesser ability to actively retrieve terms, and the particular patterns of responses made, were consistent with the predictions of the proposed hierarchical model of emotional knowledge and vocabulary. This model predicts effects of experienced frequency of different features of emotional episodes on ability to actively retrieve terms for which Experiment 2 provided only indirect evidence. The present chapter examines two aspects of this prediction in more detail.

4.1 *Feature frequency and the retrieval of terms*

A key assumption of the model outlined in Chapter 3, is that unaided activation (and thence retrieval) of a term for an emotion appropriate to a specific feature, whether antecedent or behaviour, occurs via the intervening activation of a general schema for the type of event of which the feature forms a part. Activation of the mediating general schema was argued to be a function of the frequency of experience of the specific feature, and thus the degree of prototypicality that it has within the general schema. Similarly, activation of the emotion term was argued to be a function of the frequency of events within the class of the general schema; i.e. the degree of prototypicality of the general schema for that feeling. Overall, the more frequent a specific feature is, the greater will be its degree of prototypicality within the corresponding general schema, and also, by and large, the degree the prototypicality of that schema amongst those for a term.

Now for a given individual with a specific set of prior experiences it is assumed that degree of prototypicality of both specific feature and general schema have only to be above a certain criterial value in order that activation of the next level up the hierarchy should occur. Thus the responses of an individual required to produce emotion terms appropriate to a set of specific features which vary in their experienced frequency will only discriminate between those features above and below criterial value.

However, we can envisage a population of individuals who have experienced the same environment (i.e. one in which the relative frequency of different events remains roughly constant), but to differing degrees, or in differing ways. Within this population, the probability of a given feature and corresponding general schema having attained criterial value for activation within a particular individual should vary as a function of overall frequency of occurrence. The <u>cumulative</u> responses to the production task across individuals should then vary in a correlated manner. In general, therefore, the model predicts that the more frequent the occurrence of a specific feature, the greater the number of individuals, drawn from the same population, who will be able to retrieve the relevant emotion term.

4.2 *Feature combination in general schemata and the retrieval of terms*

A related issue concerns the additional effects on the retrieval of emotion terms when antecedent and behavioural features are either presented separately or in combination. In order to provide a context for discussion of this, it is necessary to consider the nature of the proposed general schemata in greater detail.

In the initial description of the model, the intermediate stage of knowledge organization constituted by general schemata was argued for as necessary to preserve the identity of events as combinations of particular antecedents and behaviours, together exemplifying an emotion, whilst at the same time permitting sufficient generalization to allow the same basic class of event to be identified in a variety of contexts. Schemata of this kind were suggested to be the result of abstraction of features, notably antecedents and behaviours, from the experience of labelled events, although with time and accumulating experience their characteristics would increasingly be subject to the direct influence of previously encoded event schemata as associational and categorical knowledge structures become more integrated.

However, the role of general schemata in maintaining the basic form of a set of events does not necessarily entail disparate structures, one for each event class, as has been implied up till now in the interests of clarity. Richardson and Bhavnani (1984) outline a form of representation by contingency abstraction which, applied to the present context, would result in a unitary structure that would nevertheless function to keep basic event classes distinct. Such a structure can be envisaged as a matrix in which rows represent different general antecedent situations and columns represent different behavioural responses to those. Individual cells within this matrix represent the contingency between an antecedent and a behaviour, and the information contained in each is a weighting which indicates the probability (derived from previous experience) of that specific contingency, relative to all the others that are encoded by the structure. Within this framework a cell would correspond to what was regarded previously as a single general schema, and the unified structure would stand for the collection of such schemata proposed before.

This type of structure presents a number of advantages. Firstly, it maintains event identity in the most parsimonious way possible, by capitalizing on the fact that within any given category of emotion it is likely to be the case that at least some antecedents will have been accompanied in experience by different behaviours, and vice versa, although the frequency of these combinations may have been variable. Secondly, it does this in a manner which is isomorphic to what has been argued to be the principal identifying characteristic of an episode, the contingency between features. Finally, since it is a structure which is both abstractive and yet can operate on the basis of minimal prior experience, it fits well into an account which proposes simultaneous but possibly uncoordinated acquisition of both event and general schemata.

Where the two types of schema have been connected, however, their relationship and the spread of activation between them would be as described previously, with event schemata linked to the individual cells within the wider structure. The only modification to processing implied by this unified structure would be that retrieval of a term would depend on the degree of activation of the overall structure, but this in turn would be a function of the weighting of any activated cell or general schema.

Traditional prototype models (see e.g. Tversky, 1977; Smith and Medin, 1981) could also provide unitary, parsimonious structures, but this approach predicts organization of knowledge along the lines of the pooled features option, as discussed in Chapter 3, and rejected for theoretical reasons. The question of which kind of structure might obtain is, however, open to empirical resolution, since the two approaches predict different effects on label retrieval when antecedent and behavioural features are presented in combination.

So far, the theoretical pattern of activation that occurs with the presentation of single features has been outlined. In general, this pattern would be similar under both the contingency approach and the more traditional prototype model. Both yield the same prediction with regard to the outcome of the production task when single features, which vary in experienced frequency, are presented to a group of individuals.

The prototype model suggests further that when features are presented in combination, the degree of prototypicality is simply a function of the sum of the experienced frequency of the individual features. This would obviously increase the degree of prototypicality of any combination above the level of its constituent features. Therefore, more combinations would attain the criterial value for activation and retrieval of the emotion term than would be the case for the separate features. In terms of the production task, this "feature-sum" model would thus predict that more individuals would retrieve the relevant emotion term for combined features than for the constituent features presented separately.

The basic contingency approach, on the other hand, yields exactly the opposite prediction. When features are presented separately they would activate all cells or general schemata within which they are part-exemplifiers, to an extent proportional to the degree of prototypicality or probability weighting of each cell. Provided activation is above criterial value for at least one of those schemata, the overall structure will be activated in turn and the relevant term will be retrieved.

However, when features are presented in combination, the activation of general schemata which reference one feature, but not the other, should be inhibited. Effectively then, the greater specificity of information restricts the range of general schemata which will be activated. Although the degree of activation may be higher <u>within</u> a given schema than would be the case for separately presented features, retrieval of the term will be dependent on whether or not this particular schema is above the criterial value for prototypicality which will be sufficient to retrieve the term. Put simply, separately presented features might allow more individuals to retrieve a term than combinations of features, because they provide more routes for doing so.

This basic prediction may, however, be modified by two factors. Firstly, the range of general schemata activated by separate features may be restricted by the process of association between presented feature and its most probable complement. This was argued in Chapter 3 to be likely to be the first stage of processing in a production task. Secondly, if the combined features are both of relatively high frequency, and are likely to co-occur on a frequent basis, then the combined features may often tend to activate general schemata with approximately the same prototypicality values as the separate features and their associated complements. Thus there are some grounds for suggesting that the model more properly predicts that roughly equal numbers of individuals will retrieve appropriate terms for combinations of features as for the same features presented separately.

Although some evidence on this issue is available from other studies within the developmental literature, it is limited in scope. Reichenbach and Masters (1983), in a study of 4- and 9-year-olds, report accuracy of labelling combined antecedent and behavioural features (when these are consistent with each other) to be slightly below that for antecedent features presented alone, but above that for behavioural features alone. However, the data for the combined features are based on substantially fewer items, and use a sample drawn in part from a different population. In addition, the behavioural features were restricted to facial expressions, and were presented in a different modality to the antecedent features (pictorial as opposed to verbal).

Gnepp (1983), in her study of 4-, 7-, and 12-year-olds, used a balanced number of items with combined and separate features, a uniform sample, and consistent mode of presentation (pictorial), although behavioural features were again restricted to facial expressions. She reports no significant difference between accuracy of labelling antecedent and behavioural features alone, and accuracy of labelling combinations as slightly higher. Unfortunately, since the primary focus of this study was on the effects of presentation of conflicting antecedent and behavioural features, she gives no detail as to whether this difference was significant or not. It should also be noted that both these studies employed a forced-choice task, so the applicability of their findings to the case under discussion is restricted: facilitation effects from the task could have masked differences in labelling single and combined features.

Experiment 3

The following study provided a direct test of the two predictions outlined above, both of which may be regarded as central to the hierarchical model. Frequency of reference to particular types of antecedent and behavioural feature across age groups in Experiment 1 was taken as an index of actual frequency of occurrence within the population from which that sample was drawn, in line with the activation patterns predicted by the model (see Chapter 3). Four antecedent and four behavioural features were selected for each of the three emotions examined in that study (i.e. "happy", "sad", and "scared"). The selected features varied in the frequency with which they had been referred to, but all were of high to middle relative frequency. Low frequency features were avoided in order to obviate floor effects which might bias the data.

These features were used as the basis for brief stories of three different types: Antecedent feature only, Behavioural feature only, and Combined antecedent and behavioural features. All features were therefore presented in the same modality (i.e. verbal). Stories were composed in blocks based on pairs of antecedent and behavioural features, so that within a block comprising one each of the three story types, length and content other than the specific features were kept roughly constant. Within story type each individual narrative had an associated ranking according to the frequency with which its component feature or features had been referred to in Experiment 1. For the Combined features stories this ranking was based on the relative values of an estimate of the expected chance contingency of the features, in the absence of a more direct measure of contingency.

Children of approximately the same age range and social/ethnic mix as those interviewed for Experiment 1 were matched for age, sex, and vocabulary level, and assigned to groups who were read all stories of one type, and asked to say how they would feel if the described events occurred. Interest was focused first and foremost on the number of children who produced the target emotion term for each story. The target term was strictly defined as that under discussion in Experiment 1 when the component feature or features were referred to. It was predicted that:

i) Within Story Type, the ranking of individual stories in terms of the number of children who produced the target term would be positively correlated with the ranking of the stories derived from frequency of reference in Experiment 1;

ii) the mean number of responses producing the target term would be the same across Story Types.

Method

Subjects

Twenty-four children (12 girls, 12 boys) in each of three age groups, 5-year-olds (mean age 5 years, 11 months; range 5,2 to 6,8), 8-year-olds (mean 8,1; range 7,3 to 8,7), and 10-year-olds (mean 10,1; range 9,4 to 11,2), participated in the study. All 72 children were from the same primary school in a mixed area of East London. Although direct information on the socio-economic status of the children's families was not available, it was estimated that the social mix of the sample was broadly the same as that of the sample used in Experiment 1, though with a slightly lower proportion of children from middle-class families. As was the case in the previous sample, the majority of the children were from West European backgrounds, but with a sizeable minority of Afro-Caribbean or Asian descent.

Proficiency in English was established using the same procedure as Experiment 2 - i.e. on the basis of raw scores on the British Picture Vocabulary Scale (Dunn, Dunn, Whetton, and Pintillie, 1982), administered in a separate pre-test session. As before, a raw score of 7 was taken as a minimum qualification for inclusion in the study proper. No children were rejected on this basis. The mean raw score for the 5-year-olds was 11, for the 8-year-olds, 14, and for the 10-year-olds, 16. In all three age groups the vast majority of individual standardized score equivalents were in the low- to high-average range.

Material

The first stage in the compilation of the material used was the selection of four antecedent and four behavioural features from those referred to by children in Experiment 1, for each of the three emotions "happy", "sad", and "scared". Features were selected on the basis of their frequency of occurrence in the responses of children across all three age groups (see Appendix 1.2).

With two exceptions, the four most frequently mentioned antecedents and behaviours were selected for each emotion. This served to give a good range of relative frequencies, from high to middle, whilst avoiding low frequency features which might subsequently give rise to floor effects. One exception was "death of a relative", which was the most frequently mentioned antecedent for sadness. This was not used for two reasons. Firstly, its nature as an exemplar appeared exceptional, possibly deriving from intensity rather than frequency of experience (although television may be of influence here). In addition, it was felt that its use in the study might potentially give rise to some distress on the part of the participating children. The other exception was "screaming" for fear, which, although only seventh most frequently mentioned

Table 4.1 Twelve antecedent and twelve behavioural features selected from children's responses in Experiment 1, with their frequency of reference

Antecedents				Behaviours			
Emotion		Feature	Frequency	Emotion		Feature	Frequency
Happy	1	Playing with friends	32	Happy	1	Smiling	60
	2	Being given a present	26		2	Laughing	21
	3	Being taken out	22		3	Jumping around	15
	4	Going to a birthday party	12		4	Being silly	14
Sad	1	Being hurt by someone	19	Sad	1	Crying	36
	2	Being told off	17		2	Turn down head and mouth	18
	3	Not having any-one to play with	15		3	Not doing any-thing	14
	4	Getting hurt accidentally	13		4	Not saying any-thing	12
Scared	1	Strange noises	34	Scared	1	Shaking	31
	2	Being in the dark	21		2	Running away	23
	3	Horror films on television	19		3	Seeking adult comfort	11
	4	Nightmares	13		4	Screaming	4

behaviour, was included because other, more frequent instances were either highly ambiguous ("crying") or could not be properly described without explicitly naming the feeling ("say about feeling"). The 24 selected features, 12 antecedent and 12 behavioural, are presented in Table 4.1, together with their frequencies and the emotion for which they were referred to.

Since different children gave different specific details for each of the features, the frequency count was necessarily of references to the same general feature across different examples. Thus the selected features represent an abstraction at the same level as the proposed general schemata, and their frequency values effectively index degree of prototypicality of features contained within these.

In the generation of stories to embody the various features, it was necessary to give these specific values once again. This raised the issue of the representativeness of the specific narrative for the relevant general feature. Clearly, an unusual instance of a feature might result in failure to activate the more general level. Moreover, variability in the representativeness of the narratives for different features might give rise to an intrusive bias on children's responses.

This problem was dealt with in two ways. Firstly, the narratives were kept to a standard format of six basic propositions embedded in four sentences. Within each narrative for a particular type of feature, the six propositions always served the same functions (e.g. introduction of general context, additional element of context, event, etc.), and occurred in the same order. Contexts were always of a mundane nature, and their detail (such as the nature of the other participants) was suggested rather than explicitly stated, in order to allow the listener to provide their own specifics. By contrast, the relevant feature or features were clearly stated in the same general terms as used in Table 4.1. Thus as far as possible the specific values for each narrative were provided by the child's interpretation of the context indicated. This interpretation was considered to be likely to rest on familiar defaults rather than on the unusual.

The second method of controlling the representativeness of the narratives related to the process of composition of the Antecedent, Behaviour, and Combined feature story types. Before the narratives were composed, pairings of antecedent and behavioural features were made, to provide the basis for the Combined feature narratives. In all cases the most frequent antecedent feature for a particular emotion was paired with the most frequent behavioural feature, the second most frequent antecedent with the second most frequent behaviour, and so on. This method of pairing was used to ensure the maximum spread of values for the contingency measure employed to determine rankings for the combined features. Once the features had been paired in this manner, the Combined features narratives were composed in the way outlined above.

The Antecedent and Behaviour narratives were then derived from the Combined features stories, by deletion of reference to the complementary feature, and insertion of a redundant filler to maintain narrative length. This process served to maximize the comparability of the different story types, other than in the crucial respect of the features that they embodied.

Examples of a Combined, Behaviour, and Antecedent narrative created in this way are given below:

Emotion: Happy

Antecedent: Playing with friends

Behaviour: Smiling.

Combined feature version:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. It's your friend waiting there, and they've come round to see if you want to play. You start to smile.

Behaviour version:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. You rush to go and answer the door, and then see who it is standing there. You start to smile.

Antecedent version:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. Your mum answers it. It's your friend waiting there, and they've come round to see if you want to play.

Twelve narratives for each of the three conditions of Story Type were composed in this way. As with Experiment 2, the narratives were written with the listener as supposed central protagonist in each case. All 36 narratives are presented in Appendix 3.1.

Design

Children heard all 12 narratives within one condition of Story Type only, in order to prevent transfer of responses from one version of a story to another. So as to maximize the comparability of the groups of children in each condition, 8 blocks of 3 children each were formed within each age group, matched within block for age, sex, and vocabulary score. Children within each block were then assigned at random to the three conditions.

Procedure

All children were interviewed individually within a quiet room at school. Each session began with the experimenter explaining to the child that they would hear some stories about things that might happen to them from time to time. As they listened to each story, they were to try to imagine what it would be like if those things happened, and in particular to try to think how they would be feeling. After they heard each story, they would be asked how they thought they would be feeling, but there were no right or wrong answers, the experimenter was just interested in what they thought.

After making sure that the child understood the procedure, the experimenter then went on to read each story in turn. After each story, the child was asked "How do you think you'd be feeling if that happened?" If the child's response to this question was not relevant, or failed to name a feeling, the question was repeated once. Requests to hear the story again were granted, with the restriction that only one repetition per story was allowed. Such requests were, in the event, rare.

Within each condition of Story Type, the order in which the different narratives were read was systematically varied from child to child, and no two children heard the narratives in the same order. All sessions were tape-recorded for subsequent transcription and analysis of the child's responses.

Scoring

Children's responses to each narrative were scored on three counts:

1) Whether the child had produced the target term for that narrative, the target being strictly defined as the term for which the relevant feature or features had been referred to in Experiment 1 - i.e. "happy", "sad", or "scared", depending on narrative.

2) If the child had failed to produce the target term, whether they had produced an alternative term for a specific quality of emotion, which was consonant with the feature(s) described.

3) As an additional diagnostic (see Chapter 3), whether the child had spontaneously described antecedent or behavioural features other than those contained in the narrative, irrespective of whether they had also produced either the target or an alternative term.

All transcripts were independently scored by two raters with regard to the last two measures. Overall agreement between the two raters was 90% for the alternative terms (89% for the Combined features condition, 85% for the Behaviour condition, and 94% for the Antecedent condition). Agreement was 89% overall for the additional features (93% for antecedents, 87% for behaviours). All disagreements were resolved by discussion.

Analyses

Since the primary focus of attention was on differences between items (i.e. narratives), and initial predictions had been framed in these terms, all analyses conducted on the data were from this perspective. In general, item scores on the three measures outlined above were given by the number of children within Story Type condition who had made a response of the specified kind for that item. Further details are given below, analysis by analysis.

Feature frequency in Experiment 1 as a predictor of target term retrieval

The first stage of analysis compared the ranking of narratives within each condition of Story Type on two measures: that derived from the frequency of their component features in Experiment 1, and the frequency with which children across all age groups produced the target term for those items in the current study (maximum = 24).

For the Antecedent and the Behaviour narratives, the Experiment 1 rankings were based simply on the the frequency of the relevant features. For the Combined features narratives, the Experiment 1 rankings were based on an estimate of the chance contingency of the two features (see Richardson and Bhavnani, 1984). The expression used to calculate this was

$$(fA_i \times fB_j)/(\Sigma fA_i + \Sigma fB_j)$$

Table 4.2 Frequency of reference to component features (Antecedent and Behaviour narratives) or derived contingency value [CV] (Combined narratives) from Experiment 1, and frequency of production of target term across age groups, for each narrative within Story Type condition (rankings on each measure are presented in parentheses)

	Story Type					
	Combined		Behaviour		Antecedent	
Item	Exp 1 CV	Target Freq	Exp1 Freq	Target Freq	Exp1 Freq	Target Freq
Happy 1	3.82 (12)	19 (12)	60 (12)	16 (12)	32 (11)	18 (12)
2	1.09 (9)	18 (10.5)	21 (8)	13 (11)	26 (10)	17 (10)
3	0.66 (7)	16 (9)	15 (6)	7 (4.5)	22 (9)	17 (10)
4	0.33 (3)	14 (6.5)	14 (4.5)	10 (7)	12 (1)	17 (10)
Sad 1	1.36 (10)	11 (3)	36 (11)	12 (10)	19 (6.5)	10 (3.5)
2	0.61 (6)	11 (3)	18 (7)	6 (3)	17 (5)	12 (6.5)
3	0.42 (5)	11 (3)	14 (4.5)	7 (4.5)	15 (4)	15 (8)
4	0.31 (2)	10 (1)	12 (3)	4 (1.5)	13 (2.5)	11 (5)
Scared1	2.10 (11)	18 (10.5)	31 (10)	11 (8.5)	34 (12)	12 (6.5)
2	0.96 (8)	15 (8)	23 (9)	4 (1.5)	21 (8)	10 (3.5)
3	0.42 (4)	13 (5)	11 (2)	11 (8.5)	19 (6.5)	8 (1.5)
4	0.10 (1)	14 (6.5)	4 (1)	9 (6)	13 (2.5)	8 (1.5)

where fA_i is the frequency of the ith antecedent, fB_j is the frequency of the jth behaviour, and the summations are across all the antecedents and behaviours selected for this study. This measure provides an indication of the relative frequency with which, on the basis of the Experiment 1 data, the features in the Combined narratives might be expected to co-occur (i.e. of the degree of prototypicality of the conjunction). Table 4.2 presents values and rankings on each measure for the narratives within condition of Story Type.

Comparisons within condition between the two measures were made by computing values for Spearman's rank correlation coefficient. For the Combined condition, narrative rankings for frequency of target term production were found to be positively and significantly correlated with rankings on the contingency values derived from Experiment 1 ($r_s = .60$, $n = 12$, $P < .025$, one-tailed), as predicted. For the narratives within the Antecedent and Behaviour conditions, however, although correlations between rankings on the two measures were again positive ($r_s = .31$ and $.43$ respectively), neither achieved statistical significance.

One possible reason for the failure of the single feature narratives to give rise to significant correlations with the frequencies from Experiment 1 could be that retrieval of the target term was additionally influenced by children's associations between the presented feature and its most likely complement within their experience. This process of association was previously argued to constitute the first step towards retrieval of an emotion term in the production task.

Some evidence that such associations are an important stage of processing was provided, both in Experiment 2 and here, by spontaneous responses which detailed complements in the form of either additional antecedent or behavioural features. Overall, responses of this kind occurred on 13% of occasions in the current study, slightly more frequently than was the case in Experiment 2 under the Production condition.

Two points are of interest here. Firstly, the frequency of these responses was more-or-less identical under all conditions of Story Type (12.5% in the Combined condition, 13.5% in the Behaviour condition, 13% in the Antecedent condition). This suggests that associations may sometimes influence responses even when both antecedent and behavioural features are available. More importantly, though, there was a marked shift in the _type_ of complement referred to between the different conditions, in line with the type of feature presented. In the Combined condition, 75% of the complements described were behaviours. This rose to 84% in the Antecedent condition. In the Behaviour condition, however, 67% of the detailed complements were antecedents.

Whilst these responses are in themselves an uncertain diagnostic, they do give rise to a testable prediction: if, under the Behaviour and Antecedent conditions associations between features and complements do constitute the first step towards retrieval of an emotion term, then it should be the degree of prototypicality of these _conjunctions_ that determines the probability of the term being retrieved. Direct evidence as to the nature of any associated feature was of course only available in instances where children had explicitly detailed the complement. However, if the model is correct, then, simply on a chance basis, the most probable complement ought to be the most frequently mentioned feature of the appropriate type (i.e. antecedent or behaviour) for that emotion in Experiment 1.

In order to explore this possibility further, contingency values were calculated for each behavioural feature with the most frequent antecedent of the same emotion, and vice versa. The formula used was the same as that for the combined features. As before, these values gave an indication of degree of prototypicality for the conjunctions expected under the modified prediction.

Rank correlations between the contingency values and frequency of target term per narrative were then computed as before. For narratives within the Behaviour condition, there was sufficient an increase in the value of the correlation coefficient to achieve statistical significance ($r_s = .52$, $n = 12$, $P < .05$, one-tailed). For the Antecedent condition, however, the value of the correlation coefficient was found to more than double ($r_s = .74$, $n = 12$, $P < .005$). Both outcomes provide strong support for the presence of an association stage, and for the model in general.

<u>Retrieval of target terms under different conditions of Story Type</u>

The second main prediction derived from the model was that, on average, retrieval of the target terms would be at about the same level of frequency across the narratives in the three different conditions of Story Type. This prediction was based in part on the hypothetical operation of the association stage in the process of retrieval from single features, for which the first analyses provided strong evidence.

In order to examine this, a mixed-model analysis of variance was carried out on the frequencies for target term retrieval per narrative within age group and condition. Story Type condition and, additionally, Emotion, constituted between-item factors in this analysis, and Age Group provided a single within-item factor. Mean frequencies by Condition, Emotion, and Age Group are presented in Table 4.3.

Where required, tests of simple main effects used a family-wise error rate of .05, divided evenly between the tests within a family (see Kirk, 1968, p. 181). Only the results from tests which achieved this conservative level of significance are reported. Further comparisons between means were carried out using the procedurally similar Dunn Multiple Comparison Test (Kirk, 1968, pp. 79-81). Again, only comparisons which achieved significance with an error rate of .05 divided evenly between the family of comparisons are reported.

Against expectation, the analysis of variance showed a significant effect of Condition ($F = 13.08$, d.f. = 2,27, MSe = 2.07, $P < .001$). Further comparison of means revealed that this effect was, however, attributable solely to the Behaviour condition, where the frequency of target terms was significantly lower than for the Combined or Antecedent conditions (tD (3;27) = 4.92 and 3.69 respectively, $P < .01$ in both cases).

This difference was not constant across age groups, however, the analysis of variance finding a significant interaction between Condition and Age Group ($F = 3.14$, d.f. = 4,54, MSe = 1.27, $P < .05$). Tests of simple main effects showed significant differences between Conditions for the 5-year-olds ($F = 19.89$, d.f. = 2,27, MSe = 0.90, $P < .001$) and the 10-year-olds ($F = 7.06$, d.f. = 2,27, MSe = 2.01, $P < .005$), but not the 8-year-olds. Comparison of means revealed further that amongst the 5-year-olds, as was the case

Table 4.3 Mean frequency of Target terms per narrative by Story Type, Emotion, and Age Group (n = 4, maximum frequency = 8)

		Age Group			
Condition	Emotion	5-year-olds	8-year-olds	10-year-olds	All Age Groups
	Happy	4.25	5.75	6.75	5.58
Combined	Sad	4.00	2.50	4.25	3.58
	Scared	4.50	4.50	6.00	5.00
	All Emotions	4.25	4.25	5.67	4.72
	Happy	1.75	4.50	5.25	3.83
Behaviour	Sad	1.50	4.00	1.75	2.42
	Scared	2.25	3.00	3.50	2.92
	All Emotions	1.83	3.83	3.50	3.05
	Happy	4.50	5.50	7.25	5.75
Antecedent	Sad	4.50	5.25	2.25	4.00
	Scared	1.00	3.75	4.75	3.17
	All Emotions	3.33	4.83	4.75	4.30
	Happy	3.50	5.25	6.42	5.06
All	Sad	3.33	3.92	2.75	3.33
Conditions	Scared	2.58	3.75	4.75	3.69
	All Emotions	3.14	4.31	4.64	4.03

overall, the frequency of target terms for the Behaviour condition was significantly lower than for both the Combined and Antecedent conditions (tD (6;81) = 4.78, $P < .01$; and tD (6;81) = 2.96, $P < .05$ respectively). Amongst the 10-year-olds, however, the only significant difference was between the Combined and Behaviour conditions (tD (6;81) = 4.28, $P < .01$).

In general, then, there were no significant differences between the Combined and Antecedent conditions in the frequency with which target terms were produced. There was, however, some tendency, variable across the age groups, towards a lower frequency in the Behaviour condition, which runs counter to prediction.

The analysis of variance also showed a significant main effect of Age Group ($F = 17.52$, d.f. = 2,54, MSe = 1.27, $P < .001$). There was a general increase across the age groups in the frequency with which target terms were produced, although comparison of means showed that the increase between the 5- and 8-year-olds was significant (tD (2;54) = 4.40, $P < .01$), whilst that between the 8- and 10-year-olds was not. Within the different conditions, this pattern was the same for the Antecedents and Behaviour (tD (6,54) = 3.26, $P < .05$; and tD (6;54) = 4.35, $P < .01$ respectively), but was reversed for the Combined condition, where the significant increase lay between the 8- and 10-year-olds (tD (6;54) = 3.09, $P < .05$).

Although the precise variations in the pattern of change with age are more difficult to interpret, the general trend towards increased production of the target terms is in line with expectation. As detailed in Chapter 3, with increase in experience, more features, and specifically feature conjunctions, from within a given set, would be anticipated to reach the criterial level of prototypicality necessary to activate the relevant terms. Variations in this trend could perhaps reflect shifts in the typical experiences of different age groups, which would result in non-uniform increases in the frequency with which particular features had been encountered previously.

Also consistent with the model is the significant main effect of Emotion which was found by the analysis of variance ($F = 14.34$, d.f. = 2,27, $MSe = 2.07$, $P < .001$). In all three conditions, the contingency values which were calculated for the first stage of analysis were highest on average for the happy narratives, and lowest for the sad. Table 4.4 presents these mean values. It will be noted that the pattern of differences in the mean contingency values, taken before as a general measure of prototypicality, is the same as the pattern of differences in the frequency with which target terms were produced, with the exception of the relative positions of the sad and scared narratives in the Antecedent condition.

This similarity extends to the size of the differences between the emotions in overall mean frequency of target terms across conditions and age groups. Comparisons between the emotions showed the mean for the happy narratives to be significantly larger than those for either the sad or scared narratives ($tD\ (3;27) = 5.10$ and 4.04 respectively, $P < .01$ in both cases), which were not themselves significantly different. This can readily be interpreted as a reflection of the relevant mean contingency values, where the difference between the sad and scared features is between a third and a quarter the size of that between either of these and the happy features. Thus the differences between the emotions serve to

Table 4.4 Mean feature contingency values by Emotion and Condition (n = 4)

	Condition			
Emotion	Combined	Behaviour	Antecedent	All Conditions
Happy	1.47	1.47	1.84	1.59
Sad	0.67	0.63	0.76	0.69
Scared	0.89	0.98	0.90	0.92
All Emotions	1.01	1.03	1.17	

further underline the predictive value of the contingency measure.

The general picture to emerge from the analysis as presented thus far is of gradual increases with age in the production of the target terms, with the pattern of variability between narratives and conditions in line with the contingency values for the features derived from Experiment 1. The one exception to this is the presence of some anomalously low frequencies in the Behaviour condition. A further anomaly, however, is indicated by a significant interaction between Emotion and Age Group ($F = 8.52$, d.f. = 4,54, MSe = 1.27, $P < .001$). Whilst there were significant increases with age in target frequency for the happy ($F = 20.29$, d.f. = 2,54, MSe = 1.27, $P < .001$) and the scared narratives ($F = 11.07$, d.f. = 2,54, MSe = 1.27, $P < .001$), as would be expected, there is no main effect of Age Group over the sad narratives, where target frequency actually drops between the 8- and the 10-year-olds. Such a finding is, on the face of it, totally at variance with the predictions of a model where activation strength has been portrayed as always accruing with experience, if not at a constant rate.

Moreover, this anomalous pattern for the sad narratives is relatively consistent across the different conditions of Story Type, although there is a significant three-way interaction between Condition, Emotion, and Age Group ($F = 3.18$, d.f. $= 8,54$, MSe $= 1.27$, $P < .01$). In all three conditions there are consistent increases with age in target frequency for the happy and scared narratives, although of these the only ones which achieve the conservative level of significance are the increases for the happy narratives in the Behaviour condition ($F = 8.58$, d.f. $= 2,18$, MSe $= 1.58$, $P < .005$), and for the happy ($F = 13.72$, d.f. $= 2,18$, MSe $= 0.56$, $P < .001$) and scared narratives ($F = 26.70$, d.f. $= 2,18$, MSe $= 0.56$, $P < .001$) in the Antecedent condition. For the sad narratives on the other hand, there is a drop in target frequency between the 5- and 8-year-olds in the Combined condition, and between the 8- and 10-year-olds in the two single feature conditions, although again, only the pattern of differences for the Antecedent condition achieves significance at the conservative level ($F = 17.26$, d.f. $= 2,18$, MSe $= 0.56$, $P < .001$).

In spite of the apparent contradiction between the predictions of the model and these drops in the frequency of target term production from one age group to another, this pattern of results is, in fact, amenable to an explanation consistent with the model. This explanation rests on the idea of feature ambiguity. In the present context this may be defined as the state which obtains when a feature has different associated complements with evenly matched probabilities of association, and the conjunctions formed with the different complements have above criterial prototypicality within the hierarchy of activation of more than one emotion term. Hypothetically, the same state would also obtain if one conjunction had above criterial prototypicality for more than one emotion term, with ambiguity increasing as these different values for prototypicality become more similar. This second case is, however, less likely to occur, given the greater informational detail contained in the feature conjunction.

The existence of ambiguity will not necessarily be particularly evident in the responses of specific individuals: theoretically, the higher probability connections would tend to determine explicit responses even when the difference in relative activation strengths is marginal. However, within a sample of individuals from a population in which a particular feature is ambiguous in the way defined, the cumulative frequency distribution of different terms given in response to that feature would tend to reflect the degree of ambiguity. This is for much the same reason as cumulative responses were argued to reflect degree of prototypicality: i.e. individuals will vary in which response has higher activation as a function of the probability of association within the population as a whole. So, for instance, as the probabilities of association between a feature and two complements appropriate to different terms approach parity, the number of individuals retrieving those two terms will also tend towards parity.

Three points follow from this. Firstly, the ability of a feature to activate, via association, a conjunction with above criterial prototypicality for a given term, does not guarantee that this term will be the one produced in the task used for this study. If the feature can also elicit another, and to the individual, more probable conjunction with above criterial prototypicality for another term, this latter will be the one produced.

However, the higher the probability of a particular conjunction, the smaller the likelihood of another conjunction having a still higher probability, and thus being activated in its stead. The probability of association between the component features of a conjunction will be influenced by how frequently that conjunction has occurred in experience. This in turn has already been argued to determine how prototypical that conjunction will tend to be for a particular term.

Thus degree of ambiguity, as measured by the frequency of alternative terms being given in responses, should in general tend to be negatively correlated with the degree of prototypicality of the expected conjunction. As noted previously, the sad features in all three conditions had the lowest levels of prototypicality as measured by their contingency values.

The second point is that degree of ambiguity need not remain stable over time. Changes in the pattern of typical experience could lead to a feature's acquisition of alternative complements of relatively high probability where none existed previously. Conversely, one complement from an evenly-matched range could become substantially more probable than the others. Thus whilst absolute activation potential of a complement may always be considered to increase with experience, the <u>relative</u> probability of activation of different complements may increase <u>or</u> decrease.

In the context of the production task this could give rise to the same drops and rises in the frequency of a particular term that were observed for the sad narratives under all three conditions of Story Type. In general, increases in the frequency of alternative terms over age should be at their greatest when increases in the frequency of target terms are at their lowest.

The implications for the production of target terms of this added notion of feature ambiguity are therefore consistent with the data presented so far as regards the sad narratives. Superficially, it might also be tempting to advance this mechanism as an explanation for the lower frequency for target terms under the Behaviour condition. However, one further point stands against this. Overall, the mean contingency values for the behavioural features were no lower than for the features in the other conditions. There would thus appear to have been no greater room for ambiguity to influence the responses in this condition than in the Combined or Antecedent conditions, if the argument above is correct.

Production of alternative terms to targets

Direct evidence on all of these three points is available from an examination of the frequency of occurrence of alternative terms to the targets. As outlined previously, the greater the experienced ambiguity of features contained in the narratives, the more frequent these responses should be. Mean frequencies by Condition, Emotion, and Age Group are presented in Table 4.5.

Three specific aspects of this data were addressed, in line with the points above:

i) Overall frequency of alternative terms per narrative across age groups, and the contingency values of the features contained in those narratives, as calculated previously, were predicted to be negatively correlated. In order to test this prediction, all 36 narratives from the three conditions of Story Type were ranked according to their contingency value and the frequency with which alternative terms were given for them, and the value of Spearman's rank correlation coefficient computed. In line with prediction there was a highly significant negative correlation between the two measures ($r_s = -.52$, $n = 36$, $P < .001$, one-tailed). Ambiguity would appear to be greatest in general when the degree of prototypicality of a feature and its expected complement is lowest.

ii) The extent of change in the frequency of target terms and alternative terms per narrative between age groups was also predicted to be negatively correlated. Values for change in the two measures between 5 and 8 years, 8 and 10 years, and 5 and 10 years, were computed for all 36 narratives, and product-moment correlations calculated between them (since the measures were directly comparable, the more powerful statistic was preferred here). In line with prediction, highly significant negative correlations were found for the changes in the two measures between all three pairings of age group (from 5 to 8 years, $r = -.48$, $P < .005$; from 8 to 10 years, $r = -.59$, $P < .001$; from 5 to 10 years, $r = -.57$, $P < .001$; $n = 36$, all probabilities are one-tailed). In general, then, decreases or small increases in the frequency of target terms were associated with large increases in the frequency of alternative terms, supporting the hypothesis of ambiguity.

iii) The frequency of alternative terms under the different

Table 4.5 Mean frequency of Alternative terms per narrative by Story Type, Emotion, and Age Group (n = 4)

		Age Group			
Condition	Emotion	5-year-olds	8-year-olds	10-year-olds	All Age Groups
	Happy	0.00	0.50	1.00	0.50
Combined	Sad	1.25	2.00	2.25	1.83
	Scared	1.00	1.75	1.00	1.25
	All Emotions	0.75	1.42	1.42	1.19
	Happy	0.25	0.25	0.50	0.33
Behaviour	Sad	1.50	1.25	2.00	1.58
	Scared	0.00	2.00	1.50	1.17
	All Emotions	0.58	1.17	1.33	1.03
	Happy	0.25	2.25	0.50	1.00
Antecedent	Sad	0.25	2.25	4.75	2.42
	Scared	3.50	3.25	3.00	3.25
	All Emotions	1.33	2.58	2.75	2.22
	Happy	0.17	1.00	0.67	0.61
All	Sad	1.00	1.83	3.00	1.94
Conditions	Scared	1.50	2.33	1.83	1.89
	All Emotions	0.89	1.72	1.83	1.48

conditions of Story Type was also examined, in order to see whether there was any evidence to support an explanation of the lower target frequency in the Behaviour condition in terms of ambiguity. If ambiguity in the sense defined were the cause, then alternative terms should be more frequent here than in the other two conditions.

As can be seen from Table 4.5, this was not the case. A mixed-model analysis of variance on the frequency of alternative terms for each narrative, with factors as for the analysis of the target terms, did show a significant effect of Story Type condition ($F = 8.24$, d.f. = 2,27, MSe = 1.83, $P < .005$). Comparison of means, however, confirmed that this was the result of significantly more alternative terms being produced under the Antecedent condition than under either the Combined or Behaviour conditions ($tD\ (3;27) = 3.23$ and 3.73 respectively, $P < .01$ in both cases).

The same analysis also found a significant effect of Emotion ($F = 11.21$, d.f. = 2,27, MSe = 1.83, $P < .001$). As would be expected from the two preceding analyses, the relative frequencies of alternative terms for the different emotions exactly mirrored those of the target terms, with the frequency for the happy narratives this time significantly lower than for the sad or the scared narratives ($tD\ (3;27) = 4.17$ and 4.01 respectively, $P < .01$ in both cases).

The general increase in the frequency of alternative terms across the age groups, again found to be significant ($F = 10.43$, d.f. = 2,54, MSe = 0.92, $P < .001$), is also unsurprising. The theoretical outline of feature ambiguity carried with it the implication that with increase in experience more conjunctions appropriate to the alternative terms would achieve criterial prototypicality. This would perhaps not take place at the same rate as for the target terms overall. However, the previously reported correlations indicate that the most rapid increments occur where prototypicality of conjunctions for the target term is lowest, and thus where the rate of these passing criterion would be expected to be slowest.

A further indication of this is provided by a significant interaction between Age Group and Emotion ($F = 3.66$, d.f. = 4,54, $MSe = 0.92$, $P < .05$). Whereas for the target terms change across age groups was significant for the happy and scared narratives, but not for the sad, this position is exactly reversed for the alternative terms (for the effect of Age Group within the sad narratives $F = 13.17$, d.f. = 2,54, $MSe = 0.92$, $P < .001$). A significant three-way interaction between Condition, Emotion, and Age Group ($F = 4.24$, d.f. = 8,54, $MSe = 0.92$, $P < .005$) is largely attributable to the fact that the increase with age is most pronounced for the sad narratives under the Antecedent condition ($F = 42.23$, d.f. = 2,18, $MSe = 0.48$, $P < .001$).

Taken overall then, the data on the frequency of alternative terms provide good support for the notion of feature ambiguity, and are certainly consistent with this explanation of the drops in the frequency of target terms noted for the sad narratives. Ambiguity in the sense defined does not, however, seem to be the basis for the lower frequency of target terms in the Behaviour condition. The source of the apparently higher than expected degree of ambiguity of the narratives in the Antecedent condition, as evidenced by the greater frequency of alternative terms, is similarly unclear.

In virtually all respects the data provide excellent support for the proposed hierarchical model of the organization of emotion knowledge. In general, both initial predictions, held out as central to the model, were met. The single important exception, the lower than expected frequency of target terms in the Behaviour condition, will be examined further below. Otherwise, where performance on the production task differed from prediction, this proved to be readily explicable in terms of logical extensions to the model's operation.

The following points should be noted in particular:

a) Overall, the predictive value of a prior measure of feature frequency for the probability of retrieval of specific terms was well established. It might conceivably be argued that the strength of the relationship found was not as great as the model should predict. However, a certain amount of extraneous variation in the frequency of production of target terms was inevitable, due to the relatively small sample size, and thus the likelihood of some difference in experience from the sample in Experiment 1. This would still have tended to be the case even if more stringent controls had been applied in the selection of participants.

b) Of greater importance was the fact that frequency of target term production was found to be related, not to <u>simple</u> feature frequency, but to the values for chance contingency between antecedents and behaviours. This is, in fact, not so striking an outcome for the Combined features condition, where the rankings on the contingency values would not be greatly disparate from those based on the simple sum of the frequencies of the component features of each narrative (see Richardson and Bhavnani, 1984; Abdi, 1987). However, that this relationship was found to hold for the Antecedent and Behaviour conditions is inexplicable outside of the framework of the hierarchical model, or something closely resembling it, since no other approach would predict a systematic effect of features not actually presented to participating subjects. This finding in particular serves to provide strong support both for an initial stage of association between feature and complement, and for the intermediate organizational level of general schemata, underpinned by representation of feature contingency.

c) Degree of prototypicality of the general schemata can be seen to be definable, therefore, in terms of the frequency of occurrence of a specific feature conjunction. This in turn provides a further reason for the goodness-of-fit of the contingency values to the production of target terms not being higher. The contingency values used were based on chance co-occurrence of features, given an estimate of their separate frequencies (i.e. equivalent to the expected values in a contingency table under the null hypothesis). In practice, of course, higher level (i.e. above chance) associations between different features would be expected to occur. These would bias their contingency values, and thus the degree of prototypicality of specific conjunctions (see Richardson, 1987, for the use of parameter estimates from saturated log-linear models to yield predictive values under these circumstances). For the purposes of this study, however, there was insufficient prior information to calculate modified contingency values to take this into account.

d) The lack of significant difference between the Combined and Antecedent conditions in the frequency of target terms provided convergent support for the association stage and contingency representation within general schemata. This finding is particularly hard to explain within the context of the feature-sum prototype model, which would predict greater frequency for the Combined condition. Reichenbach and Masters (1983) try to explain a similar result as being due to children in their combined features condition only attending to one cue type. However, Gnepp (1983) reports that children do in general encode both feature types when presented with this kind of combination, and, moreover, that their responses are based on an integration of these features. In the face of this evidence, any feature-sum approach must turn instead to an explanation of better than expected performance when only antecedent features are presented. The most obvious route to an explanation is via auto-association between features (see Sharkey, 1988), and increased activation as a result. But this leads back to exactly the properties contained in the hierarchical model.

e) The mechanism of feature ambiguity yields an explanation of some anomalies in the production of the target terms which is both consistent with the data, and constitutes a natural extension of the model as initially presented. If emotion knowledge is organized, as the model suggests, and as the other findings indicate, in terms of the conjunction between features (largely antecedent and behaviour), then it is clear that the same basic feature is likely to be represented in more than one conjunction. It follows from this that it will sometimes be the case, especially when single features have been presented, that competing activation of these different conjunctions will occur, and that this will result in different apparent judgements of emotion being made.

f) A further point of interest here is that the pattern of relative frequencies with which the different target terms were produced is very similar to that for the selection of different facial expressions found by Borke in her classic early study (Borke, 1971). Bearing in mind the lower degree of prototypicality (i.e. frequency of feature conjunction) noted for the sad and scared features, there is some suggestion that features connected with these emotions may in general occur in a wider range of conjunctions than is the case for those connected with happiness, and that they have, as a result, a greater degree of ambiguity. A further indication of this possibility is provided by Stein and Jewett (1986) in their theoretical analysis of the distinction between "sad", "angry", and "scared". In particular, their formulation suggests that sadness and anger very often have the same antecedents, and that the distinction derives from the focus of the interpretation of those antecedents. This last may be the case for adults, but for children the distinction seems likely to reduce to one of different associated behavioural complements.

The one outstanding issue of importance is the lower frequency of target terms in the Behaviour condition. This was not predictable on the basis of the contingency values for these features, and apparently it is not explicable in terms of feature ambiguity, at least in the sense defined, as there was no accompanying increase in the frequency of alternative terms. In general children simply made fewer definite responses in the Behaviour condition.

Two explanations of this may be advanced. The first takes as its starting point the observation that behavioural features are likely to occur in conjunction with a greater number of antecedents, than vice versa. Thus it seems possible that, presented with behavioural features alone, a range of complements with more-or-less equal probability of association, are activated. This greater array of conjunctions may make selection of any specific complement harder, and so reduce the frequency with which terms are retrieved, since this has been argued to be dependent on successful association. The effect identified by this account then is broadly one of heightened or excessive ambiguity, resulting in confusion and inability to respond, if only at a marginal level. Some evidence in favour of this explanation is provided by the lower degree of relationship found between target frequency and the contingency values computed for expected conjunctions in the Behaviour condition. This could be taken to reflect a greater degree of variability in the nature of the associated complement than was the case in the Antecedent condition.

The alternative explanation suggests what is in effect a task-related problem. The argument here is that rather than being submerged by a plethora of complements, the child finds it more difficult to select a complement for a behavioural feature because of a lack of familiarity with tasks which require a reversal of the temporal flow. Thus activation of an appropriate complement may occur relatively automatically, but this complement may sometimes be ignored because it fails to fit the standard temporal pattern of "what happened next". As a result retrieval of the term breaks down. The fact that older children may find this reversal of temporal focus less unnatural might account for the slight improvement of performance in the Behaviour condition relative to the other conditions amongst the older age groups.

Evidence for these two explanations is examined further in the following chapter, which focuses specifically on the association stage in the retrieval of emotion terms.

Summary

According to the model of emotion knowledge outlined in Chapter 3, production of the category label appropriate to an episode depends on a three stage process: activation of an event schema by the input features; of a general schema by the event schema; and of a label by the general schema. For labelling to be successful, the activation at each stage must be strong enough to spread upwards and initiate the next stage. This activation will be stronger the more often an input episode has been experienced before. Thus the probability of an episode being successfully labelled by an individual will vary with the extent of their past experience of that episode, and this should be a function of episode frequency.

Although their results are inconclusive, other authors (Gnepp, 1983; Reichenbach and Masters, 1983) have also been interested in whether children's success at labelling episodes is different when features are presented singly, or in combination with each other. According to the model, the labelling process should differ slightly if input consists of an antecedent or behavioural feature on its own, as opposed to a plausible combination of the two. In the first case, the event schema which contains the most similar feature will be activated most strongly. In the second case, it is the event schema which contains the most similar combination that will be the most activated. Thus it is theoretically possible for different schemata to be activated under the different contexts, and these schemata may vary in their ability to activate a label.

There should in fact, though, be no systematic difference in success rate whether single or combined features are presented.

This is because event schemata are activated at the first stage of labelling in both cases. If the combinations of features are realistic (i.e. are ones which are reasonably likely to be encountered), then in many instances the same schema will be activated by a combination <u>and</u> either of its constituent features. Even when this is not so, the schema accessed by a single feature is unlikely to differ markedly in terms of the frequency of the episode it encodes from the schema accessed by that same feature in an appropriate combination.

In order to test the model's predictions on these two issues, Experiment 3 investigated the effect of episode frequency on production of labels, under conditions where either single or combined features were presented. Four antecedent and four behavioural features were chosen for each of the "target" emotions "happy", "sad", and "scared". These features were used to construct three sets of 12 brief narratives. One set employed only antecedent features; a second, only behavioural; and a third, emotionally congruent combinations of both. Estimates were then made of the relative frequency of episodes which involved the features, either separately or in the combinations that had been used. These estimates were based on the number of references made to the features by the children who participated in Experiment 1.

Children aged 5, 8, and 10, of approximately the same background as participants in Experiment 1, heard all the narratives from one set only. After each narrative they were asked to say how they would feel if the described events occurred. It was predicted that:

a) totalled across the three age groups, the number of target labels produced for a narrative, would be positively correlated with the estimates of episode frequency;

b) there would be no difference between the narrative sets in the mean rate of success in producing target labels.

At first sight, analysis of the effect of episode frequency revealed apparently mixed results. For the combined features, there was a significant positive correlation between the number of target responses and estimates of the frequency of each combination. For the single antecedent and behavioural features, on the other hand, correlations with simple estimates of the relative frequency of the features themselves were positive, but non-significant.

However, target responses for the single feature narratives did correlate significantly with another measure: the estimated frequency of a <u>combination</u> of the explicitly stated feature with its most likely complement (i.e. for an antecedent, the most frequent behaviour associated with the same target label, and vice versa). This is in fact consistent with the model, since under these circumstances the event schemata which are activated at the first stage in label retrieval should specify such combinations. It would be the frequency of the combination, not the feature itself, which would determine the likelihood of a label being activated.

With regard to the mean frequency of target responses to each narrative type, no difference was found between the combined and antecedent narratives. However, both 5- and 10-year-olds made significantly fewer target responses to the behavioural narratives. It was also noted that whilst the number of target responses within narrative condition generally increased with age, there were drops for the "sad" narratives of all three types.

These drops were associated with increased production of possible alternatives to the target label (e.g. "angry" instead of "sad"). Responses of this kind occurred most often for narratives where estimates of episode frequency were lowest. It is possible, therefore, that a form of ambiguity influenced responses on some occasions. This ambiguity would be present when the same feature activates separate event schemata linked to different emotion labels. When the frequency of the episode relevant to the target label is low, there is an increased chance that the feature will have been experienced more often in the episode appropriate to the other label. It is the schema for the more frequent episode that would guide subsequent activation. However, ambiguity of this kind does not account for the lower frequency of target responses made to the behavioural narratives: these also received the lowest number of alternative responses.

The data provide support for the model in most respects. Of greatest importance is the effect on label production of the frequency with which feature combinations occur. This effect appeared to hold whether such combinations were explicit in the presented material, or left implicit, and so presumably identified by the children themselves on the basis of past experience. This tallies with the fact that explicit provision within narratives of antecedent-behaviour combinations failed to influence the mean level of target responses, on one comparison at least. Both points are consistent with the model's requirement that activation of event schemata is the first stage in the process of label retrieval, irrespective of the form of input. This in turn lends weight to the idea that the combination of antecedent and behaviour must be ascertained in order to identify emotional category.

Chapter 5: The role of event schemata in the active retrieval of emotion terms

Taken together, Experiments 2 and 3 provide evidence for the role of specific activational effects in the process of unaided identification of the affective category signified by different instances of the antecedent and behavioural features contained in emotional episodes. In particular, Experiment 3 yielded data which were consistent with the prediction of the hierarchical model that the probability of successful active retrieval of an emotion term is a function of the frequency of experience of the conjunction between specific antecedents and behaviour.

There is one central aspect of the retrieval process defined by the model which remains to be more rigorously tested, however. This is the hypothetical "association stage" required when the child is only presented with information about one type of feature, and by means of which an event schema can be isolated that provides the antecedent-behaviour conjunction necessary for activation of an emotion term. This chapter reports a study designed to generate more certain evidence as to whether or not label retrieval is in fact dependent on such a stage of processing, and whether the apparently greater difficulty children have in retrieving labels for behavioural features can be explained in terms of its operation.

5.1 *Activation of event schemata and the retrieval of emotion terms*

The hierarchical model by definition places emotion terms and representations of specific events which exemplify those terms at opposite ends of an interconnected network which allows processing of information to occur by means of the spread of activation from one point in the network to another. This spreading of activation permits vertical operations such as abstraction and categorization, which provided the main focus of the two preceding chapters, but also horizontal operations such as association, which was to a large extent the focus of Chapter 2. As has already been indicated, however, under many circumstances a complete description of the process of identification of emotion is reliant on an integration of these two types of operation.

Two primary routes to activation of the connection between an event representation and an emotion term have been defined on the basis of the model, encapsulated in recognition that an externally provided term is appropriate to an event, and in active retrieval of a term for an event. In the first case a connection was held to be achieved via top-down activation of general schemata linked to a term, combined with bottom-up activation from an event schema corresponding to the experienced episode. Recognition occurs if the total activation in a general schema is above criterion. In the second case the connection is achieved solely on the basis of bottom-up activation from an event schema. Retrieval of a term occurs if there is criterial activation of a general schema by the event schema, and also criterial activation of the term by the general schema.

It was suggested previously that the two stages to activation of the link between an event schema and an emotion term required under conditions of active retrieval might in practice be regarded as unitary, since an event schema which has been experienced sufficiently frequently to activate a general schema will tend to have increased the frequency weighting of that general schema to above the criterial level for activation of the term. Successful activation of the general schema will therefore produce activation of the term on the majority of occasions. However, when a child is presented with the task of active categorization of episode information, a successful response will be dependent in the first instance not on this transfer of activation, but on activation of the event schema itself.

If full information (i.e. both antecedent and behavioural features) about the episode to be categorized has been provided to the child, then broadly speaking a corresponding event schema will be activated if one is held. If, on the other hand, only partial event information (either antecedent or behaviour) is available, then a number of different event schemata may be applicable, and the child is faced with the problem of selecting one schema from amongst this range.

It is argued that this process of selection can in fact take place automatically by means of activation of all schemata which contain the presented feature, but with degree of activation determined by the frequency of prior experience of the events encoded by each. Attention will be directed to the most strongly activated schema, which thus becomes the one that is selected. Effectively then, the process serves to isolate the most probable featural complement associated with the feature that has been presented. Categorization of the episode proceeds on the basis of the antecedent-behaviour conjunction identified in this way.

It is this process that has previously been referred to as the "association stage" in label retrieval, although it is in fact identical with the process of episode recognition discussed in Chapter 2. The process is therefore theoretically important in its own right, as the basis of the regulatory activity of prescription and prediction, as well as forming a hypothetically crucial link in the retrieval of emotional terms for otherwise potentially ambiguous antecedent or behavioural features. However, thus far the evidence to support the existence of the association stage is restricted.

One phenomenon that might be taken to be significant here was children's spontaneous reference to complementary features for those contained within narratives when making labelling responses in Experiments 2 and 3. In particular, it was noted in Experiment 3 that the content of these references shifted according to the nature of the narrative features, with presentation of antecedent features tending to produce references to behaviour, and vice versa. These references are strongly suggestive of a need to explicitly disembed featural complements in order to decide on an appropriate emotional label. However, responses of this kind were only made by a small minority of children, and cannot therefore be taken as necessarily indicative of the sequence of processing employed by the entire sample. Even without this objection, logically such responses can at best only be held to demonstrate that there was an association between label retrieval and the isolation of complementary features, not that categorization is actually dependent on the isolation of appropriate event schemata.

More widespread evidence for the association stage having a central role in categorization was provided by the fact that in Experiment 3 the frequency of retrieval of target terms for antecedent or behaviour narratives was found to be correlated not with individual feature frequency but with estimates of the probability of antecedent-behaviour conjunctions. The implication is that such conjunctions were themselves retrieved prior to labelling and determined the specific term which was subsequently identified. The pattern of retrieval of alternative terms was also found to be consistent with operation of the same mechanism. Again, though, these points only constitute indirect evidence.

A more rigorous test of the hypothetical role of an association stage in label retrieval is possible, however. If the theory is correct, it predicts that children should not be able to successfully produce emotion terms for separate antecedent or behavioural features without also isolating an appropriate event schema. In addition to the term they should therefore always be able to state a consonant complementary feature to that which has been presented to them. Ability to describe a complement, on the other hand, would not necessarily always be associated with retrieval of a term, since an identified event schema could not be guaranteed to generate criterial activation of the relevant general schema.

5.2 *Activation of event schemata for behavioural features*

One further question remains with regard to the operation of the association stage for different types of feature. Experiment 3 found that in general notably fewer emotion terms were retrieved for behavioural features presented on their own than was the case for antecedents. Within the framework of the hierarchical model, this points to a failure at the association stage which is for some reason more pronounced for behavioural features. Any other account that was consistent with the model would entail systematically lower frequencies of experience of the event schemata isolated for the instances of behaviour used in Experiment 3, but there was no indication that this was the case.

Two reasons why associational failure might be more common for behavioural features were advanced in Chapter 4. The first of these was founded on the possibility that it is more often the case that behaviours are associated with equiprobable antecedents than vice versa. Thus in this account increased failure would be the result of children experiencing greater difficulty in isolating a single event schema on which to base subsequent processing. The second explanation stems from the observation that one of the primary functions of the association stage is to serve episode recognition and thence prescription or prediction of behaviour. Children might therefore be expected to be substantially more familiar with searching for associations in the direction of the normal temporal flow of events, and so would tend to spontaneously divert attention away from activated event schemata that tied behaviours to their antecedents. Failure would then result from difficulty in isolating an event schema in which an emotional reaction stood in the role of an antecedent.

These explanations are both open to empirical test, since if the first is correct it should be evidenced by a lesser ability to describe antecedent complements for behavioural features than vice versa. If the problem is one of temporal focus, however, then explicit questioning with regard to probable antecedents might be anticipated to facilitate appropriate responses, since it would serve to focus attention in the correct direction.

Experiment 4

The study reported below was designed to test firstly the predicted relationship between ability to describe complementary features for presented antecedents or behaviours, and success in retrieving appropriate emotional labels; and secondly the patterns of response to behavioural features suggested by the two accounts of associational failure. Children from the same age range as Experiment 3 were read narratives containing either single antecedent or behavioural features, and were asked to both identify appropriate emotional labels for the episodes described, and to suggest complementary antecedents for presented behaviours, or complementary behaviours for presented antecedents. The antecedent and behavioural features embodied in the narratives were the same as those used in Experiment 3.

Although the main predictions of outcome were straightforward, it remained possible that isolation of event schemata and label retrieval are in fact associated and not interdependent processes. If this were the case, then the order of complement and labelling questions might be expected to have some impact on the responses made. Two effects in particular would be anticipated. The first is that memory or attentional lapses would result in a tendency for children to find it easier to make appropriate responses to the initial question, irrespective of its focus. The second is that the content of the initial response would tend to exert some influence on the content of the second response. Taken together, these two effects might give rise to a specific pattern of responses when the label question is asked second, of terms being produced which are appropriate to the complement described by the child, but not the original narrative. As a check on these effects the order of the two questions was systematically counterbalanced across the sample.

Method

Subjects

Twenty-four children (12 boys, 12 girls) in each of two age groups, 4- to 6-year-olds and 8- to 10-year-olds, took part in the study. For the younger group ages ranged from 4 years 8 months to 6 years 11 months, with a mean of 6 years 0 months; for the older group the age range was from 7 years 9 months to 10 years 7 months, with a mean of 9 years 2 months. The 48 children were all from the same primary school in a mixed area of East London. The proportion of children from other than West European ethnic backgrounds was somewhat higher than in the previous studies, with approximately half those in each age group coming from Afro-Caribbean, East European, or Asian families, but predominantly the first of these.

Once again, proficiency in English was established via scores on the British Picture Vocabulary Scale Short Form (Dunn, Dunn, Whetton, and Pintillie, 1982), administered in individual pre-test sessions. Although a raw score of 7 was set as a nominal minimum, in line with Experiments 2 and 3, the lowest recorded score was 8, and no children were excluded from the study on this basis. The mean raw score for the 4- to 6-year-olds was 11, and for the 8- to 10-year-olds it was 17. Almost all individual standardized score equivalents were in the low- to high-average range.

Material

Two sets of 12 brief stories apiece were devised for use with the children. One set, the antecedent narratives, described situations that would provoke an emotion; the other, the behaviour narratives, described responses of a central protagonist to unspecified events. Each set of narratives contained four stories which related to features associated with each of the three emotions "happy", "sad", and "scared".

The basic features embodied in both the antecedent and behaviour narratives were in all cases the same as those used in Experiment 3, and for the most part the actual narratives were slightly modified versions of those which had been employed for the Antecedent and Behaviour conditions of that study. The purpose of modification was primarily to remove redundant filler sentences, which were no longer needed to maintain narrative length in comparison to stories that described both types of feature, but also to remove some artificialities of construction which were felt to be present in the earlier versions. In all instances narratives continued to portray the listener as the supposed central protagonist.

In the few cases where new versions of stories were composed, this was done in the interests of topicality, given that the study took place in high summer instead of mid-winter. These new narratives were constructed using the same process as in Experiment 3: antecedent and behaviour pairs (identical to those which had been used previously) were worked into an overall episode, from which separate versions were derived by deletion of reference to the complementary feature. As before, then, maximum comparability was maintained between the two sets of narratives, other than with respect to the specific features that they described.

In common with Experiments 2 and 3, the narratives were designed to be followed by questions as to how the child thought that he or she would feel under the circumstances. In addition, though, children were to be asked after hearing the antecedent narratives what they thought they would do or say if the events happened, or after the behaviour narratives, what they thought might have happened prior to the behaviour described. Since the phrasing of these questions was required to vary from narrative to narrative, they were prepared in advance for each case. Appendix 4.1 details all 24 narratives, together with their accompanying questions.

Design

As in Experiment 3, children heard all 12 narratives from one set only, yielding two conditions of Story Type. Within these two conditions, the order of occurrence of requests for complementary features and emotional labels was constant for individual children, but systematically counter-balanced across children. Thus there were two conditions of Question Order crossed with the two Story Type conditions. Equal numbers (3 boys, 3 girls) of children from each Age Group were assigned to the four resultant experimental groups. In order to maximize the comparability of these groups, 6 blocks of 4 children each were formed within both age bands, matched within block for age, sex, and vocabulary score. Members of each block were then assigned at random to the four groups.

Procedure

Experimental sessions were conducted in the same way as those for Experiment 3. Children were taken individually to a quiet room within the school, where they were introduced to the task by being told that they were going to hear some stories about things which might happen to them sometimes. As they listened to each story they were to try to imagine what it might be like if the things described happened to them, and how they might be feeling. After each story they would be asked some questions about these things, but there were no right or wrong answers, and they should just say what they thought about them.

Once it had been established that the child understood what he or she was to do, the experimenter went on to read each of the twelve narratives for the relevant condition in turn. At the end of a narrative, children were asked to say either what they thought they might do if the things described had happened (antecedent condition), or what they thought might have happened at the point in the story before their reaction was described (behaviour condition). They were also asked to say how they thought they would have been feeling. The order of these two questions was fixed for each child according to experimental condition. If responses to either question were irrelevant, or of an inappropriate form, the question was repeated once before proceeding. Single repetitions of a narrative were permitted if requested.

The order in which narratives were read within the two conditions of Story Type was systematically varied across children such that each received a unique sequence of presentation. All sessions were openly tape-recorded for subsequent transcription and analysis of responses.

Scoring

For each narrative, children's responses were scored according to the characteristics of their descriptions of features complementary to those given in the narrative, and the quality of feeling named, if any:

a) For the antecedent condition children were credited with having described an appropriate complement if they had detailed a behaviour which either directly indicated, or was consonant with, a likely emotional response to the situation outlined. For the behaviour condition appropriate descriptions of a complement were defined as those which detailed a situation or elements of a situation likely to provoke an emotion consonant with the behaviour outlined. Only one complement per narrative was counted if more than one had been given, and the maximum possible score overall on this dimension was 12 complements, 4 for each emotion.

b) Labels for a quality of feeling were scored as appropriate if they named a specific emotion consistent with both the situation (antecedent condition) or behaviour (behaviour condition) contained in the narrative and any complement which had been described. Appropriate labels were thus primarily the target emotions as defined in Experiment 3, or close synonyms of these, although alternative labels were scored in the same way if they were consistent with the features defined. The maximum possible score was 12 labels, 4 for each emotion.

c) In addition, a record was kept of labelling responses which named specific emotions inconsistent with the narrative features but consonant with a described complement (for instance, where a child had said that he or she would have run out of the room because their friend had played a joke on them, but provided the label "angry").

All transcripts were scored independently by two trained judges. Agreement on the scoring of complement responses was 91% overall; for label scores it was 88%. All differences were resolved by discussion.

Results and Discussion

Analyses

Since examination of the data was focused by interest in any differences between children's performance under the separate conditions rather than in specifically item-related effects, all formal analysis was subject-based, in contrast to Experiment 3. This change of perspective does not affect interpretation of the data in other ways, however, and any robust effect would be detected by both subject- and item-based analyses.

Within these analyses, Age Group, Story Type, and Question Order were all between-subject factors, and Emotion constituted a single within-subject factor. Analysis concentrated on five main variables and the relationships between them: number of appropriate complements, number of appropriate labels, number of narratives where complements were given without labels, number of narratives where labels were given without complements, and number of labels consistent with complement only. Initial analyses of variance on these variables with the factors as listed above found no significant main or interactive effects of Emotion. This factor was therefore excluded and the analyses re-computed. The results of this second set of computations are reported in detail below.

Activation of event schemata as an intermediate stage in the retrieval of emotion terms

It had been predicted that if the first stage towards children's retrieval of emotion terms for presented antecedent or behavioural features was the isolation of an appropriate event schema, then, in general, terms would not be identified for a narrative without a child also being able to state the complementary feature contained in that schema. The converse would not be true, however, since schema activation would not guarantee activation of the term.

At the simplest level this was taken to imply that children should have tended to produce more appropriate complements than labels across the set of narratives. Table 5.1 presents means for the number of complements and labels scored as appropriate by Age Group and Story Type conditions (a full breakdown of these scores by condition is presented in Appendices 4.2 and 4.3). As can be seen, in both age groups, and in both the antecedent and behaviour conditions, the number of complements exceeded the number of labels. Before proceeding to direct comparison between these values, however, preliminary analyses of variance were carried out on the complement and label scores taken separately, as check for the presence of any influences of specific task conditions on responses, which might complicate interpretation of more global analysis.

A three-way (Age Group, Story Type, and Question Order) analysis of variance on complement scores found a significant main effect of Age Group ($F = 4.85$, d.f. = 1,40, MSe = 4.68, $P < .05$), but no effects of the order in which responses were made, or of the type of feature presented. Taken overall, the number of complements identified by children increased as a function of age. An analysis of the same structure carried out on label scores again found a significant effect of Age Group ($F = 9.37$, d.f. = 1,40, MSe = 9.68, $P < .005$), with the number of appropriate labels identified also

Table 5.1 Mean number of complementary features and emotional labels identified by children, by Age Group and Story Type (n = 12)

	Story Type					
	Antecedents		Behaviours		Both Story Types	
Age Group	Complements	Labels	Complements	Labels	Complements	Labels
4-6 y.o	9.33	7.75	9.17	6.58	9.25	7.17
8-10 y.o.	10.75	10.08	10.50	9.75	10.62	9.91
Both Groups	10.04	8.91	9.83	8.17	9.93	8.54

tending to increase with age. Whilst there was some indication that labels were more likely to be produced when this response was requested first (the mean score here was 9.12 as against 7.96), this effect was not significant. In contrast to Experiment 3 there was in addition no significant difference between the number of labels identified for the antecedent and behaviour narratives.

A four-way mixed-model analysis of variance, with between-subjects factors as before, and Response Type as a within-subjects factor, was performed on the complement and label scores to yield a direct comparison between the frequency of appropriate responses of the two kinds. This analysis confirmed the general effect of Age

Group ($F = 10.01$, d.f. = 1,40, $MSe = 10.20$, $P < .005$), and also found the difference between scores on the two dimensions to be highly significant ($F = 11.23$, d.f. = 1,40, $MSe = 4.16$, $P < .005$). There were no effects of Question Order or Story Type. Children consistently identified more appropriate complementary features than emotional labels, then, irrespective of the type of feature they had been presented with, or of the order in which they were asked to make these responses.

Whilst this evidence is consistent with the hypothesized intermediate activation of event schemata in the retrieval of emotion terms, it is, however, only indirectly supportive, since it is not based on an examination of the relationship between specific complement and label responses. Further evidence consonant with the hypothesis that label responses are dependent on activation of event schemata is provided by the fact that complement and label scores were found to be positively correlated ($r = .49$, $n = 48$, $P < .001$, two-tailed). Strictly speaking, though, the hypothesis yields the more definite prediction that whilst there may be narratives for which a child can state a complement but not a label, the reverse should not be the case.

Given that responses of the latter kind might occasionally occur because of confusion or other extraneous influences, this resolves to the position that responses which describe a complement without provision of a label should at minimum be more frequent than those which provide a label without description of a complement. Moreover, the incidence of "complement only" responses should tend to decrease with age, since with increased experience the range of event schemata capable of activating a general schema, and thence a

Table 5.2 Mean frequency of complement only and label only responses by Age Group (n = 24)

Age Group	Response Type: Complement Only	Label Only
6-8 y.o.	2.87	0.79
8-10 y.o.	1.58	0.87
Both Groups	2.23	0.83

term, should also increase. "Label only" responses, on the other hand, might be expected to occur more randomly if they are artefactual in origin.

In order to examine these points in more detail a count was made for each child of the number of narratives for which full (i.e. appropriate complement plus label), complement only, and label only responses were made. Table 5.2 shows the mean frequency of complement only and label only responses within each age group (a full breakdown of mean frequencies by condition and age group is presented in Appendices 4.4 and 4.5). In both cases complement only responses occurred more often, and, taken overall, they were close to three times as frequent as label only responses. Direct comparison of the frequencies in a four-way mixed-model analysis of variance, with between- and within-subject factors as for the previous analysis of complement and label scores, showed the difference in incidence of complement only and label only responses to be highly significant ($F = 11.23$, d.f. = 1,40, MSe = 4.16, $P < .005$). There were no other significant effects.

In addition, preliminary three-way (Age Group, Story Type, and Question Order) analyses of variance on the two separate variables had found that the drop in incidence of complement only responses between the younger and older age groups approached conventional levels of statistical significance ($F = 3.33$, d.f. = 1,40, MSe = 6.01, $P < .1$), whilst no age effect was apparent for label only responses. For both variables there was some indication that memory effects may have had a contributory influence on the occurrence of such responses: children were more likely to have only described complements if they were asked for this element of the response first (the mean frequency here is 2.87 as against 1.58 when asked to provide labels first); and conversely they were slightly more likely to have only provided labels if asked for this element first (the mean frequencies for this and the other condition of Question Order are 0.96 and 0.71 respectively). However, neither of these differences was significant, and there were no observed effects of Question Order or Story Type in either of the two analyses.

Consistent with the hypothesis of intermediate activation, then, it was found that complement only responses were not only substantially more numerous, but were also apparently subject to a developmental influence not evident for label only responses. Convergent evidence that this was the case, and that label only responses were, in contrast, a random occurrence, was provided by the presence of a strong negative correlation between full and complement only responses ($r = -.75$, $n = 48$, $P < .001$, two-tailed), whilst full and label only responses were found to be uncorrelated ($r = -.16$, $n = 48$, P n.s.).

That there was not a more marked difference between the age groups in the frequency of complement only responses is perhaps attributable to the existence of some limitations on the circumstances under which such responses would occur. Specifically, the hierarchical model suggests that this response pattern would be apparent only when the child possesses an appropriate event schema which is either unconnected to a general schema or else is of a degree of prototypicality insufficient to lead to activation of the term. If the child does not possess (or cannot retrieve) an appropriate event schema, then neither complement nor label will be produced. Bearing in mind that younger children described significantly fewer appropriate complements, it is possible that a lack of event schemata led in many instances to such "null" responses, whereas a slightly greater extent of knowledge would have resulted in more complements being described without provision of a label.

Retrieval of emotion terms for behavioural information

The subsidiary aim of the study had been to generate evidence which would help to clarify why, in Experiment 3, children had apparently found it more difficult to retrieve emotional labels when presented solely with information about behavioural reactions. In particular, it was predicted that if the problem stemmed from an occasional failure to isolate a single event schema because children held a multiplicity of schemata within which a given behaviour was more-or-less equally probable, then in the context of the present study this would result in fewer complements being identified for the behaviour narratives. If, on the other hand, the problem was simply one of unfamiliarity with the task of making inferences in a direction counter to the normal temporal sequence, then it was anticipated that the use of a procedure that included specific questions requiring children to make associated antecedents explicit might have the effect of facilitating responses for the behaviour narratives.

In the event, the data from this study appeared to support the second of these two accounts. Firstly, as noted in the preceding section, no significant differences were found between the label scores of those who had heard the two different sets of narratives. Since the material used here was ostensibly the same as that employed in Experiment 3, this would suggest either that the previous findings were a chance effect, which is unlikely in view of the fact that fewest labels were provided for behavioural information alone in all three age groups; or else that modifications to task or scoring within the present study had somehow served to obscure or remove the previous differences.

It was in fact the case that, due to the different focus of interest, the scoring system used for labels in this study was slightly less strict than that employed in Experiment 3 with regard to the target responses. However, the absence of differences between the number of labels produced for the two narrative types is not attributable to this. In Experiment 3, even when both target and alternative labels were taken into account, the total number of labels produced was still markedly less for behavioural than for antecedent or combined features narratives.

Having discounted this line of argument, the remaining possibility is that elements of the present task served in some way to facilitate responses to the behaviour narratives. In particular, attention must focus on the use of explicit questions with regard to the nature of features complementing those contained in the narratives, since this was the only procedural difference from the task used in Experiment 3. Two further pieces of evidence are informative here. The first of these is that no differences were found in the number of appropriate complements described for the two types of narrative. If, as the evidence suggests, retrieval of labels is dependent on activation and selection of an appropriate event schema, the implication is that the facilitatory effect of questioning with regard to complementary features centred on an enhancement of the ability to isolate a single schema and hence the antecedent complement of a described behaviour.

Viewing this from the perspective of the two accounts proposed initially, it is hard to see how such questions could have this facilitatory effect if the problem were one of confusion as to which of a number of possible schemata to select. At best, explicit questions about antecedents should merely serve to bring this confusion into the open. However, if the original problem stemmed from a kind of functional fixity with regard to the temporal direction in which associations should be sought, then, as argued previously, questions which serve to focus attention in the opposite direction should indeed facilitate appropriate responses.

Table 5.3 Mean frequency of label responses consonant with complementary features only, by Age Group, Story Type, and Question Order (n = 6)

	Story Type					
	Antecedents			Behaviours		
Age Group	Complement First	Label First	Both Orders	Complement First	Label First	Both Orders
4-6 y.o	0.50	0.00	0.25	0.33	1.17	0.75
8-10 y.o.	0.17	0:00	0.08	1.00	0.17	0.58
Both Groups	0.33	0.00	0.17	0.67	0.67	0.67

The second piece of evidence is provided by the pattern of occurrence of label responses consonant with a described complement for a narrative but not with the feature contained within it. The mean frequency of these by age group and conditions of narrative type and order of question is presented in Table 5.3. Although the overall incidence of such responses was relatively low, a three-way (Age Group, Story Type, and Question Order) analysis of variance revealed that they occurred significantly more often in responses to the behaviour narratives ($F = 4.74$, d.f. = 1,40, $MSe = 0.63$, $P < .05$). There were no other significant main effects.

This finding is readily interpretable in a manner consistent with a tendency to fixate on the standard temporal flow of events, and with this tendency having a particular impact on responses to the behaviour narratives. Mistaken labelling responses of exactly this kind would occur if children, having isolated an appropriate antecedent complement for a behaviour (perhaps aided by explicit questioning), then lost sight of the original feature contained in the narrative because of the temporal reversal involved, identified a different behavioural complement for the antecedent, and finally retrieved the label for this new conjunction.

The picture generated by this account is not substantially affected by the fact that these mistaken label responses showed some considerable variability in their point of occurrence outside of the association with the behaviour narratives, as was indicated by a significant three-way interaction between Age Group, Story Type, and Question Order revealed by the analysis of variance ($F = 4.74$, $d.f. = 1,40$, $MSe = 0.63$, $P < .05$). Follow-up tests of simple main effects and simple interactions showed no effects which were significant at the conservative level derived from partitioning of the per family error rate (Kirk, 1968). It may be broadly noted, however, that when these responses were made for antecedent narratives they all occurred when children were asked to describe complementary features first, suggesting that they may have been primarily the result of a shift of attention in these cases.

This was also the pattern found amongst older children who heard the behaviour narratives, and, again, it seems plausible that any tendency to shift attention in line with the normal sequence of events might be more likely to be manifested when the task structure interposed explicit consideration of the child's own knowledge of emotional episodes between narrative and labelling response. More curiously, younger children in this narrative condition predominantly made mistaken label responses when they were asked to produce labels before descriptions of complementary features. That this could occur is perhaps suggestive of a more involuntary process of association in which the task sets up an expectation that an antecedent must be sought for the described behaviour, but any such antecedent arrived at is automatically associated with other behaviours. This response pattern also provides further convergent evidence for the role of event schemata in the retrieval of emotion terms, though, since the implication is that in these instances production of a term was determined by features which had not been explicitly described at the point of response.

Conclusions

The first point of importance to be noted about the data generated by the study is that they provide formal evidence, where none was available previously, of the link between active label retrieval and the isolation of event schemata which incorporate both presented features and associated complements. Scores on the label and complement dimensions were found to be positively correlated, indicating at the very least that the two types of knowledge are connected, and that activation of one tends to be associated with activation of the other.

This might be argued to be of a piece with more passive priming effects between emotion terms and episodic knowledge of the kind demonstrated by Conway and Bekerian (1987), although these findings were in themselves held to imply the existence of hierarchical knowledge structures similar to those proposed in this thesis. However, the data from the present study yield evidence that label retrieval and schema activation are not just associated processes but that that the former is actually dependent on the latter, as implied by the particular model under investigation.

In the first place, despite the relationship between them, appropriate complement responses were apparently made more easily than appropriate label responses, irrespective of question order. This is not only what was anticipated on the basis of the hierarchical model, but is, more generally, the outcome which would result if the retrieval process were stage-based with schema activation occurring at an intermediate point, since with each successive stage the probability of response failure would increase.

More importantly, as predicted antecedent only responses, which would be equivalent to partially successful retrievals in this stage-based framework, occurred between two and three times as often as the more anomalous label only responses, and, crucially, they did so in a systematic way which was consistent with the hierarchical model. Label only responses, on the other hand, were occasional and appeared to be more-or-less random in point of occurrence, which is suggestive of extraneous influences on pattern of responding. In a sense these differences are not as clear-cut as predicted by theory, since label only responses should not strictly have been able to occur at all. At the same time, any account of the relationship between complement and label responses which is based on a simple association of knowledge types should tend to predict much less imbalance between the circumstances under which the two kinds of response were made.

Such an account was also argued to suggest that question order would affect the likelihood of complement only and label only response patterns, since for the younger children in particular full attention was more likely to be sustained for the first of the two questions. Whilst there were slight indications that a successful response to the first question only was more likely than one to the second question only, regardless of focus, these effects were not significant for either response type. Taken overall, complement only responses were in fact more frequent after a failed label response than label only responses were when this element was requested first.

If this evidence favours a dependency of label retrieval on the activation of an appropriate event schema, it must be accepted that it is not, however, conclusive. Final evidence would rest, for instance, on a demonstration that label retrieval failed when activation of event schemata was blocked, a test which, although direct, might be technically difficult to put into practice. In the absence of such evidence, the incidence amongst younger children of mistaken label responses when emotion terms were requested first is a particularly suggestive additional pointer to a dependent relationship of the kind hypothesized, since selection of a label seems in these cases to have been determined by the complement in a manner counter to any simple associative chain. Whilst superficially it appears plausible that the label was isolated first, and then a complement associated with it identified, this account falls down because it provides no basis for initial retrieval of the label except as a guess or random response.

Mistaken label responses of the kind predicted by associative explanations of the relationship between complements and labels (i.e. those which occurred when complements were detailed first) were observed in small numbers. However, for the antecedent narratives these responses were exceptional, present in less than 4% of instances, and for the behaviour narratives, where they were more frequent, they are part of a general trend towards this type of error, regardless of question order. The significantly greater incidence of mistaken label responses for the behaviour narratives is again not easily assimilated into the simple associative account of label and schema relations, but it does fit well with the mooted tendency towards a fixed temporal focus in the processing of episode information and subsequent retrieval of emotion terms.

The overall evidence to support the idea of this temporal focus, particularly the apparently facilitatory effect of explicit questions about antecedent complements on retrieval of emotion terms for behavioural information, provides a further point consistent with the hierarchical model and its prediction of the dependent relationship between schema and label activation. If the complement questions served perhaps not actually to enhance schema activation, but at least to divert attention in the correct direction, and this in turn permitted emotion terms to be more readily accessed as compared to Experiment 3, then the implication is again that label retrieval requires prior isolation of an event schema. Taken together, Experiments 3 and 4 could therefore be regarded as constituting a form of the direct test for dependency outlined above.

Further than this, if label retrieval is dependent on schema activation, at least under the circumstances where only antecedent or behavioural features are available, the most obvious reason why this should be so is that, as has been argued, categorization of emotion requires a wider informational base than single types of feature. That appropriate labelling responses were correlated with appropriate complement responses of the kind singled out is again indicative that it is isolation of probable antecedent-behaviour conjunctions that tends to be important here. These effects are also all consistent with the hypothetical narrowing of activational range on presentation of joint features that was suggested by Rumelhart and McClelland (1981) to occur within networks of the type adapted as the basis for the hierarchical model.

Finally, both the data on the co-occurrence of complements and labels, and the evidence in favour of a tendency to focus attention on the normal temporal flow of events, provide wide support for a general primacy of activation of event schemata in processing episode information. Firstly, the temporal effect suggests forward-looking prescription or prediction is the most natural processing outcome when children are presented with information about aspects of emotional events, as would be expected given the crucial regulatory role played by this activity. More generally, though, the data demonstrate that throughout the age range considered by the studies here associational knowledge about event features is in advance of categorical knowledge, in line with the argument, proposed in Chapter 3, that it is the former which is acquired first.

Within the proposed model, an attempt to categorize emotion on the basis of a single antecedent or behavioural feature always begins with isolation of a schema for the whole episode. Each event schema that contains an approximation to the feature is activated, but activation is strongest where similarity between input and previously encoded information is greatest. This will be a function of how frequently the feature has occurred in past experience of each of the relevant episodes. Attention then focuses on the schema that is most strongly activated. Once an event schema has been selected in this way, retrieval of a label proceeds via activation of a general schema.

One consequence of this process is that input features will identify their most likely complement. For instance, the antecedent "being hit by brother" might have occurred most often in an episode where the behavioural complement was "hitting him back". Activation of the schema for this episode via information about the antecedent would therefore serve to link that antecedent to its most common behavioural outcome. The same process would apply if the behavioural feature were input. Experiment 3 provided indirect evidence that the first stage of label retrieval under these circumstances is of precisely this form. Target responses to the single feature narratives were correlated with estimates of the relative frequency of <u>combinations</u> of explicit feature and most probable complement.

It follows from this that children should always be able to describe a complement for a presented a feature if they are also able to produce a label for that feature: retrieval of the label depends on prior selection of an event schema that contains information about the complement. The converse does not hold: a selected schema might allow a complement to be identified, whilst being unable to activate a general schema to the level necessary for retrieval to proceed.

It is also possible that children in Experiment 3 were less successful at producing labels for single behavioural features because there were problems at the first stage of the retrieval process. This may be because behaviours are associated with a large number of equally probable antecedents. Alternatively, children may naturally tend to think of features in terms of their temporal flow. Thus rather than relating a behaviour to its antecedent, they may focus on events that would follow it. Both accounts suggest difficulties in the selection of event schemata which would in turn affect label retrieval.

However, the first explanation suggests that children should find it difficult to make a response if explicitly questioned about possible antecedents. If the second explanation is correct, and the problem is one of attention to strict temporal order, direct questioning may well have a facilitatory effect. In this case differences between the retrieval of labels from antecedents and from behaviours should be reduced.

Experiment 4 examined the relationship between complement and label retrieval in the light of the above predictions. Children aged 4 to 6, and 8 to 10, heard one of two sets of 12 narratives. These sets were similar to those used in the two single feature conditions (antecedent only, behaviour only) in Experiment 3. After each narrative children were asked to identify an antecedent where a behaviour had been described; or a behaviour where an antecedent had been described. They were also asked to say how they would feel under the circumstances (i.e. produce an emotion label). The order of these questions was counter-balanced within age group.

Responses were scored for the number of appropriate complements and labels identified by each child. Both elements increased significantly with age, and, unsurprisingly, they were positively correlated. Throughout the age range, though, significantly more complements were produced than labels. Responses to a narrative which identified a label but not a complement were rare, and occurred significantly less often than "complement only" responses. These "label only" responses were also randomly distributed throughout the age groups. This suggests that they may have been the result of distraction or other similar errors. Complement only responses, on the other hand, declined with age, and were strongly negatively correlated with full (i.e. label <u>and</u> complement) responses.

These points are consistent with a retrieval process which is reliant on selection of an event schema in the manner hypothesized. In addition, question order had no effect. This is hard to account for if the correlation between the two response elements reflects, say, mutual priming, rather than causal influence. If the former were the case, the response element requested first would tend to be identified slightly more often because of its proximity to the relevant material. In contrast to Experiment 3, there was no difference between antecedent and behaviour narratives in number of appropriate labels, or, for that matter, complements. This suggests that the original problem with the behaviour narratives was due to children imposing constraints of temporal order. But if explicit questions do facilitate production of antecedents, and this results in enhanced label retrieval, this is direct evidence that labelling is dependent on activation of event schemata.

These findings are also consistent with one of the conclusions drawn from Experiment 1. Here it was argued that relationships between antecedents and behaviour were particularly salient to children because knowledge of them allowed guidance or anticipation of reactions during an episode. In view of the likely need for rapid responses under these circumstances, such knowledge would be primed for immediate activation from the moment that it began to be acquired. It is plausible that the process for retrieval of emotion labels takes the form that it does because it capitalizes on pre-existing usage of event schemata.

Chapter 6: Function, structure, and content in concepts of emotion

In the opening chapter stress was laid on the importance of functionalist approaches to emotional development and the acquisition of emotional knowledge. From this general standpoint, three key adaptive or regulatory activities were defined: identification of emotion, prescription and prediction of behavioural responses to an emotion-provoking situation, and causal understanding and explanation of the course of emotional episodes. The informational requirements of these activities were argued to shape the process of knowledge acquisition, and both the content and organization of what is known.

On this basis, the objective of this volume and the empirical studies that it describes was specified to be an examination of children's knowledge of emotion, and the application of that knowledge, from the perspective of the three regulatory activities, in an attempt to define a general model of conceptual development in this area which was consistent with function. This final chapter reviews the model that emerged from the research reported above, and discusses both its strengths and potential weaknesses, before concluding with a brief outline of issues for further investigation.

6.1 *Summary description of the hierarchical model of emotion concepts and its relation to function*

Experiment 1 showed that children's knowledge of emotion could be successfully described in terms of instances of the four basic classes of qualitative feature identified in Chapter 1: antecedent situations, behavioural expressions, internal sensations, and mental states. From an early age, emotional knowledge (as opposed to that for other feeling states) was found to focus in particular on the relationship or conjunction between antecedents and behaviour, but with internal aspects of experience, especially mental states, gradually interposed within this framework.

This pattern of knowledge acquisition was held to be indicative of an on-going process of encoding of the experience of emotional episodes within event schemata, which permit both recognition of an episode, and prescription or prediction of behaviour within it. Activation of such schemata during an episode was defined as the source of characteristic mental states, with the consciously available features of these encoded within modified schemata as experiences of similar events are overlaid. Activation of these 'higher level' schemata, it was suggested, serves to facilitate the development of an increasing degree of personal control over emotional reaction.

Since, in this way, event schemata encode aspects of the process connecting antecedent to behaviour, they can also provide the basis for causal understanding of emotional episodes in the sense defined by Piaget (1972). Possession of this knowledge does not, in itself, equate with causal understanding, however, as mature forms of this activity are defined in terms of the attribution or investment of a conceived process in others, which in this context is taken to mean the accurate construction of the mental train of others. The available evidence suggests that this is a relatively late development compared to prescription and prediction, the beginnings of which can be traced back to infancy, although more primitive forms of causal comprehension may be present from the late pre-school years.

The reason for the different rate of development of these two activities lies, it was argued, in the nature of the regulatory functions that they serve, and their consequent knowledge requirements. Prescription and prediction, which are themselves dependent on episode recognition, have as their primary goal the production of adaptive behaviour within an episode. They need to be based, therefore, on rapid, low-level associational processes which capitalize on the observation and encoding of simple featural regularities and contingencies.

Causal understanding and causal explanation, however, usually occur post-event, and have the goal of making more explicit the structure of an episode, eventually tending to focus more specifically on sequences of events that do not conform to expectation. They are thus more reflective, conscious processes which will often require a high level of manipulation of representations, and transfer of knowledge across contexts, either in terms of abstraction of general principles, or insightful application of specific knowledge from one context to another. Appropriate application of knowledge is dependent in the first instance on identification of an overarching knowledge structure which encompasses the episode in question and others of a similar nature. In other words, it depends upon a process of categorization.

The knowledge structures required for processing of this kind were argued to consist of a hierarchy of encodings at different levels of detail, from autobiographical memories of single events, through event schemata dealing with the characteristics of repeated similar events, to general schemata which abstract and preserve the primary identifying features of particular classes or types of events, defined principally in terms of antecedent-behaviour conjunctions. At this highest level, different structures access and are accessed by different emotional terms which denote generic branches of experience; i.e. a term stands for a whole structure. These structures integrate abstractive and associational processes and the content on which they are based, and, since activation in one part of a structure has the potential to lead to activation in other parts, they effectively allow generalized knowledge to be applied to different contexts, and also permit specific knowledge to inform more general representations.

Such activation is not unrestricted, however. Integrated structures have to be acquired, and associative and abstractive processes are initially limited in the extent to which they can make use of the same knowledge. Even once integration has started to become more widespread, the probabilistic weighting of connections, and the decision-making criteria necessary for knowledge to be used effectively, entail variation in activation potential between different points at different levels of the hierarchy, and also variation in actual activation depending on access route.

Thus it is easier to recognize that a term is applicable to an episode than it is to generate that term oneself (Experiment 2), because the former provides both top-down and bottom-up activation, whereas the latter is reliant on bottom-up activation alone. The *relative* between-levels activation potential of different representations remains constant across access route, and varies as a function of prior activation of that link, which in the case of abstractive relationships between levels is directly equivalent to the frequency of experience of an episode (defined as an antecedent-behaviour conjunction). In the case of the link between general schemata and terms, it is functionally related to that frequency of experience.

The need for activation of one level by another to be above a criterial value for processing to occur results in the probability of a successful retrieval of information from another level also being defined by previous frequency of experience of an episode, as defined above (Experiment 3). Horizontal associational processing of event information is primary, however, at least initially, because of its more immediate adaptive value, its earlier acquisition, and its more automatic nature. Successful vertical processing, such as categorization, is dependent, according to circumstances, on successful horizontal processing (Experiment 4), or else on successful activation at the associational level, since otherwise there is no basis for activation of the connection between levels.

As a final point, it may be noted that successful integration of associative and categorical knowledge structures into an overall activational hierarchy can be viewed as ultimately crucial to the development of causal understanding and causal explanation. In addition to their original functional separation, the two types of knowledge are different in character. Associational knowledge, in the form of event schemata, encodes a greater wealth of detail, including, eventually, regularities of mental process intervening between antecedent and behaviour, although this knowledge is unstructured, personalized, and context-bound.

Categorical knowledge, in the form of general schemata and overarching terms is more structured and generalizable, but is much sparser in detail, with a predominant focus on antecedent-behaviour conjunctions across individuals and contexts. Integration of the two types of knowledge allows more specific detail, such as patterns of thought, to be retrieved via terms and general schemata, thus providing the informational basis through which explicit identification can become extended or transformed into attribution of process. At first such attribution may rely predominantly on insightful application of specific event schemata, but eventually more general principles or patterns of mental activity may be abstracted as part of general schemata. This last development may not take place until adolescence or even adulthood, however.

6.2 *Strengths and potential weaknesses of the hierarchical model*

The theoretical framework developed in this thesis, encapsulated in the hierarchical model and the account of the acquisition of the structures defined by it, requires further empirical work to be carried out on various detailed aspects in order for its validity to be more firmly established. However, before proceeding to identify key issues for future research, it will be useful to note some general points in favour of the model, as well as some potential criticisms of it.

On the positive side, the model successfully brings together in overall structures knowledge relating to the three main regulatory activities, as evidenced in guidance of personal emotional behaviour and anticipation of the behaviour of others, explicit causal understanding, and the use of the emotional vocabulary. Whilst all these areas have been investigated previously by many other researchers, there has been some tendency towards a fragmentation of the theoretical frameworks developed in each case, and in the developmental literature in particular it has often been unclear how the emotional knowledge evidenced by children at different ages in a range of studies might specifically be related to actual behaviour.

It can be argued that difficulties of this kind have stemmed, at least in part, from a recognition of the experiential and functional separation between the type of knowledge which allows explicit statements or judgements of emotion to be made outside of involvement in an on-going episode, and the cognitive activity which guides behaviour whilst a participant in an episode. Such a separation is crystallized in the apparently contradictory yet experientially valid nature of statements of the form "I was so angry I didn't know what I was doing when I threw the cup at his head". Although this is an extreme example, the separation is more generally evidenced by similar needs to treat one's own emotional behaviour as a case for explanation post-event.

The hierarchical model, however, provides a basis for this separation in terms of differences in the level and consciousness of processing involved in different functional activities, whilst at the same time preserving continuity of content and structure within emotional knowledge. By the same token, it also accounts for the experiential complexity of emotions, particularly in terms of mental states, as the result of multiple activations of schemata. Although in the main body of this volume attention was fixed on the selection of single schemata as the basis for action or subsequent processing, this need not mean that all other activations are inaccessible to consciousness. In fact, awareness of multiple activations, especially when a number of schemata are more-or-less equally appropriate, would serve to explain the mental confusion that not infrequently accompanies emotional episodes. More generally, the model provides a functional basis for the actual emergence of mental states within emotional experience as the product of activity which directly enhances the scope of behavioural control.

In terms of phenomena more removed from direct emotional experience, the model serves to account well for characteristics of children's performance on a variety of judgement and categorization tasks, as has been seen. In particular, it suggests a consistent mechanism that could give rise to 'prototype' style effects at different levels of detail, whilst at the same time maintaining coherent event knowledge.

Again, the studies described here have focused on a very limited, albeit basic, range of emotion terms. The model allows, however, for expansion of vocabulary within the sub-classes defined by primary terms such as "happy", "sad", "angry", "scared", and so forth (as is argued to occur by Conway and Bekerian, 1987; and by Shaver, Schwartz, Kirson, and O'Connor, 1987), by means of further differentiation of general schemata of different types within a sub-class, and the attachment of these to more refined terms for varying shades of feeling (e.g. within "happy", differentiation into "satisfaction", "pleasure", "joy", and so on).

A final, general point is that the hypothetical mechanisms used to define the hierarchical model are current within cognitive psychology and cognitive science, and also maintain a continuity between concepts of emotion and other types of concepts, both causal and non-causal. In one sense this is important because of the gathering weight of evidence in favour of connectionist models of cognition for a vast range of activity (see e.g. McClelland, Rumelhart, and Hinton, 1986). Perhaps as significant, though, is the demonstration that despite the unique phenomenological nature of emotion, its supporting cognitions need not be specialized.

In spite of these strengths, though, the hierarchical model and the processes that it implies remain open to a number of possible objections, at least at a superficial level. The most important of these are considered in turn below, together with countering arguments.

Perhaps the most fundamental criticism of the model that could be raised is that it is too mechanistic in its nature, and fails to accurately reflect the experience of emotion. This line of argument is an extension of objections that have been raised previously by a number of authors with regard to possible relationships between emotion and cognition, and particularly to what have been seen as attempts to reduce emotions to a set of cognitions (see e.g. Zajonc, 1980). A key point in this debate has tended to be the issue of the unmistakable biological origin of emotion, which has often been suggested to render affective processes both functionally and experientially distinct from 'pure' cognitions.

In the present context two responses can be made. The first is that, as both Mead (1934) and Vygotsky (1978) argue, the process of socialization produces a transformation of biologically-based behavioural functions as a result of the acquisition of explicit knowledge. Human emotion is clearly dependent on knowledge at some level, since, on the one hand, reactions are modified by the perceived characteristics of antecedents, and, on the other, behavioural expression is not random, but targeted according to perceived agency and responsibility. At the very least, then, cognition plays a major role in shaping the external aspects of emotional experience, such as what is reacted to, and what form that reaction takes. The proposed model merely constitutes an attempt to formalize the nature of that role.

The second point is that the account of emotional processes developed here does not in fact reduce the experience of emotion solely to its cognitive components. The biological basis of emotion is regarded as being preserved in the changes in level of physiological arousal that accompany involvement in an episode. The subjective awareness of these changes was argued previously to be a key feature distinguishing genuine emotional reactions from simple adoption of a behavioural role that gives an outward appearance of emotionality.

A more specific form of the objection that the hierarchical model is too mechanistic in character relates to the process of making judgements of emotions, particularly those of other people. In contrast to the approach to this issue encapsulated in the model, where such judgements are viewed as determined by featural knowledge derived from prior experience, and by the organization of that knowledge, other authors in the developmental sphere have placed greater emphasis on children's use of an intuitive grasp of the experience of others, embodied in a form of role-taking. Thus, Gnepp (1983), for instance, describes such judgements almost in terms of a kind of rudimentary 'verstehen' or insight. Harris (1989) suggests that it is children's ability to creatively imagine their responses to a situation and to project these onto others which is central to their appreciation of emotional experience outside their own, and which is thus presumably a major influence on performance in judgement tasks.

Whilst the apparent flexibility of judgement accorded to children by these approaches is appealing, they do not, however, provide any clear basis for an explanation of the systematic variation in responses to different instances of antecedent and behavioural features noted in Experiments 2 and 3. Although, admittedly, the narratives used in these studies focused on the child him- or herself, rather than someone else, as supposed protagonist, this appears unlikely to have greatly affected the way in which children arrived at their judgements. The episodes presented were hypothetical, and Barden, Zelko, Duncan, and Masters (1980) report that there were no obvious differences in children's responses to this type of material when they varied identification of the protagonist between self and another.

It does, in fact, seem hard to account for the findings of Experiments 2 and 3 other than in terms of the existence of informational constraints on judgement. Within these constraints, though, it is possible that children do vary in the extent to which they actively take on the role of the portrayed protagonist, and 'experience' for themselves the episode under consideration. Such variation may be a function of the degree to which the child's attention is fixed on an activated event schema, and thus effectively on the re-living of personal experiences, as opposed to on the task of judgement. This mode of attending to activated knowledge could plausibly form a more general basis for empathic responses to the emotions of others.

A further objection which could be raised is that the model focuses too much on a single causal direction, from antecedent to behaviour, both in terms of the actual sequence of an episode and in terms of causal understanding, whereas the process of emotional causation is in fact potentially multidirectional, as was considered in Chapter 1. Evidence that this is the case is provided by demonstrations of successful induction of emotion via recall of an appropriate situation (Bower and Cohen, 1982), adoption of relevant facial expressions (Laird, 1974) or more general motor activity associated with feelings (Zajonc and Markus, 1984), and physiological arousal (Schachter and Singer, 1962; Maslach, 1979).

However, it remains the case that full-blown experience of an emotion is predominantly brought about by a specific antecedent, or perhaps more properly an antecedent-evaluation conjunction, whether or not the cognitive element is conscious. Aside from the fact that this accords with experience, it is also indicated by the necessity for induction procedures to be bolstered in some way in order for them to be effective. Bower and Cohen, for instance, use hypnosis to render recall close to actual experience (c.f. the point made above concerning attention to schema activation), and Schachter and Singer found interpretation of arousal, and consequent emotion, to be dependent on the antecedent or context provided. In the absence of this element, Maslach reports that subjects claim to experience only vague negative affect.

Moreover, whilst discussion of the model has focused on the causal role of antecedents, the schema-based approach which has been adopted, together with the mechanism of spreading activation, explains why induction techniques are effective, but also why they tend not to produce full-scale responses. Presentation of any element of an event schema will tend to lead to its activation, but, as Experiment 4 suggests, there is an attentional bias towards activation that permits prescriptive or predictive regulation in a positive temporal direction. This might be taken to indicate that it is the presence or absence of a requirement for behavioural regulation that determines whether or not full experience of an emotion occurs. If this were the case it would certainly be consistent with the general desirability of adaptive efficiency.

In something of the same vein, it may be argued that more generally the model focuses too much on the role of conjunctions of antecedent and behaviour in definition of an emotion, and that it is not necessarily these contingencies which are required for identification because labelling can take place in spite of behavioural suppression or substitution. However, in terms of the model there is no necessary difference from the point of view of identification between behaviours which are positive expressions of emotion and those which are in this sense suppressions. Many of the behaviours cited as being associated with feelings by children in Experiment 1 were in fact control behaviours. The purpose of these, though, it is argued, is not to hide emotion, but to moderate the feeling and to maintain an acceptable (i.e. adaptive) pattern of interaction within a given context. Such behaviours still provide featural cues to emotional state, not least because prescription of personal action and recognition and prediction of the behaviour of another are based on shared knowledge.

It may be true, however, that too much emphasis has been placed on *explicit* antecedents and behaviour as regards identification of personal emotion. From this perspective, the onset of consciousness of schema activation in effect gives rise to an implicitation of behaviour (i.e. awareness of what you'd like to do, which is not necessarily equivalent to what you actually will do). After this point the conjunction between antecedent and implicit behaviour may gradually become as definitive as that between situation and explicit behaviour. Similar implicitation of antecedents may also occur, via the availability of particular conscious evaluations which are not evident to others.

In this sense, then, other featural conjunctions could be used to identify emotion, but, as noted in Chapter 2, the distinction between the content of antecedents and behaviour and their mental equivalents tends to blur in this context. The remaining class of feature, arousal or internal sensation, has been demonstrated to be insufficiently distinctive on its own to permit identification in the case of most emotional experience, although, as argued before, it may have secondary significance when it occurs in conjunction with other classes of feature. More generally, detailed arguments have already been presented with regard to the requirement for disambiguation via featural *conjunctions*.

Finally, one further reason why the emphasis on antecedent-behaviour conjunctions as paradigmatic may seem either restrictive, or even artificial, is that, in order to simplify discussion, and also to facilitate practical manipulation within the studies which have been described, these features have been treated here as single compressed units. In practice, and especially for adults, they may in fact be of a looser, more extended character.

A potentially more serious objection to the account of emotion concepts and their development which has been presented here is that it ignores the fact that variation in individual reaction to a situation does occur, and, more crucially, that children apparently have the ability to make use of knowledge of this variation when making judgements of emotion (Gnepp, Klayman, and Trabasso, 1982; Gnepp, 1989). Gnepp et al. define three types of knowledge in this context: "situational", or universal; "normative", or that appropriate to separate social groupings; and "personal", which applies to individual idiosyncrasies. The emphasis throughout this thesis has in fact been on the acquisition of knowledge applicable both to self and to others (i.e. situational or normative in terms of Gnepp et al.'s definitions). However, the existence of evidence that more personalized judgements can be made by children suggests that the gradual generalization of emotional knowledge is paralleled by an additional process of individuation (c.f. Nelson, 1983, on the abstraction of detail from holistic concepts).

Interestingly, though, the hierarchical model provides a basis on which such individuation could occur which fits well with the available data on personalized judgements viz. separate storage of antecedent-behaviour contingency values for important others, or important other groupings. Gnepp et al. (1982) examined children's judgement responses to narratives in which there was an implicit conflict between a probable situational response and a defined normative response, between situational and personal response, and between normative and personal. They found that even 4-year-olds chose facial expressions to indicate the more individualized of the possible emotional responses on two-thirds of occasions.

However, the material used in this study explicitly stated the antecedent and behaviour contingency for all but the situational response (which was presumed to be known already), and, moreover, couched this in terms which gave it a probability of association of 1. For instance, one of the situational-personal conflict narratives was as follows:

"This is a story about Sarah. She lives in Green Valley. Sarah is friendly with tigers and plays games with them all the time. One day, Sarah was walking along and she saw a tiger." (Gnepp et al., 1982, p. 116).

Under the circumstances, it is perhaps more informative that 4-year-olds made inappropriate responses so *often*.

That children as old as 10 years do in fact have much greater difficulty in extracting and separating individual contingencies from observation for themselves is indicated by a series of studies reported by Gnepp (1989). When children were described a previous situation involving a protagonist (and in some cases additionally told of protagonist's reaction), and then asked about reaction to a repeat of that situation, the majority of 5-year-olds failed to make a personalized inference, and even one-third of 10-year-old's responses were inappropriate in this sense. The implication is that storage of individual contingencies is possible, but that it is a development that occurs after more generally applicable schemata have been acquired.

A final, more general criticism that can be made about the model is that it relies too much on analogues from object concepts and physical causation. With regard to the latter, one theoretical distinction which has often been drawn between physical and social causality is that the first is deterministic in nature, whereas the second is probabilistic. It is not clear, however, whether as far as children, or even non-expert adults, are concerned that this is a valid or functional distinction. Work on children's ideas about why objects float and sink (Howe, Rodgers, and Tolmie, in press), for example, shows the existence of associational complexes (e.g. being light and round, or having air in) in which the presence or absence of features is held to affect the probability of outcome, but none is treated as a necessary or sufficient cause.

Apparent analogies between emotional and physical concepts extend even further than this. Anderson, Tolmie, Howe, Mayes, and Mackenzie (1990) report a lack of correlation between secondary school children's predictions and explanations of the trajectories followed by moving objects under conditions of free fall. Whilst the relationship between prediction and explanation of emotional responses was not explicitly investigated here, the model which has been developed suggests a similar separation would be likely, at least during the primary school age range. Gnepp, McKee, and Domanic (1987) provide some evidence that this is the case, since children's awareness of the role of evaluation in determining emotional response was not found to be matched by corresponding judgements of likely reaction. In general, the extent of similarities between physical and emotional concepts is a matter for empirical research. As noted in the first part of this section, though, an approach derived from physical concept models has already been shown to be efficacious to some extent.

6.3 *Issues for future research*

The foregoing discussion suggests that future research should focus on three broad areas:

<u>Knowledge of featural contingency and its relationship to the active production or retrieval of emotion terms</u>

There are a number of issues of importance here, but, in view of its central position within the hierarchical model, the greatest need is perhaps for an evaluation, under less constrained circumstances than was the case in Experiment 4, of the predicted primacy of isolation of antecedent-behaviour conjunctions (i.e. event schemata) in processing event information. This could be achieved via open-ended questioning and content analysis with regard to the associations children make with presented situations or behaviour at different ages.

In view of the apparent effects of the material used by Gnepp et al. (1982), another potentially productive line of research would be direct observation of the impact of manipulations of probable antecedent-behaviour contingencies on labelling responses. This would involve explicit provision of probabilities, varying in size, of different complements for presented antecedents or behaviour and requests for judgements of likely emotional reaction. Data from such a study would go some way towards establishing more definitively whether categorization of emotion is indeed dependent on isolation of the most probable antecedent-behaviour conjunction, as has been argued. The same methodology would also allow more direct investigation of the effects of feature ambiguity as defined in Chapter 4.

Gnepp's work on personalized judgements of emotion suggests that investigation of children's ability to extract and store individual contingencies from observation at different ages could best be studied using more extended material to build up a character's 'history'. This could be done via presentation of a series of related narratives, with children making direct estimates of the character's probable behavioural responses (rather than named emotion) at key points in the series, and comparing these judgements to the child's prediction of his or her own response. Depending on the situations used, this approach could have the additional advantage of allowing study of children's ability to transfer response probabilities from one context to another (i.e. the development of general schemata).

The predicted effects of frequency of experience of an episode and of frequency of external labelling on the active retrieval of emotion terms are somewhat harder to investigate empirically in any direct way, as are the more general predictions about the integration of associative and categorical knowledge. Ideally what is required here is a longitudinal study of estimates of response likelihood and of judgements of emotional category, linked to behavioural observation or a parental diary. Clearly such work would have to be small scale, though, and would be subject to considerable time constraints.

Understanding of emotional causation

Previous studies of children's understanding of causality in emotion have tended to rely either on responses to circumscribed questions, or on indirect inferences based on other types of response, such as categorization under specified conditions. It would seem likely to be more informative if future studies avoided these kinds of interpretative constraints, at least until more detailed data on the variables which might be of interest is available. Of particular potential importance would be studies which attempted to isolate more clearly the range of possible explanation types, examined the distribution of these at different ages, and identified whether they are general or context-bound, as the account given in this thesis suggests should be the case in the primary age range.

Thus what is indicated are studies which employ open-ended questioning on causation, possibly under circumstances where children are presented with descriptions of more and less likely behavioural responses within more and less familiar episodes. This specific combination is of interest because, in general, more mentalistic explanations might be expected to be provided for the less likely behavioural responses, in order to account for the departure from norm, but the model predicts that these explanations should be constrained by familiarity and the availability of associative detail.

Comparison of physical and social causal concepts at different ages

Finally, in view of the apparent success achieved thus far from application of physical concept models to emotion, and the theoretical appeal of Piagetian notions of causal explanation for accounts of the development of the understanding of emotional processes, more detailed and direct comparison of the acquisition of physical and social concepts, especially those relating to causation, is clearly desirable.

On one level, studies in of this kind could address specific issues such as whether there is intra-individual correlation between understanding in diverse areas (i.e. whether there is a form of individual 'conceptual style'). This might be taken to be the case on the basis of evidence that there exists a considerable range of individual differences within age bands in understanding of a topic (see e.g. Howe et al., in press), which is suggestive of variation in the way that children make use of the regularities provided by observation.

Of even greater interest, though, is the more general issue of the extent of any similarity of conceptual structures in what have previously been taken to be markedly different domains. The evidence presented here in favour of widespread correspondences is particularly intriguing in view of differences, not just in terms of basic subject matter, but also in some instances in explicit instruction, and, more widely, in availability of information as a result of being social objects but only being able to experience most physical objects from an external perspective. Such pointers hold out the prospect of being able to isolate truly general principles of conceptual development relating both to action and explanation.

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Appendix 1: Raw Data for Experiment 1

1.1 Percentage of children in each age group (n = 32) referring to each of four basic cue types (antecedent situations, behavioural expressions, internal sensations, and mental states) for each of six feelings

		Age Group		
Feeling	Cue Type	5-year-olds	8-year-olds	10-year-olds
Happy	Antecedents	75	94	87
	Behaviours	66	97	97
	Sensations	41	56	62
	Mental States	6	47	62
Sad	Antecedents	72	87	87
	Behaviours	56	66	78
	Sensations	44	59	59
	Mental States	6	47	62
Scared	Antecedents	84	94	90*
	Behaviours	47	97	90*
	Sensations	41	75	81*
	Mental States	37	37	74*
Wide-Awake	Antecedents	62	75	69
	Behaviours	56	91	97
	Sensations	41	59	69
	Mental States	9	34	72
Tired	Antecedents	59	78	81
	Behaviours	75	97	94
	Sensations	56	75	91
	Mental States	16	41	66

cont'd...

Hungry	Antecedents	62	72	66
	Behaviours	53	84	81
	Sensations	50	97	100
	Mental States	16	31	44

* n = 31, missing data from 1 female subject due to tape recorder malfunction

1.2 Antecedent situations and behavioural expressions referred to for each of six feelings, with number of children in each age group (n = 32) making reference

Happy

Antecedent	5 y.o.	8 y.o.	10 y.o.
Playing with friends	11	11	10
Being given a present	5	8	13
Being taken out	4	11	7
Going to birthday party	4	4	4
Christmas	1	5	4
Good things happen	0	2	7
Others joking	3	4	1
Eating	2	1	2
Making others happy	1	2	2
Others being nice	0	4	1
Getting what you want	0	3	1
Winning something	0	0	4
Doing good things	0	0	4
Doing something well	0	0	4

Behaviour	5 y.o.	8 y.o.	10 y.o.
Smile	18	23	19
Laugh	4	8	9
Jump around	0	6	9
Be silly	2	5	7
Say about feeling	3	4	7
Agree to play	1	1	5
Suggest things to play	0	2	2
Do what told	0	2	1
Talk about nice things	0	1	2
Be kind to others	0	1	2
Cry	0	2	0
Work well	0	1	1
Breathe	1	0	0
Talk funny	1	0	0
Ask for present	1	0	0
Try to cheer			

cont'd...

Good dreams	3	0	0
Getting good toy	1	1	1
Relatives have baby	0	0	3
Reading	2	0	0
Playing tricks	1	1	0
Getting back home	1	1	0
Getting pet	1	1	0
Relatives visiting	1	0	1
See someone after a long time	0	1	1
Football match	0	0	2
Talking about good things	0	0	2
In bedroom	1	0	0
Working	1	0	0
Daytime	1	0	0
Having been good	1	0	0
Touching flowers	1	0	0
Cooking	1	0	0
Loving people	1	0	0
Getting letter	1	0	0
Snow	1	0	0
Not going to school	0	1	0
Writing about nice things	0	1	0
Finding something that was lost	0	1	0
Playing instrument	0	1	0
Being naughty	0	1	0
Bedtime story	0	1	0
Weddings	0	0	1
Being on stage	0	0	1
Christening	0	0	1
Finding something	0	0	1
Others opening presents	0	0	1
Family come home	0	0	1
Good news	0	0	1
people up	0	0	1
Open present	0	0	1

Sad

Antecedent	5 y.o.	8 y.o.	10 y.o.
Death of a relative	4	8	11
Being hurt by someone	4	8	7
Being told off	8	4	5
Not having anyone to play with	3	8	4
Getting hurt accidentally	4	4	5
Someone else getting hurt	1	2	5
Losing something	2	2	0
Someone else having something you want	1	1	1
Being lost	1	1	1
Something nasty happening	0	1	2
Going to school	1	1	0
Things going wrong	1	0	1
Being woken up	1	0	1
Not being allowed to do something	1	0	1
Being nasty to someone else	0	1	1
Not having anything to do	0	1	1
Football team losing	0	0	2
Saying goodbye to someone	0	0	2
Pet running away	1	0	0
Not being allowed to stay up	1	0	0
Someone taking			

Behaviour	5 y.o.	8 y.o.	10 y.o.
Cry	11	14	11
Turn down head/ mouth	7	3	8
Not do anything	2	3	9
Not say anything	1	2	9
Not be nice to others	0	0	4
Say about feeling	0	2	1
Go away	0	2	1
Ask friend to cheer you up	1	0	1
Scream	1	0	1
Go to bed	0	1	1
Change subject	0	0	2
Say you don't want play	0	0	2
Go floppy	0	0	2
Drag feet	0	0	2
Go to teacher	1	0	0
Go to family	1	0	0
Lie down	1	0	0
Moan	0	1	0
Runny nose	0	1	0
Bang on floor	0	1	0
Kick stone	0	0	1
Act grumpy	0	0	1
Behave differently	0	0	1
Frown	0	0	1
Stump	0	0	1
Don't eat	0	0	1
Take deep breath	0	0	1

cont'd...

your things away	1	0	0
Someone telling on you	1	0	0
Someone else crying	1	0	0
Creepy-crawlies	1	0	0
Not having birthday	1	0	0
Family in hospital	1	0	0
Not getting something you want	0	1	0
Parent going away	0	1	0
Going away from home	0	1	0
Parent going out	0	1	0
Not being allowed to have pet	0	1	0
Hearing something sad	0	1	0
Dreams	0	1	0
Nature	0	1	0
Parents arguing	0	0	1
Someone being in jail	0	0	1
People ignoring you	0	0	1
At the end of a holiday	0	0	1
Losing friend	0	0	1
Getting bad marks	0	0	1
Someone breaking something of yours	0	0	1

Scared

Antecedent	5 y.o.	8 y.o.	10 y.o.	Behaviour	5 y.o.	8 y.o.	10 y.o.
Strange noises	16	12	6	Shake	3	13	15
Being in the dark	7	8	6	Run away	2	12	9
Horror films on TV	5	7	7	Seek adult comfort	4	6	1

cont'd...

Nightmares	5	6	2	Say about feeling	0	9	5
Someone making you jump	2	3	4	Make scared face	2	3	1
Somebody hitting you	1	3	5	Cry	0	3	2
Wild animals	2	2	1	Go stiff	0	3	1
Being in a strange place	0	1	3	Look around	0	3	1
Being told off	1	1	1	Scream	0	2	2
Creepy-crawlies	1	0	2	Gasp	0	2	1
Having done something bad	0	0	3	Jump	0	1	2
Frightening stories	1	1	0	Keep still	1	0	1
Starting new school	0	2	0	Pant	1	0	1
Being lost	0	1	1	Go white	0	1	1
Death of a relative	0	2	0	Turn round quickly	0	1	1
Someone about to shoot you	0	0	2	Close eyes	0	1	1
Being alone	0	0	2	Say "Oh no!"	0	2	0
Electric shock	0	0	2	Hold on to something	0	2	0
Being woken up	1	0	0	Stare	0	2	0
Having accident	1	0	0	Talk a lot	0	0	2
Someone seeing you do something	1	0	0	Panic	0	0	2
Coming back to house after a holiday	1	0	0	Sit down	1	0	0
Scary games	0	1	0	Say something silly	1	0	0
Sleeping at someone else's house	0	1	0	Chase thing away	1	0	0
Saying you're scared	0	1	0	Sit up	1	0	0
Relative in hospital	0	1	0	Pull up socks	1	0	0
Having fortune told	0	1	0	Punch tummy	1	0	0
Going far away	0	1	0	Shout	1	0	0
Running fast	0	1	0	Go straight to bed	0	1	0
Going to dentist	0	1	0	Watch out for thing	0	1	0
Falling over	0	1	0	Jump out of bed	0	1	0
Fire	0	1	0	Gulp	0	1	0
Climbing	0	1	0	Red face	0	1	0
				Eyes go wide	0	1	0
				Lie in bed	0	1	0
				Behave funny	0	1	0
				Not do what you're			

cont'd...

Someone stronger does				told	0	1	0
something bad	0	0	1	Bite nails	0	0	1
Meeting people who				Do what you're			
don't like you	0	0	1	told	0	0	1
See someone				Can't sleep	0	0	1
suspicious	0	0	1	Don't touch thing	0	0	1
Big wave at beach	0	0	1	Teeth chatter	0	0	1
Something happens				Turn away	0	0	1
same as in film	0	0	1	Cringe	0	0	1
Getting big shock	0	0	1	Say "Let's not go			
Bet all your money	0	0	1	there"	0	0	1
Look on people's				Pull feet up	0	0	1
faces	0	0	1	Huddle up	0	0	1
See something				Keep very quiet	0	0	1
horrible	0	0	1	Voice shakes	0	0	1
Being suspended from				Be too normal	0	0	1
school	0	0	1	Can't do anything	0	0	1
				Careful of			
				everything	0	0	1
				Hair stands up	0	0	1
				Back up	0	0	1
				Get dramatic	0	0	1
				Hunch back	0	0	1
				Cover yourself with			
				your arms	0	0	1

NB For 10 y.o. n = 31 due to missing data

Wide-Awake

Antecedent	5 y.o.	8 y.o.	10 y.o.	Behaviour	5 y.o.	8 y.o.	10 y.o.
Morning	11	4	4	Have eyes open	7	16	14
Daytime	4	7	1	Be lively	3	11	17
Being woken by noise	5	3	1	Get up	2	3	4
Being active	0	5	3	Play	2	3	4

cont'd...

Washing	0	1	6	Talk	2	1	2
Playing	1	2	3	Say about feeling	1	2	2
Waking up	0	3	3	Watch people	1	2	2
When it's sunny	3	2	0	Walk	0	4	1
Nighttime	2	3	0	Can't sleep	0	3	1
At breakfast	2	1	0	Do things	0	0	4
Working at school	2	1	0	Stay up late	0	3	0
In the wind	0	3	0	Wide-awake face	2	0	0
Going to bed early	0	0	2	Work	1	0	1
After long sleep	0	0	2	Sit straight	0	2	0
Weekend	0	0	2	Suggest doing			
Watching TV	1	0	0	active things	0	0	2
After dream	1	0	0	Help others	0	0	2
Staying in bed	0	1	0	Sigh	1	0	0
Rubbing eyes	0	1	0	Sing	1	0	0
Going to bed late	0	1	0	Can do anything	0	1	0
Talking	0	1	0	Eat	0	1	0
Being put to bed	0	1	0	Flex muscles	0	1	0
Drinking coffee	0	1	0	Smile	0	1	0
Pinching yourself	0	1	0	Read	0	0	1
Eating	0	1	0	Dress	0	0	1
Just gone to bed	0	1	0	Go to school	0	0	1
Noise	0	0	1	Do what you're			
Being out	0	0	1	told	0	0	1
Something good				Annoy people	0	0	1
happening	0	0	1	Do things well	0	0	1
Christmas	0	0	1	Say about feeling			
Taking it easy	0	0	1	good	0	0	1
				Agree to do things	0	0	1

Tired

Antecedent	5 y.o.	8 y.o.	10 y.o.	Behaviour	5 y.o.	8 y.o.	10 y.o.
Bedtime	5	7	3	Sleep	9	13	13
Being active	3	5	7	Close eyes	6	14	15

cont'd...

Nighttime	6	5	3
Staying up late	3	3	8
Working a lot	1	3	10
Walking a long way	1	6	5
Early morning	1	6	4
After school	1	4	0
At school	1	0	3
In bed	3	0	0
Playing too long	2	0	1
Daytime	1	1	1
Evening	1	1	1
Reading	0	3	0
Watching too much TV	0	1	2
Slept badly	0	1	2
Getting up too early	1	0	1
When it's hot	1	0	1
Driving a long way	0	2	0
Talking too long	0	0	2
Drinking too much	1	0	0
In front of fire	1	0	0
When the radio's on	1	0	0
After meal	1	0	0
Bedtime story	0	1	0
When ill	0	1	0
Carrying a lot	0	1	0
Been hit	0	1	0
Home from long journey	0	1	0
When out	0	1	0
Bright light	0	0	1
Having nothing to do	0	0	1
Doing something a lot	0	0	1
On bus	0	0	1
Christmas	0	0	1

Yawn	9	7	11
Sit down	3	11	10
Flop	3	9	9
Say about feeling	4	4	6
Go to bed	3	4	4
Can't do anything	2	3	6
Splash water on self	0	3	4
Stretch	2	3	1
Stagger	1	5	0
Ask others to go slowly	0	4	2
Stay in bed	0	3	2
Ask to go to bed	0	4	0
Ask to stop doing things	0	2	2
Pale face	1	1	1
Bags under eyes	0	2	1
Pant	0	2	1
Can't be active	0	1	2
Don't say anything	0	0	3
Can't work	0	0	3
Snore	2	0	0
Eyes run	1	1	0
Rub eyes	1	1	0
Don't look good	1	1	0
Don't play	0	2	0
Shake head	0	2	0
Blink	0	1	1
Put things down	0	1	1
Talk funny	0	1	1
Switch off light	0	0	2
Go home	1	0	0
Legs shake	0	1	0
Have hot drink	0	1	0
Suck thumb	0	1	0
Moan about getting			

cont'd...

up	0	1	0
Day dream	0	1	0
Don't listen	0	1	0
Stamp on floor	0	1	0
Do things wrong	0	0	1
Cry for no reason	0	0	1
Don't eat	0	0	1
Wake up late	0	0	1
Be horrible	0	0	1

Hungry

Antecedent	5 y.o.	8 y.o.	10 y.o.	Behaviour	5 y.o.	8 y.o.	10 y.o.
Not having eaten	7	4	8	Eat	6	18	10
Waiting for meal	3	4	6	Say about feeling	5	15	13
Mealtime	6	2	4	Get food	2	4	6
Someone else eating	1	6	3	Ask for food	2	5	1
Morning	2	2	3	Tummy rumbling	0	4	2
Not having food	2	1	4	Hungry face	4	0	0
Seeing food	1	4	2	Flop	1	0	3
Daytime	1	3	0	Clutch stomach	1	1	0
Smelling food	3	0	0	Look at food	0	2	0
Having been active	1	1	0	Suggest eating	0	1	1
Someone cooking	1	1	0	Keep going into kitchen	0	1	1
Someone else being given food	0	1	1	Eat anything	0	1	1
After school	0	1	1	Moan	0	0	2
After bad meal	0	1	1	Grab food	0	0	2
Sleeping	1	0	0	Keep still	1	0	0
Nighttime	0	1	0	Drink	0	1	0
Travelling	0	1	0	Swallow saliva	0	1	0
Someone talking about food	0	1	0	Get nasty	0	1	0
Working a lot	0	0	1	Keep talking about food	0	1	0
Having nothing to do	0	0	1	Mouth opening	0	1	0

cont'd...

Lie down	0	1	0
Make faces	0	1	0
Accept food	0	1	0
Say you're going to get food	0	0	1
Sleep	0	0	1
Look at someone eating	0	0	1
Can't do anything	0	0	1
Cry for no reason	0	0	1
Do things wrong	0	0	1

1.3 Percentage of children credited with knowledge of internal sensation in each age group who described a specific pattern of activity, for each of six feelings

	Age group			
Feeling	5-year-olds	8-year-olds	10-year-olds	All Age Groups
Happy				
No. credited	13	18	19	50
No. specific	2	2	9	13
Percentage	15	11	47	26
Sad				
No. credited	14	19	19	52
No. specific	5	13	11	29
Percentage	36	68	58	56
Scared				
No. credited	13	24	25	62
No. specific	6	15	23	44
Percentage	46	63	92	71

cont'd...

Wide-Awake				
No. credited	13	19	22	54
No. specific	3	9	16	28
Percentage	23	47	73	52
Tired				
No. credited	18	24	29	71
No. specific	4	16	24	44
Percentage	22	67	83	62
Hungry				
No. credited	16	31	32	79
No. specific	10	25	32	67
Percentage	63	81	100	85

1.4 Frequency of reference within each age group to each of five types of mental cue, for each of six feelings (percentage frequencies in parentheses)

		Age Group		
Feeling	Cue Type	5-year-olds	8-year-olds	10-year-olds
Happy	M/A	2 (100)	10 (38)	14 (33)
	M/B	0 (0)	3 (11)	13 (30)
	M/MA	0 (0)	6 (23)	8 (19)
	M/E	0 (0)	6 (23)	7 (16)
	M/FE	0 (0)	1 (4)	1 (2)
Sad	M/A	3 (100)	4 (18)	14 (25)
	M/B	0 (0)	9 (41)	19 (34)
	M/MA	0 (0)	4 (18)	11 (20)
	M/E	0 (0)	4 (18)	9 (16)
	M/FE	0 (0)	1 (4)	3 (5)

cont'd...

Scared	M/A	7 (47)	12 (43)	15 (30)
	M/B	0 (0)	5 (18)	10 (20)
	M/MA	1 (7)	4 (14)	13 (26)
	M/E	6 (40)	4 (14)	11 (22)
	M/FE	1 (7)	3 (11)	1 (2)
Wide-Awake	M/A	0 (0)	1 (5)	2 (5)
	M/B	1 (33)	12 (63)	20 (49)
	M/MA	2 (67)	5 (26)	8 (19)
	M/E	0 (0)	1 (5)	10 (24)
	M/FE	0 (0)	0 (0)	1 (2)
Tired	M/A	0 (0)	0 (0)	0 (0)
	M/B	4 (80)	21 (72)	27 (66)
	M/MA	0 (0)	5 (17)	7 (17)
	M/E	0 (0)	3 (10)	7 (17)
	M/FE	1 (20)	0 (0)	0 (0)
Hungry	M/A	1 (20)	1 (5)	2 (8)
	M/B	3 (60)	11 (55)	12 (48)
	M/MA	1 (20)	2 (10)	5 (20)
	M/E	0 (0)	5 (25)	6 (24)
	M/FE	0 (0)	1 (5)	0 (0)

Key: M/A Representations of Antecedents
M/B Representations of Behaviour
M/E Evaluations
M/MA Mental Activity
M/FE Figurative Evaluations

1.5 Frequency of occurrence in each age group of dialogues combining in sequence two or more specific cue types for each of six feelings, and for emotions and non-emotions (sequences in order of descending rank for total frequency)

		Feeling/Feeling Type							
Cues Combined	Age Group	Happy	Sad	Scared	Emotions	Wide-Awake	Tired	Hungry	Non-emotions
A + B	5 y.o.	4	3	4	11	4	2	4	10
	8 y.o.	14	6	24	44	5	11	4	20
	10 y.o.	11	10	9	30	3	11	5	19
	Total	29	19	37	85	12	24	13	49
B + I	5 y.o.	1	0	1	2	0	1	0	1
	8 y.o.	1	3	0	4	2	5	2	9
	10 y.o.	3	4	6	13	9	14	4	27
	Total	5	7	7	19	11	20	6	37
B + M/B	5 y.o.	0	0	0	0	1	2	0	3
	8 y.o.	1	0	2	3	7	8	2	17
	10 y.o.	2	7	4	13	8	10	1	19
	Total	3	7	6	16	16	20	3	39
B + M/MA	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	3	3	2	8	1	3	3	7
	10 y.o.	4	6	1	11	5	3	3	11
	Total	7	9	3	19	6	6	6	18
A + I	5 y.o.	0	0	1	1	0	0	0	0
	8 y.o.	2	0	1	3	1	6	4	11
	10 y.o.	0	1	1	2	3	5	6	14
	Total	2	1	3	6	4	11	10	25

cont'd...

I + M/B	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	0	0	0	0	0	4	2	6
	10 y.o.	3	2	1	6	4	6	3	13
	Total	3	2	1	6	4	10	5	19
A + M/B	5 y.o.	0	0	0	0	0	2	0	2
	8 y.o.	0	2	0	2	0	1	2	3
	10 y.o.	2	3	2	7	1	5	4	10
	Total	2	5	2	9	1	8	6	15
A + M/E	5 y.o.	0	0	2	2	0	0	0	0
	8 y.o.	2	1	2	5	0	0	2	2
	10 y.o.	3	3	5	11	1	1	1	3
	Total	5	4	9	18	1	1	3	5
A + M/A	5 y.o.	0	1	2	3	0	0	0	0
	8 y.o.	4	1	1	6	0	0	0	0
	10 y.o.	2	3	5	10	0	0	0	0
	Total	6	5	8	19	0	0	0	0
B + M/E	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	0	0	0	0	0	2	0	2
	10 y.o.	1	2	3	6	3	1	0	4
	Total	1	2	3	6	3	3	0	6
A + M/MA	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	0	0	1	1	1	0	0	1
	10 y.o.	4	2	3	9	0	0	0	0
	Total	4	2	4	10	1	0	0	1
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ I	8 y.o.	0	0	1	1	0	2	0	2
	10 y.o.	0	0	2	2	1	2	2	5
	Total	0	0	3	3	1	4	2	7

cont'd...

A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	1	0	1	0	2	1	3
	10 y.o.	0	1	0	1	2	1	1	4
	Total	0	2	0	2	2	3	2	7
B + M/A	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	1	0	1	2	0	0	0	0
	10 y.o.	1	2	3	6	0	0	0	0
	Total	2	2	4	8	0	0	0	0
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/A	8 y.o.	0	0	2	2	0	0	0	0
	10 y.o.	0	1	2	3	0	1	0	1
	Total	0	1	4	5	0	1	0	1
I + M/MA	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	0	0	0	0	0	1	1	2
	10 y.o.	1	0	1	2	0	1	1	2
	Total	1	0	1	2	0	2	2	4
I + M/E	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	3	3	1	1	1	3
	Total	0	0	3	3	1	1	1	3
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	1	0	1	2	0	0	0	0
	10 y.o.	0	0	2	2	0	0	0	0
	Total	1	0	3	4	0	0	0	0
A + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	0	0	0	1	0	1
	10 y.o.	0	0	2	2	0	1	0	1
	Total	0	0	2	2	0	2	0	2

cont'd...

B + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	0	0	0	0	1	1
	10 y.o.	0	0	0	0	1	1	1	3
	Total	0	0	0	0	1	1	2	4
M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	2	0	2	2	0	0	0
	Total	0	2	0	2	2	0	0	2
B + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	1	1	2
	10 y.o.	0	0	0	0	0	1	0	1
	Total	0	0	0	0	0	2	1	3
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	1	0	0	1	0	0	0	0
	10 y.o.	1	0	0	1	1	0	0	1
	Total	2	0	0	2	1	0	0	1
B + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	0	0	0	0	0	1	1
	10 y.o.	0	0	0	0	2	0	0	2
	Total	0	0	0	0	2	0	1	3
B + M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	1	0	0	1	0	0	0	0
	10 y.o.	1	0	1	2	0	0	0	0
	Total	2	0	1	3	0	0	0	0
M/E	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	1	0	2	3	0	0	0	0
	Total	1	0	2	3	0	0	0	0

cont'd...

B + M/E	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	1	0	0	1	0	1	1	2
	Total	1	0	0	1	0	1	1	2
A + M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	1	1	0	2	0	0	0	0
	10 y.o.	0	0	0	0	0	0	0	0
	Total	1	1	0	2	0	0	0	0
M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	1	1	0	0	0	0
	10 y.o.	0	0	1	1	0	0	0	0
	Total	0	0	2	2	0	0	0	0
M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	1	1	0	2	0	0	0	0
	Total	1	1	0	2	0	0	0	0
B + M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	1	0	1	0	0	1	1
	Total	0	1	0	1	0	0	1	1
A + M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	1	0	0	1	0	0	0	0
	10 y.o.	0	0	0	0	0	0	0	0
	Total	1	0	0	1	0	0	0	0
B + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/A	8 y.o.	0	0	1	1	0	0	0	0
	10 y.o.	0	0	0	0	0	0	0	0
	Total	0	0	1	1	0	0	0	0

cont'd...

M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	0	0	0	0	0	1	1
+ M/E	10 y.o.	0	0	0	0	0	0	0	0
	Total	0	0	0	0	0	0	1	1
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ I	8 y.o.	0	1	0	1	0	0	0	0
+ M/B	10 y.o.	0	0	0	0	0	0	0	0
	Total	0	1	0	1	0	0	0	0
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/A	8 y.o.	0	0	1	1	0	0	0	0
+ M/B	10 y.o.	0	0	0	0	0	0	0	0
	Total	0	0	1	1	0	0	0	0
I + M/A	5 y.o.	0	0	0	0	0	0	0	0
	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	1	0	1	0	0	0	0
	Total	0	1	0	1	0	0	0	0
M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	0	0	0	1	0	1
	Total	0	0	0	0	0	1	0	1
A + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/A	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	1	1	0	0	0	0
	Total	0	0	1	1	0	0	0	0
A + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	0	0	0	0	1	1
	Total	0	0	0	0	0	0	1	1

cont'd...

A + M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	1	1	0	0	0	0
	Total	0	0	1	1	0	0	0	0
A + M/E	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	1	0	1	0	0	0	0
	Total	0	1	0	1	0	0	0	0
B + M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	0	0	1	0	0	1
	Total	0	0	0	0	1	0	0	1
I + M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	0	0	0	0	0	0	1	1
	Total	0	0	0	0	0	0	1	1
I + M/B	5 y.o.	0	0	0	0	0	0	0	0
+ M/MA	8 y.o.	0	0	0	0	0	0	0	0
	10 y.o.	1	0	0	1	0	0	0	0
	Total	1	0	0	1	0	0	0	0
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	0	0	0	0	0	0	0
+ M/MA	10 y.o.	0	1	0	1	0	0	0	0
	Total	0	1	0	1	0	0	0	0
A + B	5 y.o.	0	0	0	0	0	0	0	0
+ M/E	8 y.o.	0	0	0	0	0	0	0	0
+ M/MA	10 y.o.	0	0	0	0	0	0	1	1
	Total	0	0	0	0	0	0	1	1

cont'd...

A + M/A	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	0	0	0	0	0	0	0
+ M/MA	10 y.o.	0	1	0	1	0	0	0	0
	Total	0	1	0	1	0	0	0	0
B + I	5 y.o.	0	0	0	0	0	0	0	0
+ M/B	8 y.o.	0	0	0	0	0	0	0	0
+ M/MA	10 y.o.	0	0	1	1	0	0	0	0
	Total	0	0	1	1	0	0	0	0

Key: A Antecedent Situations
B Behavioural Expressions
I Internal Sensations
M/A Representations of Antecedents
M/B Representations of Behaviour
M/E Evaluations
M/MA Mental Activity

1.6 Examples from interview transcripts of descriptions of each type of sequence combining two or more specific cues, together with total frequency of occurrence for emotions [E] and non-emotions [NE] (qualification for inclusion: total f > 1; sequences in order of descending rank for total frequency)

Sequence Type	Total Frequency E	NE	Subject	Feeling	Example
A + B	85	49	F 5,4	Scared	When my mum comes and opens the door, sometimes I'm asleep in the morning, she gets up before me. And when she opens the door, it gives me a jump and makes me sit up in bed.
B + I	19	37	M 8,5	Tired	You're feeling all hot and you're not playing.
B + M/B	16	39	M 8,8	Wide-Awake	Your eyes are wide open and you feel like playing out and doing

cont'd...

					school work and going into assembly and all the other stuff like that.
B + M/MA	19	18	M 8,1	Sad	Just try and find something to play with and forget about being sad.
A + I	6	25	F 8,6	Hungry	You see other people eating and you feel your tummy rumbling.
I + M/B	6	19	F 8,3	Tired	If you feel tired you often, to me you sort of feel hot, on me, and you sort of want everybody to get out of the bed, if you're with anybody, and sprawl out like that.
A + M/B	9	15	F 10,8	Hungry	You see some food, you just feel like taking it and eating it.
A + M/E	18	5	M 8,6	Happy	If they've done something kind or something to you, then they might, they might've, not thought about it but you thought about it, and, and, you sort of think that was kind of them.
A + M/A	19	0	F 8,3	Scared	If I'm going to the dentist, I keep thinking horrible things, I keep thinking horrible things about my brother 'cos I saw his teeth today, disgusting.
B + M/E	6	6	F 11,0	Sad	You, stump, and you don't sort of lift your feet up, you sort of, slide them along the floor, and you, you don't, care about anything else.
A + M/MA	10	1	M 11,4	Happy	I don't think about what's happening as much, I just have a great time.
A + B + I	3	7	M 10,7	Wide-Awake	Doing something, say, put myself to a task like jumping over that, see if you can do it, then I, and, then I sort of do it again and, then I just do it for a bit of fun again, then I get all lively.
A + B + M/B	2	7	M 10,11	Tired	You have to go to some, some place and you have to walk, if you're, walking there, then, and, don't want a rest then, they'll think that you're not tired because you're walking.

cont'd...

B + M/A	8	0	M 10,3	Scared	You think someone's watching you and you keep looking round.
A + B + M/A	5	1	M 11,3	Sad	You can't find anyone and you start to cry and you get very nervous, 'cos, you start to feel sad because you probably think, they just left me behind, they didn't even think about it.
I + M/E	3	3	F 10,10	Wide-Awake	When you're listening to somebody, you don't mind, you keep on hearing them.
I + M/MA	2	4	M 11,0	Hungry	I just feel it from, your stomach, and I just can't wait to eat, you know.
A + B + M/E	4	0	F 11,6	Scared	When you're watching something, you just like get a visual feeling that, there's gonna something really ghouly's going to come back and you just do that and turn away.
M/B + M/E	2	2	F 10,11	Wide-Awake	You want to smile or laugh about something and you feel that you shouldn't because it will make the other person cross with you.
A + I + M/E	2	2	M 8,6	Tired	You play a game as I said, and, and then you, you sort of feel tired and then, well, you sort of get it, you, and then you sort of just feel that, that, body, sort of body moving thing in your body and you say 'Right, I'm tired', and then, well you think that.
B + I + M/E	0	4	F 8,3	Hungry	Well, your tummy sort of gets, tight, tingle there, and, you just, think 'Oh I'm absolutely full up', but you're not, you're starving because you think you're full up from, eating and that your stomach ache is full up, and you're full up, but it's not really, it means you're hungry, and then when you finally eat something you go, 'Oh God, I'm starving'.
M/E + M/MA	3	0	M 10,9	Happy	Well sometimes I know what, what it's going to be like and if it would be, nice and, joyful.

cont'd...

B + M/A + M/MA	3	0	F 11,6	Happy	Just put a smile on my face, try to smile and, probably try and forget what happened, and think of something else, nicer.
A + B + M/MA	2	1	F 10,5	Happy	Just jump for joy, you're really thrilled about something, like going to a party, you're really happy, you don't know what to do.
B + M/E + M/MA	1	2	F 10,7	Tired	You don't think that you're tired, you don't think about it, just keep playing and doing exercises.
B + I + M/B	0	3	M 11,4	Wide-Awake	If you're not doing anything, you're kind of bored because you feel more jumpy, and you, and you feel, like, you know, like doing something really fun.
B + I + M/MA	0	3	M 8,2	Hungry	My memory tells me sometimes, and my belly's empty, and when I go like that I can hear a kind of drumming sound, that means that my belly's not full up, so I go and get something to eat or drink.
M/A + M/E	2	0	F 10,11	Scared	I sort of, think to myself, 'No, well stop being scared, it's rather stupid what you're being scared about', and then I'd, I'd just sit there, and then suddenly I think about it again, and then I'd become scared again.
M/A + M/MA	2	0	M 10,7	Sad	I can maybe just, get it out of my head for a little while, and then it would, it would suddenly sort of just come back again.
A + M/A + M/B	2	0	F 8,2	Sad	I feel sad in the morning when I come to school, 'cos I, you, I wish I didn't have to and I wish my mummy could stay at school all the time.
B + M/B + M/E	1	1	M 11,3	Hungry	You just start off thinking that you're hungry, and, you just want to eat something, sometimes you sort of, you're not really hungry, but, you, you just eat because, just for eating, just for the sake of it.

Appendix 2: Material for Experiment 2

2.1 Eight narratives, divided into two Story Sets (two positive and two negative stories in each), read to participating children in separate sessions

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Story Set 1

Positive Narrative 1

Suppose that one day at school you hear that someone else in your class is having a birthday party. You really want to go to it, but you don't think you'll be invited because you haven't always got on with the person whose party it is. But at dinner time they come up to you and say, "Would you like to come to my birthday party?"

Positive Narrative 2

Suppose that you've been off school ill and it's the day before your friend's birthday party. Your mum has said that you won't be able to go to it because of being ill. But when your mum takes you to the doctor's to see how you are, the doctor says that you're better. Your mum says, "I think you can go to the party tomorrow after all then."

Negative Narrative 1

Suppose that you're working hard on a drawing at school one day, and you want to get it finished so that it can go up on the wall. Just when you're finishing another boy/girl, bigger than you, comes over and scribbles all over it. They tell you that you'd better not tell anyone what they've done or they'll punch you.

Negative Narrative 2

Suppose that one day at home you're waiting for your favourite programme to come on TV. Just as it's about to start your mum comes in and turns the TV over because they want to watch something else. She says, "And don't start making a fuss about it or you'll be in real trouble."

Story Set 2

Positive Narrative 3

Suppose that one day at school your teacher calls you and your friend over. You think you might be in trouble about something, and that your teacher wants to tell you off. But your teacher says, "One of the other classes is going on a trip to the zoo, and there's two spare places. Would you like to go?"

Positive Narrative 4

Suppose that you're at home one day during the holidays, and you're thinking about a film that you really wanted to go and see because someone at school was talking about it. Before, when you asked your mum about taking you, she said that she couldn't. Suddenly, your mum says, "How would you like to go to that film this afternoon?"

Negative Narrative 3

Suppose that one day you're having fun playing with a ball in the playground at school. Suddenly someone else grabs your ball and throws it, and it breaks a window. Your teacher comes out and says, "Whose ball was that?"

Negative Narrative 4

Suppose that one day you're playing outside at home, waiting for your friends to come round. Another boy/girl you know who's older than you comes past and tells you that they just saw your friends. He/she says, "Your friends know that you told a lie about them to get them into trouble, because I just told them. They said they were going to hit you when they saw you."

Appendix 3: Material for Experiment 3

3.1 Three versions (antecedent plus behaviour, behaviour only, antecedent only) of each of twelve narratives, of which all instances of one type only were read to each participating child

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Narrative 1

Emotion: Happy
Antecedent: Playing with friends
Behaviour: Smiling

Antecedent plus Behaviour:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. It's your friend waiting there, and they've come round to see if you want to play. You start to smile.

Behaviour only:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. You rush to go and answer the door, and then see who it is standing there. You start to smile.

Antecedent only:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. Your mum answers it. It's your friend waiting there, and they've come round to see if you want to play.

Narrative 2

Emotion: Happy
Antecedent: Being given a present
Behaviour: Laughing

Antecedent plus Behaviour:

Suppose that you've just come home from school one day, and you're wondering what to do. Your mum brings something out of the cupboard. She's got you a present, and it's something that you really want. You start to laugh.

Behaviour only:

Suppose that you've just come home from school one day, and you're wondering what to do. Your mum brings something out of the cupboard. You take it from her, and then you see what it is. You start to laugh.

Antecedent only:

Suppose that you've just come home from school one day, and you're wondering what to do. You ask your mum. Your mum brings something out of the cupboard. She's got you a present, and it's something that you really want.

Narrative 3

Emotion: Happy
Antecedent: Being taken out
Behaviour: Jumping around

Antecedent plus Behaviour:

Suppose that you're at school one day, and you hear some friends talking. One of them comes over to you. They're being taken to the circus, and ask if you'd like to come with them. You start jumping up and down.

Behaviour only:

Suppose that you're at school one day, and you hear some friends talking. One of them comes over to you. They say something to you, and then you realise what they were asking the others. You start jumping up and down.

Antecedent only:

Suppose that you're at school one day, and you hear some friends talking. You're wondering what they're talking about. One of them comes over to you. They're being taken to the circus, and ask if you'd like to come with them.

Narrative 4

Emotion: Happy
Antecedent: Going to a birthday party
Behaviour: Being silly

Antecedent plus Behaviour:

Suppose that you're at school one day, and you're talking to some of your friends. One of them pulls out an envelope. Inside is an invitation to their birthday party, which you really want to go to. You start dancing about being silly.

Behaviour only:

Suppose that you're at school one day, and you're talking to some of your friends. One of them pulls out an envelope. You start to open it carefully, but they're already telling you what it's all about. You start dancing about being silly.

Antecedent only:

Suppose that you're at school one day, and you're talking to some of your friends. It's breaktime so you're all outside. One of them pulls out an envelope. Inside is an invitation to their birthday party, which you really want to go to.

<u>Narrative 5</u>

Emotion: Sad
Antecedent: Being hurt by someone
Behaviour: Crying

Antecedent plus Behaviour:

Suppose that you're at school one day, outside in the playground in the morning. You join in a game with some of your friends. You have an argument with one of your friends about the game, and they hit you hard. You start to cry.

Behaviour only:

Suppose that you're at school one day, outside in the playground in the morning. You join in a game with some of your friends. The game has been going on for a while, and then one of your friends does something. You start to cry.

Antecedent only:

Suppose that you're at school one day, outside in the playground in the morning. Everyone else is playing. You join in a game with some of your friends. You have an argument with one of your friends about the game, and they hit you hard.

Narrative 6

Emotion: Sad
Antecedent: Being told off
Behaviour: Turn down head and mouth

Antecedent plus Behaviour:

Suppose that you're at school one day, and one of your friends is painting. You walk over to look at their picture. You accidentally knock the paints over, though, and your teacher tells you off for being so clumsy. Your mouth and head turn down.

Behaviour only:

Suppose that you're at school one day, and one of your friends is painting. You walk over to look at their picture. Your teacher comes and stands next to your friend as you go past, and then something happens. Your mouth and head turn down.

Antecedent only:

Suppose that you're at school one day, and one of your friends is painting. Your friend's pictures are usually good. You walk over to look at their picture. You accidentally knock the paints over, though, and your teacher tells you off for being so clumsy.

Narrative 7

Emotion: Sad
Antecedent: Not having anyone to play with
Behaviour: Not doing anything

Antecedent plus Behaviour:

Suppose that you're at home one day, and you're waiting for your friend to come round. Then the telephone rings. Your friend can't come after all, so you don't have anyone to play with. You just sit there not doing anything for a while.

Behaviour only:

Suppose that you're at home one day, and you're waiting for your friend to come round. Then the telephone rings. Your mum answers the phone, and then tells you what it was all about. You just sit there not doing anything for a while.

Antecedent only:

Suppose that you're at home one day, and you're waiting for your friend to come round. You're thinking about what you'll do when your friend comes. Then the telephone rings. Your friend can't come after all, so you don't have anyone to play with.

Narrative 8

Emotion: Sad
Antecedent: Getting hurt accidentally
Behaviour: Not saying anything

Antecedent plus Behaviour:

Suppose that you're at home one day, and one of your friends is round. You decide to have a race between you. During the race you trip over, and bang your knee very hard. You just sit there not saying anything for a while.

Behaviour only:

Suppose that you're at home one day, and one of your friends is round. You decide to have a race between you. It's not very far to run, but during the race something happens. You just sit there not saying anything for a while.

Antecedent only:

Suppose that you're at home one day, and one of your friends is round. After a while you're both wondering what to do next. You decide to have a race between you. During the race you trip over, and bang your knee very hard.

<u>Narrative 9</u>

Emotion: Scared
Antecedent: Strange noises
Behaviour: Shaking

Antecedent plus Behaviour:

Suppose that you're in your bedroom at home, and it's late in the evening. You're just dropping off to sleep. Then you hear a strange noise, and something by your window falls over. You feel your arms and legs start to shake.

Behaviour only:

Suppose that you're in your bedroom at home, and it's late in the evening. You're just dropping off to sleep. You're lying there warm and comfortable closing your eyes, and then something happens. You feel your arms and legs start to shake.

Antecedent only:

Suppose that you're in your bedroom at home, and it's late in the evening. You've only been in bed for a little while. You're just dropping off to sleep. Then you hear a strange noise, and something by your window falls over.

<u>Narrative 10</u>

Emotion: Scared
Antecedent: Being in the dark
Behaviour: Running away

Antecedent plus Behaviour:

Suppose that you're round at a friend's house one evening, and you're in their room. Your friend goes out for a minute. Suddenly the light goes out, and you're left alone in the dark. You run out of the room as quickly as you can.

Behaviour only:

Suppose that you're round at a friend's house one evening, and you're in their room. Your friend goes out for a minute. You play with one of your friend's toys, and then something happens. You run out of the room as quickly as you can.

Antecedent only:

Suppose that you're round at a friend's house one evening, and you're in their room. You've been there all day doing lots of different things. Your friend goes out for a minute. Suddenly the light goes out, and you're left alone in the dark.

<u>Narrative 11</u>

Emotion: Scared
Antecedent: Horror films on television
Behaviour: Seeking adult comfort

Antecedent plus Behaviour:

Suppose that you're at home one evening, and you're watching television. While everyone else is out of the room a film starts. It's a horror film, and something terrible is happening to a man. You rush out to find your mum or dad.

Behaviour only:

Suppose that you're at home one evening, and you're watching television. While everyone else is out of the room a film starts. You watch for a minute, and then something happens in the film. You rush out to find your mum or dad.

Antecedent only:

Suppose that you're at home one evening, and you're watching television. The programme you really wanted to see is finishing. While everyone else is out of the room a film starts. It's a horror film, and something terrible is happening to a man.

Narrative 12

Emotion: Scared

Antecedent: Nightmares

Behaviour: Screaming

Antecedent plus Behaviour:

Suppose that you're at home one night, and you're asleep in bed. You've been having a good dream. Then it all turns into a nightmare, and you wake up suddenly in the dark. You start to scream as loud as you can.

Behaviour only:

Suppose that you're at home one night, and you're asleep in bed. You've been having a good dream. In your sleep you want the dream to go on, and then something else happens. You start to scream as loud as you can.

Antecedent only:

Suppose that you're at home one night, and you're asleep in bed. You've been having a good dream. In the dream you're exploring with your best friend. Then it all turns into a nightmare, and you wake up suddenly in the dark.

Appendix 4: Material and Raw Data for Experiment 4

4.1 Antecedent and behaviour versions of each of twelve narratives, of which all instances of one type only were read to each participating child, together with questions used to ascertain perceived complementary features

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Narrative 1

Emotion: Happy
Antecedent: Playing with friends
Behaviour: Smiling

Antecedent:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. Your mum answers it. It's your friend waiting there, and they've come round to see if you want to play with them.

Q. What do you think you'd do when you saw your friend there?

Behaviour:

Suppose that you're at home one day, and you haven't got anything to do. Then there's a ring at the doorbell. Your mum answers it. When you see who it is waiting there, and what they've come for, you start to smile.

Q. Who do you think it might have been at the door?

Narrative 2

Emotion: Happy
Antecedent: Being given a present
Behaviour: Laughing

Antecedent:

Suppose that you've just come home from school one day, and you're wondering what to do. You tell your mum that you'd like something different to do. Your mum brings something out of the cupboard. She's got you a present, and she gives it to you.

Q. What do you think you'd do when your mum gave you the present?

Behaviour:

Suppose that you've just come home from school one day, and you're wondering what to do. You tell your mum that you'd like something different to do. Your mum brings something out of the cupboard. When you see what it is, you start to laugh.

Q. What do you think it might have been that your mum got out?

Narrative 3

Emotion: Happy
Antecedent: Being taken out
Behaviour: Jumping around

Antecedent:

Suppose that you're at school one day, and you hear some friends talking.

Someone's saying something about going to the seaside, which you'd like to do. Then they come over to you. They ask if you'd like to come to the seaside with them and their mum.

Q. What do you think you'd do when your friend asked you to come to the seaside?

Behaviour:

Suppose that you're at school one day, and you hear some friends talking. Someone's saying something about going to the seaside, which you'd like to do. Then they come over to you. They begin to ask you about something, and then you start jumping up and down.

Q. What do you think it might have been that your friend was asking you about?

<u>Narrative 4</u>

Emotion: Happy
Antecedent: Going to a birthday party
Behaviour: Being silly

Antecedent:

Suppose that you're at school one day, and some of your friends are talking about going to a birthday party. You say you'd like to go to a party too. Then another of your friends comes over. They say to you, "Can you come to my birthday party?"

Q. What do you think you'd do when your friend asked you to come to the party?

Behaviour:

Suppose that you're at school one day, and some of your friends are talking about going to a birthday party. You say you'd like to go to a party too. Then another of your friends comes over. They say something to you, and you start dancing about being silly.

Q. What do you think it might have been that your friend said to you?

<u>Narrative 5</u>

Emotion: Sad
Antecedent: Being hurt by someone
Behaviour: Crying

Antecedent:

Suppose that you're at school one day, outside in the playground. You join in a game with some of your friends. One of them tells you that you've got to play properly. After a while you have an argument with them about the game, and they start calling you names.

Q. What do you think you'd do when your friend started calling you names?

Behaviour:

Suppose that you're at school one day, outside in the playground. You join in a game with some of your friends. One of them tells you that you've got to play properly. After playing for a while, they come over to you and do something, and you start to cry.

Q. What do you think it might have been that your friend did?

Narrative 6

Emotion: Sad
Antecedent: Being told off
Behaviour: Turn down head and mouth

Antecedent:

Suppose that you're at school one day, and one of your friends is painting. You walk over to have a look at their picture. Your teacher tells you to be careful as you go past the table. You accidentally knock the paints over, though, and your teacher tells you off for being so clumsy.

Q. What do you think you'd do when your teacher told you off?

Behaviour:

Suppose that you're at school one day, and one of your friends is painting. You walk over to have a look at their picture. Your teacher tells you to be careful as you go past the table. As you're looking at the picture something happens, and your mouth and head start to turn down.

Q. What do you think it might have been that happened as you were looking at the picture?

Narrative 7

Emotion: Sad
Antecedent: Not having anyone to play with
Behaviour: Not doing anything

Antecedent:

Suppose that you're at home one day, and you're waiting for your friend to come round. You're thinking about what you'll do when your friend comes. Then the telephone rings. Your mum tells you your friend can't come after all, so you don't have anyone to play with.

Q. What do you think you'd do when you heard that your friend couldn't come?

Behaviour:

Suppose that you're at home one day, and you're waiting for your friend to come round. You're thinking about what you'll do when your friend comes. Then the telephone rings. Your mum tells you what it was about, then you just sit there not doing anything for a while.

Q. What do you think it might have been that your mum told you?

<u>Narrative 8</u>

Emotion: Sad
Antecedent: Getting hurt accidentally
Behaviour: Not saying anything

Antecedent:

Suppose that you're at the park one day, and one of your friends is with you. After a while you decide to have a race between you. Your friend says you're no good at running. When you're racing each other, you trip over, and bang your knee very hard.

Q. What do you think you'd do when you banged your knee?

Behaviour:

Suppose that you're at the park one day, and one of your friends is with you. After a while you decide to have a race between you. Your friend says you're no good at running. During the race something happens, and then you just sit there not saying anything.

Q. What do you think it might have been that happened as you were racing?

<u>Narrative 9</u>

Emotion: Scared
Antecedent: Strange noises
Behaviour: Shaking

Antecedent:

Suppose that you're in your bedroom at home, and it's late in the evening. Everything looks different to how it does in the day. You're just trying to go to sleep. Then you hear a strange noise, and something by your window falls over.

Q. What do you think you'd do when you heard the strange noise?

Behaviour:

Suppose that you're in your bedroom at home, and it's late in the evening. Everything looks different to how it does in the day. You're just trying to go to sleep. Then something happens and you feel your arms and legs start to shake.

Q. What do you think it might have been that happened as you were trying to go to sleep?

Narrative 10

Emotion: Scared

Antecedent: Being in the dark

Behaviour: Running away

Antecedent:

Suppose that you're round at a friend's house after school, and you're in their room. It's winter so it's already dark outside. Your friend goes out for a minute. Suddenly the light in the room goes out, and you're left alone in the dark.

Q. What do you think you'd do when the light suddenly went out?

Behaviour:

Suppose that you're round at a friend's house after school, and you're in their room. It's winter so it's already dark outside. Your friend goes out for a minute. Then something happens, and you run out of the room as quickly as you can.

Q. What do you think it might have been that happened after your friend went out?

Narrative 11

Emotion: Scared

Antecedent: Horror films on television

Behaviour: Seeking adult comfort

Antecedent:

Suppose that you're at home one evening, watching television. Your mum has said that you must turn the television off after the programme you're watching. But while everyone else is out of the room a film starts. It's a horror film, and something terrible is happening to a man.

Q. What do you think you'd do when you saw it was a horror film?

Behaviour:

Suppose that you're at home one evening, watching television. Your mum has said you must turn the television off after the programme you're watching. But while everyone else is out of the room a film starts. Something happens in it, and you run out to find your mum.

Q. What do you think it might have been that happened in the film?

Narrative 12

Emotion: Scared
Antecedent: Nightmares
Behaviour: Screaming

Antecedent:

Suppose that you're at home one night, and you're asleep in bed. You're having a really good dream. In the dream you're exploring with your best friend. Then suddenly it all starts to turn into a nightmare, and you wake up.

Q. What do you think you'd do when you woke up from the nightmare?

Behaviour:

Suppose that you're at home one night, and you're asleep in bed. You're having a really good dream. In the dream, you're exploring with your best friend. Then something else happens, and you start to scream as loud as you can.

Q. What do you think it might have been that happened in your dream?

4.2 Mean number of appropriate complementary features identified by children, by Age Group, Story Type, and Question Order (n = 6)

	Story Type								
	Antecedent			Behaviour			Both Story Conditions		
Age Group	Complement First	Label First	Both Orders	Complement First	Label First	Both Orders	Complement First	Label First	Both Orders
4-6 y.o.	10.33	8.33	9.33	9.67	8.67	9.17	10.00	8.50	9.25
8-10 y.o.	10.67	10.83	10.75	9.83	11.17	10.50	10.25	11.00	10.62
Both Age Groups	10.50	9.58	10.04	9.75	9.92	9.83	10.12	9.75	9.93

4.3 Mean number of appropriate labels identified by children, by Age Group, Story Type, and Question Order (n = 6)

Age Group	Story Type: Antecedent Complement First	Antecedent Label First	Antecedent Both Orders	Behaviour Complement First	Behaviour Label First	Behaviour Both Orders	Both Story Conditions Complement First	Both Story Conditions Label First	Both Story Conditions Both Orders
4-6 y.o.	8.33	7.17	7.75	5.00	8.17	6.58	6.67	7.67	7.17
8-10 y.o.	9.33	10.83	10.08	9.17	10.33	9.75	9.25	10.58	9.91
Both Age Groups	8.83	9.00	8.91	7.08	9.25	8.17	7.96	9.12	8.54

4.4 Mean number of complement only responses, by Age Group, Story Type, and Question Order (n = 6)

Age Group	Story Type: Antecedent Complement First	Antecedent Label First	Antecedent Both Orders	Behaviour Complement First	Behaviour Label First	Behaviour Both Orders	Both Story Conditions Complement First	Both Story Conditions Label First	Both Story Conditions Both Orders
4-6 y.o.	2.67	2.00	2.33	5.00	1.83	3.42	3.83	1.92	2.87
8-10 y.o.	2.17	1.17	1.67	1.67	1.33	1.50	1.92	1.25	1.58
Both Age Groups	2.42	1.58	2.00	3.33	1.58	2.46	2.87	1.58	2.23

4.5 Mean number of label only responses, by Age Group, Story Type, and Question Order (n = 6)

	Story Type								
	Antecedent			Behaviour			Both Story Conditions		
Age Group	Complement First	Label First	Both Orders	Complement First	Label First	Both Orders	Complement First	Label First	Both Orders
4-6 y.o.	0.67	0.83	0.75	0.33	1.33	0.83	0.50	1.08	0.79
8-10 y.o.	0.83	1.17	1.00	1.00	0.50	0.75	0.92	0.83	0.87
Both Age Groups	0.75	1.00	0.87	0.67	0.92	0.79	0.71	0.96	0.83