Elements of Design that Affect Aesthetic Evaluation

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ABSTRACT

Point-of-Purchase (POP) displays are effective tools for increasing sales of a product. However, Consumer Psychology and marketing literature contains little theoretical development in the area of POP-displays and its communicative effects. Consequently the aim of this thesis was to explore the phenomenon of POP-displays with the objective of providing a foundation for a conceptual framework that shows how humans respond to and evaluate certain in-store stimuli. The sort of questions addressed by this research refers in particular to how elements of design affect aesthetic evaluations of POP-displays and how this in turn may affect dwell time, product contact and purchase probability.

The influence of design elements upon aesthetic evaluation is of particular interest to designers as research has shown that people no longer buy products for their functionality but for their physical attributes which make the product meaningful.

The outcome of the studies conducted, showed that design elements such as colour and shape can be used to capture consumers' attention and be used to construct perceptual concepts such as 'complexity' and 'clarity', which in turn affects the overall visual evaluation of a display. It was also found that design principles such as unity and focal point can be utilised to increase the overall aesthetic evaluation. Moreover aesthetic evaluation was found to be affected by haptic properties as well as visual evaluation. Depending on the textures used the overall aesthetic evaluation is sometimes more influenced by haptic properties than visual evaluation.

Furthermore it was found that dwell time can be influenced by whether the display is perceived to be 'mysterious', 'complex' or 'interesting', as well as the textures used on a product.

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Chapter 1: Introduction

1.1 - Aim of the thesis

The physical environment that we encounter in any retail outlet today is of a very complex nature. It tends to be filled with an enormous amount of stimuli that are all competing for our attention. One stimulus that is increasingly being used in cluttered environments to help capture our attention is the Point-of-Purchase display (POP). The usage of POP-displays by manufacturers and marketers has grown significantly during the last ten years, and it has been estimated that the POP industry is currently worth more than £1.1billion in the Britain alone (ISN, 2004).

However, very little is actually known as to what it is that makes the POP-displays so effective in increasing sales figures. Consequently the aim of this thesis is to explore the phenomenon of POP-displays with the objective of providing a foundation for a theoretical framework that shows how humans respond to and evaluate certain in-store stimuli. The sort of questions addressed by this research refer in particular to the elements of design that affect the aesthetic evaluations of POP-displays and how this in turn may affect dwell time, product contact and purchase probability.

So far, the Consumer Psychology and marketing literature contains little theoretical development in the area of POP-displays and its communicative effects. In order to try and construct a comprehensive and effective framework for how elements of design can function as communicative tools, it is necessary to draw upon a diverse range of subject areas. It should however be remembered that since the kind of environment where POP-displays are encountered is of a highly complex nature, it is impossible to include all of the elements in one thesis that may affect the consumers' perception of a POP-display. Therefore it was decided to concentrate upon those elements that are more likely to function as effective communication tools for aesthetic judgements in most retail environments.

1.2 The efficacy of POP-displays

POP-displays can be described as free standing display units that are used to display products within retail environments. These units are more than just adverts and can be regarded as products in their own right. POPAI (Point of Purchase Advertising Institute) UK defines POP-displays as "any form of advertising within a retail environment that is designed to influence the consumer to purchase a product or service" (POPAI UK Consumer Habits Study, 1995). It has also been suggested that consumer behaviour can be better understood in terms of a state of interaction between the consumer and the retail environment in which the POP-display plays an important part (Philips & Bradshaw, 1993).

The most common medium for marketers to communicate with a target audience is through advertising. It has been suggested that advertising is one form of promotion in which the initial processing and actual time of purchase is much farther apart in time than most other marketing communicative tools (Keller, 1991a). The result often being that the consumer has difficulties in retrieving the information from memory once they are in a retail environment. This is clearly a great obstacle in the effectiveness of advertising. Especially if one considers that 60-70% of all the decisions made are unplanned (Kahn & McAlister, 1997; Keller, 1987; POPAI, 1995) and that between half and two-thirds of all purchase decisions are made at the point of sale (Inman & Winer 1998). This may also partially explain why POP materials have been found to be more effective in increasing product sales than for example newspaper advertising (Wilkinson, Mason, & Paksoy, 1982).

Others have also stated that the only reason as to why in-store marketing works is because most consumers come to the store undecided about what to buy, this in combination with the fact that they only look at a fraction of the products available, makes consumers easily distracted by in store displays (Inman & Winer, 1998; Park, Iyer & Smith, 1989). Out of all the unplanned purchases it has also been estimated that around 25% are influenced directly by the immediate external environment (Phillips & Bradshaw, 1993). It is not known exactly what it is that makes the consumers purchase the items that they do, but it has been suggested that they tend to purchase the items that captures their visual attention (Pieters & Warlop, 1999). These may be some of the underlying reasons as to why marketers are increasingly using POP-displays to promote their products (Kahn & McAlister, 1997). Not only can POP-displays be used to facilitate recall of previous marketing communications, but it can also be put to use as a direct tool to capture consumers' attention.

POP-displays have been proven to be effective tools for increasing sales of products (Wilkinson et al., 1982), and have at times increased sales by more than 50% (Bemmaor & Mouchoux, 1991; Inman, McAlister & Hoyer, 1990). However little is known as to why POP-displays are so successful, and since they have also been known on occasions to decrease sales (Areni, Duhan & Kiecker, 1999), it is important to conduct research to clarify what the underlying causes are to their success. There are academics who believe that there is good reason to take POP seriously and that it is necessary to carry out research to ensure it is right for the target market if you want it to be successful (Miles, 1998).

Some of the success may come from the fact that POP-displays are novel stimuli by their very nature, which is why they have the greatest potential for attracting consumers' focal attention. Additionally, they may also function as pre-attentive influences that can also stimulate the consumers' focal attention, since certain stimuli are simply too prominent not to be noticed (Kardes, 1994).

Within the Advertising and Marketing industries it appears to have become accepted practice that to influence unplanned decisions, you must first grab the consumers' attention. Consequently it has resulted in many designers trying to create anything that is 'big', 'loud' and 'flashy' in order to capture consumers' attention. However, the conscious information processing capacity of consumers is limited (Iyer, 1989; Moore Hausknecht & Thamodaran, 1986), and their tendency to rely on peripheral cues (Bitner & Obermiller, 1985), is affected by time constraints as well as other in-store distractions. The result being, that only a small number of all the products and displays in a given retail environment are normally attended to with focal attention.

1.3 Why the design of a POP-display is important

Researchers have found that consumers are increasingly purchasing products for their physical attributes and psychological benefits as opposed to their practical functionality (e.g. Dittmar, 2001). Consequently designers are putting more emphasis on making products and displays more attractive since the idea that products should be purely practical has been diminished and it has been found that the appearance of a product has the capacity to increase overall consumer pleasure (Creusen & Snelders, 2002). This is clearly one of the repercussions of the "you are what you have" mentality, which is a fundamental part of today's westernised society (e.g. Benson, 2000; Fischer & Gainer, 1991). However it is the marketing behind the products, which ultimately creates the 'value' of a product that will make them so attractive to consumers with a "you are what you have" mentality.

The right product image can help establish products as 'personalities' (Jordan, 2002) which is then bought by consumers who wish to extend their own individual personalities through the usage of such products (e.g. Dittmar & Drury, 2000). These sorts of 'personalities' can partially be reinforced by the design of the product as it has been found that there is a link between aesthetics and personality, suggesting that people have a preference for products which they feel reflect their own personality (Jordan, 1997). Product personalities can also be reinforced by marketing tools, such as POP-displays, which are commonly used to promote them. However it is vital that the right design elements and symbols are used when designing a POP-display so that the message the designer is trying to get across will not be misinterpreted. It should be remembered that the symbolic meaning that is derived from a POP-display is obtained through the actual design elements and symbols used.

In order to make sure that one is communicating effectively with the consumer it is of utmost importance to make certain that every aspect of the marketing campaign that surrounds a particular product is carefully designed. Numerous studies have highlighted the importance of likeability as a measure of advertising effectiveness (e.g. Biel & Bridgewater, 1990; Walker & Dubitsky, 1994), and it has been suggested that advertising likeability is the single best predictor of adverting effectiveness (Haley & Baldinger, 1991; Rossiter & Eagleson, 1994). One theory as to why likeability contributes to advertising effectiveness is that viewers who experience positive feelings toward an advertisement will associate those feelings with the brand advertised (Walker & Dubitsky, 1994). This raises the possibility that if it is possible to create a POP-display that is perceived to be very aesthetically pleasing and therefore also more favoured, such a perception is likely to be directly transferable to the product advertised and should in turn also increase purchase probability.

The sensations that are aroused from sight, touch, smell, hearing, taste, and movement, all help to form aesthetic appreciation of an object. Each one of these senses is finely tuned and they are extremely discriminating and able to distinguish, often subconsciously, the finer details of the object being perceived. Since the senses are working together to determine whether or not an object is aesthetically pleasing it is important to establish whether one sense is more affective than another, and to what extent they contribute to the overall aesthetic evaluation. It has been suggested that aesthetics in product design is generally restricted to making products and their displays overall more attractive when evaluated visually, and that such design is based upon the designers previous experiences as supposed to empirical research findings (Overbeeke, Djadjadiningrat, Hummels & Wensveen 2002). Consequently it is important to provide some empirical evidence for how a POP-display can be designed to be aesthetically pleasing.

1.4 How perception influences what we see

Everything that humans pay attention to will ultimately be affected by the processes involved in perception. Perception starts working as soon as we start scanning for elements to focus upon. In particular the study of visual selective attention is of interest to marketers since most consumers initially explore retail environments visually.

The study of visual selective attention can be defined as the way any living organism selects a particular stimulus to focus upon and in turn successfully manage to ignore all other objects that may have the capacity to control the organism's actions (Tipper & Driver, 2000). The stimulus that is chosen is subjected to the influence of our perception, this happens during the selection process, and continues once the stimulus has been focused upon.

The study of perception is the study of the largely unconscious processes through which information in the external environment is attended to, and it is biased by previous experiences so that not everything appeals equally to our senses and cognition (Eibl-Eibesfeldt, 1988). It is an active process of categorising and interpreting (Eibl-Eibesfeldt, 1988) which is based upon the interpretation by the brain of incoming signals from the sense organs and in the light of previous experiences it is transformed into knowledge about the stimulus in question.

People gain understanding of the meaning of a scene or an object almost instantly (Intraub, 1980; Thorpe, Fize & Marlot, 1996; VanRullen & Thorpe, 2001). The time required to show evidence of semantic processing are so short that it is difficult to imagine that any meaning is extracted by a succession of attentional deployments to a succession of objects. Whilst linking previous experiences to the stimulus the perceiver may actively (counter) modulate the percept of the stimulus (Payne, Bettman & Johnson, 1992; Petty & Cacioppo, 1986). This knowledge is then co-ordinated with the information derived through the other sense organs to form a perceptual pattern. Qualities such as colour, shape and texture can all assist in creating such a pattern (Wright, 1969). This pattern is then stored in our memory.

Around 80% of our perception is accounted for by vision (Levine, 2000) and in particular our visual perceptions enable us to experience the existence of objects, and their colour, form and position (Padgham & Saunders, 1975). It has been established that our visual perception is a key element in understanding the interaction that customers have with the point of sale (Phillips & Bradshaw, 1993), especially since it is often the only way to acquire information about brands in consumer choice contexts. In most activities the first step is to conduct a visual search in order to locate a target in a scene, which neuro-anatomic studies have suggested is a fundamental aspect of perception (e.g. Held, 1970).

One aspect of perception that has been particularly well researched is the question of how features are organised into whole figures. In order to explain this, Gestalt psychologists proposed a number of principles that describe how the perceptual system "glues" raw sensations together in particular ways, organising stimuli into a world of shapes and patterns. The principles included features such as proximity (the closer objects are to one another the more likely they are to be perceived as belonging together), and simplicity (humans tend to group features of a stimulus in a way that provided the simplest interpretation of the world) (Kaufman, 1974; Wertheimer, 1958). They also suggested that humans tend to be biased to see distinct forms when they briefly observe geometrical figures that show light irregularities or asymmetries. For example if a square or a circle is not entirely complete we still perceive a complete figure due to that we tend to generalise and repress the irregularities (Hochberg, 1971). Furthermore Gestaltists established that figural stimuli are focal, whereas background stimuli are non-focal. For example bright complex and moving stimuli stand out when contrasted to drab and simple backgrounds (Fiske & Taylor, 1991).

1.5 Clutter in the consumer environment

Today's consumer environments tend to have a very high number of resplendent displays and products that are all desperately competing for the consumers' attention. Paradoxically those products and displays tend to function as an obstacle when trying to communicate effectively with the consumers. Consumers are literally bombarded with disparate stimuli that tend to form a barrier of clutter which consumers neither have time nor the desire to attend to. The clutter bombards our senses and demands an intense simultaneous processing of information. However since our selective perception filters out information that is not compatible with our existing values (Lewin, 1951), the result is that customers generally only look at a small percentage of all the displays (Inman & Winer, 1998; Park et al., 1989).

Unfortunately for the marketers the consumers generally only look at the displays for a few seconds, and much of their behaviour happens with minimal or no awareness (Kirsh & Lynn, 1999). The continuous rows of aisles or similar large quantities of display can also be less effective in triggering a more thorough search. This being because our senses tend to be dulled with exposure to continuous stimuli, referred to as the "adaptation theory" (Schiffman & Kanuk, 1994). The only stimuli that may 'break through' the barrier of clutter and protective selective perception filter are novel elements that need further processing. Researchers have even managed to pinpoint specific brain regions that respond to environmental novelty in the absence of awareness (Berns, Cohen & Mintun, 1997).

As mentioned earlier, consumers often do not have the time to attend to all of the clutter presented to them in a retail environment. When consumers are faced with time poverty, there is a greater tendency for them to rely on peripheral cues as a means of assessing the worth of a product, compared to relying on the detailed quality of the arguments presented by any in-store marketing stimuli (Bitner & Obermiller, 1985). It has also been found that consumers are more likely to engage in impulse buying under peripheral processing. Peripheral cues include visual stimuli such as branding and packaging, but display aesthetics would also be expected to be a part of this (Petty & Cacioppo, 1986). However bearing in mind the vast amount of packaging one encounters in the retail environment, it is of utmost importance to establish which aesthetic elements can break through the clutter barrier as well as being relied upon for peripheral processing.

The importance of establishing which aesthetic elements that may have the capacity to communicate effectively can also be noted from research conducted on memory for advertising. Such research has shown that there is reason to be concerned about the effects of competitive clutter since it has been found that there is a negative association between the number of print ads and for competing brands seen and recall scores. The underlying explanation for the results being that consumer's simply can not attend to all of the stimuli encountered and will therefore not be able to recall what they have seen (Burke & Srull, 1988; Keller, 1987, 1991b).

1.6 Aesthetic evaluation

An area in marketing that has been gaining recognition in recent years is the aesthetics of product design. It has been found that consumer decisions are not always based on logical choices, rather the actual design features or the interaction between them, may trigger off emotions and memories (Costley & Brucks, 1992) which in turn could affect the consumers choice. Despite the fact that aesthetic evaluation has a clear impact on design issues for marketing in practice few empirical studies on aesthetics in relation to consumer behaviour can be found in the marketing literature (Bamossy, Scammon & Johnston, 1983; Bloch, 1995).

The dilemma for manufacturers and marketers is how to present consumers with the 'right' information on which they can base their decisions as to whether or not to buy a specific product, and aesthetics can play a vital part in such decision making process. Presenting such information is not simple, and it is important to present consumers with information that is appropriate to the particular context in which the product is presented (Ariely, 2000). A big part of what is considered the 'right' information is the physical characteristics of a product or display that will make the consumer perceive it as more or less attractive. Despite people's abilities to effortlessly choose between products they are generally unable to explain their choices or responses in a rational manner. Therefore researchers are beginning to ask some basic questions in this area such as "What is an aesthetic response?", "How are they formed?", and "What factors influence aesthetic responses?" (Veryzer, 1993, p.224).

At this point there is no generic definition of an aesthetic response but according to Veryzer (1993) there is a consensus in the belief that the response involves the registering of affect or pleasure derived from a stimulus (product). This thesis will make use of Holbrook and Zirlin's (1985) definition, which states that an aesthetic response is an experience that is enjoyed purely for its own sake without regard for practical considerations. This would mean that a stimulus is liked or appreciated purely on the basis of how 'attractive' it is considered to be.

Numerous studies have investigated how humans visually evaluate the beauty of various elements, whether it is in relation to patterns (e.g. Berlyne, 1960), or how specific elements may affect processing and overall aesthetic evaluation (e.g. Berlyne, 1971, 1974; Cupchik & Heinrichs, 1981; Eibl-Eibesfeldt, 1988; Kaplan, S., 1975). The outcome from such studies has generated a string of theories of how aesthetic elements are evaluated. For example research into aesthetics reveals that cultures tend to be homogeneous in their aesthetic responses (Berlyne, 1971). This is a critical finding as it suggests the possibility that there are some general underlying dynamics that determine consumers' preferences of design in general, which once identified can aid future design proposals.

It has also been found that women tend to evaluate colours and other aesthetic stimuli differently to men (Holbrook, 1986; Rapoport & Rapoport, 1984), such findings are likely to stem from cultural and societal influences on individual ontology. More specifically previous writers (e.g. Laurie, 1981) have suggested that women prefer rounded contours whilst men prefer angular ones, which may perhaps be explained by culturally defined roles. Other explanations have also included a possible neuro-psychological basis for gender differences in aesthetic preferences (Regard & Landis, 1988).

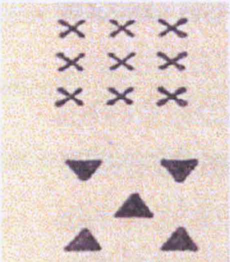
Based upon neuro-psychological findings a cognitive model of aesthetic processing has been suggested that explains preference in terms of prototypicality (the degree to which a stimulus is a good example of a particular category) and the activation of neural networks (Martindale 1988, Martindale, Moore & West, 1988). The theory assumes that stimuli are processed by cognitive 'nodes' which are arranged hierarchically and grouped into analysers at different levels. Nodes that are connected vertically are assumed to have a primarily excitatory effect on each other (for example, red would excite colour) whereas nodes that are laterally adjacent are stated to have mainly inhibitory effect on each other (such as that red would inhibit orange). The basic prediction of this theory is that 'aesthetic pleasure' and 'aesthetic preference' for stimulus is a neural activation, and without the activation one would not experience aesthetic pleasure.

The idea that cultures tend to be homogenous in their aesthetic responses (Berlyne, 1971), may partially elucidate why environmental psychologists have managed to map out certain variables that contributes to a more favourable visual assessment of landscapes (e.g. Kaplan, R., 1975; Kaplan, S., 1975, 1987; Kaplan, Kaplan & Brown, 1989; Kaplan & Wendt, 1972). Some of the underlying ideas that were used by psychologists to map out which variables may assist in creating a more auspicious assessment of a particular environmental setting, stem from a series of studies conducted by Berlyne (1974, 1971, 1963, 1958, 1957). Berlyne was one of the first empirical researchers within aesthetics to suggest that there may be a relationship between complexity and visual preference. He found that the relationship between the two produced an inverted U-curve putting the visual preference peak at some moderate amount of complexity. This has also more recently been supported by Sprott (1996) who found a clear relationship between complexity measures and aesthetic ratings. A moderate amount of complexity is often found to be the most appealing. Similarly Berlyne also proposed that other factors such as novelty may play a part in how people determine aesthetic preference.

Berlyne also investigated whether certain elements had the capacity to extend the amount of time an observer spent looking at a picture. His findings indicated that more complex patterns attracted prolonged exploration by humans than did patterns that he considered to be of a low-complex nature. However this was only found to be the case if the elements used were not themselves of an overly complex nature. If the elements evaluated were in themselves very complex they were actually found to reduce the amount of time that they were explored. The exploration time was found to generate an inverted U-curve, mirroring the relationship between complexity and visual preference.

The figures below are examples collected from Berlyne, Borsa, Craw, Gelman & Mandlell's 1965 study.

Figure 1a: Low degree of Low Complexity



1b: Medium degree of Low Complexity

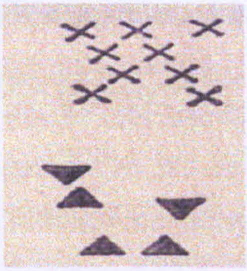
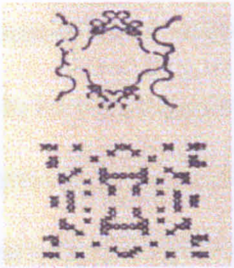


Figure 1a and b show examples of images representing the low complex category. The patterns in 1a were categorised as 'less complex patterns' and Figure 1b represents 'more complex patterns' in the low complex category.

Figure 2a: Low degree of High Complexity **2b: High degree of High Complexity**



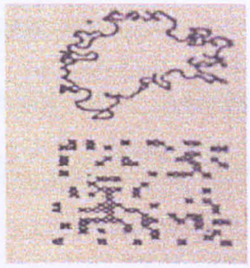


Figure 2a and b are examples of figures representing the high complexity category. The patterns in 2a are considered to be less complex than those in 2b.

The more complex patterns were found to be rated as less pleasing but in general the same patterns were judged as being overall more interesting. From this Berlyne concluded that the patterns participants took longer to explore were not judged as being aesthetically pleasing, but were found to be generally more interesting. Patterns were judged aesthetically pleasing only if there had been the opportunity to fully explore the more complex patterns initially.

Berlyne's idea that cultures tend to promote homogenous aesthetic responses was taken one step further in the Kaplan and Wendt's (1972) study. They were some of the first environmental psychologists to attempt to construct a theoretical framework for specific qualities that may affect individual evaluations of a particular landscape. Originally they proposed that there were two vital components that influenced the aesthetic judgements of landscapes, namely "making sense" and "involvement". 'Making sense' referred to humans' innate need of wanting to understand a particular environment and 'involvement' referred to the extent that we may become engaged by it. These two components were then linked as to whether the environment was of a two or three-dimensional nature. If the environment was of a two-dimensional nature it was suggested that it had to be coherent (i.e. the environment had to be well organised) in order for an individual to try to make sense of it, and for a person to become involved with it, it had to be complex (i.e. have a high number of various elements in it).

For three-dimensional environments, it was suggested that if the environment was considered to be legible (i.e. the degree of distinctiveness that enables the viewer to categorise the contents in the environment) the evaluator would be able to make sense of it. For the evaluator of the three-dimensional environment to become more involved with it, it was suggested that the setting had to be mysterious (i.e. the environment had to contain 'hidden' information).

A number of studies went on to expand upon Kaplan and Wendt's theoretical framework (Kaplan, R., 1975; Kaplan, S., 1975, 1987; Kaplan et al., 1989) and from these it was determined that peoples' preferences for certain environmental scenes can be predicted by the relationship between four distinct concepts namely 'complexity', 'mystery', 'coherence' and 'legibility'.

The definitions of the four concepts were as follows: 'Complexity' was defined as relating to the number of and variety of elements in a scene. ‘Mystery’ was said to be "a promise of new but related information" (Kaplan et. al., 1989, p 516). Basically it was linked to the degree to which a scene contains hidden information so that one is drawn into the scene to try to find this information. ‘Coherence’, was linked to the degree to which a scene “hangs together” or how well it is organised. Coherence has also been shown to be a highly influential factor in other studies (Anderson, 1978 as cited in Kaplan et al., 1989; Gallagher, 1977 as cited in Kaplan et al., 1989). The last of the four concepts, 'legibility', was defined as the degree of distinctiveness that enables the viewer to understand or categorise the contents of a scene.

It was originally hypothesised that the higher the level of the four concepts that an environment contained the higher the preference for that particular environment would be. However, when testing this idea their results were not exactly according to prediction. Initially only three out of the four concepts were tested, mystery, complexity and coherence (Herzog, 1984; Herzog, Kaplan & Kaplan, 1982; Kaplan R, 1975). Mystery was then found to be a highly influential factor. However, the other two variables were not found to play a significant part in why some environmental settings are preferred to others.

A second series of studies also included the concept of legibility (Anderson, 1978; Herzog, 1984; Lee, 1979;). This time not only the concept of mystery was found to be significant, but also coherence. Complexity was also found to have more of an impact than in the previous tests but legibility did not have any apparent impact.

The assessment of the implications for coherence and legibility was particularly difficult as they were on occasion found to be interrelated. It was speculated that some of the results may be due to the recent conceptualisation of legibility and that it might not have been totally satisfactory. It was also found that the combination of low coherence and high complexity can produce a less favourable evaluation (Herzog, et. al., 1982).

It was only when Herzog decided to only explore people's preferences for urban settings that all of the variables were found to be significant (Herzog et. al., 1982; Herzog, Kaplan & Kaplan, 1976). It was in the light of all of these studies that it was then concluded that the preference for an environment increases as the levels of all the four concepts increases (Kaplan, 1987).

The four above-mentioned concepts that influence our preference for one environment over another are not consciously processed. Kaplan (1987) explain that this is in accordance to an evolutionary interpretation. The idea being that humans are disposed to seek out or move into environments that can be easily understood, provides relevant information for survival such as information about orientation and food sources.

The idea of preferences and aesthetic responses being innate is not a new one. The Gestalt school found more than one hundred principles of innate design preference. Gestalt psychologists argued that aesthetic responses are dependent upon whether the object displays characteristics that are consistent with the Gestalt laws of organisation (Veryzer & Hutchinson, 1998).

If these innate aesthetic preferences do exist, it is likely that they can be generalised and applied to different stimuli and different contexts. However, whilst Kaplan and Kaplan's research is a clear indication that innate preferences do exist in relation to landscape environments, it is less certain that such preferences and aesthetic responses are applicable when the stimuli are less essential to people. The question is, are such innate preferences at work when stimuli are encountered within retail environments? Do such innate preferences entice consumers to purchase particular goods? In these cases the aesthetic response would be an experience that is enjoyed purely for its own sake and not for any immediate practical considerations, although it still may emanate from subconscious evolutionary perceptual mechanisms.

Other studies of aesthetic design have indicated that elements such as colour and shape may be efficient tools for attracting consumers' attention (Walters, Apter, & Svebak, 1982), and that women and men tend to evaluate them differently (Holbrook, 1986; Rapoport & Rapoport, 1984). However, from the literature it is unclear whether specific sensory characteristics such as colour and shape, produce consumer preferences per se. They may contribute to 'higher order' aesthetic groupings such as those hypothesised by the Kaplans.

Previous research has also found that products can elicit at least moderate levels of aesthetic responses in consumers, which includes an engagement of attention and strong positive emotions (Bloch, 1995). There are many possible design principles or characteristics that could be relevant to POPs. Gestalt alone, found more than one hundred principles of possible innate design preferences (Bloch, 1995). However there are three design attributes in particular that are thought to be of great importance for any type of design. These are 'unity', 'proportion' and 'focal point'.

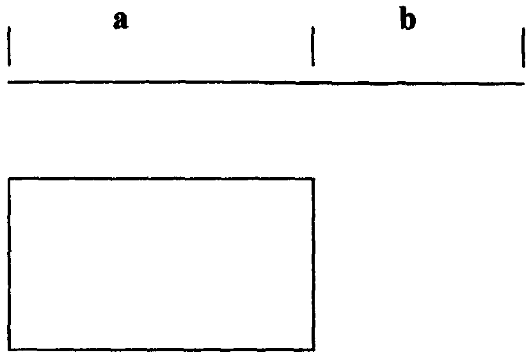
The first of the three design attributes, unity, refers to a congruity among the elements in a design such as that they look as though they belong together and were not thrown together by chance (Lauer, 1979 as cited in Veryzer, 1993). Malcolm (1972) stated that every element of a unified design plays an important part that requires individual attention, but they would be weaker when out of the context of the other parts. In other words the whole must be predominant and more important to the viewer than the individual parts. There are three ways or techniques to achieve 'unity' within a design; these are proximity, repetition and continuation (Lauer, 1985).

Proportion is the second design attribute and can be described as "the relationship between the horizontal and vertical dimensions"(Henderson & Cote, 1998 p.17).

Ancient Greek and Renaissance architects have spent considerable time looking for the 'ideal' proportion which will be considered to be the most aesthetically pleasing to the eye, and research (both early on and later) has suggested that certain proportions can be more appealing than others (e.g. Boselie, 1992; Weber, 1931).
One of the best known (and probably the most debated) examples of 'good proportion' is the 'golden section' and many of the studies that have been conducted claim that it holds the key to the secret of beauty (e.g. Benjafield, 1976; McManus, 1980; Piehl 1978; Svensson, 1977). Some explanations as to why we favour the golden section have been offered, for example Stone and Collins (1965) observed that the binocular visual field can be seen to possess an outline form which is not too unlike that of a rectangle. They found that a rectangle drawn around the outside of the visual field has a height-to-width ratio of approximately .768, and that a rectangle drawn fully inside the visual field has a height-to-width ratio of approximately .565. Eysenck and Tunstall (1968) suggested that certain personality traits may be the underlying cause for why people have a preference for the golden section. The effectiveness of the golden section has also been questioned, and some claim that it does not generate a preferable response (Godkewitsch, 1974; Piehl, 1976; Schiffman, 1969, 1966; Schiffman & Bobko, 1978).

The mathematical formula for the golden section is as follows: two lengths, 'a' and 'b', constitute a 'golden section' if 'b' divided by 'a' equals 'a' divided by the sum of 'a' and 'b' (as illustrated on the next page in Figure 3).

Figure 3: 'The Golden Section'



b =0.618a ***(Not to scale.)***

The third design attribute which is believed to have the capacity to make a significant contribution to a design is the focal point. The focal point is the 'point of emphasis' and is a technique used to attract attention to a design. There are several ways to achieve a focal point and according to designers the best ways of doing so are through the use of contrast, isolation or by placement (Lauer, 1985). The idea being that the focal point calls attention to the most important areas and subdues the rest of the design. It helps to capture the attention and the viewer is more likely to look further at that design as opposed to looking at another design, and for longer (Malcolm, 1972). In the case of POP-designs the header with the logo tends to be the focal point and is normally used to attract attention in most cases in the retail environment.

1.7 How to capture the consumer's attention

A primary concern of retailers is how to make consumers aware of products and displays within the retail environments (Dreze, Hoch & Purk, 1995). In particular it is important to arouse the consumer's attention in order to directly influence impulse purchases or simply to remind them that they are there. However, simply attracting their attention is not enough since consumers today are purchasing products for the 'aeshtetical appreciation' just as much as for the practical use. Therefore it is not only vital that the product can attract the consumers attention, but also that it will automatically (as soon as it has been noticed) be considered as being 'attractive'.

However the first step is to gain the consumers attention. Attention in general refers to the contents of short-term memory and these contents can often be drawn from both internally and externally presented stimuli (Kahneman, 1973). Our attention in perception has been compared to a searchlight (Wachtel, 1967). The similarities being that the brief direction of our attention is focused upon something which then temporarily becomes conscious until it is moved on to the next object and then the next, just like a searchlight would be moved from object to object. From a marketers point of view it is important that they manage to capture the consumers' full attention and that their attention stays upon that particular desired focal point.

Focal attention occurs when a person has the capacity to centre his attention on an object fully, so that the object can be perceived as clearly as possible (Schachtel, 1959). It has been established that our focal attention is guided by intentional as well as unintentional cognitive processes (Kahneman, 1973), and that it can be directed toward product information present in either the external environment or the product information already stored in our long-term memory (Eysenck & Keane, 1999; Kardes, 1994). Due to the fact that the information consumers pick up on from the external environment is temporarily stored in the short term memory, (which can only handle a limited amount of information (Miller, 1956) at any one time), consumers will automatically attend to focal information and neglect non-focal information. This will be reflected upon trying to recall information, as an individual would be expected to more readily recall the elements that had captured their direct attention.

What actually captures the consumer's attention is determined by many factors, such as the relevance of the message and the consumer's motivation. Also other factors such as the novelty of the stimuli (Berlyne & Parham, 1968) and how vivid the message itself is (Rook, 1986) can also help draw attention to a stimulus. What the consumer has a 'particular' interest in at the time may also direct attention such as a fashionable colour that the consumer really likes would almost automatically capture their attention (Klinger, 1975).

In particular it is useful to know how the visual aspect of our attention works. Bearing in mind that visual information is the most common way for individuals to acquire information about brands in consumer choice environments, one needs to consider what we do visually when we enter a retail environment. Visual attention can be defined as the activity of scanning the visual world and searching for targets (Wickens & Hollands, 2000). Research has shown that the first thing that humans tend to do in any setting is to conduct a visual search. Such a visual search is intentional information processing (i.e. selective attention) that is driven by our desire to find targets.

The visual search tends to start at the upper left corner of the visual field and work their way down, in a similar fashion to the process of reading (Megaw & Richardson, 1979). It is worth remembering that this kind of search behaviour is learnt and consequently such visual search patterns are likely to be culture specific. For example it is unlikely to be applicable to Arabic cultures since they read from right to left unlike the western cultures which read from left to right. Other researchers have also suggested that humans generally focus their searches towards the centre of any display (known as an edge effect) (Parasuraman, 1986).

However, much of the human visual search behaviour is internally driven by cognitive factors, and this means that there are no highly consistent patterns of how humans conduct visual searches (Wickens, 1992). Even so it has been found that on occasion certain display factors can help to guide our visual attention, such as displays that are large, bright, colourful and blinking (Wickens & Hollands, 2000) even though they are often overridden by cognitive factors. This is especially so if the targets differ from distractors in certain single salient features. They can be rapidly discerned irrespective of the number of items in the display (Krummenacher, Müller & Heller, 2002) as it creates a type of 'pop out' effect. Furthermore it should also be remembered that the visual system is limited in the number of items it can process at any given time (Martens, Wolters & VanRaamsdonk, 2002), which means that in a highly cluttered retail environment consumers are unlikely to see all of the products and displays.

1.8 Colour

One aesthetic design feature in particular that may be able to assist in reducing the visual search time in a cluttered environment is colour. There has been much research on colour and its effects. Moreover, it has been pointed out that there are few well-documented studies on the effects of colour (e.g. Davidoff, 1991; Gorn, Chattopadhyay, Yi, & Dahl, 1997) and that most reported effects of colour (especially those in producing changes in mood states) are artefacts of poor experimental design (Davidoff, 1991). Suggestions such as; that warm and cold colours can produce emotional responses (Wilson, 1966), that red accelerates the passage of time (Smets, 1969), that warm colours can make you feel warmer (O'Connell, Harper & McAndrew, 1985), should be treated with prudence, as they appear to lack sound empirical support. Although there is little systematic empirical research on the effects of colour, it is still important to point out that there are a limited number of studies that have managed to contribute meaningful results within the area of colour research.

It is widely accepted that there are three independent properties of colour: hue, saturation and value (Thompson, Palacios & Varela, 1992). Hue is the pigment of the colour, saturation being the proportion of pigment within them (this is also sometimes referred to as chroma, e.g. Gorn et al., 1997; Padgham & Saunders, 1975) and the value is the degree of darkness or lightness of the colour. It is also generally accepted that there are eleven colours that humans tend to be able to identify with minimal response times (Boynton, 1988; Davies & Corbett, 1995). These eleven colours (white, grey, black, red, green, yellow, blue, orange, pink, purple and brown), have been labelled as 'basic' colours, and all other colours are referred to as 'non-basic' ones. From previously conducted research it is known that colour is easily detected by our pre-attentive system (Bundesen & Pedersen, 1983; Carter, 1982; Farmer & Taylor, 1980; Green & Anderson, 1956; Smith, 1962; Williams, 1966) this being due to its perceptibility in parafoveal regions of the visual field (Carter, 1982). Pre-attentively processed colour information has also been found to be readily used to select items for subsequent attentional processing (Egeth, Virzi, & Garbart, 1984; Kaptein, Theeuwes, & Van der Heijden, 1994). The idea that colour is pre-attentively easily detected, together with the fact that colour can be retrieved rapidly from our immediate visual memory explains why hue is an effective tool for reducing visual search times when trying to locate a specific target in a scene (Carter, 1982; Williams, 1966).

Previous visual search studies that have investigated the relationship between colour and visual search time, have mainly focused on 'colour-singleton' search (i.e. the search for a single odd coloured item among homogeneously coloured distractors), and have as a result failed to address whether there are colours that may have an impact in multi-coloured and cluttered environments. However some of the studies have produced findings that can be used as 'pointers' for what may be expected if a visual search is conducted in a cluttered real life environments. A consistent finding within visual search experiments, is that search time and errors increase with the number of distractors in a search display (Eriksen & Spencer, 1969), that search time increases when the targets and the non-targets are of similar colour (D'Zmura, 1991; Farmer & Taylor, 1980; Nagy & Sanchez, 1990; Nagy, Sanchez & Hughes, 1990), and that the speed of the visual search depends on how easily the target item enters visual short term memory (Duncan & Humphreys, 1992, 1989). Furthermore it has been found that when a specific stimulus is similar in colour to the background it is presented against, it tends to reduce the attentional value of the colour (Farmer & Taylor, 1980) and that when multiple distractor colours are used, colours are only effective as pre-attentive features if the colours are widely separated (Duncan, 1988; Smallman & Boynton, 1990).

Precisely which colours are the most effective to reduce visual search time is not entirely clear. Attempts have been made to try and establish this but with what appears to be rather mixed results. It would however appear to be logic that basic colours ought to produce better search times than non-basic colours as they are instantly recognisable. In a study conducted by Boynton and Smallman (1990) where they investigated just this (whether basic colours may be more effective in reducing visual search speed than non-basic ones) it was concluded that there were no apparent difference between the two. However the highest amount of distractor targets used at any one time was only 140 which obviously means that it can't be established with any certainty whether this would be applicable to a highly cluttered retail environment where the number of stimuli would be well over 140. It was however apparent from two out of the three participants in the study that the non-basic colours produced longer search times than did the basic colours as the number of distractor targets increased. Unfortunately there were only three participants in the study of which two were the experimenters themselves and subsequently it would be difficult to conclude that this would apply to the population at large.

On a number of occasions it has also been speculated that the visual features of an object can also be of use in reducing visual search times (e.g. Roggeveen, Kingstone & Enns, 2003). However this has also been disputed in earlier conducted research which has suggested that pre-specification of target shape or size is almost non existent (e.g. Williams, 1966). Unfortunately just like with colour, very few experiments have looked at how this may translate into a cluttered environment. Consequently it is important to further consider whether different shapes can be used to decrease the visual search time. Hypothetically one would expect colour to be a more efficient tool when it comes to decreasing visual search times due to its perceptibility in parafoveal regions of the visual field where form is actually indistinct (Carter, 1982). Additionally it may also depend upon whether colour and shape are processed separately or simultaneously. If simultaneous processing occurs it is possible that the more prominent of the two aesthetic features will be more effective in decreasing search times.

Considerable evidence has been produced that demonstrates the existence of parallel processing channels both precortically and at the cortex (De Valois & De Valois, 1975; Stone Dreher & Leventhal, 1979; Zeki, 1980). The idea that we process colour and shape separately (Ellis & Chase, 1971; Garner, 1974; Posner, 1978) can particularly be noticed from findings that hue differences alone makes edge detection difficult (Frome, Buck & Boynton, 1979), and geometric illusions disappear (Gregory, 1977, McCarter, 1979). Furthermore spatial frequency has been found to depend little on colour (Elsner, 1978; Lovegrove & Badcock, 1981). The studies mentioned here used arbitrary conjunctions of colour and shape, but even with meaningful materials it has been found that colour is surprisingly unhelpful in shape processing (Power, 1978) and does not facilitate recall (Rusted & Coltheart, 1979).

However, it is still believed that colour and shape must combine at some stage since humans tend to be aware if objects are incongruously coloured (Pearlmutter, 1980). That is not to say that colour is a part of the pictorial coding of objects. For example it has been noted that humans tend to determine what size something is more quickly in regards to pictures than they do for words, but that is not the case when they are judging colours (Te Linde & Paivio, 1979). Consequently the conclusion has been drawn that colour may be stored as a part of an associative network of attributes rather than being a part of pictorial encoding for objects (Seymore, 1979). This may also help to account for findings that have shown that in order for a consumer to fully recognise a product and apply meaning to it, colour which is an highly interactive visual feature of any object, must be fully integrated with the other features (Bruce & Green, 1990; Crick, 1994; Davidoff, 1991; Marr, 1982; Treisman & Gelade, 1980).

Within the visual search literature it appears to be presumed that the outcome of the searches should be the same for women and men. However there are a number of reasons as to why one can expect sex differences to occur when searching for a specific hue in a cluttered environment. It has been shown on numerous occasions that it is virtually impossible to pinpoint exactly where colour meanings and associations stem from, but it is known that they are influenced greatly by culture, society, sensitivity and individual experience, (Sivik & Taft, 1991; Taft & Sivik, 1991, 1992). Due to the diversity within the socialisation procedure, men and women tend to build up rather different experiences, which makes it likely that colours and shapes (perhaps also positioning) will affect women and men differently. Men have also been found to be more tolerant to achromatic colours than women (Guilford & Smith, 1959.)

It is also possible that biological differences related to colour vision abilities may play a part in why men and women evaluate colours differently, which in turn may also influence the length and accuracy of a visual search.

Colour vision defects are a relatively commonly occurring problem in humans, and there is a sex difference in detecting colour, with roughly 8% of the male population showing weaknesses in detecting colour, whilst only half a percent of women show the same defect (De Valois & De Valois, 2000). The commonest varieties of these colour weaknesses are congenital, due to genetic differences in the sex determining Y chromosome.

There are also other findings that demonstrate that colour can be a compelling visual cue for persuasive communications purposes, such as that colour is considered to be the most salient and meaningful visual feature of those seen in early vision (Hilbert, 1987). Colour is also believed to produce favourable product attitudes (in comparison to black and white) when consumers' processing motivation is low as they then tend to rely upon simple heuristics associated with the physical attractiveness (Myers-Levy & Peracchio, 1995). This together with findings that colour generally attracts more attention than black and white (Evans Moutinho & VanRaaij, 1997) is also likely to partly explain why colour has been found to have the capacity to draw consumers to a product (Bloch, 1995).

Perhaps the overall attractiveness is also linked to aesthetic composition of the colours used to attract consumers' attention. A number of art researchers, who have attempted to investigate whether humans prefer certain colour combinations empirically, claim that certain relations between colours are more attractive and desirable than others. As earlier mentioned colour preferences are often cultural or even completely individual (e.g. Taft & Sivik, 1991, 1992), but people are otherwise relatively concordant about which colours are considered to be warm and cold (Sivik, 1997). Warm colours representing the red end of the spectrum and cold the blue end of the spectrum. Bearing this in mind it appears somewhat remarkable that in the most common context for colour preference experiments (judging paper colour samples), the conformity between people has been found to be considerable (Sivik, 1997). For example the judgement of 'masculine' and 'feminine' colours has been suggested to be a function mainly of their blackness and to a much lesser extent of hue (Sivik, 1997).

It cannot be disputed that the literature on colour preference and meaning is abundant. However it is apparent from the number of overviews that have been written (e.g. Burnham, Hanes & Bartleson, 1963; Whitfield & Wiltshire, 1991; Wise & Wise, 1988), that colour preference research is rather inconsistent and confusing.

Colour preference studies conducted with colour samples have also been criticised for lacking ecological validity, the argument being that humans do not make preference judgements of colours when they are attached to meaningless objects such as colour samples (Whitfield & Wiltshire, 1990). This has also been supported by Davidoff (1991) who suggested that colour preferences are linked to the objects to which they are associated. Even though the literature in regards to the usage of colour samples in preference ratings is somewhat controversial some research findings have shown their usefulness. In particular studies that have investigated colour meaning in relation to architectural interiors (e.g. Hogg, Goodman, Porter, Mikellides & Preddy, 1979; Sivik 1974), it was found that the correlations between the comparisons of semantic differential ratings of isolated colours, and colours applied to interiors and exteriors were high.

Helson and Lansford (1970) whose subjects rated the pleasantness of 125 colours on 25 coloured backgrounds in five sources of illuminations found that the most pleasant combinations involved large brightness differences between colour and background. They also found that the least pleasant combinations involved little or no difference and that hue and saturation contrast were less decisive factors. In particular large differences in saturation between the colour and background tended to be judged as being more pleasant than were small differences. This was also confirmed by Pieters (1979) who stated that colour combinations that have the same value will be less favourably evaluated than colours that have different values. However it should be noted that both Helson and Lansford and Pieters have stressed that colour harmony is not easily predicted due its complexity and should be treated with some caution. Other studies have also found contradictory evidence to the previously mentioned. Polzella

& Montgomery (1993) did not find any evidence for Helson and Lanford's (1970) findings that brightness contrast is the principal factor determining the pleasantness of colour combinations. Instead they suggested that the combinations rated as being more harmonious were those of similar brightness.

It is clear that when it comes to choosing the colour of a POP-display or a product one needs to be particularly cautious as colour is a cultural artefact that holds personal meanings for an individual due to prior experience (Scott, 1994) and as a result the image may be affected by the interpretation that the viewer places on it. Colour is also known to carry important symbolic and associative information about products and brands (Hine, 1996), and such meanings often overshadow the direct sensory experience thereby mediating and occasionally dominating the colour response (Garber, Hyatt & Starr, 2000). Even though humans can identify objects relatively easily regardless of the colour, it may be that it is the colour associations that makes it easier for them to actually name the objects when they appear in their original colour (Ostergaard & Davidoff, 1986).

There is very little doubt that colour can help attract our attention (Mikellides, 1990; Walters et al., 1982) and that we tend to be particularly drawn to colourful items (Wickens, 1992). However information such as this is simply too broad to be of much use in a persuasive communications context (Garber & Hyatt, 2003) and consequently of little use to manufacturers and marketers.

1.9 Haptic properties

Humans tend to touch objects in order to explore stimuli further so that they can make some form of discrimination. This is notable at an early age where the role of touch is important in exploring and evaluating the surroundings (e.g. Bushnell & Boudreau, 1991; Piaget, 1952), and it has been suggested that the interest in sensory experience is carried through into adulthood. Such interest have by consumer behaviourists been referred to as the experiential perspective which encourage consumers to investigate multisensory psychophysical relationships (Holbrook & Hirschman, 1982). The idea that humans have a curious nature and want to physically explore objects may indicate that the haptic influence upon evaluation of such objects is a major contributor. This being applicable to the simplest tasks such as clothes shopping. In such situations both visual and tactile senses are both drawn upon to evaluate the 'likeability' of the garment. When the material does not have a satisfactory feeling, the shopper normally continues their search elsewhere (Gladwell, 1996). From these sort of experiences it is clear that the handling of materials will have an affect upon the overall evaluation.

There are also a number of researchers that have investigated how touch can influence shopping behaviour. In a dissertation that focused upon individuals making judgement decisions about particular products in relation to touch, it was found that consumers who have a great desire to touch elements in general tend to become frustrated when not allowed to do so (Peck, 1999). Furthermore it also discussed that such consumers tend to be "less confident in their judgements" (page 191) when they could not draw upon their tactile experiences. Others have looked at how consumers in a supermarket who were touched on the arm at the same time as being asked to sample a snack item were more likely to comply than those who were not touched.

The consumers whose arm was touched were also more likely to purchase the product (Hornik, 1992). The same study also found that consumers who touched a product were also 88% more likely to buy the product that they had touched, however no distinction was made as to whether they were planned or impulse purchases. Such findings led Hornik to the assumption that simply touching a product can influence a consumer's attitude positively towards a product.

Research conducted within the area of aesthetic evaluation has mainly focused upon the impact our vision has on the evaluation process. This is not surprising considering that visual attention is a vital way to acquire information in consumer environments since vision accounts for around 80% of the human perception (Levine, 2000). However it is important to remember that most of our knowledge about a stimulus derives from more than one sense (Heller, 1982), and our daily activities are guided by an amalgam of sensory inputs from different modalities. Such sensory modalities function together, such as that touch can influence visual perception of surface texture (Heller, 1982) and surface slant (Ernst, Banks & Bulthoff, 2000). However there are clear differences in how the different senses operates and as Heller (1991) pointed out, if all senses worked in the same way as the visual system, which tends to dominate the perception, then there would be no point in studying the non-visual senses. As it stands it is not clear what happens to aesthetic evaluation when a consumer touches a product after an initial visual evaluation.

The skin is extremely sensitive to light pressure and under ideal conditions, displacements of the skin of less than 0.001 mm and can result in a sensation of touch (Montagu, 1986). Our fingers are densely supplied with nerve fibres and are therefore more sensitive than other areas of the skin, and are correspondingly represented by larger sensory areas in the brain (Gregory & Colman, 1995). Although many studies of touch involve different areas of the human body, the primary studies of interest involve using the hands as the primary source of input to the touch perceptual system. In this thesis the focal point will be upon the hand, where haptics will be used to refer to the pickup of information by the hand.

It is frequently argued that when humans encounter both visual and tactile information simultaneously, vision has a tendency to dominate and in some cases supersede the integrated visual/haptic perception (e.g. Ernst & Banks, 2002a; Warren & Rossano, 1991), however there are exceptions to this rule (e.g. Ernst & Banks, 2002a). Touch has been found to dominate vision in judgement of haptic properties such as texture (Heller, 1989; 1982; Jones & O'Neil, 1985; Lederman & Abbott, 1981; Lederman, Thorne & Jones, 1986), and information on properties such as hardness, thickness, weight and temperature, which are generally only available to haptics (Klatzky & Lederman, 1987; Klatzky, Leederman & Reed, 1987; Krueger, 1989). In such situations our vision provides a quick glance which results in a broad but coarse information about the haptic properties of an object (Klatzky, Lederman & Matula, 1993). Such quick glances also tend to determine whether or not the object in question needs further processing.

It has also been found that our perceptual system can be equally influenced by our visual and tactile systems when discriminating between different stimuli (Ernst & Banks, 2002b), and that the haptic system is an effective recognition device of three-dimensional objects (Klatzky, Lederman & Metzger, 1985). This does not however explain what happens when humans encounter a stimulus that looks one way but feels slightly different, which is a rather common occurrence within the retail environment. For example, when touching a jumper that looks soft and fluffy but that actually does not feel very soft at all.

Studies that have focused upon the comparison of visual only and tactual only judgements of texture have shown that both modalities have virtually identical discrimination functions for accuracy and variability measures (Jones & O'Neil, 1985; Lederman & Abbott, 1981). In particular Heller (1982) found that visual and tactile information, obtained separately, produced equivalent performance on a task involving judgement of smoothness. However, visual judgements have been found to be performed more rapidly than tactile judgements and it has been suggested that this is due to the fact that it takes "longer to run one's fingers over an object" (Jones & O'Neil, 1985, p.71). It is due to findings such as these that the human hand has been described as a person's outer brain (Klatzky & Lederman, 1987), and as the 'intelligent hand' (Lederman & Klatzky, 1987). The latter in particular referring to the stereotypical hand movements associated with the extraction of specific object properties.

Even though there is no need to doubt the 'intelligence' of our hands there, are limitations to their effectiveness. Studies conducted on blind participants have clearly demonstrated that vision is far more effective than haptics when it comes to determine the proportion, symmetry or aesthetics of an object (Appelle, Gravetter & Davidson, 1980). It has also been confirmed that haptics are orientated towards the encoding of substance and can therefore not compete with vision when it comes to the encoding of shape (Klatzky & Lederman, 1987; Klatzky, Lederman & Reed, 1987).

However vision and touch do not only interact in competition. For example it has been found that judgements of shape and surface texture are better when both visual and tactual information are available (Manyam, 1986). These studies indicate that vision and touch may be capable of processing the same events but that they do so independently of one another (Warren & Rossano, 1991), even though some researchers have suggested it to be unlikely (Rock & Harris, 1967). One should however bear in mind that it is not entirely clear when the two modalities work simultaneously and when one may override the other. In some situations vision may mediate better perception and occasionally also supersede touch entirely and it is also possible that the reverse can happen (Warren & Rossano, 1991).

Studies of attentional cueing has shown that cues presented in one modality (e.g. touch) can influence the speed of responding to stimuli presented in a different modality (e.g. vision) (Spence & Driver, 1997; Spence, Nicholls, Gillespie & Driver, 1998; Spence, Pavani & Driver, 2000). This also suggests that it is possible that the processing within one particular modality can be directly influenced by a stimulus presented within another modality.

In the light of previously conducted research within the area of haptic influences it would appear to be ignorant to solidly rely upon visual evaluations of various stimuli. It would only be suitable to do so in circumstances where humans are not allowed to encounter physical interaction with a stimulus. This more often than not, is the case when looking at paintings and sculptures in art galleries. However, in everyday situations, such as those encountered in the retail environment, whilst deciding upon whether a particular stimulus is appealing, we are mostly presented with the opportunity to touch it.

1.10 Dissertation goal & Research hypotheses defined

No one has previously attempted to systematically analyse a given design into its constituent elements such as colour and shape, or investigated the relationship between combinations of these and the influence of the perceiver's evaluation in regards to POP materials. This thesis is an attempt to do this.

In order to be able to construct a theoretical framework that has the capacity to increase the effectiveness of POP-displays, it is important to demonstrate how the contextual environment influences consumer choice. Furthermore some products are not noticed at all. This may be linked to the aesthetics of the design elements that do not have the capacity to attract and maintain the consumer's attention.

The literature review illustrates that there are a number of useful approaches that can be used for developing a conceptual framework that can increase the overall effectiveness of POP-displays. Essentially, the conceptual model developed in the present thesis attempts to combine a number of approaches previously applied within various areas of psychology that appear to have the capacity to further enhance the efficiency of POP-displays. For the purpose of establishing a conceptual model it was deemed appropriate to use student populations throughout all of the studies. Furthermore it was also decided not to focus upon individual differences, as one of the main aims of the series of studies was to establish a range of methodologies and approaches to measuring aesthetic responses. The focus throughout the thesis is upon the participants' combined responses. The area of individual differences can be explored at a later date after the framework for the POP displays has been established.

When considering how to create a successful and highly competitive POP-display, there is a need to pinpoint which aspects of such displays have an ultimate impact on consumers. Ideally it needs to be established what kind of aesthetic elements in a POP-display generate a positive evaluation so that consumers find the products on the display appealing. Also of great interest is how the consumers' attention can be captured within a cluttered environment, and whether they are likely to be drawn towards certain aesthetic elements. Furthermore it needs to be determined whether certain aesthetic elements can contribute to how long a consumer can be kept in front of the POP-display. The idea being that by increasing the dwell time, one is also increasing the likelihood of purchase.

This raises a string of questions such as; 'What kind of elements may affect the aesthetic value of POP-displays? ', 'Can the overall evaluation of a POP-display be positively affected by the use of aesthetic elements?', 'Is it possible to establish if there are aesthetic elements that have the capacity to draw consumers attention to the POP-display without their direct awareness?' Do such aesthetic elements also have the potential to lure consumers towards the POP-display in order to explore the products on display further?', 'Can certain aesthetic elements influence the consumers' decision even under time pressure?', 'What elements have the capacity to arouse consumers' focal attention?', 'How can dwell time be effectively increased?', and 'Does the response to an enhanced aesthetic evaluation lead to an increase in dwell time and perhaps touching of the product?'.

Previously outlined research findings raise a number of possibilities in regards to how these questions can be investigated. To initially address what kind of aesthetic elements may have the capacity to produce a more favourable evaluation it appears logical to test whether previously established design principles can assist in doing so. This can be done by investigating if the three design elements (e.g. unity, proportion

& focal point), which are considered to be of great importance to any design (e.g. Boselie, 1992; Henderson & Cote, 1998; Lauer, 1985; McManus, 1980), may have an impact upon how attractive POP-displays are considered to be. Consequently, study one tests four hypotheses that seek to address the extent to which the three design principles 'unity', 'proportion' and 'focal point' may influence consumers' overall evaluation of POP-displays.

H1: The design principles 'unity', 'proportion' and 'focal point' are all important factors when consumers evaluate POP-displays.

H2: Aesthetic responses are more favourable for POP-displays that exhibit 'unity' than they are for POP-displays that do not exhibit 'unity'.

H3: Aesthetic responses are more favourable for POP-displays that exhibit ideal proportions than they are for POP-displays that do not exhibit such proportionate relationships.

H4: Aesthetic responses are more favourable for POP-displays that exhibit a 'focal point' than they are for POP-displays that do not exhibit a 'focal point'.

For the purpose of establishing what makes humans prefer one POP-display over another, it would be useful to explore Kaplan's idea of four distinct concepts (complexity, mystery, coherence & legibility) that can be used to predict people's preferences for certain environmental scenes over others (e.g. Herzog et al., 1982; Kaplan et al., 1989; Kaplan, 1987; Kaplan & Kaplan, 1987). This is taken into consideration in study two, where an initial investigation is launched into the idea that Kaplans' four dimensions can be applied to POP-displays in order to produce a favourable evaluation. In order to do so the following five hypotheses are tested;

H5: Perception of POP-displays will be influenced by variation in the four dimensions of aesthetic assessment as postulated by Kaplan and Kaplan.

H6: An increase in perceived 'complexity' will increase a positive aesthetic response.

H7: An increase in perceived 'mystery' will increase a positive aesthetic response.

H8: An increase in perceived 'coherence' will increase a positive aesthetic response.

H9: An increase in perceived 'legibility' will increase a positive aesthetic response.

The third study set out to explore whether some of Kaplans' and Berlyne's original concepts of aesthetic preferences can be operationalised. To do so, simple aesthetic elements such as basic shapes and colours can be utilised to test if they will somehow combine or 'coalesce' into meaningful precepts such as 'complexity' and 'mystery' and in turn help to produce more favourable evaluations as hypothesised by the Kaplans. Initially the following hypotheses results;

H10: Simple aesthetic elements such as shape, colour, and shade can directly influence how a POP-display is perceived.

H11: The number of elements used and whether or not they are fully visible can affect how a POP-display is perceived.

Based upon the results of the second study which looked at Kaplan's model of aesthetic response and its application to influence consumer mood and in turn the evaluation of POP-displays, it was decided in study three to operationalise two of the Kaplan concepts, namely 'mystery' and 'complexity'. Part of such a process was also to develop an understanding of how the design elements were used in their function as heuristics in the process of information processing. This is of particular importance as it has been suggested that consumers rely upon simple heuristics when their processing motivation is low (Myers-Levy & Peracchio, 1995). Consequently, it should be useful to identify which particular design elements contribute to whether or not a POP-stand is perceived as being 'mysterious'. This results in the following hypotheses;

H12: The number of elements used in a picture will affect whether it is perceived as being 'mysterious'.

H13: The type of shapes used in a picture will affect whether it is perceived as being 'mysterious'.

H14: The colour used in a picture will affect whether it is perceived as being 'mysterious'.

H15: The shade used in a picture will affect whether it is perceived as 'mysterious'.

H16: The elements in a picture that are hidden behind other elements will affect whether it is perceived as being 'mysterious'.

The underlying reasons for trying to operationalise Kaplans' concept of complexity were not solidly based upon the outcome of the second study but were also linked to some of the studies previously conducted by Berlyne (e.g. 1971, 1974, 1963). The idea that both the Kaplans' and Berlyne have suggested that complexity within a scene can be linked to visual preference, makes complexity a strong contender for the possibility of producing a favourable evaluation of a POP-display. However as previously pointed out by Berlyne one should be cautious as to how complex one makes a display, as highly complex elements tend to reduce the preference rating as opposed to increasing it. Therefore another five hypotheses were generated to explore whether certain design elements may contribute to whether or not a display is perceived as being complex;

H17: The number of elements used in a picture will affect whether it is perceived as being 'complex'.

H18: The type of shapes used in a picture will affect whether it is perceived as being 'complex'.

H19: The colour used in a picture will affect whether it is perceived as being 'complex'.

H20: The shade used in a picture will affect whether it is perceived as being 'complex'.

H21: The elements in a picture that are hidden behind other elements will affect whether it is perceived as being 'complex'.

Berlyne's (e.g. 1974, 1971) research also showed aesthetic preferences can be positively affected if the evaluator perceives the display as being novel. Just like with complexity he suggested that novelty would increase the preference rating up to a point, and if the display was too 'novel' it would decrease the rating. This directly contradicts more recent research conducted within advertising which has suggested that familiarity increases likeability, and that the more familiar you become with a stimulus the more you will like it (Moorthy & Hawkins, 2004). However since Berlyne's research was conducted with relatively simple patterns and shapes, it appears feasible to presume that his studies may have more relevance for the kind of designs applied to POP-displays. Therefore it also appears logical to outline certain design elements that may appear to be of a familiar nature to consumers. The following hypotheses result;

H22: The number of elements used in a picture will affect whether it is perceived as being familiar.

H23: The type of shapes used in a picture will affect whether it is perceived as being familiar.

H24: The colour used in a picture will affect whether it is perceived as being familiar.

H25: The shade used in a picture will affect whether it is perceived as familiar.

H26: The elements in a picture that are hidden behind other elements will affect whether it is perceived as being familiar.

Even though Berlyne found that highly complex patterns that were rated as interesting did not increase overall likeability, there are some advantages in establishing what makes a POP-display to be perceived as interesting. His findings indicated that the participants in his experiments spent longer looking at the 'interesting' patterns before evaluating them. This means that it may be a useful tool for increasing dwell time. Furthermore if it is found that familiarity increases overall likeability, it may also raise the possibility that an interesting POP-display might produce a favourable aesthetic response. Perhaps it may work in a similar fashion to Kaplans' concept of mystery in that it may draw the evaluator into the scene in order to investigate it further. Subsequently study three also investigated which elements that can be used to endow an perception that the display is interesting. The following hypotheses result;

H27: The number of elements used in a picture will affect whether it is perceived as being 'interesting'.

H28: The type of shapes used in a picture will affect whether it is perceived as being 'interesting'.

H29: The colour used in a picture will affect whether it is perceived as being 'interesting'.

H30: The shade used in a picture will affect whether it is perceived as being 'interesting'.

H31: The elements in a picture that are hidden behind other elements will affect whether it is perceived as 'interesting'.

Since the aim of the third study is to operationalise various concepts that can create positive aesthetic evaluations of POP-displays it is imperative that one simultaneously creates an understanding of what kind of aesthetic influences may be considered attractive. Can a number of circles or squares contribute to an overall more favourable evaluation of a POP-display? Does it actually matter what colours that are used? Or is it simply dependent upon the shape? Perhaps both colour and shape plays an active part in evaluation procedures? To answer such questions a further five hypotheses were explored;

H32: The number of elements used in a picture will affect whether it is perceived as being 'attractive'.

H33: The type of shapes used in a picture will affect whether it is perceived as being 'attractive'.

H34: The colour used in a picture will affect whether it is perceived as being 'attractive'.

H35: The shade used in a picture will affect whether it is perceived as being 'attractive'.

H36: The elements in a picture that are hidden behind other elements will affect whether it is perceived as 'attractive'.

Furthermore one needs to ask if simple aesthetic elements can be used to establish what it is that makes a display 'mysterious', 'complex', 'familiar' or 'interesting', do the four concepts increase or decrease overall likeability? Therefore in line with previous research findings (e.g. Berlyne, 1974,1971; Kaplan, 1975; Kaplan et al., 1989) an investigation can be conducted into the idea that novelty just like mystery and complexity can increase likeability. This also raises the question of which of the three may be the most efficient when it comes to generating a positive evaluation of a POP-display. However, as already mentioned before, Berlyne did not believe interesting patterns generated favourable responses, but as recent research has indicated this may have changed, which means that this needs to be investigated further. The following hypotheses emerge;

H37: An increase in how complex a picture is perceived to be will increase a positive aesthetic response.

H38: An increase in how interesting a picture is perceived to be will increase a negative aesthetic response.

H39: An increase in how familiar a picture is perceived to be will increase a negative aesthetic response.

H40: An increase in how mysterious a picture is perceived to be will increase a positive aesthetic response.

The last four hypotheses in study three are concerned with the idea that the four concepts investigated may have the capacity to increase overall dwell time. Kaplan and Kaplan's proposition that a mysterious concept would draw people into a scene in order for them to further explore the hidden information, would indicate that they would spend more time in such an environment than they would in a non-mysterious one. If the mystery concept can be applied to a POP-display it would suggest it might be used to increase the amount of time spent in front of the display. Even though Berlyne proposed that interesting patterns do not normally generate aesthetically pleasing responses it still may be worth investigating if interest can function as an effective tool to increase dwell time. Furthermore it may also be possible to increase dwell time by exploring Berlyne's (and the Kaplans') idea that complex patterns attract longer exploration. Even though nothing has been said in regards to whether or not novelty can be used in the function of increasing visual exploration, it is not entirely infeasible to suggest that it may have a similar impact upon dwell time as a mysterious concept. Bearing in mind that with an unusual or unfamiliar display a consumer would not have any previous experiences to draw upon, the consumer would have to explore it further in order to create a fully legible perception of the stimulus. However just the opposite may also happen, especially if the stimuli is too complicated, bearing in mind that consumers tend to rely on peripheral cues (Bitner & Obermiller, 1985) they may evaluate it as unattractive and simply disregard it. Additionally it would also be useful to explore which of the four concepts generates the longest time of exploration. This leads to the final four hypotheses in study three;

H42: An increase in how 'complex' the picture is perceived to be will increase the time of exploration.

H43: An increase in how 'interesting' the picture is perceived to be will increase the time of exploration.

H44: An increase in how 'familiar' the picture is perceived to be will decrease the time of exploration.

H45: An increase in how 'mysterious' the picture is perceived to be will increase the time of exploration.

Because consumers generally only look at the displays for a few seconds, and much of their behaviour happens with minimal or no awareness, (Kirsh & Lynn, 1999), it is important to establish how design elements within the retail environment can be manipulated to maximise their impact. Since colours and shapes may function as heuristics (Myers-Levy & Peracchio, 1995) it appears logical to investigate if they may also have the capacity to reduce the search time in the visual search process within a cluttered setting. The visual search procedure is of particular interest since the activity of scanning our visual environments and subsequently searching for suitable targets is directly linked to our visual attention (Wickens & Hollands, 2000). It has previously been found that both colour and shape can have the capacity to reduce the visual search time (e.g. Carter, 1982; D'Zmura, 1991; Farmer & Taylor, 1980; Roggeveen et al., 2003). From these sort of studies it has also been concluded that search time and errors increase with the number of distractors in a search display (Eriksen & Spencer, 1969). However none of the studies have included any more than a maximum of 140 distractor targets, making it somewhat uncertain what will happen when humans are presented with hundreds of distracting targets at any one time (as they would be within a retail environment).

Simply knowing that search times increase linearly with the amount of distractors in a display is not very helpful information when trying to create new displays for cluttered commercial environments. This is why it will be investigated whether certain design elements such as basic colours and certain shapes can help reduce the search time in what is more often than not a cluttered and often chaotic settings. If colours and shapes can be used to attract attention to a POP-display in a cluttered setting, it would also eliminate the possibility that another stimulus will distract the consumers' attention (i.e. a competitors brand). It appears feasible to hypothesise that 'basic' colours should be more effective than 'non-basic' colours when it comes to reduce visual search time since they are generally recognised in an instant (Boynton, 1988; Davies & Corbett, 1995). This leads to the first three hypotheses outlined in the fourth study;

H46: Speed of target detection in a cluttered scene will be influenced by the target colour.

H47: Basic colours will be detected more rapidly than non-basic colours.

H48: Speed of target detection will be influenced by its shape.

It would also be of great interest to test if there are differences between the sexes in regards to visual search procedures, since it seems to have previously been presumed that they should be the same for both of the sexes. The idea that men and women may find certain coloured targets more or less rapidly may be linked to socialisation procedures (e.g. Taft & Sivik, 1991). There are however also other possibilities such as that women generally are less tolerant of achromatic colours (Guilford & Smith, 1958) and that a larger proportion of the male population suffer from colour vision defects (De Valois & De Valois, 2000). The preceding discussion leads to the following hypothesis;

H49: There will be a sex difference in the detection of targets of different hue.

Studies conducted in relation to aesthetic evaluation have shown that men tend to prefer stimuli that have angular contours whilst women prefer rounded contours (e.g. Laurie, 1981). This may also suggest that men and women's visual search procedures may also be influenced differently by shapes, that they may be more 'tuned into' the shapes they find more aesthetically pleasing, and in turn would locate them more rapidly. Therefore the following two hypotheses were also included in study four;

H50: Male subjects will detect square targets more rapidly and accurately than females.

H51: Female subjects will detect round targets more rapidly and accurately than males.

If basic colours can reduce the visual search times in cluttered environments, the question is can they also capture our focal attention. It is possible that whether POP-displays will be able to capture consumers may be contingent upon whether they are presented in basic colours. Theories of visual attention generally distinguish stimulus driven selection from goal driven selection (Egeth & Yantis, 1997). The former indicates that attention is captured by a visually salient object, irrespective of observer's intention. The latter indicates the deliberate allocation of attention of objects that are goal relevant in a given behavioural context. From a marketer's point of view the stimulus driven selection is of particular interest, especially if they are trying to introduce a new product into the market. If a stimulus has the capacity to capture a consumer's attention, then just as with the visual search strategy, it is less likely that the consumer will be distracted by competitive brands. Consequently the fifth study also investigates the role of colour. In addition, the role of branding upon focal attention was also perused, bearing in mind that already existing brands were used in this study. It has been suggested that advertising for familiar brands may not work in the same way as advertising for unfamiliar brands (Machleit, Allen & Madden, 1993). Information related to the more familiar brands advertised in the marketplace may be less susceptible to competitive interference (Kardes, 1994; Kent & Allen, 1993). Kent & Allen (1994) found that consumers are more likely to recall ad information related to highly familiar brands and that their memory will be less affected by exposure to competitors' ads. This may also indicate that the more familiar brands within retail environment may therefore also be more readily focused upon and consequently recalled.

Similarly other studies have also shown that the encounter of a highly popular brand within a retail environment may capture consumers' attention. It is possible that popular brands will generally create a higher level of consumer involvement i.e. the enhancement of motivation to process stimuli presented (Petty & Cacioppo, 1979). Research has shown that when involvement is low, consumers are much less likely to engage in elaborative processing, since the information encountered is then normally processed with minimal effort and consciousness. However, if the involvement is high it enables the consumers to draw on relevant associations, images and previous experiences from memory (Petty & Cacioppo, 1986). Nevertheless, even on a low involvement level certain elements are still likely to be encoded into long term memory due to pre-attentive processes (Greenwald & Leavitt, 1984), and then the focal attention then tends to be directed by the context or by vivid stimuli themselves (Fiske & Taylor, 1991). If the level of product involvement is of a moderate level, then the consumer is required to collate information already stored with the encountered novel stimuli, in order to facilitate comprehension and retention of the new information (Alba & Hutchinson, 1987).

The above resulted in two hypotheses being developed for this study;

H52: POP-displays presented in either red or green will have higher attentional values than when other colours are used.

H53: Kit Kat will be noticed more than the other three brands.

Even though there are contradictory ideas of what it is that makes a combination of colours aesthetically more pleasing it was then decided to explore this further in the sixth study. Since it has been proposed that colour combinations that have the same value will be more favourably evaluated than colours that do not have the same value (Polzella & Montogmery, 1993) this formed the basis for the 54th hypothesis. Furthermore it was decided to test earlier research findings that have suggested that larger differences in saturation between colour combinations tend to be judged as more aesthetically pleasing than those that are not (Helson & Lanford, 1970).

Additionally it was also decided to look into whether there may be a preference for colour combinations that consist of a mixture of a basic and a non-basic colour. This is partially based upon the findings from the qualitative analysis of the previous study. The following hypotheses were tested;

H54: Colour pairs with the same value will be rated as being more attractive than colour pairs with different values.

H55: Colour pairs with large saturation differences will be rated as being more attractive.

H56: Colour pairs that consists of a mixture of a basic and a non-basic colour will be rated as being more attractive.

The final part of the thesis focuses upon what happens when the consumer touches a product. This is of interest since it is known from studies conducted on shopping behaviour (such as in clothes shopping) that the consumer draws upon both visual and tactile senses to evaluate a product (e.g. Gladwell, 1996). As it stands it is not known what happens to aesthetic evaluation when a consumer touches a product after an initial visual evaluation. Does the evaluation remain the same? Can touching alter overall product evaluation; and if so, how does this interact with, or influence initial visual evaluation?

The idea that consumers' previous experiences lead to prior expectation (Deliza & Mac Fie, 1996) raises a number of possibilities in regards to how touch may affect evaluation of a product. Can different textures that may not be in line with previous expectation help alter overall product evaluation, and in turn affect purchase probability? Perhaps different textures are used as some form of discrimination within the evaluation procedure? The seventh study was undertaken by beginning an initial contribution to comprehending whether tactile senses contribute to the overall aesthetic evaluation of a product. Two hypotheses were tested:

H57: Haptic interaction with different kinds of textures [on a video/DVD container] will affect overall aesthetic evaluation.

H58: The texture normally encountered on a video/DVD container will produce a more positive aesthetic response than the other two materials.

From a design point of view it also needs to be determined whether textures are evaluated in the same sort of way when they are encountered separately, as compared to when they are a part of a product. This is useful to know as it demonstrates whether or not discrimination of surfaces are contextually driven. In the eighth study a blind haptic evaluation (the participant can't see the object whilst touching it) was conducted in order to establish whether or not the evaluation of different plastic textures in themselves generate different preferences. It has repeatedly been proven that humans have the capacity to discriminate between different kind of textures (e.g. Jones & O'Neil, 1985; Lederman & Abbott, 1981), the question is whether they also discriminate between different types of textures in terms of preference. The following hypothesis was tested:

H59: Aesthetic evaluations of different plastic textures will differ when evaluated using only tactile influences.

Based upon the seventh study it was decided to conduct one more study that could corroborate the results. Consequently the research hypothesis in the ninth study remained almost the same even though the research methodology was different;

H60: Simultaneous visual and haptic evaluation of a DVD box will be affected by the surface texture.

The tenth and final study conducted was based upon previous studies which have shown that the tactile sensory system can in certain situations directly compete with our visual perception (e.g. Heller, 1982; Jones & O'Neil, 1985; Lederman & Abbott, 1981; Lederman et al., 1986). However it is not known to what extent haptic properties may influence overall aesthetic evaluation of products and whether the evaluation of 'aesthetic quality' is influenced more by one modality than another (e.g. vision or touch). Bearing in mind that 80% of our perception is accounted for by our vision (Levine, 2000) and that our visual perception would take into consideration all of the other design elements that a product consists of such as colour and shape, it is likely that the visual input will be the more dominant modality within the evaluation process of a product. However if this were found to be incorrect, it would demonstrate that the haptic senses are a much forceful tool than previously anticipated. In the light of this the following hypothesis was constructed:

H61: Visual perception will affect overall aesthetic evaluation more than haptic perception.

The idea that texture may contribute to the discrimination of products also raises the possibility that certain textures may have the capacity to influence dwell time. For example, a highly unusual or 'unexpected' texture may prolong the time a consumer is physically interacting with a product in order for the consumer to establish whether or not they like it. This leads to the final hypothesis in study ten;

H62: The texture normally encountered on a DVD container will be haptically explored for a shorter period of time than the other two materials.

By setting out to explore the above outlined hypotheses, it should be possible to create a theoretical framework that demonstrates how POP-displays can utilise certain aesthetic elements in order to communicate more effectively with consumers within cluttered retail environments. The main emphasis of the theoretical framework will be how the POP-display can be designed to increase the overall 'likeability', but also it will be taken into consideration whether certain elements can be used to capture attention and perhaps increase the dwell time.

Figure 4: Hypotheses and the conceptual framework of how to increase the effectiveness of POP-displays.

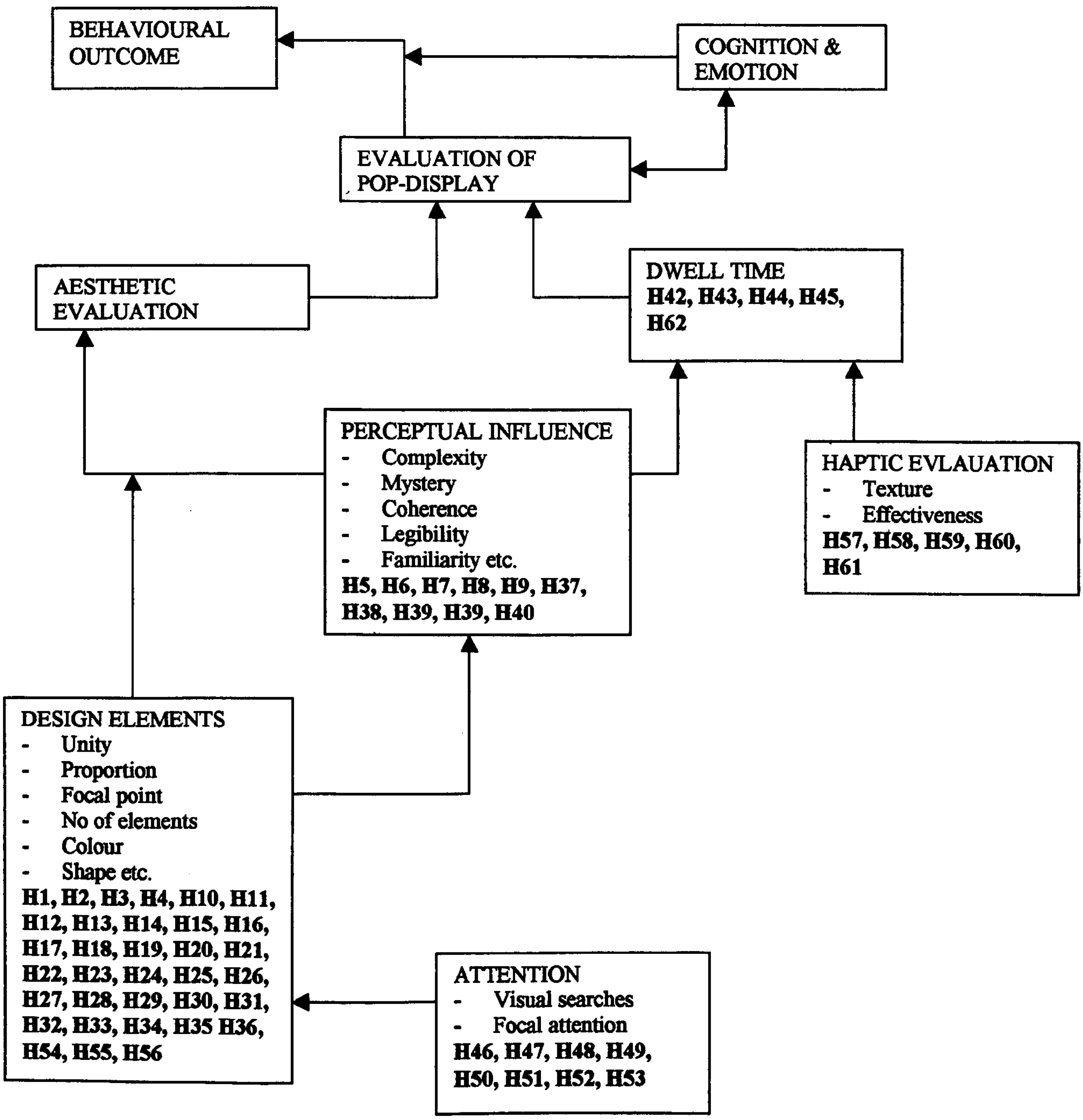


Figure 4 illustrates the framework outlined earlier and how the hypotheses fit in to the framework.

Chapter 2

Study 1[1]: Do 'proportion', 'focal point' and 'unity' affect aesthetic evaluation of POP-displays?

The idea that design principles such as 'proportion', 'focal point' and 'unity' can be used to generate a more favourable perception of POP-displays was explored in this study. These previously established design principles have been suggested to be of utmost importance to any design (e.g. Boselie, 1992; Henderson & Cote, 1998; Lauer, 1985; McManus, 1980), subsequently the aim is to decipher which one out of the three designs of POP-displays will elicit the most positive aesthetic response among consumers and why.

2.1 Method

2.1.1. Participants

Two hundred and seventy-two students and staff (mainly students) at the London Metropolitan University participated in this study. There were 59 recorded males and 166 recorded females, and on 47 of the cases there was missing data on the sex. The subjects were aged between 18 and 50 years, but exact ages were not recorded.

It was decided not to use 'real life' consumers to identify the aesthetic attributes that are important to them when assessing a POP-display as previously generated evidence suggests that people do not appear to be able to consciously identify key differences in design (Veryzer, 1993).

For this study a student population was particularly appropriate since they have

[1] This study has been published: Jansson, C., Bointon, B., & Marlow, N. (2003). An exploratory conjoint analysis study of consumers' aesthetic responses of Point-of-Purchase materials. The International Review of Retail Distribution and Consumer Research, 13, 59-76.

stronger cognitive and test-taking abilities than the rest of the population, which makes them consistent in their responses (Sears, 1986). This makes students, compared to the rest of the population, motivated to be consistent in their responses to the measure on a Likert scale. Another advantage of using a student population was that a larger proportion were of a younger age, which would not be to dissimilar to the market of interest for this study.

Participants were recruited individually from various locations throughout the university campus or in small groups gathered from lectures and seminar rooms.

2.1.2 Materials

It was decided that it was appropriate to use visual cues in this study as suggested by Holbrook and Moore (1981), instead of the more traditional method of using verbal descriptions of the products and their attributes. Previously it has been suggested that the validity of using pictorial stimuli may be affected by the possibility that respondents could fail to recognise an attribute, or only recognise it half way through the task (Loosschilder, Rosberge, Vriens & Wittink, 1995). However, since this particular study is looking for preferences that may not be available to introspection but are more likely to be a reflection of emotional (not necessarily rational) responses (Costley & Brucks, 1992), it would not appear as if Loosschilder et al.'s findings would be an issue in this study.

The three design attributes ('unity', 'proportion' & 'focal point') and specifically assigned attribute levels (see Table 1) were combined to form different hypothetical versions of POP-displays for the respondents to assign preference ratings (Halbrendt, Wirth & Vaughn, 1991). However, this generated a large number of product versions (in this case: 2x3x3 =18) and therefore the decision was taken to select a sample of product versions to make the participants' task of evaluation easier without interfering with the effectiveness of evaluating multi-dimensional attributes. Hence a fractional factorial design was used.

This study used SPSS Conjoint 80. software, which employs the use of orthogonal array designs to construct the three sets of eight product versions used in this study. The randomised presentation of the nine versions is shown in Appendix A. Transparencies of three original POP stands supplied by Coutts Retail Communications Ltd were used.

The titles of these transparencies were:

1) *New Balance* (Training Shoes) Stand
2) *Star Trek* (The Movie) Merchandise Stand
3) *Independence Day* (The Movie) Video Stand

The three images were then scanned onto a CD and Adobe PhotoShop software (a two-dimensional programme) was then used to manipulate the image to create nine product versions (stimuli) from each of these titles. A variety of techniques were used in PhotoShop to create the twenty-seven images, these included brushes and masks (see Appendix B for example of original *New Balance* transparency).

Two-dimensional computer generated stimuli were used in this study as opposed to three-dimensional techniques due to expense. In addition to the matter of the cost of designing three-dimensional stimuli it was decided that there was only a marginal advantage to a 3D representation in terms of the consumer evaluation. Often point of purchase materials are not viewed by the consumer from all angles and are designed with one perspective (front view) in mind to save on costs and space in the retail environment. Therefore it was agreed that the stimulus would be presented in a two-dimensional format in a flat plane, from a front angle view.

The computer images were printed in colour onto A4 paper, using a Hewlett Packard DeskJet 690C, and then laminated to protect them. They were also made into 35mm colour slides to be viewed through a projector.

To evaluate the computer generated two-dimensional images of the POP-displays, all the participants were given a questionnaire (see appendix C).

2.1.3 Attribute levels

Specific attribute levels were also assigned to each one of the three design attributes investigated here. The attribute levels that were used for 'unity' were (disunity/unity). 'Unity' was achieved through the use of repeated patterns, proximity and similarity. These techniques were used to create 'high unity', parts that interacted in a mutually supportive way. However, this is not to say that the level 'low unity' did not have any of these features. In order for the participants to take the designs seriously some degree of visual similarity between the different parts of the design was needed. In the case of the 'low unity' hypothetical versions, there was simply less 'unity' than in the 'high unity' versions, thus disrupting the viewer's perception of the design flow.

The attribute levels for 'proportion' were (1 to 1.618, proportions of the golden section that is known to be aesthetically pleasing), (1 to 2) and (0.4 to 1).

The attribute levels for the 'focal point' were (large/small/none). In the case of the three POP-displays used in this study the focal point was always the header board which contained the product name or logo and was slightly raised above the rest of the design, thus creating emphasis through placement.

Table 1: Specification of POP Attributes and Levels

Attributes	Level
Unity	1. Disunity 2. Unity
Proportion	1. 1 to 0.618 2. 1 to 2 3. 0.4 to 1
Focal Point	1. Large 2. None 3. Small

2.1.4 Design

The attributes that were chosen to reflect key product characteristics of point of purchase styling in this study were three fundamental design principles, 'unity', 'proportion' and 'focal point'.

There are many possible design principles or characteristics that could be relevant to POP-displays. The selection for this study's POP attributes was chosen from basic design books and recent research papers into aesthetic design. The analysis is intended to gauge the importance of these three attributes, the preferred attribute levels and therefore the most desired products. Although it may be argued that these may not be the only attributes that are of importance in a design, it was decided that these are arguably three of the most salient factors for product aesthetics. No more than three attributes were considered in this exploratory analysis, as it would have made measurement very difficult (Ness & Gerhardy, 1994).

The following hypotheses were generated and tested:

H1: The design principles 'unity', 'proportion' and 'focal point' are all important factors when consumers evaluate POP materials.

H2: Aesthetic responses are more favourable for POP-displays that exhibit 'unity' than they are for POP-displays that do not exhibit 'unity' (i.e. disunity, lack of coherence).

H3: Aesthetic responses are more favourable for POP-displays that exhibit ideal proportions (i.e. proportions known to be aesthetically pleasing) than they are for POP-displays that do not exhibit such proportionate relationships.

H4: Aesthetic responses are more favourable for POP-displays that exhibit a 'focal point' (i.e. that have a point of emphasis) than they are for POP-displays that do not exhibit a 'focal point'.

2.1.5 Procedure

The participants' were asked to evaluate only one of the three titles that were under review. Each participant was asked to rate each of the nine versions, one in turn, for how 'attractive' or 'unappealing' they found that particular POP-display on a Likert scale ranging from – 4 to + 4, (see Appendix C).

Participants were shown the nine versions either individually using A4 laminated coloured copies or in the case of small groups, through the use of 35mm colour slides projected on to a screen so everyone in the group could asses them at the same time although independently.

Each time any of the sets were presented it was in a different random order. This was to safe guard against any order effect that might occur. The participants were asked not to compare one image with previous images they had seen but to judge them on their individual merits. The participants were also instructed not to discuss their rating with other people.

2.2 Results

A conjoint analysis was employed to analyse the results. Conjoint analysis was employed as a technique used to determine how consumers trade off different attributes of a product or service, for example: styling against technical specifications or price versus brand.

Assessing the importance of many of the normal attributes associated with the conjoint techniques is not appropriate in the case of POP materials, as these attributes will vary from POP to POP and will not be relevant in many cases. Therefore the researcher cannot control for many of these attributes. This is due to the fact that a POP stand is not the product that will be purchased but merely a vessel for the products to be displayed in. In this study the only attribute that is being assessed and measured is the product styling in relation to POP-displays, so the emphasis is on the aesthetic values rather than technical specifications for consumers assessing POP-displays.

The reason for using conjoint analysis rather than regression analysis is to determine if it is possible to define POP styling in terms of combinations of design principle attribute levels. If indeed this is the case it is then possible to predict the consumers' willingness to trade one design principle for another. The results should then present a clearer understanding of peoples' design preferences.

Although Holbrook and Moore (1981) argue that conjoint techniques are more appropriate for studying utilitarian product features rather than for aesthetic elements, it is know believed that this is no longer the case. With the recent success of conjoint studies using realistic pictorial representations of the products (Loosschilder et al 1995; Vriens, Loosschilder, Rosberge & Wittink, 1998) as well as new techniques in computer generated design (e.g. Adobe PhotoShop and computer scanners) conjoint analysis is now a useful technique to support product styling decisions. However it should be taken into consideration that conjoint models assume that all products and services are considered to have the exact same level of advertising, marketing and distribution. Since this is not realistic, it has to be remembered that certain POP's could have previously been seen on a number of occasions, whilst the others may have never been seen before by the consumer, which in turn could affect how the consumer evaluates the POP-display.

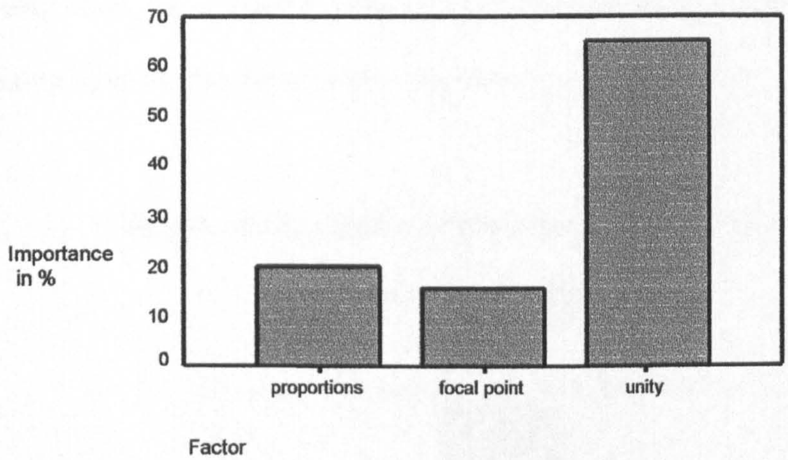
Even though conjoint analysis can be used to estimate individual respondent's preferences (Ness & Gerhardy, 1994) this study concentrates on aggregated results for generalisable extrapolation. The results below are therefore the respondent's preferences when combined. The model used was to estimate an aggregate model for the whole sample over three POPs.

2.2.1 Results for Point of Purchase 1 (New Balance)

Figure 5a shows the average importance for the three factors 'proportion', 'focal point' and 'unity' for the 'New Balance' stand which was the first of the three stimuli that were presented to the participants in this study. This is the result of the responses for the seventy-one participants that assessed the attractiveness of the nine versions of this POP on a Likert scale. Three of the 71 cases were excluded from the analysis, as there was no variance in the scores.

Figure 5a: Average Importance Summary for all Three Factors

New Balance POP 1.



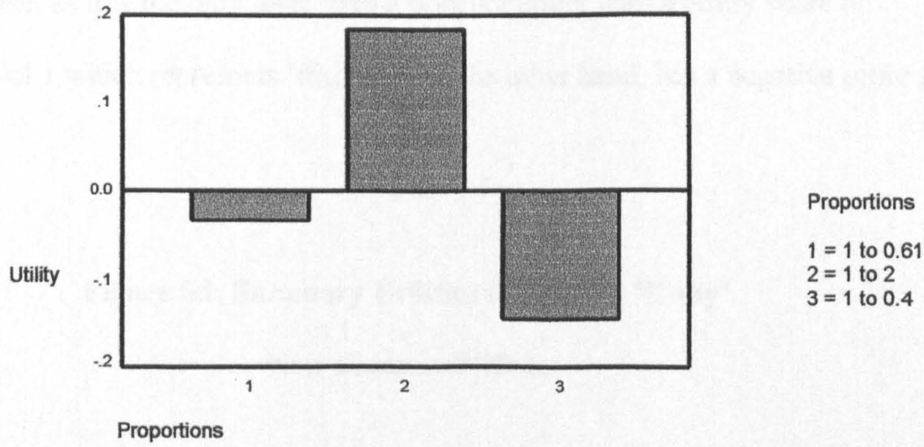
This figure shows that all three factors were important for the participants when they were evaluating the attractiveness of this POP stimulus. However, it is apparent that the factor 'unity' which included the levels 'unity' and 'disunity' was on average the most important factor when assessing this POP with a score of 64.72%. The factor 'proportion' which had the levels (1 to 0.618) (2 to 1) and (1 to 0.4) was considered the second most important with the average score of 19.53%. The least important factor of the three was 'focal point' which had three levels, these were 'large' 'small' and 'no focal point', which in the case of all three POPs was the header board. This factor had an average score of 15.74%.

Figure 5b, c and d show the summary utilities of the factor levels for 'proportion', 'focal point' and 'unity' separately in relation to the same stimulus; 'New Balance' stand. These figures show that the levels for each of the factors are found to have varying degrees of success in adding to the POP's 'attractiveness'. Some levels are found to have a positive effect whereas other levels appear to have a negative effect.

Figure 5b shows the summary utilities for the levels of the factor 'proportion' for POP1. The results indicate that level 2 (1 to 2) is the most preferred level as it is the only level with a positive effect with a utility score of 0.1814. Level 1 (1 to 0.618), on the other hand, has a negative score of -0.0343 and level 3 (1 to 0.4) is the least preferred level for this factor with a negative score of -0.1471.

Figure 5b: Summary Utilities for Factor ' Proportions'

New Balance POP 1.



In figure 5c which shows the summary utilities for the levels of the factor 'focal point' for POP1, it can be seen that it is only level 3 which represents the 'small focal point', that has a positive utility score of 0.1471. Both of the other levels, of which level two represents 'no focal point' and level 1 which represents the 'large focal point', have negative scores of – 0.0294 and – 0.1176 respectively.

Figure 5c: Summary Utilities for Factor 'Focal Point.

New Balance POP 1.

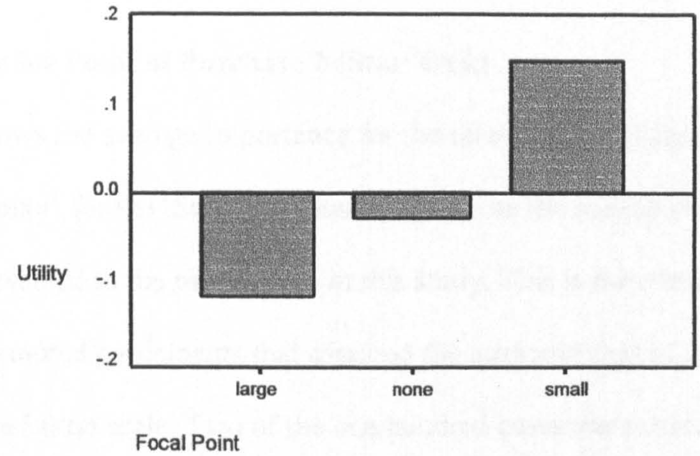
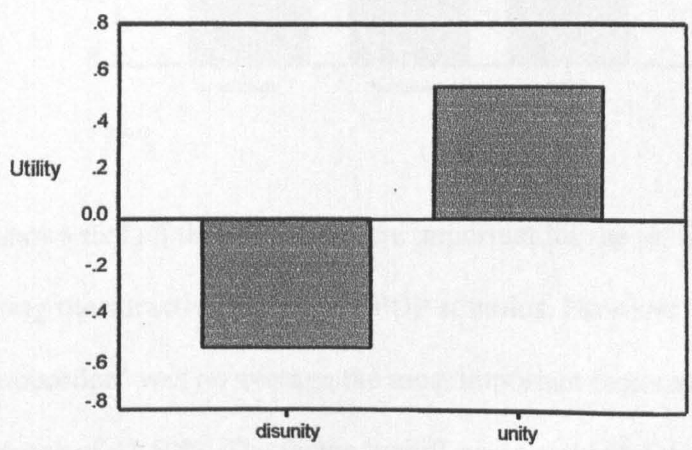


Figure 5d shows that the summary utilities for the levels of the factor 'unity' for POP1. The results indicate that level 2 which represents the level 'unity' is the most preferred level as it is the only level with a positive effect with a utility score of 0.5441. Level 1 which represents 'disunity' on the other hand, has a negative score of -0.5441.

Figure 5d: Summary Utilities for Factor 'Unity'

New Balance POP 1.



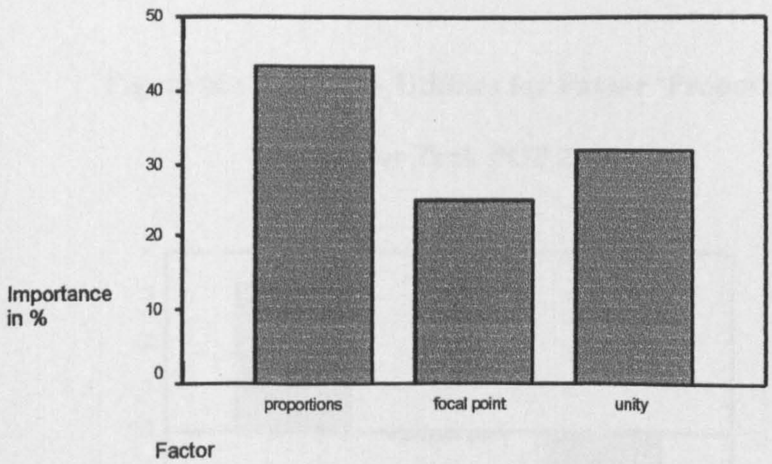
The results show that the model fits the data very well; there are correlations between the observed and estimated preferences. Pearson's R = 0.973, significance = 0.0000 and Kendall's tau = 0.776, significance = 0.0018.

2.2.2 Results for Point of Purchase 2 (Star Trek)

Figure 6a shows the average importance for the three factors 'proportion', 'focal point' and 'unity' for the 'Star Trek' stand which was the second of the three stimuli that were presented to the participants in this study. This is the result of the responses for the one hundred participants that assessed the attractiveness of the nine versions of this POP on a Likert scale. Two of the one hundred cases were excluded from the analysis, as there was no variance in the scores.

Figure 6a: Average Importance Summary for all Three Factors

Star Trek POP 2.



This figure shows that all three factors were important for the participants when they were evaluating the attractiveness of this POP stimulus. However, it is apparent that the factor 'proportion' was on average the most important factor when assessing this POP with a score of 43.50%. The factor 'unity' was considered the second most important with the average score of 31.65%. The least important factor of the three was 'focal point' which in the case of all the POPs was the header board. This factor had an average score of 24.86%.

Figure 6b, c and d show the summary utilities for the factor levels for 'proportion', 'focal point' and 'unity' separately in relation to the same stimulus; 'Star Trek' stand. These figures show that the levels for each of the factors are found to have varying degrees of success in adding to the POPs 'attractiveness'. Some levels are found to have a positive effect whereas other levels appear to have a negative effect.

Figure 6b shows that the summary utilities for the levels of the factor 'proportion' for POP2. The results indicate that level 1 is the most preferred level as it is the only level with a positive effect with a utility score of 0.3288. Level 2, on the other hand, has a negative score of -0.0213 and level 3 is the least preferred level for this factor with a negative score of -0.3075.

Figure 6b: Summary Utilities for Factor 'Proportion'

Star Trek POP 2.

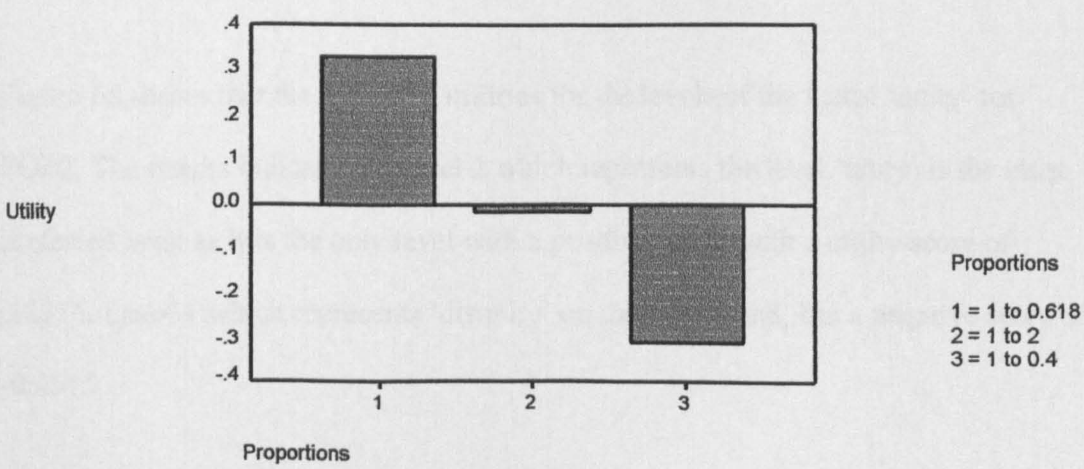


Figure 6 c shows that the summary utilities for the levels of the factor 'focal point' for POP2. The results indicate that level 3 which represents the 'small focal point' is the most preferred level and it has a positive effect with a utility score of 0.1538. Level 1 that represents the 'large focal point' also has a positive effect but much lower with a score of 0.0561. Level 2, which represents the level 'no focal point', is the least preferred level for this factor with a negative score of -0.2099.

Figure 6c: Summary Utilities for Factor 'Focal Point'

Star Trek POP 2.

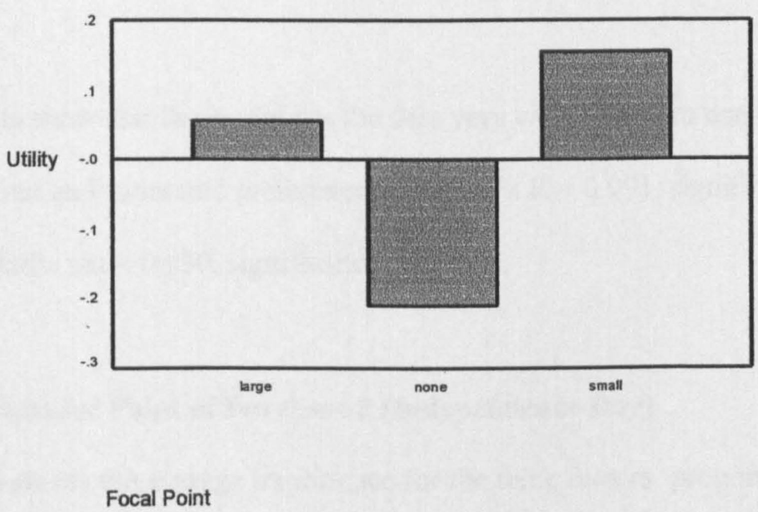
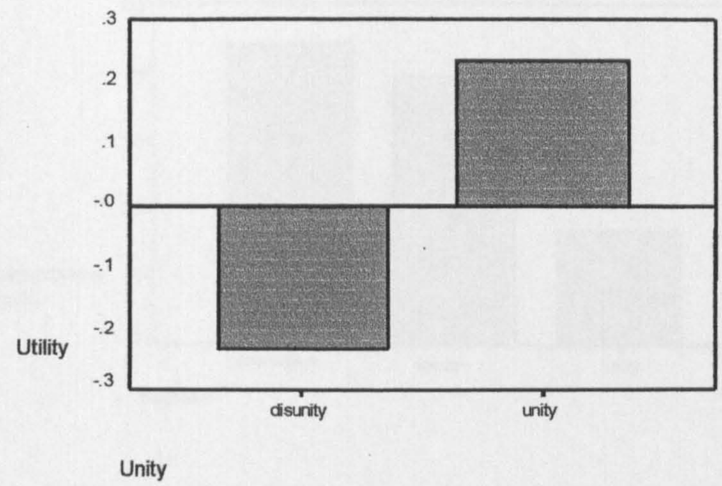


Figure 6d shows that the summary utilities for the levels of the factor 'unity' for POP2. The results indicate that level 2 which represents the level 'unity' is the most preferred level as it is the only level with a positive effect with a utility score of 0.2315. Level 1 which represents 'disunity' on the other hand, has a negative score of -0.2315.

Figure 6d: Summary Utilities for Factor 'Unity'

Star Trek POP 2



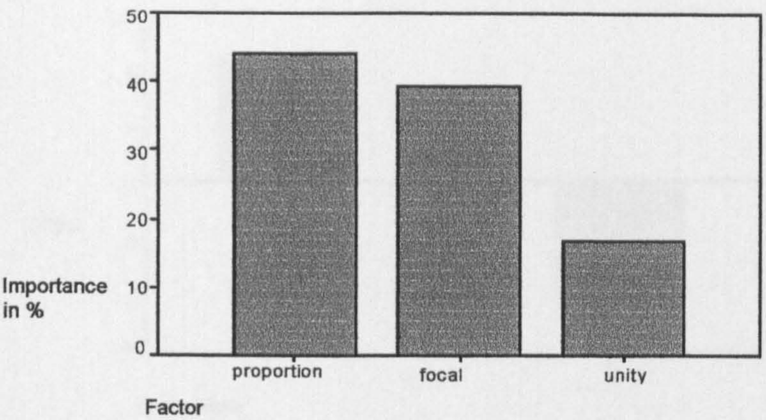
The results show that the model fits the data very well; there are correlation's between the observed and estimated preferences. Pearson's R = 0.991, significance = 0.0000 and Kendall's tau = 0.930, significance = 0.0003.

2.2.3 Results for Point of Purchase 3 (Independence Day)

Figure 7a shows the average importance for the three factors 'proportion', 'focal point' and 'unity' for the 'Independence Day' stand which was the third of the three stimuli that was presented to the participants in this study. This is the result of the responses for the ninety-nine participants that assessed the attractiveness of the nine versions of this POP on a Likert scale. Two of the ninety-nine cases were excluded from the analysis, as there was no variance in the scores.

Figure 7a: Average Importance Summary for all Three Factors.

Independence Day POP 3.



This figure shows that all three factors were important for the participants when they were evaluating the attractiveness of this POP stimulus. However, it is apparent that the factor 'proportion' was on average the most important factor when assessing this POP with a score of 44.13%. The factor 'focal point' which had three different levels, was considered the second most important with an average score of 39.19%, and 'Unity' was considered the least important with the average score of 16.68%.

Figure 7b, c and d show the summary utilities of the factor levels for 'proportion', 'focal point' and 'unity' separately in relation to the same stimulus; 'Independence Day' stand. These figures show that the levels for each of the factors are found to have varying degrees of success in adding to the POPs 'attractiveness'. Some levels are found to have a positive effect whereas other levels appear to have a negative effect.

Looking at figure 7b it can be seen that level 1 is the most preferred level, as it is the only level with a positive utility score of 0.4456. Level 2 has a negative score of –0.0408, whilst level 3 has a negative score of –0.4048.

Figure 7b: Summary Utilities for Factor 'Proportion'.

Independence Day POP 3

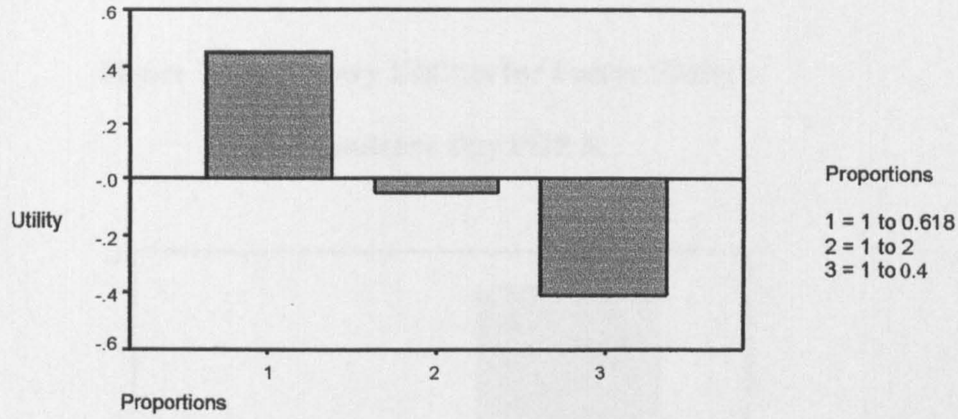
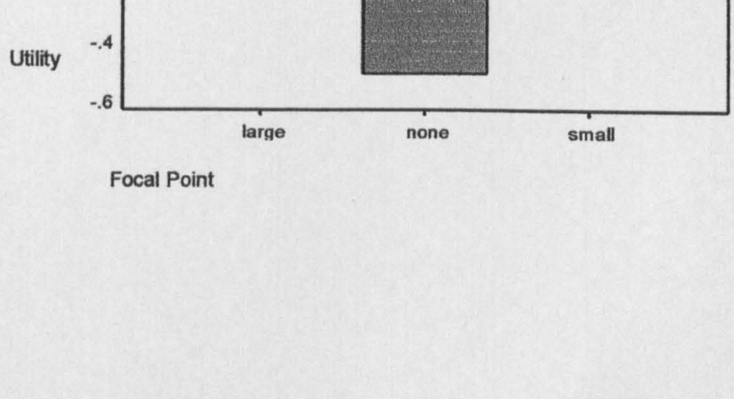


Figure 7c shows that the summary utilities for the levels of the factor 'focal point' for POP3. The results indicate that level 3 is the most preferred, with a utility score of 0.2585. Level 1 is the second most preferred level with a positive score of 0.2381 and level 2 is the least preferred level for this factor with a negative score of -0.4966.

Figure 7c: Summary Utilities for Factor 'Focal Point'.

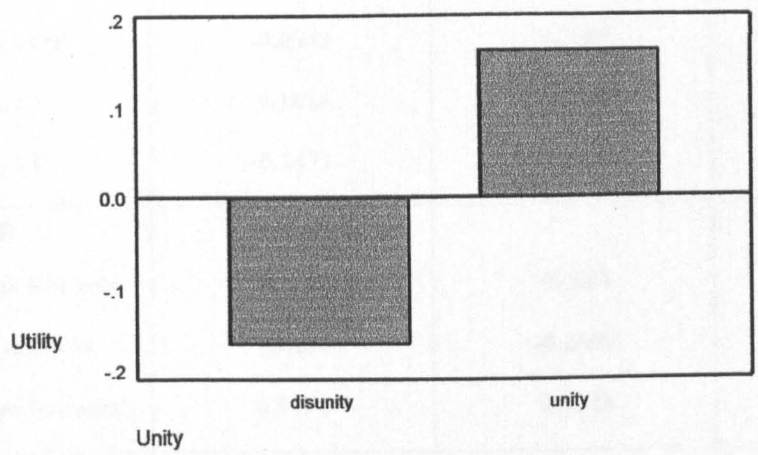
Independence Day POP 3.



The results from figure 7d shows that only level 2 has a positive effect with a score of 0.1607, level 1 on the other hand has a negative score of –0.1607.

Figure 7d: Summary Utilities for Factor 'Unity'.

Independence Day POP 3.



The results show that the model fits the data very well; there are correlations between the observed and estimated preferences. Pearson's R = 0.994, significance = 0.0000 and Kendall's tau = 0.889, significance = 0.0004.

Table 2: Results Compared

	NEW BALANCE	STAR TREK	INDEPENDENCE DAY
Proportion	**19.53%**	**43.50%**	**44.13%**
Focal Point	**15.74%**	**24.86%**	**39.19%**
Unity	**64.72%**	**31.65%**	**16.68%**
Proportion			
Level 1 '1 to 0.618'	**-0.0343**	**0.3288**	**0.4456**
Level 2 '1 to 2'	**0.1814**	**-0.0213**	**-0.0408**
Level 3 '1 to 0.4'	**-0.1471**	**-0.3075**	**-0.4048**
Focal Point			
Level 1 'large focal point'	**-0.1176**	**0.0561**	**0.2381**
Level 2 'no focal point'	**0.0294**	**-0.2099**	**-0.4966**
Level 3 'small focal point'	**0.1471**	**0.1538**	**0.2585**
Unity			
Level 1 'disunity'	**-0.5441**	**-0.2315**	**-0.1607**
Level 2 'unity'	**0.5441**	**0.2315**	**0.1607**

When comparing the above results for all three POP-displays it becomes apparent that all three of the factors being assessed are important for the participants when they assess the 'attractiveness' of the POP. However, the average importance of the factors varies from POP to POP. In two out of the three POP-displays the factor 'proportion' was found to be the most important factor but in the third POP 'unity' was more important than 'proportion'. The relative importance of the three attributes 'proportion', 'unity' and 'focal point' is calculated from the range of the utility values for each attribute. This range predicts the impact of changing the level of a certain attribute and the relative importance of attributes (Ness & Gerhardy, 1994).

When comparing the levels for the factor 'proportion' across the 3 POP-displays we find that on two out of the three POP-displays level 1 (1 to 0.618) is the most preferred level. This is the level that represents the golden section. However, on POP1 the New Balance stand the most preferred level was level 2 (1 to 2). Level 3 (1 to 0.4) was the least preferred level across all three POP-displays.

When comparing the levels for the factor 'focal point' which was the header board for the three POPs, it was found that level 3 'small focal point' was preferred over the other two levels 'no focal point' and 'large focal point'. However, which of these were preferred over each other depended upon the POP in question.

Finally, when comparing the results for the levels of the factor 'unity' it was found that on all three POPs that were assessed the level 'unity' was preferred over the level 'disunity'. 'Disunity' always had a negative effect upon how 'attractive' the respondent found the POP.

2.2.4 Sex differences in results

The results show that women and men evaluate the importance of the three factors differently. Women felt that 'unity' (35.12%) was more important than 'proportion' (33.94%) when assessing the 'attractiveness' of POPs and that 'focal point' (30.94%) was the least important. However, all the scores were very close together. Men on the other hand scored 'proportion' as the most important factor (47.59%) and 'focal point' was the second most important factor (30.42%). 'Unity', for men was the least important, with an average score of (21.99%).

When comparing the results for men and women in relation to the factor levels no differences were found. When assessing 'proportion' both men and women found level 1 (1 to 0.618) the most appealing, level 2 the second and level 3 the least. Both men and women preferred 'small focal points' to 'large focal points' and large to non-at all. Finally, both men and women preferred 'unity' to 'disunity' whilst assessing POP-displays.

2.3 Discussion

The aim of this study was to determine the impact of the design principles 'proportion', 'unity', and 'focal point' on consumer aesthetic responses to materials using conjoint analysis.

The key findings of this study shows that hypothesis 1 is accepted, the 3 design principles were all important factors when evaluating POP-displays. The analysis reveals that also hypothesis 2 is supported, as aesthetic responses were more favourable for POP-displays that exhibited 'unity' than they were for the control POP stimuli that exhibited 'low unity'.

Hypothesis 3 was also supported as 'proportion' level 1 (1 to 0.618) which represented the 'golden section' was the most preferred 'proportion' in two out of the three POP stand evaluated. Therefore, it may be concluded that aesthetic responses are more favourable for POP-displays that exhibit ideal 'proportions' than they were for POP-displays that do not exhibit such proportionate relationships in this study. Also hypothesis 4 is accepted, as none of the POP displays evaluated were rated favourably when they were lacking a 'focal point'. In this study small 'focal points' were preferred over the larger ones.

The results also indicated that men put more importance on 'proportion' and women on the design principle 'unity'. It has also previously been suggested that women and men have different aesthetic preferences (Laurie, 1981). Therefore this finding might be important to bear in mind when designing gender specific POP-displays. Otherwise there do not appear to be any major differences in design principle levels between men and women.

All the results are the consumers' combined responses for the POP-displays and not their individual preferences, which makes it possible to predict consumers' preferences when designing or re-styling POP-displays. It would not be possible to take into account every person's preference as these vary too greatly and would require each POP to be tailor –made for each person.

A number of possibilities may offer some explanations for some of the results encountered. It was mentioned earlier that conjoint analysis can not account for that the original POP-display may have been seen by the respondents on numerous occasions previously, which may have affected how they evaluated them aesthetically. For example, for both the Star Trek and Independence Day displays, the results were identical in that 'proportion' was rated as the most important factor of aesthetic evaluation, and for each of the design principles 'proportion', 'focal point' and 'unity' the same levels were rated as the most important. Since both Star Trek and Independence Day were heavily marketed films, it is possible that the evaluations made were based on how the original POP-displays actually looked. Therefore further research should be conducted in order to eliminate such possibility.

There are two reasons as to why it would not be wise to extrapolate these results to the whole population until further studies have been conducted on more random populations. First of all it should be noted that the 272 (minus the 7 that were taken out) respondents were particularly skewed towards female, even though there are generally more female consumers encountering POP in supermarkets etc., the same tests ought to be conducted on a larger number of males, to establish that the findings are applicable to both genders. Secondly, it should be remembered that although university populations are a useful starting point in exploratory research, they tend to be young and have less crystallised ideas, which often means that their attitudes and judgements are easily changed (Sears, 1986).

2.4 Summary and conclusion

Overall this study has demonstrated the potential for the technique conjoint analysis to be used in order to decipher which design principle and level would be needed in a POP design to elicit the most positive aesthetic response among consumers. In the case of the POP-displays that were assessed in this study by the 272 participants from the London Metropolitan University, the designs that had; high 'unity', the proportion of the 'golden section' (1 to 0.618) and a small 'focal point' were the most favoured designs. The least preferred designs were the ones that had the proportion (0.4 to 1) but also had low 'unity' and no 'focal point'.

There may be many other styling attributes which could have been included in the research concerning design, such as size, colour, typesetting, construction materials to name but a few. Other possible design principles that could be assessed are symmetry and balance, however the study did not attempt to specify all these possible attributes because it would have generated extremely complex designs that would have been too difficult to evaluate and explore in an initial study.

Future research is clearly needed to decipher which other design principles that may have an effect upon consumers' aesthetic value of POP materials. It could also be of interest to conduct a conjoint analysis of many design principles (attributes) and levels at the same time. Although it was argued at the beginning of the paper that it is unwise to investigate more than three attributes in one investigation, this may not be the case for POP styling. This is because we have assessed participants 'attraction' towards POP materials that is based on a gut reaction. We did not ask the participants to make a choice or state a preference based upon rational trade-offs of attributes, as other conjoint studies have required, which takes time and require them to consider several things at once.

This study contributes a modest amount of information to the growing area of research into the aesthetics of product design, but more specifically it contributes to the start of a new and exciting area into POP styling. However, much more research is needed before any real conclusions for POP design recommendations can be drawn.

Chapter 3

Study 2[2]: Can Kaplan's four 'dimensions' produce a more favourable evaluation of POP-displays?

The purpose of this study was to examine Kaplan and Kaplan's four distinct dimensions ('mystery', 'clarity', 'legibility', and 'coherence') that have been shown to have the capacity to predict aesthetic responses for particular landscapes (e.g. Kaplan, 1987; Kaplan et.al., 1989; Kaplan & Wendt, 1972, 1979) and in turn assess their usefulness as a tool in evaluating POP-displays.

3.1 Method

3.1.1 Participants

100 students, staff, and visitors at the London Metropolitan University participated in this study. An opportunistic sampling method was applied. The volunteers consisted of 58 women and 42 men aged between 18 and 35 years. Just as in the previous study it was also here particularly appropriate to use mainly a student population based upon the fact that they tend to have stronger test-taking abilities (Sears, 1986), which meant that they were likely to be more consistent in their responses.

3.1.2 Materials

Three genuine point-of-purchase display units (minus products) were used in this study (all provided by Coutts Retail Communications Ltd). They were 3-D cut-out constructions made from cardboard and printed in full colour. Each one was designed

[2] This study has been published: Jansson, C., Bointon, B., & Marlow, N. (2002). Determinants of consumers' aesthetic responses to Point-of-Purchase materials. International Journal of Consumer Studies, 26, 145-153.

to display a product and to be used in the retail environment. The first display was promoting 'Wild brew guarana' drinks (POP 1), the second was for 'Flipper' (the movie) videos (POP 2), and the third promoted 'Something for the weekend' (a rock and pop audio tape) (POP 3). A 21- item questionnaire was used to evaluate the POP-displays (see below).

3.1.3 Questionnaire development

It was decided to emulate Lazarsfeld's (1958) approach in developing an instrument to measure the concepts 'complexity', 'mystery', 'coherence' and 'legibility'. This approach involved searching for the underlying dimensions of the concepts. By specifying the dimensions, the full complexity of these concepts could be captured and had the further advantage of reducing the abstractness and of bridging the gap between the formulation of the concepts and their measurements.

Kaplan and Kaplan had attempted to detect the underlying dimensions of the four concepts, this is how they described them:

<u>Exploration</u>

1) *Complexity*: The number of, and variety of, elements in a scene.

2) *Mystery:* The degree to which a scene contains 'hidden information' so that one is drawn into the scene to try to find this information.

<u>Understanding</u>

3) *Coherence*: The degree to which a scene 'hangs together' or has organisation.

4) *Legibility:* The degree of distinctiveness that enables the viewer to understand or categorise the contents of a scene.

A pool of items was generated which characterised the above four dimensions. This was achieved through the generation of lists of synonyms and parallel expressions of Kaplan and Kaplan's underlying dimensions. Five items for each dimension were then linked with phrases concerning the evaluation of POP design so the items would have relevance to the participants of this study. A dependent variable was added which was also linked with a relevant phrase. This item was added to measure participants 'attraction' to the POP stimulus.

The 21 items were randomly ordered and arrange in Likert-format (see Appendix D) with a short explanatory introduction

3.1.4 Design

A between subjects design was employed for this study with the dependent variable being the rating of the POP-displays and the independent variable was the POP-displays themselves. The following five hypotheses were tested:

H5: Perceptions of POP-displays will be influenced by variation in the four dimensions of aesthetic assessment as postulated by Kaplan and Kaplan.

H6: An increase in perceived 'complexity' will increase a positive aesthetic response.

H7: An increase in perceived 'mystery' will increase a positive aesthetic response.

H8: An increase in perceived 'coherence' will increase a positive aesthetic response.

H9: An increase in perceived 'legibility' will increase a positive aesthetic response.

3.1.5 Procedure

The study was conducted in a lab setting in order to make sure that the participants would not be distracted by other elements. This also avoided the possibility of the particular participants' perceptions being influenced in a particular way due to environmental factors. Each one of the participants was given three questionnaires and was asked to rate (one at the time) the three POP-displays used in the study. There were no time restrictions in regards to how long the participants could take to evaluate each one of the displays. The POP-displays were sectioned off so that the participants could only look at one display at a time. Once they had evaluated the first POP-display the participants moved to the next 'section' and evaluated the next one. The order of evaluation was randomised so that an order effect was guarded against.

3.2 Results

An initial inspection of the correlation matrix of the 20 variables representing the four Kaplan and Kaplan dimensions showed that there was a sufficient significant ($p<0.05$) and meaningful relationships ($r >0.30$) between the items to indicate that exploratory factor analysis would be useful.

There were no inter-item correlations greater than 0.70, indicating that none of the items were redundant.

A series of Principal Component Analyses was run on the data, with Varimax rotation. After each rotation, variables which loaded greater than 0.30 on more than one factor were removed from subsequent analysis. This procedure was followed in order to obtain a 'pure' solution to the pattern of loadings. After three iterations of the above process, three factors emerged which accounted for 60.4% of the variance in the sample responses. The three factors, together with the factor loadings are shown in Table 3.

Table 3: Factors emerged from Principal Component Analysis

Variable	Description	Loading		% variance explained
12	Features connected well	0.83		
3	Features hang together well	0.79		
15	Message is very clear	0.75	***Factor 1***	28.4
14	Harmony between features	0.70		
10	Easy to work out meaning	0.68		
11	More than meets the eye	0.85		
9	Contains secrets	0.79	***Factor 2***	21.7
17	Wish to uncover secrets	0.75		
21	Info. suggested but obscured	0.68		
1	Plain and simple	0.73	***Factor 3***	10.3
2	Easy to put in a category	0.72		
			Total	**60.4**

The final pattern of the three factors was quite distinct and, because of the magnitude of loadings, it was possible to identify and label the dimensions. Factor 1, however, was a mixture of Kaplan and Kaplan's 'legibility' and 'coherence' dimensions. Both these factors relate to the description of understanding or 'making sense' out of the stimulus. Therefore, this factor was renamed 'clarity'. Factor 2 and Factor 3 matched Kaplan and Kaplan's concepts of 'mystery' and 'legibility' respectively. The same names have been retained for these factors. Kaplan and Kaplan's concepts of 'complexity' were not apparent in the final pattern.

The comparison of the three concepts emerging from the factor analysis is compared with the original four concepts of Kaplan, R. (1975) and Kaplan, S. (1975, 1987) in Table 4.

Table 4: Original concepts vs. new concepts

Kaplan and Kaplan	**Factors**
1. Complexity	1. Clarity
2. Mystery	2. Mystery
3. Coherence	3. Legibility
4. Legibility	

Internal reliability (alpha) coefficients were calculated for each factor (see Table 5).

Table 5: Internal reliability

Factor	**Alpha** (Cronbach)
1. 'Clarity'	0.80
2. 'Mystery'	0.78
3. 'Legibility'	0.26

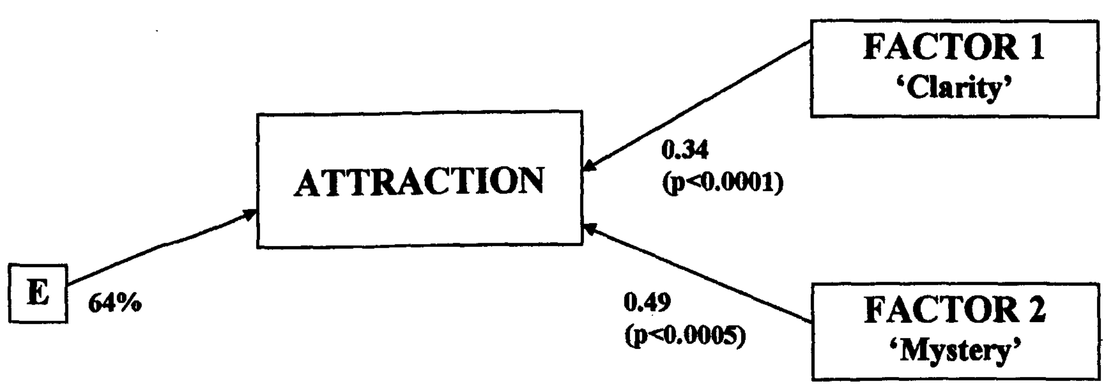
Factor 1 and Factor 2 were found to be internally reliable, whereas Factor 3 was not.

In order to assess the influence of the three concepts of the perceived attractiveness of each stimulus, a path analysis was conducted using regression calculations.

It was found that Factor 1 and Factor 2 had a significant influence on perceived attractiveness of the POP stimulus. Factor 3, whilst entered in the equations was found to have a less than meaningful influence ($r<0.10$) and the effect was not statistically significant ($p>0.36$).

The path model is shown in Figure 8 below. The path coefficients are shown as Beta weights.

Figure 8: Model showing the influence of the two dimensions on the aesthetic response to POP material



The two factors in figure 8 are unrelated, $r = 0.0$, $p = 1.0$, suggesting an orthogonal relationship. Together they explain 36% of the variance in the participants' responses of perceived 'attraction'. This leaves 64% of the variance in the dependent variable 'attraction', unexplained in the model.

Differences between men and women were also tested for in this study but no significant differences were found.

3.3 Discussion

Table 3 shows the three dimensions that emerged from the exploratory factor analysis. The loadings of the individual items from the original scale are robust and the name of each dimension was strongly indicated. When the resulting three dimensions are compared with the original four from Kaplan's work (1975, 1987) (see Table 4), there are intriguing similarities and some differences.

The obvious difference is the number of dimensions. Although the original questionnaire contained items relating to the four Kaplan dimensions, only three 'pure' factors emerged from the factor analysis. This may indicate that the Kaplan dimensions are not universal, and do not generalise across aesthetic judgements other than environmental scenes.

On the other hand, there is enough similarity between the meaning of the emergent three factors and the Kaplan dimensions that some sort of correspondence is indicated.

The 'Mystery' dimensions are clearly similar, as are also those labelled 'Legibility'. However, the Kaplan 'Complexity' dimension disappears in the factor analysis, and is replaced by a fusion of 'Legibility' and 'Coherence' items, which were named 'Clarity'. (The complexity items loaded negatively on the proposed 'legibility' factor.) Table 3 shows that the dimensions 'Clarity' and 'Mystery' are the major dimensions in terms of the amount of variance explained, being 28.4% and 21.7% respectively. These two dimensions are also the only dimensions with reasonable internal validity (see Table 3). The third dimension 'Legibility' has a low reliability coefficient, (alpha = 0.26), due to the fact that there are only two items (v1 and v2), that constitute its scale.

Taken all together, the results in Tables 3-5, indicate that the subjects in this study have really only assessed the POP stimuli using two dimensions, 'Clarity' and 'Mystery'. The first hypothesis, H5 is therefore not supported. Individuals do not use all of the four dimensions previously identified by the Kaplans' (1975; 1987).

The fragility of the 'Legibility' dimension was confirmed during path analysis. It was entered into the regression equations, but its effect on the dependent variable of 'attraction' was low ($r < 0.10$), and it was not statistically significant ($p > 0.36$).

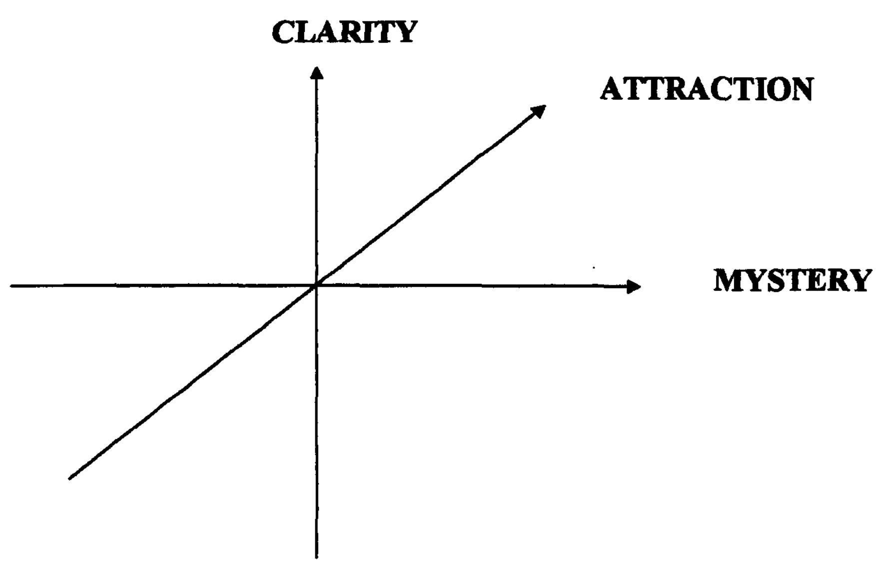
The final path model is shown in Figure 8. Factor 1, 'Clarity' and Factor 2, 'Mystery', both have a significant effect on the aesthetic response of subjects. The relationships are positive, as each assessment increases the level of attraction increases. The beta weightings show that 'Mystery' has a stronger influence than 'Clarity' on the response of subjects.

Compared with the Kaplans' model, it seems that their original four dimensions have coalesced into two, 'Clarity' and 'Mystery'. 'Clarity' appears to be a dimension which is a fusion of Kaplans' Coherence and Legibility, whilst 'Mystery' is similar to that of the Kaplans' but now contains elements of their original 'Complexity' dimension. The model proposed by the authors is therefore more parsimonious than that of the Kaplans'(1975, 1987). The two new dimensions have internal reliability, but further studies are required to test their robustness in other contexts with other stimuli.

Of the original hypotheses, only H7 is supported. The greater the perceived mystery in the POP-display, the greater the aesthetic response. The hypotheses H6, H8 and H9 cannot be supported because the Kaplan dimensions to which these refer were not discovered in this study.

Also shown in Figure 8 (by default), is the lack of relationship between the 'Clarity' and 'Mystery' dimensions ($r = 0.0$, $p = 1.00$). This suggests that if the two dimensions are expressed as orthogonal scales, POP stimuli can be classified as falling into one of four segments, with aesthetic response increasing from bottom left to top right (see Diagrams 9 and 10).

Figure 9: Illustration of the orthogonal relationship between the factors 'Clarity' and 'Mystery' and their influence on the perceived attractiveness of POP.



As 'Mystery' and 'Clarity' increases, the aesthetic response 'Attraction' increases.

Figure 10: Illustration of the four types of POP which can be identified using the relationship between 'Clarity' and 'Mystery'.

Clarity without Mystery Peripheral processing ***Elementary***	Clarity with Mystery Central processing ***Enchanting***
Neither Clarity nor Mystery Peripheral processing ***Sombrous***	Mystery without Clarity Central processing ***Deceptive***

The four segments in figure 10 are created by the orthogonal relationship between the dimensions 'Clarity' and 'Mystery' and give rise to four 'categories' of POP. The names given are descriptive of the combinations of the two influential dimensions and are meant to indicate the type of response observers of the POP material will experience. The most attractive POP will be the ***'Enchanting'*** design, whilst the least engaging will be the ***'Sombrous'***. Also noted in the four cells is the most likely processing route for the information contained in the POP according to Petty, Cacioppo & Goldman's (1981) elaboration model.

The importance of the two dimensions is illustrated by the fact that together they explain 36% of the variance in the aesthetic response (leaving 64% of the variance unexplained, (labelled >E= in figure 8), by other factors).

It is not surprising that 'Clarity' is an important determinant of 'attraction'. If a scene is 'unclear' then it will be difficult to understand. As described in the introduction, Kaplan (1987) explained that this 'clarity' relates to the symmetries, repeated elements and unifying textures in a scene. High 'Clarity' implies that the information in the scene can be organised into smaller 'chunks' that help enhance understanding and comprehension. The finding that 'Clarity' is an important determinant of 'attraction' is consistent with Gestalt theory. According to which humans delight in order, and have a preference for objects with design elements containing symmetry, unity and harmony (Bloch, 1995). Similarly, the dimension 'Mystery' concerns information. This information is not explicit, but is only inferred from what is in the scene. The deeper the person goes into the scene the more information can be acquired from it.

It is possible that in order to capture people's attention, in a busy retail environment, and to interest them for a few moments in something as mundane as a POP-display unit, a high degree of 'mystery' is required. 'Mystery' may draw people and motivate them to explore the product further. According to Petty et al., (1981) elaboration likelihood model (ELM), this will mean that consumers will be more motivated to process the information displayed in the POP and consequently be more likely to be influenced by the quality and strength of the communication. 'Mystery' therefore is an important component of the 'attraction' potential consumers experience towards the target POP material.

The findings indicate two main dimensions that should guide the design of POP material. However, there are further (more complex?) issues to be resolved, such as; which design elements contribute to 'Mystery', or how should these design elements be arranged to achieve 'Clarity'? These and other questions need to be explored by further research.

Finally, there is the matter of the unexplained variance in the model to be accounted for. The path analysis (Figure 8) shows that 64% of the variance in the aesthetic response is accounted for by variables other than 'Mystery' and 'Clarity'.

There will be other factors that will influence the aesthetic response that was not examined in this initial study. Candidates for possible influential variables include; colour and shape.

Future studies can include these variables in different combinations and investigate how the different factors affect the aesthetic response both individually and in various combinations and contexts.

3.4 Summary & conclusion

This study has demonstrated the possibility of investigating consumers' aesthetic responses to POP material using measuring instruments based on the Kaplans' model. The results indicate that two major dimensions of design elements predict a substantial proportion of an individual's aesthetic response to such stimuli. Mystery may be a useful tool to increase dwell time, as it would draw the consumer towards the POP display in order to explore it further. However, since clarity was found to be the second most important determinant of 'attraction', it is also important to remember that a POP display should be designed in a way that it is easily understood by the consumer. The two dimensions discovered do not exactly correspond to the Kaplan model and further research is required to test their robustness. Future studies should also investigate the influence of other factors and design elements not included in this study, with the hope that eventually a comprehensive model predicting the consumers' aesthetic response to POP material can be established.

Chapter 4

Study 3: Is it possible to operationalise aesthetic concepts?

Partially based upon the second, study this study sets out to explore whether some of Kaplans' and Berlyne's original concepts of aesthetic preferences can be operationalised. This raises questions such as; how do mental concepts and states of mind find a convincing representation, and do lines, shapes, and colours have an autonomous and constant psychological meaning?

4.1 Method

4.1.1 Participants

Eleven women (with a mean age of 28.3) and 18 men (with a mean age of 31.2) participated in this experiment. Half of them were undergraduate students from the London Metropolitan University, and the other half were full time employed within a number of different occupational categories. Fifteen of the participants were also of different nationalities, of which three at the time had only been in the UK for one month. This was a convenience sample, however by having a wider range of participants it was hoped that if the results were found to be significant there would be a greater degree of external validity. Furthermore if Kaplan and Kaplan were accurate in their earlier assumption that aesthetic preferences are innate, it should not be of any great significance where the sample population came from.

4.1.2 Materials

<u>The shapes used in the study</u>

For this study it was decided to use three kinds of shapes, a square, a circle and an irregular non-familiar shape, which all had the same surface diameter (see Figures 11a, b and c). The decision to use a square and a circle was based upon their simplicity and familiarity and also because it has previously been suggested that men tend to have a preference for squares and that women have a preference for rounded contours (Laurie, 1981). If this is true, the evaluation procedure of whether or not a stimulus is perceived as being for example 'mysterious', should be different for men and women. Also it may indicate that overall aesthetic concepts may not be innate as suggested by the Kaplans.

The irregular non-familiar shape was created to test Berlyne's (e.g. 1971, 1974) idea that novel elements can increase the overall preference for a stimulus. Also in accordance with Berlyne's findings, it is possible that an unfamiliar shape may be perceived as being more complex, which in turn may mean that the evaluator will prolong the exploration time in order to 'make sense' of it.

The participants were presented with four types of displays. The first three would either consist of only squares, only circles or only non-familiar figures. However the fourth was a mixture of all three of the shapes used. The display that consisted of all three of the shapes was created in hope that it would be perceived as being more complex than the other three displays, as this was in line with Kaplans' theory that complexity is linked to the variety of elements in a display.

Figure 11a: Square

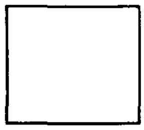


Figure 11b: Circle

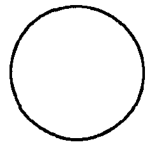
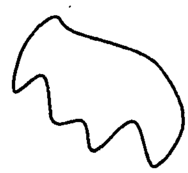


Figure 11c: Non-familiar



Please note that the figures displayed here are not the same size as those used in the study.

The colours and the shades used

Two basic colours (red and blue) were used in this experiment. The colours were randomly picked as they were simply meant to test whether or not colour would have an impact upon the creation of different 'concepts'.

Additionally two different shades were used for each colour, this was to test whether the actual shade is of equal (or perhaps more) importance than the colour. One light and one dark shade were used. For both of the colours the same saturation was used (255) and the value for the light shades were (110) and for the dark (50).

The number of elements used

In accordance with Kaplans' research findings that 'the concept of complexity' is also linked to the number of elements used, the amount of shapes in each display was alternated. The stimulus that was to be evaluated either consisted of 9, 18 or 27 figures at any one time.

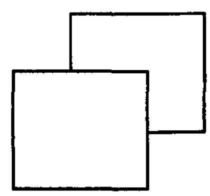
Partially hidden elements

It was also hypothesised in this study that elements that were partially hidden behind another element would have an affect upon how the stimulus was perceived.

Subsequently all of the shapes used were also presented in displays where they were partially hidden (see an example of a hidden figure below). This idea was mainly linked to the idea that 'mysterious concepts' should contain 'hidden' information that would present the evaluator with the possibility of seeing new but related information (e.g. Kaplan et. al., 1989).

All of the shapes used in the study (including the displays containing the mixture of figures) were also presented in a partially hidden condition to all of the participants.

Figure 12: Example of a partially hidden square



Please note that the figures displayed here are not the same size as those used in the study.

All of the design elements were then used to construct a total of 96 pictures that were to be presented to the participants. So that in the end there was a 4 (shapes) x 2 (colour) x 2 (shades) x 3 (number of elements) x 2 (hidden or non-hidden) design.

A power-point presentation was used to present the pictures created for this experiment as it would also allow the experimenter to time (in seconds) how long each one of the participants spent looking at the pictures.

Additionally 94 distractor displays were also created. These were presented in-between each one of the pictures that were to be evaluated. Each one of the distractor targets displayed short random messages, that were not in any way related to the experiment.

For each one of the pictures the participants saw on the screen, they had to answer five questions by indicating their answers on a Likert scale. The scale ranged from one to seven, where one represented not at all and seven represented very much so. The questions were as follows;

1. How attractive do you think the picture is?
2. Do you think the picture is complex?
3. Is the picture interesting?
4. How familiar is this picture to you?
5. I find the picture mysterious.

4.1.3 Design

An experimental design was applied where the independent variables were the pictorial stimuli presented to the participants and the dependent variables were the participants' responses. The study was seeking to explore a high number of different theories simultaneously and a total of 35 hypotheses were generated.

To determine if simple elements can directly influence how a stimulus is perceived, the following two hypotheses were tested:

H10: Simple aesthetic elements such as shape, colour, and shade can directly influence how a POP-display is perceived.

H11: The number of elements used and whether they are fully visible can affect how a POP-display is perceived.

The five questions below were also investigated and they formed the basis for hypotheses 12 - 36.

a. Can simple design elements assist in generating a 'mysterious' concept?
b. Can 'complexity' be generated with help of simple design elements?
c. Can 'familiarity' be created by the using simple design elements?
d. Is it possible that simple design elements may have the capacity to create an image that is perceived to be 'interesting'?
e. Do certain design elements influence overall 'attractiveness' more than others?

For each one of the questions five hypotheses were investigated and they were as follows:

- The number of elements used in a picture will affect whether it is perceived as being (a/b/c/d or e).
- They type of shapes used in a picture will affect whether or not it is perceived as being (a/b/c/d or e).
- The colour used in a picture will affect whether it is perceived as being (a/b/c/d or e).
- The shade used in a picture will affect whether it is perceived as (a/b/c/d or e).
- The elements in a picture that are hidden behind other elements will affect whether it is perceived as being (a/b/c/d or e).

Another four hypotheses were also generated to explore if certain concepts generate a certain response, and they were as follows;

H37: An increase in how 'complex' a picture is perceived to be will increase a positive aesthetic response.

H38: An increase in how 'interesting' a picture is perceived to be will increase a negative aesthetic response.

H39: An increase in how 'familiar' a picture is perceived to be will increase a negative aesthetic response.

H40: An increase in how 'mysterious' a picture is perceived to be will increase a positive aesthetic response.

The final four hypotheses investigated in this study were concerned with what affects the exploration time, and were as follows;

H42: An increase in how 'complex' the picture is perceived to be will increase the time of exploration.

H43: An increase in how 'interesting' the picture is perceived to be will increase the time of exploration.

H44: An increase in how 'familiar' the picture is perceived to be will decrease the time of exploration.

H45: An increase in how 'mysterious' the picture is perceived to be will increase the time of exploration.

4.1.4 Procedure

All of the participants were sat down in front of a computer on a chair that was positioned so that their face was approximately 50 centimetres away from the screen. They were instructed to look at each of the slides presented to them and answer the same five questions for each one of the slides. The participants could look at each slide for as long as they wanted. Once they had answered the five questions they had to click with the mouse on the screen and the 'distractor' screen would appear. They were asked to read the sentences in full that appeared on the distractor screen, and again they could take as long as they wanted to do so. Once they felt ready to see the next screen that they had to evaluate, they again had to click with the mouse on the screen and the next slide appeared. This procedure was repeated until the participant had evaluated all of the 96 slides.

4.2 Results

A five-way mixed analysis of variance was used to analyse the data. Due to the large amount of results generated only those that were significant will be mentioned here.

Post hoc paired sample t-tests were only conducted on single factors with more than two components and on two-way interactions. The three-way and four-way interactions are only included to demonstrate the complexity of how the elements in a design interact to produce perceptions of 'mystery', 'complexity', 'familiarity' 'interest' and 'attractiveness', and to direct future studies.

For 'mystery' the following results were found to be significant:

(a) The number of elements used in a picture

The amount of elements used in the picture was found to be significant ($F_{(2,42)}$= 6.053, p = 0.005) (see Figure 13). The post hoc test showed that stimulus containing 27 elements were rated as being more mysterious than both those containing nine elements (t = -2.513, df = 28, p = 0.001) and 18 elements (t = -4.242, df = 28, p = 0.018).

Figure 13: The mystery ratings for the number of elements used

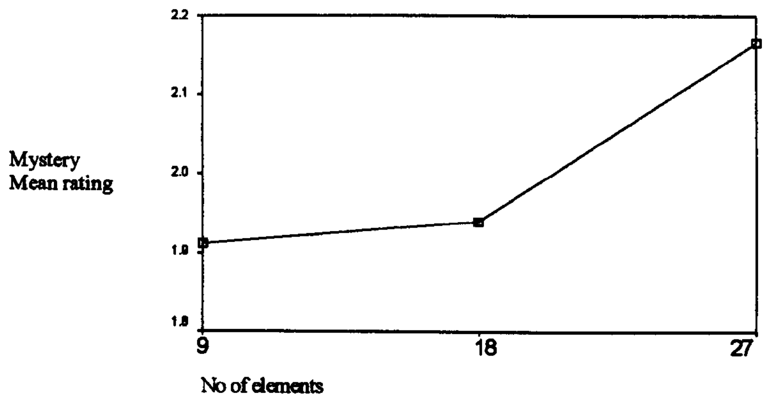


Figure 13 shows how the number of elements influenced whether the participants rated the pictures as being mysterious or not. The highest mean value was for the displays containing 27 elements (2.16), followed by those with 18 (1.93) and then those containing only nine (1.91).

A significant interaction effect was also found for the number of elements and shade used ($F_{(2,42)} = 3.524$, $p = 0.038$) (see Figure 14). The post hoc test demonstrated that when the stimulus contained nine light shaded elements it was rated to be more mysterious than those containing nine dark shaded elements ($t = 1.521$, $df = 28$, $p = 0.049$).

Figure 14: The mystery ratings for the interaction effect between the number of elements and the shades used

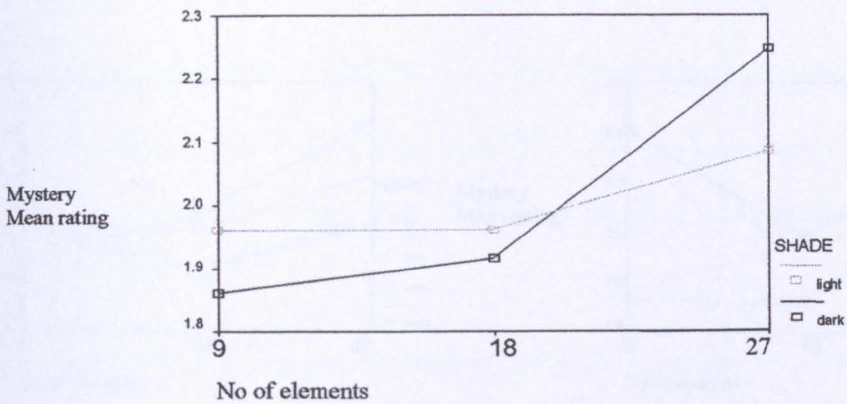
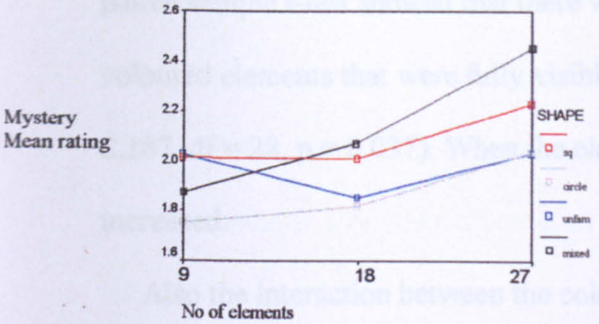


Figure 14 shows that highest mystery rating appeared when there were 27 design elements in the picture and they appeared in a dark shade. The ratings for the lighter shade were on the whole much more even and they were also perceived to be generally more mysterious than when there were nine or 18 darker elements in the pictures.

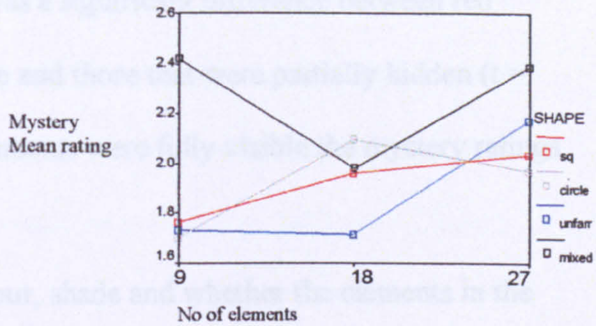
Furthermore a significant interaction effect was found for the number of elements used, the shape and the colour ($F_{(6, 126)} = 3.617, p = 0.022$) (see Figures 15a & b). These significant results are demonstrating how the number of elements, the shape and the colour are contributing to whether participants perceive the stimulus as being mysterious.

Figure 15a & b: The mystery ratings for the interaction effect between the number of elements used, the shape and the colour

15a: When using red colour



15b: When using blue colour



Sq = squares, Circle = circles, Unfam = unfamiliar shapes, Mixed = mixed shapes

From Figure 15a it can be noted that the displays that produced the highest 'mystery' ratings (when all of the elements were presented in a red colour) were those that contained 27 mixed shapes.

Figure 15b demonstrates that when all of the elements were presented in blue, the highest 'mystery' rating was given to the displays containing nine mixed shapes. This was closely followed by the 27 mixed shapes.

(b) The different shapes used

A significant interaction effect was found for the different combinations of factors of the shapes used, whether the elements in the picture were slightly hidden, and the sex of the participants ($F_{(3,63)} = 6.476$, $p = 0.002$). This significant result is showing how the interaction of these factors are contributing to the participants' overall perception that a stimulus is mysterious.

(c) The colour

The interaction between the colour used and whether the elements used in the picture were fully visible was found to be significant ($F_{(1,21)} = 15.345, p = 0.001$). A post hoc paired sample t-test showed that there was a significant difference between red coloured elements that were fully visible and those that were partially hidden (t = 2.187, df = 28, p = 0.037). When the elements were fully visible the mystery ratings increased.

Also the interaction between the colour, shade and whether the elements in the picture were slightly hidden behind another element was found to be significant ($F_{(1,21)} = 6.435, p = 0.019$). This demonstrates how a combination of factors contributes to whether participants perceived the stimulus as being mysterious.

Table 6 - Mystery: Summary of Significant Results

FACTORS	MYSTERY (Significance level)
No	0.005
No/Shape/Colour	0.022
No/Shade	0.038
Shape/Hidden/Sex	0.036
Colour/Hidden	0.001
Colour/Shade/Hidden	0.019

No = Number of elements used in a picture, Shape = Different shapes used, Colour = The different colours used, Shade = Either light or a dark shade, Hidden = Whether or not the elements in the picture were partially hidden behind other elements, Sex = Whether they were male or female

The above table shows all of the factors that were found to be significant when rating how mysterious the pictures were. The p-value is shown in the right-hand side column.

For 'complexity' the following results were found to be significant;

(a) The number of elements used in a picture

Number of elements used in a particular picture was found to be a significant contributor to whether the pictures were perceived as complex ($F_{(2,42)} = 30.508$, $p = 0.000$) (see Figure 16). The post hoc test revealed that significant differences were found between nine elements and 18 elements used (t = -4.716, df = 28, p = 0.001) and also between nine elements and 27 elements used (t = -5.2407, df = 28, p = 0.001).

Figure 16: The complexity ratings for the number of elements used

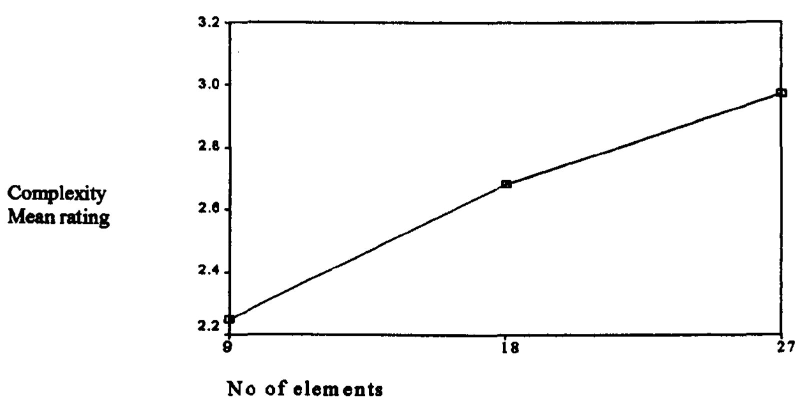


Figure 16 shows how the usage of different numbers of elements in any one picture generated a different rating for how complex they were perceived to be. The mean rating for how complex the displays were perceived to be when they contained only nine elements was 2.24. For 18 elements it was 2.68 and for 27 elements it was 2.97.

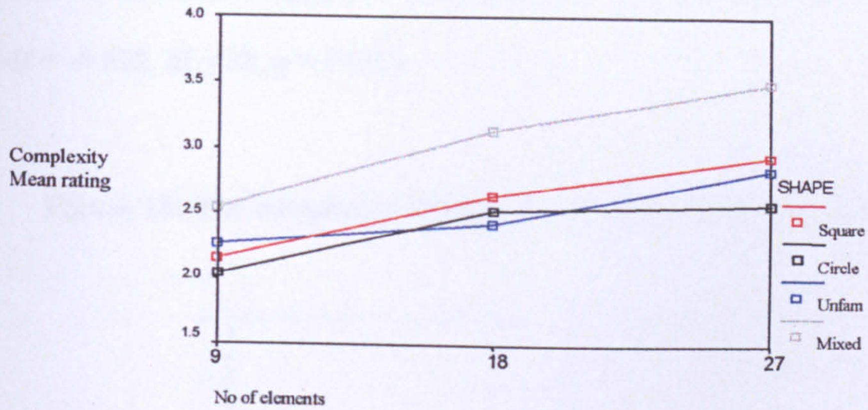
Interaction effects were found for the number of elements used in the picture and the shape ($F_{(6,126)} = 3.695$, $p = 0.008$) (see Figure 17), and the number of elements and the shade ($F_{(2,42)} = 3.310$, $p = 0.046$). Post hoc tests showed that the former of the two interactions demonstrated that the nine mixed shapes were perceived to be more complex than the nine squares ($t = -2.217$, $df = 28$, $p = 0.035$). Also the nine circles were found to be rated as being less complex than both the nine unfamiliar shapes ($t = -2.518$, $df = 28$, $p = 0.018$) and the nine mixed shapes ($t = -2.855$, $df = 28$, $p = 0.008$).

The 18 squares were rated to be more complex than the 18 circles ($t = 2.411$, $df = 28$, $p = 0.023$), but less complex than the 18 mixed shapes ($t = -3.354$, $df = 28$, $p = 0.002$). Also the 18 mixed shapes were found to be more complex than both the 18 circles ($t = -4.631$, $df = 28$, $p = 0.001$) and the 18 unfamiliar shapes ($t = -7.045$, $df = 28$, $p = 0.001$).

Moreover it was also found that the 27 squares were statistically rated as being more complex the 27 circles ($t = 3.782$, $df = 28$, $p = 0.001$). The 27 unfamiliar shapes were also more complex than the 27 squares ($t = -12.665$, $df = 28$, $p = 0.001$), and the 27 circles ($t = -12.592$, $df = 28$, $p = 0.001$). The complexity ratings were also significantly higher for 27 mixed shapes than they were for the unfamiliar shapes ($t = -6.332$, $df = 28$, $p = 0.005$), the 27 circles ($t = -5.682$, $df = 28$, $p = 0.005$), and the 27 squares ($t = -5.346$, $df = 28$, $p = 0.001$).

For the latter of the two interactions, the post hoc analysis revealed only one significant difference. This was between the 27 light shaded elements and the dark shaded elements ($t = -2.457$, $df = 28$, $p = 0.020$), showing that the lighter shade generated a higher complexity rating.

Figure 17: The complexity ratings for the interaction effects between the number of elements used and the shape



Please note that Unfam = unfamiliar shapes

Figure 17 shows how the complexity ratings were affected by the interaction effect between the number of elements used and the shape. Overall it can be seen that the highest ratings increased linearly with the number of elements used when the displays comprised of a mixture of shapes.

Furthermore significant interaction effects were also found for the number of elements used, the shape and the shade used ($F_{(6, 126)}=2.913$, $p = 0.011$) and the number of elements, the shape used and the colours used ($F_{(6, 126)}= 3.572$, $p = 0.011$). These significant results demonstrates how multiple interactions contributes to whether participants perceive the stimulus as being complex.

(b) The different shapes used

The analysis showed that shape was significant in its own right ($F_{(3, 63)}= 9.016$, $p = 0.001$) (see Figure 18). The post hoc paired sample t-test clarified that the complexity rating for the squares was significantly higher than the circles (t = 3.448, df = 28, p =

0.002), and also higher than the mixed shapes (t = -2.859, df = 28, p = 0.008). Furthermore it was found that the complexity ratings for the circles was significantly higher than the unfamiliar shapes (t = -2.115, df = 28, p = 0.043) and for the mixed shapes (t = -4.622, df = 28, p = 0.001).

Figure 18: The complexity ratings for the different shapes used

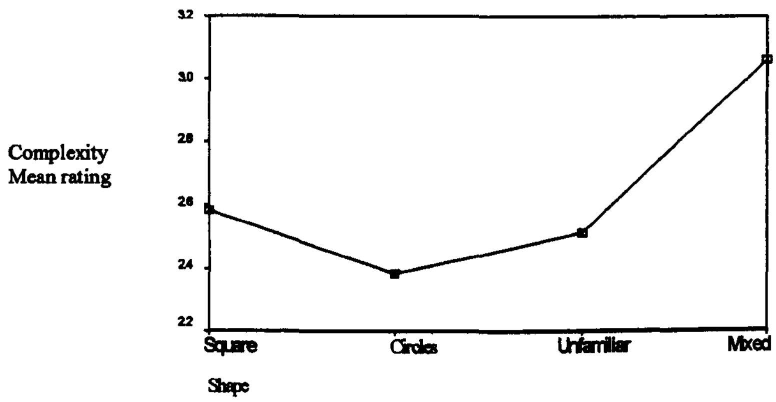


Figure 18 illustrates how the participants' complexity ratings were dependent upon the shapes used in each of the displays. The mixture of shapes had produced the highest mean (3.05), followed by the squares (2.58). The lowest complexity rating was for the pictures containing circles only (2.38), followed by those containing the unfamiliar shapes (2.51).

Interaction effects were also found for the shape in combination with the colour ($F_{(3,63)}$= 3.940, p = 0.021), and in combination with the colour and the shade ($F_{(3,63)}$= 3.997, p = 0.011).

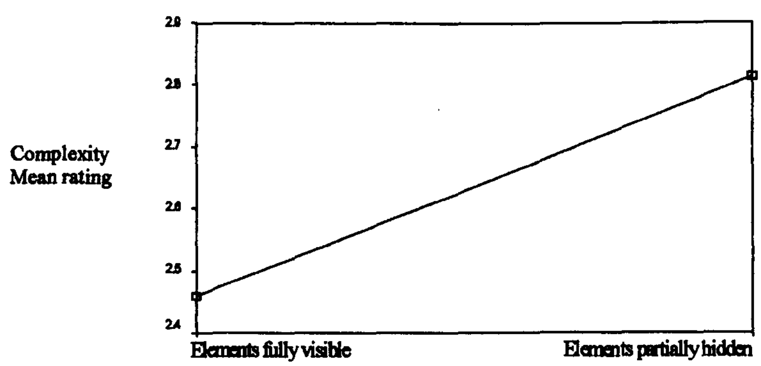
The post hoc test for the former of the two showed two significant interaction effects. The first one showed that red circles were perceived to be more complex than blue circles (t = 2.693, df = 28, p = 0.013). The second significant interaction showed that the blue mixed shapes were perceived to be more complex than the red mixed shapes (t = -2.391, df = 28, p = 0.024).

The latter of the two significant interactions is simply demonstrating how the three factors are contributing to whether the participants perceive a stimulus as being complex.

(c) When the elements in a picture were not fully visible

A significant result was found for when the elements in the picture were hidden behind another element ($F_{(1,21)}$= 20.095, p = 0.000) (see figure 19 below).

Figure 19: The complexity ratings for when elements were fully visible or partially hidden



In the figure above it can be seen how the participants' perception of how complex the displays were, was influenced more by the displays that contained partially hidden elements (2.81), than those where the elements were fully visible.

(d) The colour

The interaction between colour and whether the elements in the picture were partly hidden was found to be significant ($F_{(1,21)}$= 7.196, p = 0.014). A post hoc t-test showed two significant differences, firstly between the red fully visible elements and the red partially visible elements ($t = -2.498$ $df = 28$, $p = 0.019$) and secondly between the blue fully visible elements and the blue partially visible elements ($t = -6.127$, $df = 28$, $p = 0.001$). This is showing that when the red and blue coloured elements were partially hidden, the stimulus was perceived as being more complex.

Table 7 - Complexity: Summary of significant results

FACTORS	COMPLEXITY (Significance level)
No	0.000
No/Shape	0.008
No/Shape/Colour	0.011
No/Shade	0.046
No/Shape/Shade	0.011
No/Colour/Shade/Hidden	0.038
Shape	0.001
Shape/Colour	0.021
Shape/Colour/Shade	0.011
Hidden	0.000
Colour/Hidden	0.014

No = Number of elements used in a picture, Shape = Different shapes used, Colour = The different colours used, Shade = Either light or a dark shade, Hidden = Whether or not the elements in the picture were partially hidden behind other elements, Sex = Whether they were male or female

The above table is showing all of the factors that were found to be significant when rating how complex the pictures were. The p-value for each one of the significant results can be seen in the column to the right.

Familiarity

(a) The number of elements used in a picture

The number of elements used was found to be significant ($F_{(2,42)}$= 15.330, p = 0.000). The post hoc paired sample t-test showed that there were significant differences between nine and 18 elements used (t = -4.223 df = 28, p = 0.001) and 18 and 27 elements used (t = 5.187, df = 28, p = 0.001). This demonstrates that when 18 elements were used, the participants rated the stimulus as being more familiar.

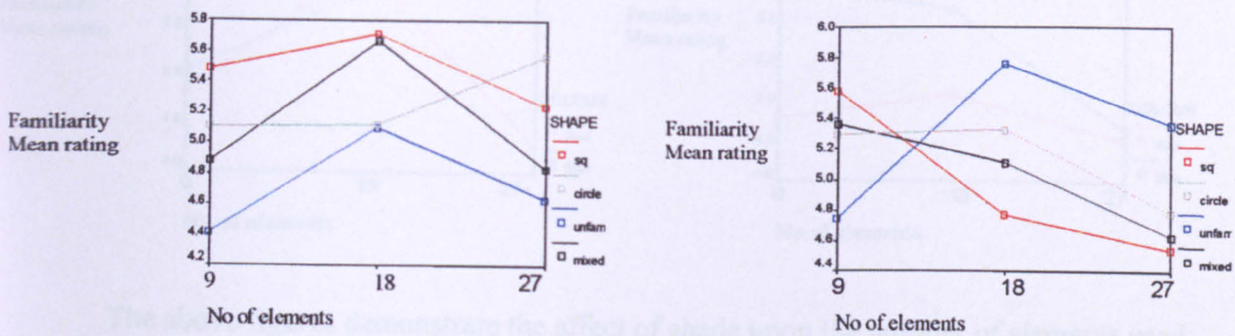
A number of significant interaction effects were also found for number of elements and the shape ($F_{(6,126)}$= 12.029, p = 0.000), and the number of elements used and the shade ($F_{(2,42)}$= 7.045, p = 0.006). For the former interaction effect, the post hoc test showed that there were significant differences between the nine squares and the nine circles (t = 3.882, df = 28, p = 0.001), the nine squares and the nine unfamiliar shapes (t = 6.032, df = 28, p = 0.001), and also the nine squares and the nine mixed shapes (t = 2.787, df = 28, p = 0.009). This indicates that the participants were more likely to rate a stimulus as being more familiar if it contained nine squares. Significant differences were also found for the nine circles and the nine unfamiliar shapes (t = 3.752, df = 28, p = 0.001), and also between the nine unfamiliar shapes and the nine mixed shapes (t = -4.055, df = 28, p = 0.001). Hence the familiarity ratings were higher for the nine circles than for the unfamiliar shapes, and also for the mixed shapes than they were for the unfamiliar shapes. One more significant difference emerged between the 27 circles and the 27 mixed shapes (t = 3.423, df = 28, p = 0.002), indicating that the circles were rated as being more familiar than the mixed shapes.

For the latter of the two significant interactions a post hoc test showed that when the pictures contained 27 light shaded elements it was rated to be significantly more familiar than if there were 27 dark shaded elements (t = 2.071, df = 28, p = 0.048).

The interaction between the number of elements, the shape and the colour was also found to be significant ($F_{(6, 126)} = 14.368$, $p = 0.000$) and also so was the number of elements, the shape and the shade ($F_{(6, 126)} = 7.116$, $p = 0.000$) (see Figures 20a & b).

Figure 20: The familiarity ratings for the interaction effect between the number of elements, the shape and the shade

20a: Light shade ***20b: Dark shade***



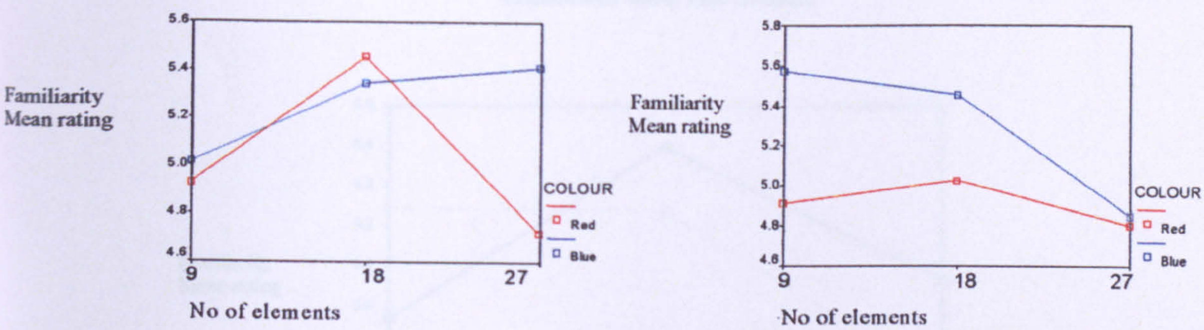
Sq = squares, Circle = circles, Unfam = unfamiliar shapes, Mixed = mixed shapes

Figures 20a & b show that the shade has a direct influence on the interaction effect on the number of elements and the shape. Overall the familiarity rating is increasing when the objects appear in a light shade. The biggest difference appears to be when there were either 18 or 27 squares in any one picture, as when they were presented in a dark shade they were perceived as being much less familiar than when they were presented in a light shade.

Other significant interaction effects were as follows: the number of elements, the colour and the shade ($F_{(2,42)} = 13.608$, $p = 0.000$) (see Figures 21a & b), the number of elements, the shape, the colour and the shade ($F_{(6,126)} = 5.871$, $p = 0.001$), and the number of elements, the shape and whether the elements in the picture were hidden behind other elements ($F_{(6,126)} = 5.145$, $p = 0.003$).

Figure 21a & b: The familiarity ratings for the interaction effect between the number of elements used, the colour and the shade

21a: Light shade ***21b: Dark Shade***



The above figures demonstrate the affect of shade upon the number of elements used in each picture and colour. The red colour appears to create a stronger perception of familiarity when presented in a light shade.

The number of elements, the colour and whether the elements were hidden behind other elements ($F_{(2,42)} = 8.746$, $p = 0.001$), in relation to the number of elements, the shape, the colour and whether they were slightly hidden ($F_{(6,126)} = 10.843$, $p = 0.000$), were also found to be significant.

Additionally the following interactions were also significant; the number of elements, the shade and if the elements were hidden behind other elements ($F_{(2,42)}$= 14.078, $p = 0.000$), the number of elements, the shape, the shade and hidden elements ($F_{(6,126)}$= 7.236, $p = 0.000$), the number, the colour, the shade and whether the elements were partially hidden behind other elements ($F_{(2,42)}$= 3.496, $p = 0.039$), and finally also the number of elements, the shape, the colour, the shade, and whether the elements were partially hidden behind other elements ($F_{(6,126)}$= 6.794, $p = 0.000$).

Figure 22: The familiarity ratings for the interaction between the number of elements and the shade

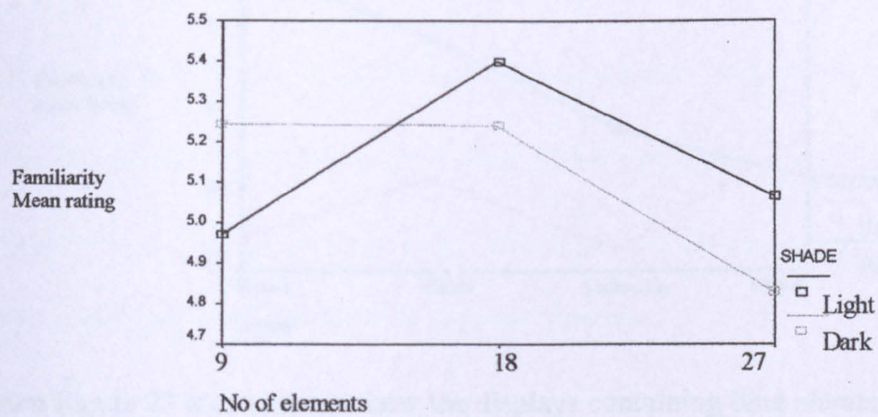
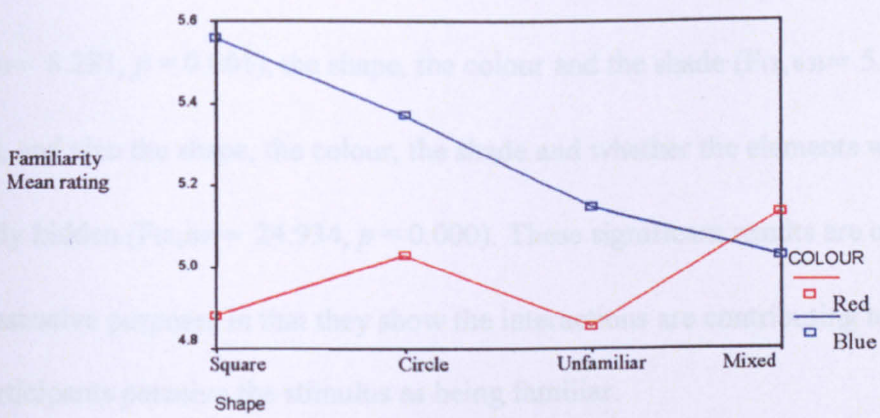


Figure 22 shows that the dark shade produced overall lower familiarity ratings when the displays contained either 18 or 27 elements. This was however the reverse for the displays containing only nine elements, when it was the light shade that generated a lower familiarity rating.

(b) The different shapes used

A significant interaction effect was found for the shape and the colour ($F_{(3,63)}$= 12.07, p = 0.000). The post hoc test revealed that the familiarity rating was higher for blue coloured squares than they were for red ones (t = -4.353, df = 28, p = 0.001), as was also the case for blue circles compared to the red circles (t = -3.580, df = 28, p = 0.001). It was also found that the unfamiliar blue shapes generated a higher familiarity rating than did the red unfamiliar shapes (t = -2.754, df = 28, p = 0.01).

Figure 23: The familiarity ratings for the interaction effect between the shape and the colour



From Figure 23 it can be seen how the displays containing blue elements were overall rated as looking more familiar. The highest familiarity rating was for the square blue elements and the lowest for the mixture of blue elements.

It was also found that the interaction of the shape and the shade was significant ($F_{(3,63)}$= 14.444, p = 0.000). A post hoc test showed that light shaded squares were rated to be more familiar than the dark shaded squares (t = 4.717, df = 28, p = 0.001).

Furthermore it showed that dark shaded unfamiliar shapes were seen as being more familiar than light shaded unfamiliar shapes (t = -3.020, df = 28, p = 0.005).

Shape and whether the elements were hidden behind other elements ($F_{(3,63)}$= 3.708, p = 0.016) was also found to be significant. The post hoc analysis demonstrated that circles that were partially hidden generated a higher familiarity rating (t = -2.685, df = 28, p = 0.012), and so did also partially hidden mixed shapes compared to the fully visible mixed shapes (t = -2.515, df = 28, p = 0.018).

Moreover, it was also found that the following interacting factors were significant: the shape, the shade and whether the elements were hidden behind other elements ($F_{(3,63)}$= 8.281, p = 0.001), the shape, the colour and the shade ($F_{(3,63)}$= 5.113, p = 0.009), and also the shape, the colour, the shade and whether the elements were partially hidden ($F_{(3,63)}$= 24.934, p = 0.000). These significant results are only for demonstrative purposes in that they show the interactions are contributing to whether the participants perceive the stimulus as being familiar.

(c) The colour

The different colours used were found to be significant ($F_{(1,21)}$= 13.926, $p = 0.001$).

Figure 24: The familiarity ratings for the colour

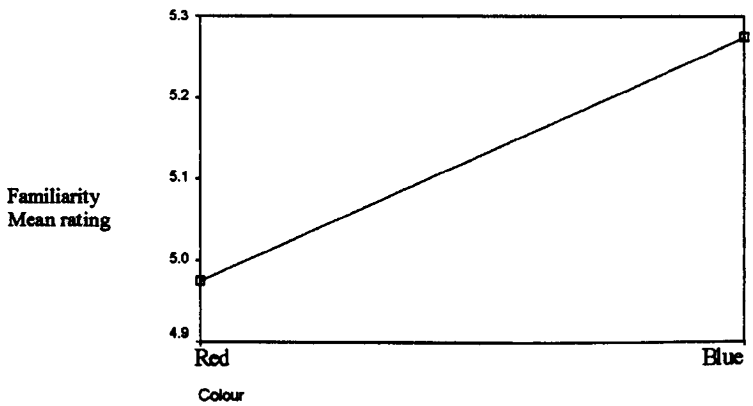


Figure 24 clearly shows that the blue colour was generally considered being more familiar than the red colour.

Table 8 - Familiarity: Summary of Significant Results

FACTORS	FAMILIARITY (Significance level)
No	0.000
No/Shape	0.000
No/Shape/Colour	0.000
No/Shade	0.006
No/Shape/Shade	0.000
No/Colour/Shade	0.000
No/Shape/Colour/Shade	0.001
No/Shape/Hidden	0.003
No/Colour/Hidden	0.001
No/Shape/Colour/Hidden	0.000
No/Shade/Hidden	0.000
No/Shape/Shade/Hidden	0.000
No/Colour/Shade/Hidden	0.039
No/Shape/Colour/Shade/Hidden	0.000
Shape/Colour	0.000
Shape/Shade	0.000
Shape/Colour/Shade	0.009
Shape/Hidden	0.016
Shape/Shade/Hidden	0.001
Shape/Colour/Shade/Hidden	0.000
Colour	0.000

No = Number of elements used in a picture, Shape = Different shapes used, Colour = The different colours used, Shade = Either light or a dark shade, Hidden = Whether or not the elements in the picture were partially hidden behind other elements, Sex = Whether they were male or female

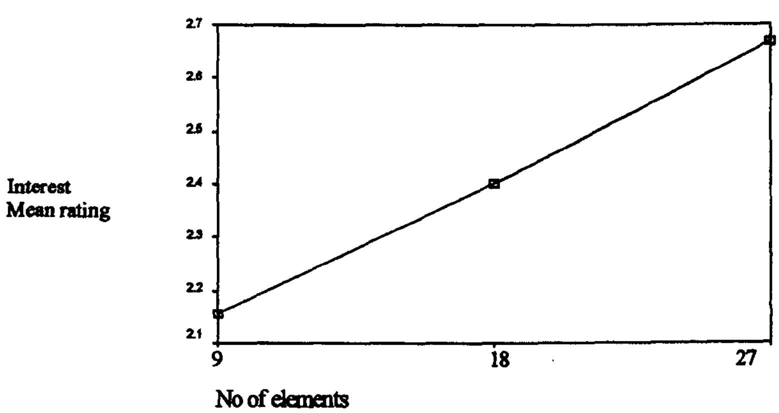
Table 8 shows the factors that were found to be significant when rating how familiar the participants found the pictures to be.

How 'interesting' the pictures were

(a) The number of elements used in a picture

The number of elements used was found to be significant ($F_{(2,42)} = 14.296, p = 0.000$). A post hoc paired sample t-test showed that 18 elements were rated to be more interesting than a picture that contained only nine elements ($t = -3.091$, $df = 28$, $p = 0.004$). The t-test also showed that pictures consisting of 27 elements were found to be more interesting than those consisting of nine elements ($t = -4.300$, $df = 28$, $p = 0.015$) and those with 18 elements ($t = -2.942$, $df = 28$, $p = 0.006$).

Figure 25: The Interest ratings for the number of elements used

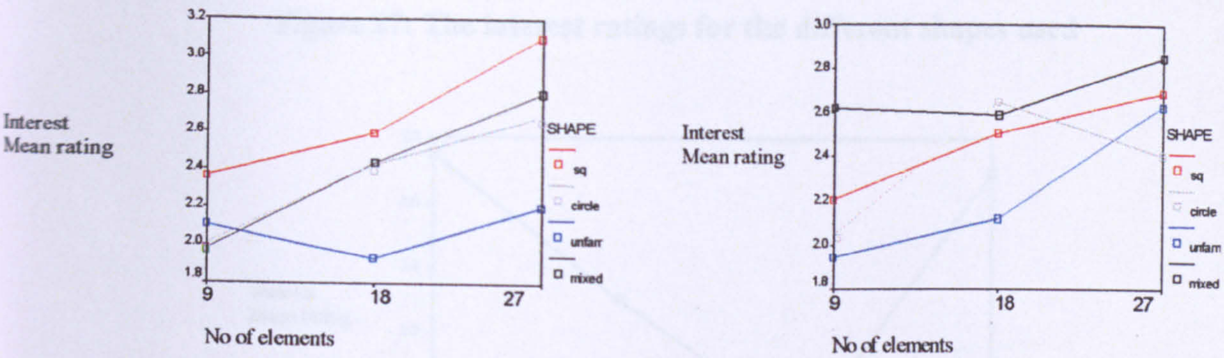


From Figure 25 it can be seen that the ratings for how interesting the pictures were perceived to be increased linearly with the number of elements used.

It was also found that a number of interaction effects were significant such as the number of elements used, the shape and the colour ($F_{(6,126)} = 3.285, p = 0.025$), between number of elements used, the shape and whether the elements were hidden slightly behind other elements ($F_{(6,126)} = 3.046, p = 0.018$), and also the number of elements used, the colour and whether the elements were partially hidden ($F_{(2,42)}$= 6.682, p = 0.003).

Figure 26 a & b: The interest ratings for the interaction effect for the number of elements used, the shape and the colour

26a: Elements presented in red **26b: Elements presented in blue**



Sq = squares, Circle = circles, Unfam = unfamiliar shapes, Mixed = mixed shapes

The two figures above demonstrates how the interaction of the number of elements used and the shape differed in relation to which colour the elements were presented in. The highest rating for how interesting the displays were perceived to be when presented in a red colour was when they consisted of 27 squares. Whilst the highest rating for the blue elements occurred when the displays contained 27 mixed elements.

Furthermore the interaction between the numbers of elements used, the shape, the colour and whether the elements were partially hidden was also significant ($F_{(6,126)}$= 3.878, p = 0.009). As was the number of elements used, the shape, the shade and whether the elements were partially hidden ($F_{(6,126)}$= 2.698, p = 0.048).

(b) The different shapes used

The variety of shapes used were found to be significant ($F_{(3,63)} = 4.271, p = 0.017$).

The post hoc analysis demonstrated that squares were rated to be more interesting than circles (t = 2.709, df = 28, p = 0.011), and unfamiliar shapes (t = 3.725, df = 28, p = 0.001). Unfamiliar shapes were also found to be perceived as more interesting than mixed shapes (t = -2.211, df = 28, p = 0.035).

Figure 27: The interest ratings for the different shapes used

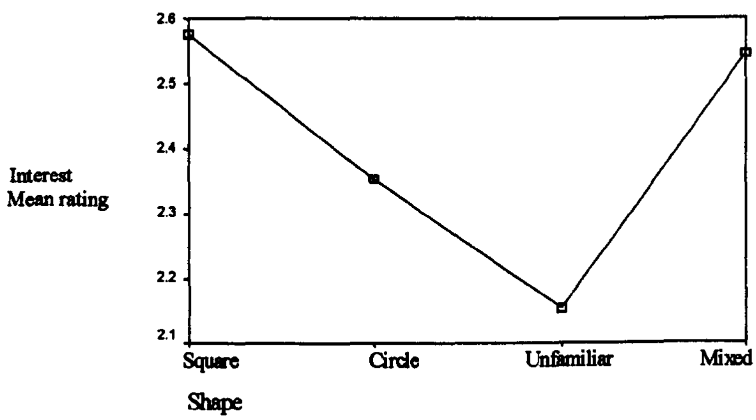


Figure 27 shows how the different shapes influenced the participants' perception in regards to how interesting they found the displays to be. The squares generated the highest interest mean (2.57), closely followed by the mixed shapes (2.54). The lowest mean was found for the unfamiliar shapes (2.15), followed by the circles (2.35).

Also the interaction between the shape and the colour ($F_{(3,63)} = 4.687, p = 0.005$), and the shape and the shade ($F_{(3,63)} = 3.145, p = 0.049$) were found to be significant.

The post hoc analysis for the first of the two interactions showed that blue coloured unfamiliar shapes were perceived to be more interesting than red coloured unfamiliar shapes (t = -2.847, df = 28, p = 0.008). This was also found to be the case for the blue and red coloured mixed shapes (t = -5.320, df = 28, p = 0.001) (as seen in Figure 28).

For the second of the two interactions, the post hoc analysis showed that light shaded squares were perceived to be more interesting than dark shaded squares (t = -2.906, df = 28, p = 0.007).

Figure 28: The interest ratings for the interaction effect for the shape and the colour

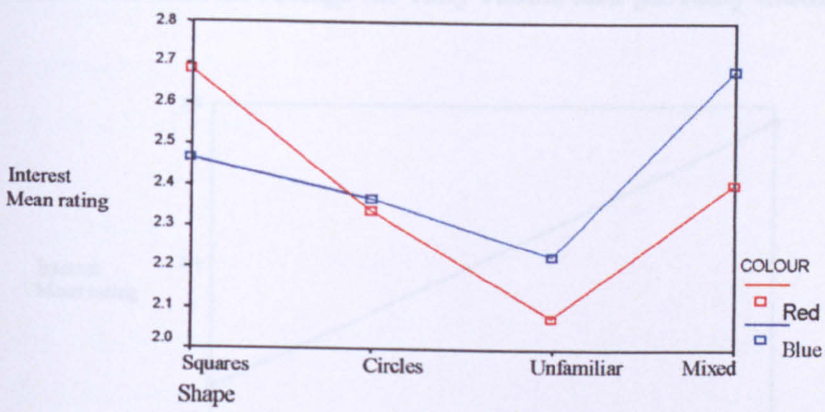


Figure 28 shows that the interaction of the blue colour and the mixed shapes produced the highest rating for how interesting the participants found the displays to be. This was closely followed by the interaction of the red colour and the square shapes. The lowest rating occurred when the displays contained unfamiliar red shapes followed by the unfamiliar blue shapes.

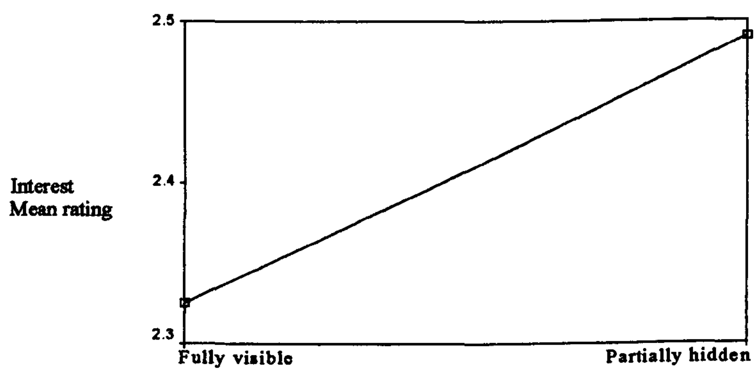
The interaction effects for the shape, whether the elements were slightly hidden behind other elements and the sex was also found to be significant ($F_{(3,63)} = 4.256$, $p = 0.008$), the shape, the shade and whether the elements were partially hidden

($F_{(3,63)}$= 3.553, $p = 0.019$) and finally also the shape, the colour, the shade, whether the elements were partially hidden and the sex ($F_{(3,63)}$= 3.970, $p = 0.030$).

(c) When the elements in a picture were not fully visible

Whether the elements in the pictures were partially hidden behind the other elements or not was found to be a significant factor ($F_{(1,21)}$= 9.349, $p = 0.006$).

Figure 29: The interest ratings for fully visible and partially hidden elements



The above figure shows that the displays containing partially hidden elements were rated as being more interesting (2.49) than those that were fully visible (2.32).

(d) The colour

The interaction between the colour and whether the elements were partially hidden behind other elements was found to be significant ($F_{(1,21)}$= 7.405, $p = 0.013$). The post hoc analysis showed that blue coloured elements that were partially hidden were rated to be more interesting than blue fully visible elements (t = -3.884, df = 28, p = 0.001).

Finally, the interaction effect between the colour, the shade and whether the elements were partially hidden ($F_{(1,21)} = 14.445, p = 0.001$) was also found to be significant.

Table 9 - Interest: Summary of Significant Results

FACTORS	INTERESTING (Significance level)
No	0.000
No/Shape/Colour	0.025
No/Shape/Hidden	0.018
No/ Colour/Hidden	0.003
No/Shape/Colour/Hidden	0.009
No/Shape/Shade/Hidden	0.048
Shape	0.017
Shape/Colour	0.005
Shape/Shade	0.049
Shape/Hidden/Sex	0.008
Shape/Shade/Hidden	0.019
Shape/Colour/Shade/Hidden/Sex	0.030
Hidden	0.006
Colour/Hidden	0.013
Colour/Shade/Hidden	0.001

No = Number of elements used in a picture, Shape = Different shapes used, Colour = The different colours used, Shade = Either light or a dark shade, Hidden = Whether or not the elements in the picture were partially hidden behind other elements, Sex = Whether they were male or female

Table 9 is displaying all the factors that were found to play a significant part in how complex the participants perceived the pictures to be. The p-value for each one of the significant results can be seen in the column on the right.

Attractiveness

(a) The number of elements used in a picture

The number of elements used in the pictures presented to the participants was found to be significant ($F_{(2,42)} = 6.576, p = 0.008$), the mean values can be seen in Figure 30. A post hoc analysis revealed that nine elements were found to be significantly less attractive than pictures containing 18 elements (t = -2.945, df = 28, p = 0.006), and those containing 27 elements (t = -2.858, df = 28, p = 0.008).

Figure 30: The attractiveness ratings for the number of elements used

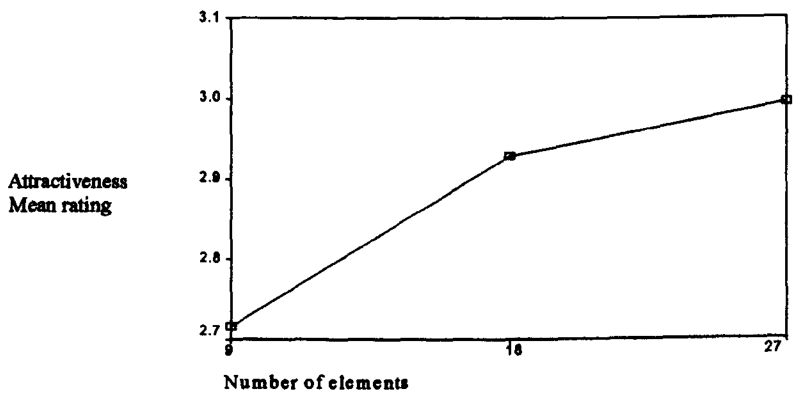
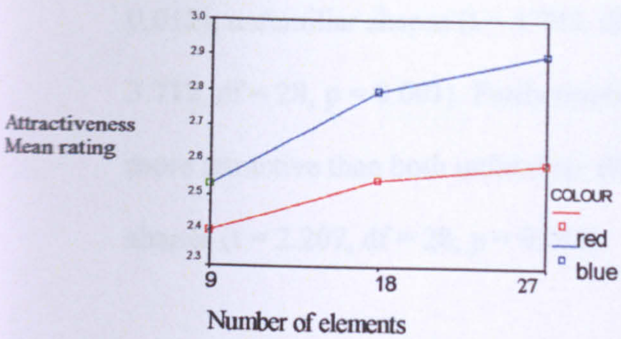


Figure 30 shows that overall the displays presented to the participants were perceived as being more attractive when they consisted of 27 elements (2.99). However this was closely followed by the mean of the displays consisting of 18 elements (2.93). The lowest rating was produced for the displays with only nine elements (2.7).

The interaction of the number of elements used with the colour and the sex was also significant ($F_{(2,42)} = 4.5, p = 0.017$), and the difference between the sexes can be seen in the diagrams below.

Figure 31a & b: Attractiveness ratings for the interaction effect between the number of elements, the colour and the sex

31a: Results for the female participants



31b: Results for the male participants

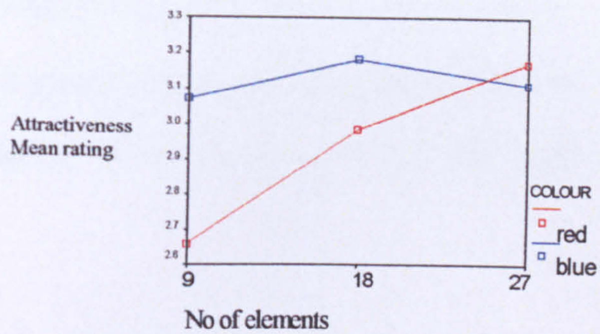


Figure 31a shows that the female participants rated all of the blue elements as being more attractive, whilst Figure 31b shows that the male participants rated the displays containing 18 blue elements and 27 red elements as being the overall most attractive.

Moreover the interaction of the shape, the colour and the shade was found to be significant ($F_{(6, 126)} = 2.903$, $p = 0.027$), and so was also the shape, the colour and whether the elements in the picture were fully visible ($F_{(6, 126)} = 2.192$, $p = 0.048$).

The last interaction effect that was found to be significant in relation to the number of elements used in a picture were in conjunction with the colour, the shade and whether the elements were hidden slightly behind other elements ($F_{(2, 42)} = 5.560$, $p = 0.007$). These significant results indicate the complexity of trying to establish what it is that makes a display overall more attractive.

(b) The different shapes used

The analysis showed that the different shapes used was significant ($F_{(3,63)}$= 6.726, p = 0.002). The analysis of the post hoc paired sample t-test demonstrated that squares were found to be significantly more attractive than circles (t = 2.685, df = 28, p = 0.012), unfamiliar shapes (t = 4.745, df = 28, p = 0.001), and than mixed shapes (t = 3.712, df = 28, p = 0.001). Furthermore it was found that circles were perceived to be more attractive than both unfamiliar shapes (t = 2.262, df = 28, p = 0.032), and mixed shapes (t = 2.207, df = 28, p = 0.036).

Figure 32: The attractiveness ratings for the different shapes used

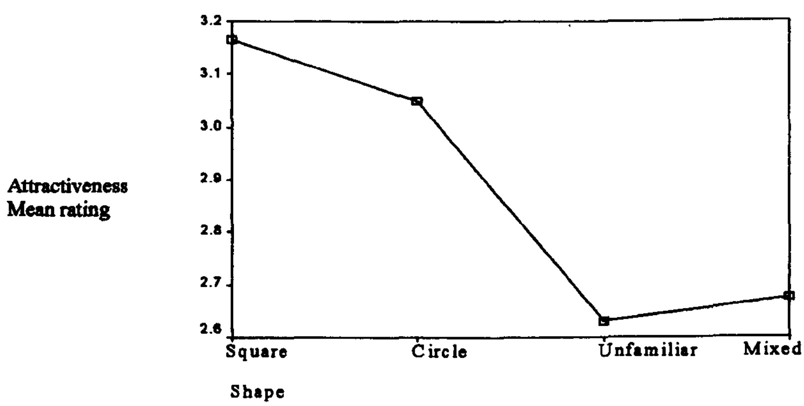


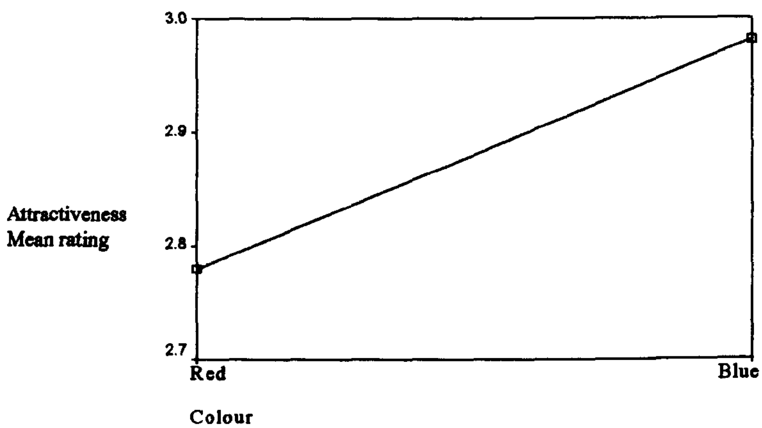
Figure 32 shows that squares were generally perceived to be more attractive (3.16), followed by circles (3.05). The least attractive were the unfamiliar shapes (2.63) followed by the mixture of shapes (2.67).

A significant interaction effect was also found for the shapes and the shades used and whether the entire elements could be seen in full ($F_{(3,63)}$= 3.529, p = 0.020).

(c) The colour

The results showed that colour was significant on its own ($F_{(1,21)} = 6.562, p = 0.018$) (see Figure 33 below), and also when interacting with shade and whether the elements were partially hidden ($F_{(1,21)} = 4.681, p = 0.019$).

Figure 33: The attractiveness ratings for colour



The above figure shows that the blue colour was generally considered to be more attractive than the red colour. The mean value for the blue colour was 2.98 and for the red 2.77.

(d) Shade

A significant interaction effect was found for the two shades used and whether the elements in the pictures were hidden behind other elements ($F_{(1,21)} = 5.170, p = 0.034$). The post hoc analysis showed that light shaded elements that were partially hidden were rated to be more familiar than dark shaded elements ($t = 2.652$, $df = 28$, $p = 0.013$).

Table 10 - Attractiveness: Summary of Significant Results

FACTORS	ATTRACTIVENESS (Significance level)
No	0.008
No/Colour/Sex	0.017
No/Shape/Colour/Shade	0.027
No/Colour/Shade/Hidden	0.007
No/Shade/Hidden	0.017
Shape	0.002
Shape/Shades/Hidden	0.020
Colour	0.042
Shade/Hidden	0.034
Colour/Shade/Hidden	0.019

No = Number of elements used in a picture, Shape = Different shapes used, Colour = The different colours used, Shade = Either light or a dark shade, Hidden = Whether or not the elements in the picture were partially hidden behind other elements, Sex = Whether they were male or female

The above table is showing all of the factors that were found to be significant when rating how attractive the participants thought the pictures were.

Additionally to the repeated measures a correlation and a series of linear regressions were carried out. The correlation was used to test if there were any linear relationships between variables measured (i.e. time, attractiveness, complexity, familiarity, mystery and how interesting the displays looked) and the regressions were used to see if one of the variables measured would predict participants' scores on one of the other variables.

The results for the correlations were as follows: There was a significant positive correlation between time and complexity ($r = .254$, $n = 96$, $p<0.05$, two-tailed), time and how interesting the displays were ($r = .246$, $n = 96$, $p<0.05$, two-tailed), and time and mystery (r = .430, n = 96, $p<0.0005$, two-tailed). A negative correlation was found for time and familiarity (r = -.584, n = 96, $p<0.0005$, two-tailed).

A significant positive relationship was also found between how attractive and interesting the displays were (r = .657, n = 96, $p<0.0005$, two-tailed), how interesting the pictures were perceived to be and complexity (r = .622, n = 96, $p<0.0005$, two-tailed), and complexity and mystery (r = .442, n = 96, $p<0.0005$, two-tailed). A negative relationship between complexity and familiarity was also found to be significant (r = -.235, n = 96, $p<0.05$, two-tailed).

Moreover a further three relationships were also found to be significant; a negative correlation was found between how interesting the pictures were and familiarity (r = -.318, n = 96, $p<0.005$, two-tailed), and for familiarity and mystery (r = -.589, n = 96, $p<0.005$, two-tailed), and a positive relationship was found between how interesting the pictures were and mystery (r = .502, n = 96, $p<0.005$).

Using the enter method six significant models occurred using linear regression analysis.

Mystery

The first out of the six was for mystery ($F_{4,91}$=26.990, $p<0.0005$). Adjusted R square = .523. Significant variables are shown below:

Predictor Variable	**Beta**	***p***
Attractiveness	-.383	p=0.001
Interesting	.604	$p<0.0005$
Familiarity	-.421	$p<0.0005$

(Complexity was not found to be a significant predictor in this model.)

Complexity

The second significant model emerged for complexity ($F_{4,91}$=23.281, p<0.0005).

Adjusted R square = .506. Significant variables are shown below:

Predictor Variable	Beta	p
Attractiveness	-.451	p<0.0005
Interesting	.916	p<0.0005

(Familiarity and mystery were not significant predictors in this model.)

Familiarity

A significant model also emerged for familiarity ($F_{4,91}$=12.277, p<0.0005). Adjusted R square = .351. Significant variables are shown below:

Predictor Variable	Beta	p
Mystery	-.598	p<0.0005

(No other predictors were found to be significant in this model.)

Interesting factor

The fourth significant model was found for the perception of how interesting the displays were ($F_{4,91}$=81.274, p<0.0005). Adjusted R square = .781. Significant variables are shown below:

Predictor Variable	Beta	p
Attractiveness	.581	p<0.0005
Complexity	.405	p<0.0005
Mystery	.289	p<0.0005

(Familiarity was not a significant predictor in this model).

Attractiveness

A significant model was also found for attractiveness ($F_{4,91}=35.774$, $p<0.0005$).

Adjusted R square = .611. Significant variables are shown below:

Predictor variable	**Beta**	***p***
Complexity	-.355	$p<0.0005$
Interesting	1.033	$p<0.0005$
Mystery	-.325	$p=.001$

(Familiarity was not a significant predictor in this model.)

Time

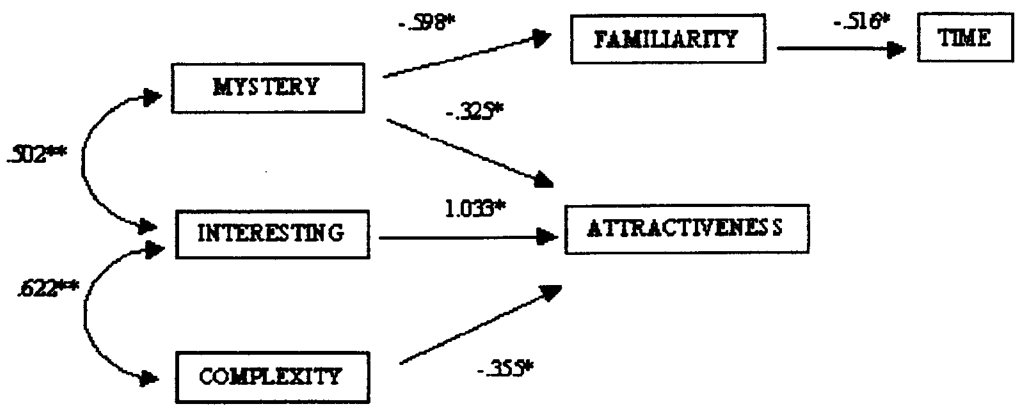
The last significant model emerged was for amount of time spent looking at the displays ($F_{4,91}=10.659$, $p<0.0005$). Adjusted R square = .372. Significant variables are shown below:

Predictor Variable	**Beta**	***p***
Familiarity	-.516	$p<0.0005$

(No other predictors were found to be significant in this model.)

From the above correlations and regressions a clear pattern emerged from which figure (34) was constructed (see next page).

Figure 34: Model showing the relationship between the variables measured



*Regression is significant at 0.001

** Correlation is significant at 0.001

Figure 34 show a pattern of how the overall attractiveness of a display is directly influenced by how interesting, mysterious and complex it is perceived to be. It also shows that that the same three factors also decreases the perception of familiarity which in turn decreases the amount of time spent looking at the display. This in turn indicates that when the display is perceived to be mysterious, interesting or complex the time spent looking at the display will increase.

4.3 Discussion

This study was conducted in order to try and operationalise previously established concepts such as 'mystery', 'complexity', 'familiarity', and 'interesting', that have been claimed by researchers such as Berlyne (e.g. 1974) and Kaplan and Kaplan (e.g. 1987) to have the capacity to generate a more favourable aesthetic preference. Due to the large amount of results that this study generated, not all of them will be discussed here.

Results from this study suggest that simple aesthetic elements such as basic shapes and colours can be used to create meaningful percepts, meaning that both hypothesis 10 and 11 can be accepted. In particular it was investigated here to what extent various design elements would generate percepts such as 'mystery', 'complexity', 'familiarity', and 'interesting'. In regards to mystery the result shows that only hypothesis 12 can be accepted. The more elements that each of the displays consisted of the more mysterious the participants rated them to be. Bearing in mind that all of the displays presented to the participants were rather simple it is not surprising that none of the mean ratings for the number of elements used were very high.

Even though hypotheses 13 to 16 were not accepted it should be noted that all of the other factors (i.e. the shape, the colour, the shade and whether the elements in the display were partially hidden) were found to be significant in combination with other elements such that the interaction between colour and whether or not the elements were fully visible. Meaning that they all indirectly influence how 'mysterious' a display is perceived to be. A total of six interaction effects were found. In comparison to the other concepts tested here, that was a rather small number, perhaps that in turn also demonstrates that peoples' perception of what it is that is mysterious is less complex than may be expected.

When measuring which design elements influenced how 'complex' a display was perceived to be, hypotheses 17, 18 and 21 were accepted. The number of elements, the type of shape and whether the elements in the display were partially hidden were all found to be significant contributors. The marginal means for the number of elements used were very similar to those for mystery, indicating that the displays were perceived as being more complex with an increase in the number of elements used. It can also be seen from the results that the mixture of shapes generated a higher complexity rating than did the other three shapes. Furthermore a higher level of complexity rating also occurred when the elements in the display were partially hidden.

The colour and the shade were only contributing factors to the complex percept when interacting with another design element, which still indicates that they were an overall important part in forming a complex perception. A total of eight interaction effects were found to be significant contributors.

Out of hypotheses 22 to 26 only hypothesis 22 (the number of elements used in a picture will affect whether it is perceived as being familiar) and hypothesis 24 (the colour used in a picture will affect whether or not it is perceived as being familiar) were accepted. All the other design factors were found to be significant whilst interacting with one or more design elements. Nineteen significant interaction effects were found for familiarity, which points towards the concept that what people perceive as being familiar is slightly more complex than for example what they perceive as being mysterious. This is not surprising considering that people would have been differently socialised, and this is simply a reflection of that.

The main influence on why the participants thought the displays were interesting appeared to be number of elements used, the shape, and whether or not the elements were partially hidden, which means that hypotheses 27, 28 and 31 can all be accepted. Again, just as with the ratings of complexity and mystery the ratings for how interesting the displays were perceived to be increased linearly with the increase of elements used. The participants rated the squares as the most interesting elements followed by the mixture of elements. Furthermore again, just as with the complexity and mystery ratings, the pictures were perceived as being more interesting when the elements in the display were partially hidden.

A total of twelve interaction effects were found to be significant contributors to how interesting the displays were rated to be. Of those twelve interactions, some included the colour and the shade. Even though the colour and the shade were found to contribute indirectly to whether or not a display was perceived to be interesting they were not significant in their own right, and consequently hypotheses 29 and 30 have to be rejected.

From the repeated measures it can also be seen that the level of perceived attractiveness is also directly affected by the design elements used in this study. The number of elements, the shape, and the colour used in each one of the displays were all found to be significant contributors in their own right. Subsequently also hypotheses 32, 33 and 34 can be accepted. The displays were rated to be the most attractive when the displays contained 27 elements, however this was closely followed by the displays containing only 18 elements. When the displays had only nine elements the attractiveness rating dropped significantly. Square shapes were rated the most attractive followed by the circles and displays with blue elements were clearly favoured over those with red. The colour findings should however be treated with some caution due to the fact that only two colours were used in this experiment. However it is a good indicator that colour is an important factor in determining how attractive something really is. It should be remembered that since colour preferences tend to be the product of socialisation procedures, it is unlikely that one can ever establish which colour would be generally more favoured by a large group of people, but it may be discovered that certain colours can be more favourable when interacting with other aesthetic elements.

Furthermore eight interaction effects were found to be significant, where these interaction effects contained both the element of shade and whether they were partially hidden. This clearly demonstrates that both the shade and hidden factor indirectly influence whether a display is perceived to be attractive. However due to the fact that they were not found to be significant contributors by themselves, hypotheses 35 and 36 can not be accepted.

In line with previous research findings conducted by Kaplan et. al. (e.g. 1989) and Berlyne (e.g. 1974, 1971), this study also investigated if novelty, mystery and complexity would increase the overall appeal of the displays. However no significant correlations were found to confirm these previous findings. Consequently hypotheses 37, 39 and 40 can not be accepted.

Furthermore it was also tested if Berlyne's idea that interesting patterns would decrease the overall attractiveness of the displays. In fact on the contrary it was found that the more interesting a picture was perceived to be the more attractive they were also rated to be, therefore hypothesis 38 also has to be rejected. It is not entirely unexpected that hypothesis 38 had to be rejected. Bearing in mind that Berlyne's research studies are now somewhat dated and that there tends to be a fashion in what makes something aesthetically pleasing. This finding may simply be a sign of modern times.

There is however also another possibility, that the ratings of attractiveness is not entirely suitable to measure the overall likeability of a display, since the judgement of how attractive an element is, may not necessarily be the same as how much people like it. Perhaps this is something that should be taken into consideration in future studies where it may be advisable to include a question asking the participants to rate how much they like the displays.

The correlations showed that hypothesis 42 can be accepted, as the time spent looking at the displays was found to increase linearly with the complexity ratings. This confirms both Berlyne's and the Kaplans' idea that complex patterns attract longer exploration. However the r-value was only .254, indicating that the relationship is not very strong. Based upon the correlations hypothesis 43 can also be accepted, since time exploration increased when the participants' rating increased for how interesting the displays were. Similarly to the r value for the relationship between time and complexity the r value for time and the percept of how interesting the displays were was also low ($r = .246$), again demonstrating that the relationship between the two was not very strong. A positive significant relationship was also found for time exploration and mystery ($r = .430$), meaning that hypothesis 45 can also be accepted. This was also in accordance with previous research conducted by Berlyne and the Kaplans'. Even though the r-values for the three above mentioned relationships were not that high, it is worth bearing in mind that they were all statistically highly significant. Hence this should be taken into consideration when trying to get consumers to interact with the POP-displays, since it is likely that the longer consumers spend in front of the displays, it is also increasing purchase probability.

Moreover also hypothesis 44 can be accepted since a significant negative correlation was found for time exploration and familiarity ($r = -.584$). That familiar displays would be looked at for a shorter period of time is logical. If a person is faced with a display that they are already familiar with, then they would also already have a preconceived idea of whether they like it or not. Subsequently there would be no need to explore the display further. This can be of particular interest for designers depending on what they are trying to achieve. If the idea is to increase the dwell time then they should try to avoid creating a POP-display that is overly familiar, as the consumer would have no need to explore the display further. However, it should also be remembered that familiarity increased the overall attractiveness ratings for the displays, so if the goal is to simply create an overall appealing display then it would be beneficial to try and make it look like something consumers have encountered before.

The six significant models that occurred from the linear regressions clearly show how some of the factors are directly and indirectly linked to one another. The model that occurred for attractiveness clearly supports the correlations in that how interesting a display is perceived to be is a significant contributor to how attractive it will be rated. One explanation as to why familiarity was not found to be a significant contributor to the overall attractiveness might be seen from the correlations where the r-value was only .235. It is possible however, that with a higher number of participants this may change.

The regression model produced for the interesting factor also offers some support for the correlations. It can be seen that mystery is a significant contributor to whether a display is perceived to be interesting. However the correlation for the interesting factor and attractiveness and complexity was not found to be significant, unlike the regression which showed that they were both contributing to the overall perception of how interesting a display is.

The model that was created for mystery showed that the attractiveness and familiarity factors decreased the overall perception of mystery, whilst the interesting factor increased it. This supports both the results generated by the correlations and the model created for the interesting factor.

'Familiarity' was the only significant factor contributing to the time spent looking at the displays. It should be noted that the model is showing that the more familiar the display appeared to be to the participants, the less time they spent looking at it. Even though the correlations previously showed that there were significant linear increases between time and complexity, time and interesting, and time and mystery, they may not have appeared as contributing factors in the regression analysis due to their low r values.

The unification of the results generated from both the correlations and the regressions can be seen in Figure 34. As previously discussed it clearly shows how the overall attractiveness is decreased by both complexity and mystery and increased by how interesting a display is. The three factors that influence overall attractiveness are also interlinked by positive correlations. 'Familiarity' directly decreases the overall dwell time which means that mystery, interesting, and complexity in turn have the capacity to increase the overall dwell time. Furthermore it is possible that if one can generate more distinct patterns of the concepts investigated here, it is also likely that they will become contributing factors in regression analysis.

4.4 Summary & Conclusion

This study was undertaken to investigate if design concepts such as 'mystery', 'complexity', 'familiarity', and ' interesting' can be produced empirically from simple single elements. The overall results show that simple design elements can be used to influence peoples' perception in relation to the four mentioned concepts. It was also found here that three of the factors (mystery, interesting and complexity) can increase the overall time spent looking at the displays, whilst the familiarity concept actually decreases the time spent looking at them. Furthermore it was also found that mystery and complexity decreases the perception of attractiveness whilst the interesting factor increases it.

Even though the results present a rather complicated picture of how one can make use of various design elements to create a display that will be perceived in a particular way, the study has confirmed that it is possible to make use of simple elements to influence peoples perceptions. It may not be clear cut, but it presents a good starting point that can be built upon further in order to fully operationalise Kaplans' and Berlyne's concepts.

Chapter 5

Study 4[3]: The influence of colour upon visual search time

The aim of this study was to establish if a particular colour can function as an aid to reduce search times for a given target in a multicoloured and cluttered environment, similar to that found in many retail contexts. Based upon the idea that humans respond more rapidly to basic colours than non-basic colours (Boynton, 1988; Davies & Corbett, 1995), it was investigated if they may also be more rapidly and accurately identified during visual searches conducted in cluttered settings.

5.1 Method

5.1.1 Participants

Fifty participants from a large UK university participated in the individual laboratory sessions. Twenty-three of the participants were male and twenty-seven were female. The age range was 18 to 54 years, with a mean age of 29.74 for women and 28.23 for men. Participants were volunteers recruited by the experimenter from a number of different undergraduate courses, and could be considered motivated by an outline of the study. The sample was a convenience one.

The aim of this study was to investigate if men and women may find a visual search target more rapidly and accurately dependent on the interaction between particular hues, shape and positioning that are known to have the capacity to reduce visual search time in cluttered environments.

[3] This study has been published: Jansson, C., Bristow, M., & Marlow, N. (2004). The influence of colour on visual search times in cluttered environments. Journal of Marketing Communications, 10, 183-193.

5.1.2 Materials

A restricted palette of colours was used in the experiment. The decision to use the hues red, blue, green, turquoise, beige and peach was based upon the fact that red, blue and green are a part of the eleven basic colours, which are recognised with minimal response time. Turquoise, beige and peach were chosen since they are not part of the basic eleven colours, and should therefore theoretically take longer to find in a visual scene.

After selecting the hues, a fixed value and saturation was used for each (value = 129, saturation = 255). A variety of different shapes were used to produce the background, including the target shapes of a circle and a square. These shapes were coloured and distributed in a random array as the background for the target search, simulating the 'cluttered' retail environment that is typically encountered by the consumer. The targets presented for the participants to identify were either a coloured circle or square. The target was always present in the background, available for a 'positive' identification.

All colour search experiments reported were set up using a Dell computer and the stimuli were presented on a Panasonic Panasync 4 colour computer monitor which was 28.5 centimetres wide and 21.5 centimetres long. The 'cluttered' background containing a specific target was presented using a modified Microsoft PowerPoint programme that allowed the experimenter to time (in seconds) how long it took for the subject to detect the target stimulus.

Each target screen had a high number of distractors with a similarity between targets and non-targets. Previous studies have shown that search time increases with the number of distractors (Eriksen & Spencer, 1969), and with hue similarity of targets and non-targets (D'Zmura, 1991; Farmer & Taylor, 1980). Based on these previous studies where, for example, it took D'Zmura's participants a minimum of 700 milliseconds and a maximum of 2000 milliseconds to find an orange target amongst 32 yellow and red distractor targets, it was expected that the response time in this experiment would be between 1-3 seconds.

Each experimental run consisted of 96 slides of which 48 slides showed the target stimulus and 48 were search screens. All of the target colours (red, green, blue, turquoise, beige and peach) used in the experiment had the same saturation (255), and were presented in the shape of either a circle or square. The different shapes were only used as a control condition, and were not expected to have an affect upon visual search time. By using two different shapes the possibility that the participants were responding to the shape of the stimuli rather than the colour was controlled for.

The search screens all consisted of 225 different shaped and coloured distractor targets (saturation and value was controlled) of which 10 were the same shape as the actual search target and five were of the same hue but completely different in saturation and value. The order of the distractor targets were altered in each one of the search screens so that the subjects would not become too familiar with a particular sequence.

Based upon previous findings that humans tend to visually search for a target starting from the top left and work their way down from left to right, (Megaw & Richardson, 1979), the screen was hypothetically divided into four equal segments, forming a 2 x 2 matrix. On each search screen the target was positioned in one of the four segments and this was repeated so that each target stimuli appeared in all four positions.

Position 1 was in the top left 'square', position 2 was the top right 'square', position 3 was the bottom left 'square' and position 4 was the bottom right 'square' of the screen. Four different positions for each colour target were used in order to control for the influence 'position' might have on response times. As the participants conducted the visual searches, the experimenter recorded whether or not the participant identified the search target accurately. When the participant identified the target on the screen with the mouse pointer and "clicked" on the search screen, a new target for the next search exercise was presented automatically.

5.1.3 Design

A 6 x 2 x 4 within–subjects design was created to measure whether colour has the capacity to influence the time it would take to identify the target accurately in a cluttered setting, and if the basic colours would be detected more rapidly.

The following five hypotheses were tested;

H46 : Speed of target detection in a cluttered scene will be influenced by the target colour.

H47 : Basic colours will be detected more rapidly than non-basic colours.

H48: Speed of target detection will be influenced by its shape.

H49 : There will be a sex difference in the detection of targets of different hue.

H50 : Male subjects will detect square targets more rapidly and accurately than females.

H51 : Female subjects will detect round targets more rapidly and accurately than males.

5.1.4 Procedure

Participants were seated in front of the computer, with the screen approximately 70 centimetres away from them. The aim of the particular task was explained together with their rights in line with the British Psychological Society (BPS) ethical guidelines.

Each experiment started with a screen consisting of only one stimulus, which was a square or a circle, coloured either red, green, blue, turquoise, beige or peach. Subjects could look at the target for as long as they wanted and when they were ready they were instructed to click on the screen to make the corresponding search screen appear. The subjects then had to search with the cursor for the stimulus they had seen on the previous screen. Once they found the target they had to point on it with the mouse and 'click'. This timed the search process from leaving the target screen to identifying the target on the distractor screen. The next target screen would then appear automatically, again consisting of a single stimulus. This procedure was repeated until all of the 48 target stimuli had been presented to the subject. Four different screen arrangements, which were randomly assigned to the different participants, were used in order to control for possible order effects.

5.2 Results

5.2.1 Colour results

The influence of colour on visual search time was analysed using a repeated measures Anova in a 6 (hues) x 2 (shapes) x 4 (position) design.

Table 11: Average Search Time (in seconds)

	TARGET	*AVERAGE SEARCH TIME*	*ACCURACY in %*
10 Fastest	SQUARE GREEN 4	1.78	98
	CIRCLE BLUE 4	1.82	98
	SQUARE BEIGE 2	2.12	90
	CIRCLE GREEN 3	2.16	92
	CIRCLE RED 2	2.20	88
	CIRCLE GREEN 4	2.28	92
	CIRCLE PEACH 1	2.30	86
	SQUARE RED 2	2.46	98
	SQUARE GREEN 3	2.46	94
	SQUARE BLUE 3	2.50	96
10 Slowest	SQUARE RED 3	3.76	90
	CIRCLE BLUE 3	3.88	88
	SQUARE PEACH 3	3.88	76
	CIRCLE PEACH 3	3.92	93
	SQUARE PEACH 1	4.14	88
	SQUARE BEIGE 4	4.34	90
	SQUARE GREEN 1	4.38	92
	SQUARE PEACH 2	4.50	82
	SQUARE PEACH 4	5.18	76
	CIRCLE BEIGE 2	6.62	88

Table 11, shows the ten quickest and the ten slowest search times. Stimuli with less than a 75% accuracy level were not included in the table.

Examining the ten quickest search times in Table 11 it can be seen that there is an even distribution in the positioning of the targets between matrix segments 2, 3 and 4, however a target in position 1 only appears once. The most salient colour appears to be green (4 hits from 10), followed by red and blue (each with 2 hits from 10), and then beige and peach (each with 1 hit from 10).

The ten slowest search times indicates that position has had an effect on influencing search times. Position 3 appears most frequently (4 hits from 10), followed by an equal distribution of positions 1, 2, and 4 (each with 2 hits from 10). Peach is the most salient colour for a slow response time (5 hits from 10), followed by beige (2 hits from 10), and then red, blue and green (each with 1 hit from 10).

The test for sphericity indicated that the variance was unequal and therefore the more conservative Greenhouse-Geisser was used for significance decisions. The analysis of variance for within-subjects effects, showed that both colour ($F_{(5,240)}=15.108$, $p=.000$) and colour/position ($F_{(6.8,330)}=6.144$, $p=.000$) and the interactions were significant. Subsequently hypothesis 46 can be accepted.

Table 12a: Estimated marginal means for colour response times in seconds

Green	Blue	Red	Turquoise	Beige	Peach
1.92	1.93	2.08	2.12	2.43	2.63

From Table 12a, it can be seen that overall the colour green had the fastest response time with a mean value of 1.92 seconds, this is closely followed by blue with a mean of 1.93 seconds, and then red with a mean value of 2.08 seconds. All of the secondary colours have the slower response values, with the peach colour the slowest.

Table 12b:Estimated marginal means for position response times in seconds

2.12	2.31
2.15	2.16

Table 12b shows that there is a difference in the mean values according to the position of the target. Positions 1, 3 and 4 are have a similar response time on average, ranging from 2.12 to 2.16 seconds. Position 2 has the largest mean response time of 2.31 seconds (p = .075).

Figure 35: Mean search times: Interaction effects position x colour

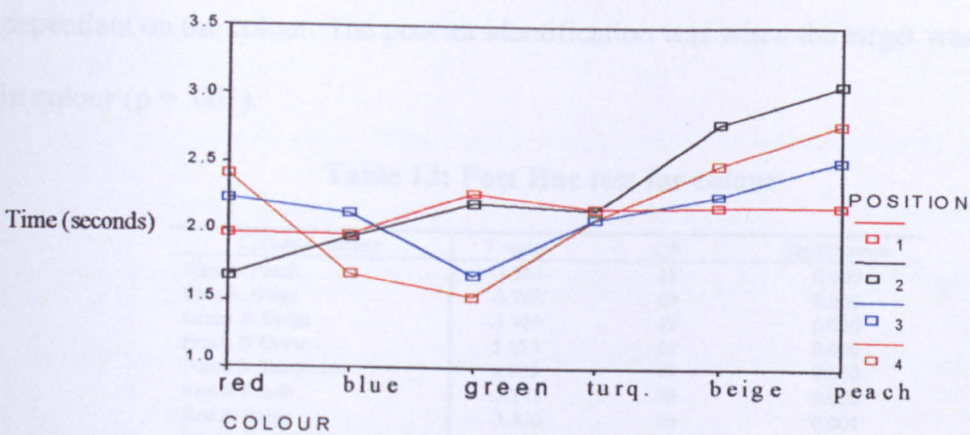
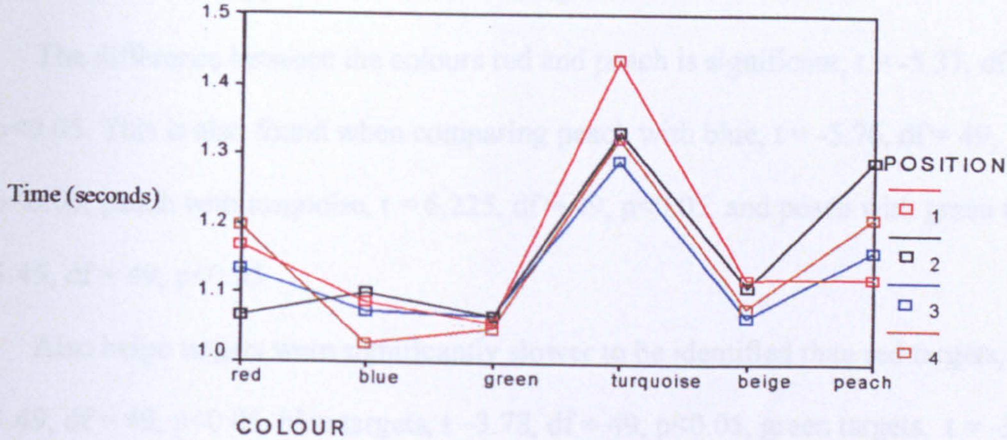


Figure 35 indicates that targets placed in position 1 (top left-hand side of the screen) had similar search times regardless of the colour of the search target. It also shows that the search times for position 2, 3 and 4 are more dependent on the colour of the target. Blue and green targets have the quickest search times when placed in position 4, and red targets when placed in position 2 (p= .000).

Figure 36: Interaction effects: Accuracy x colour x position



* Note that 1 = 100% accurate and 2 = 100% inaccurate

When examining the accuracy level for position taking colour of target into account, it can be seen that the accuracy level (correct identification of target) is highly dependant on the colour. The poorest identification was when the target was turquoise in colour (p = .001).

Table 13: Post Hoc test for colour

Collated colours	*T-value*	*DF*	*Significance*
Blue & Peach	-5.764	49	0.000
Blue & Beige	-3.788	49	0.000
Green & Beige	-3.989	49	0.000
Peach & Green	5.455	49	0.000
Peach & Turquoise	6.225	49	0.000
Red & Peach	-5.371	49	0.000
Red & Beige	-3.490	49	0.001
Turquoise & Beige	-3.305	49	0.002
Red & Blue	1.607	49	0.115
Red & Green	1.575	49	0.122
Peach & Beige	1.288	49	0.204
Red & Turquoise	0.924	49	0.360
Green & Turquoise	-0.587	49	0.560
Blue & Turquoise	-0.531	49	0.598
Blue & Green	0.210	49	0.835

Mean times for each of the colours were as follows: Green = 1.92, Blue = 1.93, Red = 2.08, . Turquoise = 2.12, Beige = 2.43, and Peach = 2.63

In order to confirm which colours had the ultimate impact on visual search times, a series of post hoc tests were conducted. From Table 13 above it can be seen that a general pattern emerges. The targets of the primary colours red, green and blue are identified significantly quicker than the targets coloured in the non-primary colours, meaning that also hypothesis 47 can be accepted.

The difference between the colours red and peach is significant, $t = -5.37$, $df = 49$, $p<0.05$. This is also found when comparing peach with blue, $t = -5.76$, $df = 49$, $p<0.05$, peach with turquoise, $t = 6.225$, $df = 49$, $p<0.05$, and peach with green $t = 5.45$, $df = 49$, $p<0.05$.

Also beige targets were significantly slower to be identified than red targets, $t = 3.49$, $df = 49$, $p<0.05$, blue targets, $t -3.78$, $df = 49$, $p<0.05$, green targets, $t = -3.98$, $df = 49$, $p<0.05$, and also with turquoise targets, $t = -3.30$, $df = 49$, $p<0.05$. The one contrast that was not significant is the comparison between green and turquoise targets.

5.2.2 The affect of shape

The results for the influence of shape upon visual searches were as follows: Mauchly's test of sphericity revealed that all of the factors had a significant result, ($p<0.05$). Therefore for all the factors Greenhouse-Geisser was assumed. Table 14 below, shows the significant result for the interactions involving shape as shown in the tests for within-subjects effects.

Table 14: Within-subjects Effects Summary of Significant Results

Factor	*DF*	*F*	*Significance*
Colour*Shape	2.86	4.376	0.006

Table 14, shows a significant result for the interaction between colour and shape ($F(5,240,)=4.376$, $p=.006$). However shape on its own was not found to be significantly influential, therefore hypothesis 48 has to be rejected.

Figure 37: Mean search times: Interaction effects colour x shape

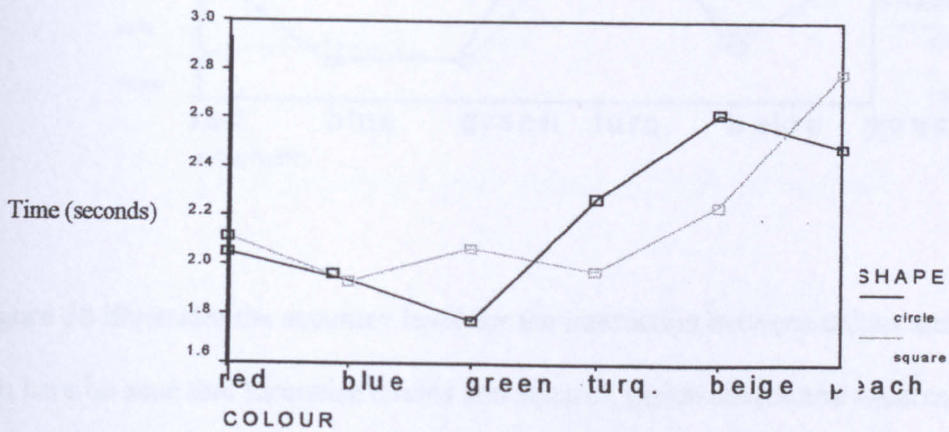


Figure 37 demonstrates that there is an interaction effect between colour and shape. Even though it should be noted that the effect is small, it still shows that the red, blue, green and peach are slightly easier to identify when presented in the shape of a circle and turquoise and beige when presented in the shape of a square, ($p<0.006$).

Figure 38: Interaction effects shape x colour x accuracy

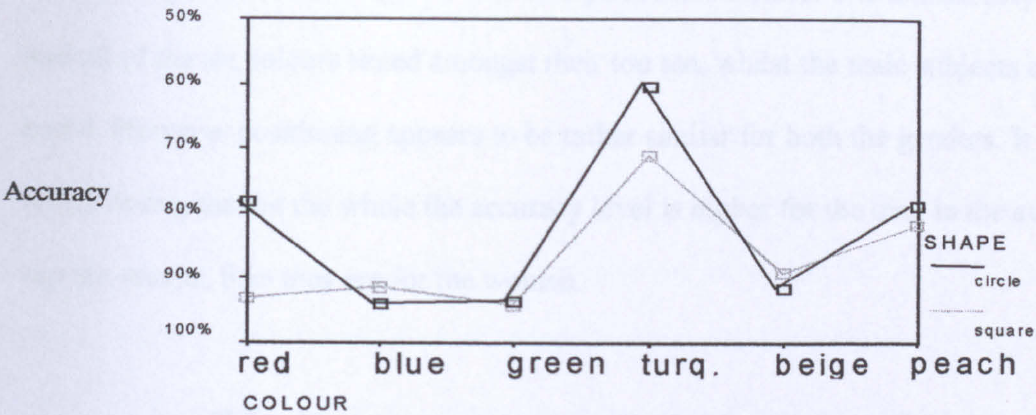


Figure 38 illustrates the accuracy level for the interaction between colour and shape. It can here be seen that turquoise circles and squares, peach circles and squares, and red circles were more frequently misidentified in the background distractor screen.

5.2.3 Sex differences

In order to test hypotheses 49-51 the results were also tested for differences between women and men, and the results were as follows:

Table 15: Average top ten search times (in seconds)

MEN			WOMEN		
Search Target	**Search Time**	**Accuracy**	**Search Target**	**Search Time**	**Accuracy**
Square Green 4	1.34	100%	Circle Blue 4	1.88	97%
Square Beige 2	1.60	92%	Square Green 4	2.14	97%
Circle Blue 4	1.73	100%	Circle Peach 1	2.33	75%
Circle Red 2	1.86	92%	Circle Red 2	2.48	86%
Circle Green 3	1.91	92%	Square Turquoise 2	2.51	86%
Circle Green 4	1.91	92%	Square Beige 2	2.55	89%
Square Red 2	1.91	100%	Circle Green 4	2.59	93%
Circle Red 1	2.08	74%	Square Turquoise 1	2.59	75%
Square Blue 3	2.21	100%	Square Turquoise 3	2.59	75%
Circle Green 1	2.26	100%	Square Turquoise 4	2.59	78%

Table 15, shows the ten best search times for men and women, and it can be noted here that the male subjects found more circles than squares more rapidly, whilst the female subjects had more squares in their top ten search times. The female subjects had all of the six colours tested amongst their top ten, whilst the male subjects only had 4. However positioning appears to be rather similar for both the genders. It is also worth noting that on the whole the accuracy level is higher for the men in the average top ten results, than they are for the women.

Table 16: Average worst ten search times (in seconds)

MEN			WOMEN		
Search Target	Search Time	Accuracy	Search Target	Search Time	Accuracy
Circle Beige 1	9.91	83%	Square Peach 4	6.22	78%
Square Peach 2	4.73	79%	Circle Peach 2	5.18	60%
Square Peach 1	4.69	87%	Square Peach 3	4.70	86%
Square Green 1	4.60	92%	Square Beige 4	4.37	97%
Square Beige 4	4.30	83%	Square Red 3	4.33	93%
Circle Peach 3	4.17	96%	Square Peach 2	4.29	86%
Square Peach 4	3.95	87%	Square Green 1	4.18	93%
Square Beige 3	3.91	96%	Circle Red 4	3.92	67%
Square Green 2	3.91	96%	Circle Blue 3	3.88	78%
Circle Blue 3	3.86	100%	Square Red 4	3.85	89%

Table 16 shows that male subjects produced the worst search times for targets coloured beige, green and peach, whilst the female subjects, just like in the top ten, had more of a spread and incorporated 5 colours out of the 6 colours tested. The ten worst search times for both men and women incorporated a higher number of squares than circles.

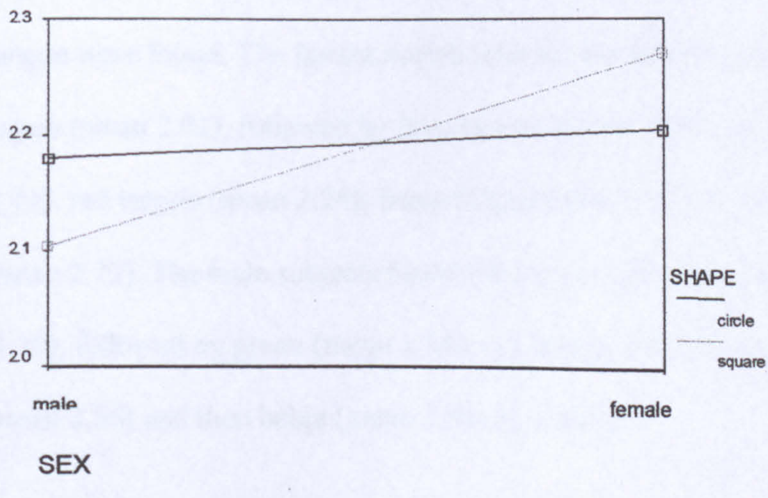
Table 17:Within-subjects Effects Summary of Significant Results

Factor	*DF*	*F*	*Significance*
Colour*Sex	3.56	2.600	0.044
Position*Sex	2.73	3.278	0.027
Colour*Shape*Sex	2.86	2.734	0.049
Colour*Shape*Position*Sex	6.48	4.022	0.000

* only statistically significant results are shown

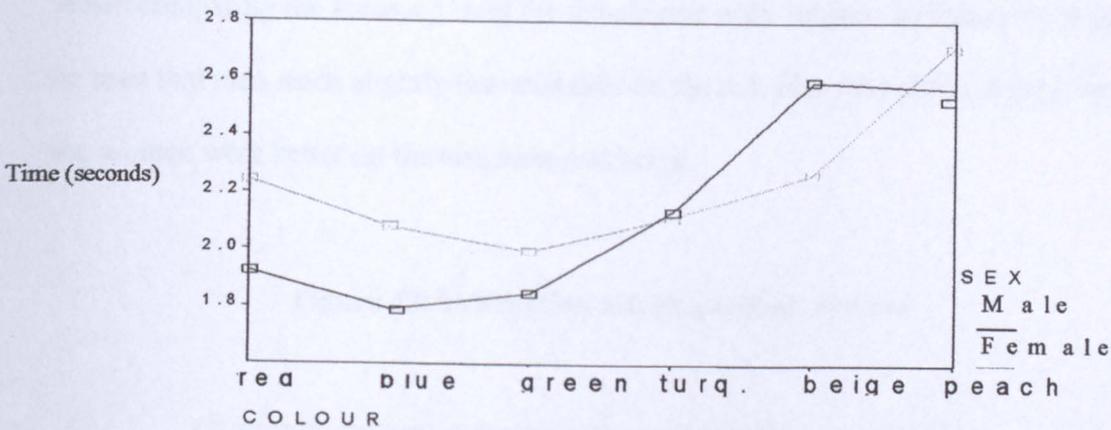
Mauchly's test of sphericity revealed that all of the factors had a significant result ($p<0.05$). Therefore for all the factors Greenhouse-Geisser was assumed. Table 16 above, shows all the variables and their interactions with a significant result in the tests for within-subjects effects. From the table it can be seen that women's and men's visual search processes are affected differently by factors such as colour ($F(5,240)=2.6$, $p=.044$) and positioning ($F(3,144)=3.278$, $p=.027$). Interaction effects were also found for colour and shape ($F(5,240)=2.734$, $p=.049$), and colour, shape and positioning ($F(15,720)=4.022$, $p=.000$).

Figure 39: Mean search times: Interaction effects shape x sex



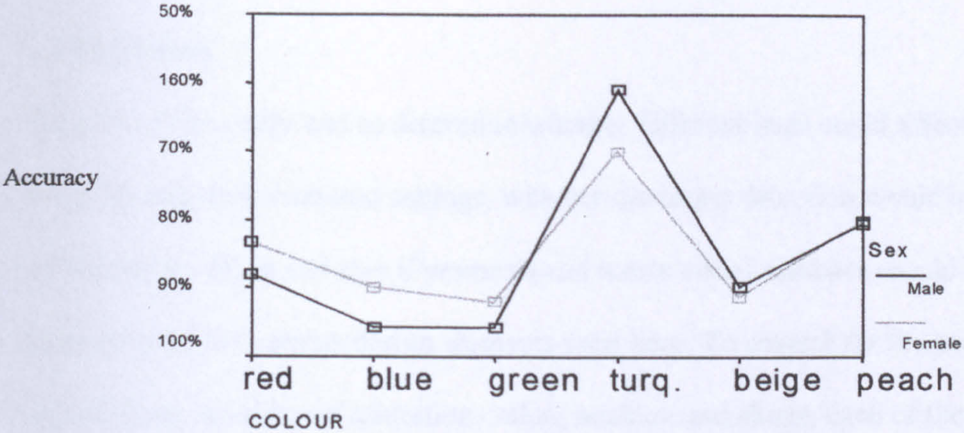
The results in Tables 15, 16 and 17 do not demonstrate any significant shape differences between the sexes. However Figure 39 indicates that when all the results are taken into consideration, female subjects' search times overall decreased a fraction when the coloured targets appeared in the form of a circle. The opposite can also be noted for the men, where the overall search times decreased when the coloured targets were presented in the shape of a square. However the difference between the search times for different shaped targets is rather small which will account for why it was not found to be significant. Subsequently hypotheses 50 and 51 have to be rejected.

Figure 40: Mean search times: Interaction effects colour x sex



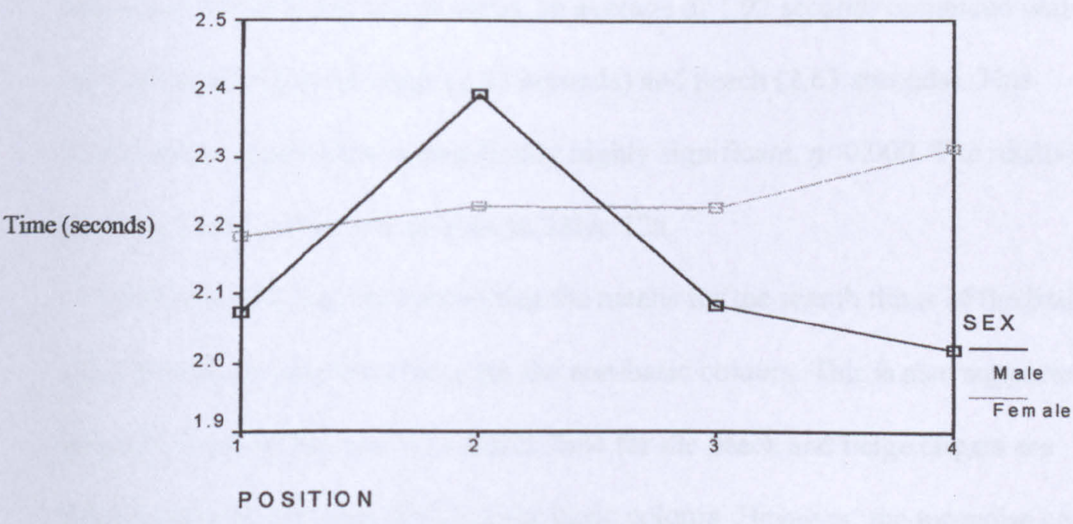
In Figure 40 it can be seen that there is a sex difference in how quickly the different colour search targets were found. The fastest search time for the female subjects was for the green targets (mean 2.02), followed by blue targets (mean 2.08), turquoise targets (mean 2.11), red targets (mean 2.24), beige targets (mean 2.27) and finally peach targets (mean 2.73). The male subjects found the blue coloured targets more rapidly (mean 1.79), followed by green (mean 1.84), red (mean 1.92), turquoise (2.13), peach (mean 2.56) and then beige (mean 2.59) ($p<0.044$).

Figure 41: Interaction effects accuracy x colour x sex



When comparing the accuracy level for female and male subjects in Figure 41, it can be seen that men made slightly less mistakes on the red, blue, and green targets, whilst the women were better on the turquoise and beige.

Figure 42: Interaction affects position and sex



The analysis of Figure 42 demonstrates that the female subjects were hardly affected by the different positions of the target. Whilst the male subjects did considerably better when the target was in position four, closely followed by three and one, their search time also increased when the target was in position two ($p<0.027$).

5.3 Discussion

The aim of this study was to determine whether different hues could affect the search times for targets in cluttered settings, whether the target detection would be influenced by shape and also if women's and men's visual searches would be affected differently by the various design elements used here. To control for the possible confounding variables of saturation, value, position and shape, each of the search screens contained five distractor targets with the same hue but with completely different saturation and value, also two different shaped targets were employed and four different positions.

The key findings of this study show that certain hues are detected more rapidly than others even when the targets are in a cluttered environment. The colour green produces overall faster search times, an average of 1.92 seconds compared with the slowest search times of beige (2.43 seconds) and peach (2.63 seconds). This difference in search time is statistically highly significant, $p<0.000$. The relative means for each colour can be seen in Table 12a.

Furthermore it was also found that the means for the search times of the basic colours were quicker than those for the non-basic colours. This is also supported in detail by the post hoc test. The search time for the peach and beige targets are significantly slower than those for the basic colours. However, the turquoise colour is not significantly slower than the basic colours, but it also did have a statistically low accuracy level. This means the turquoise targets were consistently mis-identified (false positives) and would indicate the unreliability of this hue as an 'attention getter' if used as a design element in a POP. The accuracy level for the turquoise targets was only 66% compared to the green targets which were the most accurately identified targets, with an accuracy level of 94%.

The results are also demonstrating that the positioning of the target affected the target identification. However, there is a strong interaction effect, indicating that the colour of the target has a powerful influence on any target position effects. The basic colours were consistently identified more readily than the non-basic colours regardless of position in the array.

The analysis of Figure 36 where the interaction effects of accuracy, colour and position are shown, shows that the difference in accuracy in identifying the correct colour target is colour specific rather than position specific. In terms of performance, the green and blue targets were the colours most frequently identified accurately, irrespective of positioning. It should be noted that positioning on its own was not found to be significant ($p = .075$), instead it was found to be highly significant when interacting with colour ($p = .000$). This is demonstrating that one will directly affect the other during the visual search process.

In regards to shape a significant interaction effect between colour and shape was found ($p<0.006$). This means that shape does influence target search time, even if it was not found to be a significant factor on its own. This finding supports the theoretical position of the 'unilateralists' who believe that colour and shape are initially processed separately and it is only later in the perceptual process that the information is combined at some higher level (e.g. Pearlmutter, 1980). The results suggest that colour is the more prominent element in guiding the visual search process but shape will have some influence on search times for certain coloured targets. Furthermore it also supports more recent findings such as those suggested by Roggeveen et. al. (2003) that certain shapes have the capacity to reduce the overall visual search time.

The objective of the final three hypotheses were to investigate whether there is a sex difference in how rapidly and accurately a visual search target can be identified when hue, shape, and positioning vary. The results show that hypothesis 49 can be accepted, male and female subjects detected different colour targets more rapidly. This can be noted from the analysis of Tables 15, 16 and 17, and also from Figure 40, where it is clear that men on average found blue targets most quickly, followed by green and then red targets. Whilst the female subjects on average found the green targets most rapidly followed by the blue and then red. The significance level for the interaction between colour and sex was significant ($p = 0.044$).

Hypothesis 50 and 51 can not be accepted, as can be noted from Table 15 and 17, as the interaction between shape and gender was not found to be significant. Even though Figure 39 shows that female subjects identify targets more quickly if in the shape of a circle, and the opposite is indicated for the male subjects who had marginally better search times for square targets. Since this was not significant it can therefore not fully support previous suggestions (e.g. Laurie 1981) that women prefer rounded contours and men square shapes.

Even though no predictions were made as to how the different sexes would be affected by positioning, it was found that there was indeed a significant difference between the two ($p = 0.027$). As can be seen in Figure 42, overall the search time for the female subjects did not change much, but for the male subjects an increase in search time appeared when the targets were in position 2. The women produced a slower search time in positions 1, 3 and 4 than men did. In order to fully explain these results, further research needs to be conducted.

When looking at Table 17, it is worth noting that the highest significance level is for the interaction between colour, shape, position, and sex ($p = 0.000$). So even though no significance was found for sex and shape, shape still has an significant impact on reducing the search time when interacting with the other two factors.
Figure 41, demonstrates that the accuracy level for both sexes was the worst for turquoise coloured stimuli, followed by peach. However, women produced a slightly higher accuracy level than men on beige coloured stimuli, whilst men did better on red, blue and green stimuli.

One possible explanation as to why colour causes these differences in visual search times to occur, is related to the fact that human colour perception is affected by experience, socialisation and knowledge (Taft & Sivik, 1991, 1992). There will also be individual differences in how each person perceives shapes. Therefore, it is unlikely that the findings of this study will be universal, even though it is likely that westernised societies will have similar results. This may also offer an explanation for the mis-identification of the turquoise colour targets, as it is possible that the participants may not have a lot of previous experience with the colour, and may therefore have identified it as being blue or green instead.

Future research should examine the differences in the influence of colour and the meaning of shape on search time between sub-groups in society. The influence of colour is likely to be similar to the extent that we have all experienced the same culture, but there will be significant differences to the extent that we each belong to unique small groups and have individual experiences. This may make it even more difficult for designers to create POP-displays that can attract every consumer's attention, particularly across national boundaries and cultures. One of the main limitations of this study is that by using simple objects such as circles and squares, one can not be certain that it is applicable to a real life setting. Therefore it would be useful to conduct future studies using 'real life settings', where different coloured POP-displays are presented in cluttered surroundings, in order to test if these findings are ecologically valid.

5.4 Summary & conclusion

The results support the findings of previous studies, mainly that target search time is influenced by hue, shape and positioning. Furthermore the results also clearly showed that there is a strong interaction effect between shape and colour. However, this study was undertaken to confirm that these variables also affect search time in complex cluttered environments, such as those found in retail settings, and the overall pattern emerging from the analysis has supported this.

Overall, this study has demonstrated that different colours do indeed affect the search time in cluttered visual environments and that 'basic' colours are more effective than 'non-basic' colours, and that there is a sex difference dependant upon colour, shape and positioning in the visual search. This needs to be taken into consideration when trying to design POP materials that can be identified by consumers with as little time and effort as possible.

Many other colours and shapes could have been included in this study. However, it was not the intention to find out which particular colour and shape would have the ultimate impact on visual search. Which colours and shapes, and what sort of difference they would make is something to be explored more fully in future studies. What this study shows is that shape and colour ought to be taken into consideration when trying to design POP materials, since some colours and shapes can be identified by consumers with less time and effort than others. Furthermore, positioning needs to be taken into consideration depending on whether the target audience are female or male consumers, as the results showed that in addition to colour and shape, it is also an important factor when trying to design a POP-display that will easily be identified during the visual search.

Chapter 6

Study 5: The influence of basic colours upon recall and focal attention

This study was designed to investigate the effect of colours 'insitu'. Are certain colours (red and green) more effective in attracting consumers' attention to POP-stands in a cluttered retail environment, as compared to non-basic colours (e.g. turquoise)? In addition to colour, a further variable was introduced into this study. This was 'brand popularity'. It was hypothesised that a brand high in popularity, would attract more attention and also affect subsequent recall.

6.1 Method

6.1.1 Participants

Four hundred and eighty undergraduate students from the London Metropolitan University participated in this study, of which 288 were female (mean age = 25.3), and 192 were male (mean age 23.2). The students were recruited from 14 different undergraduate programmes, and they all had to volunteer to participate in the experiment.

6.1.2 Materials

An image of a supermarket interior was manipulated using Adobe photo-shop so that no brand names were visible. Four different pictures of POP-displays were then selected. The 'brand popularity' variable was operationalised by selecting POP-displays depicting a very popular brand, KitKat, and a less popular one, Heinz salad dressing. Moderate 'brand popularity' was obtained using Twix chocolate bars and a display of Pot Noodle snacks. This ranking was based upon sales figures, rating the biggest selling grocery brands in the UK. The higher the ranking the more likely it is that the brand will be 'spotted' by a consumer (AC Nielsen, 1996).

The 'chocolate' display stands were of similar shape, as were the Heinz and Pot Noodle POPs. The four POP-displays were altered so that each one of the four displays appeared in three different colour combinations, green, red and turquoise. Again using Adobe photo-shop, the POP-displays were paired off so that all the colour combinations of the KitKat and Twix stands appeared together at the front of the supermarket picture. To control for any colour order effect, the combinations were also presented in the reverse order.

The two stands were also reshaped so that the two stands had exactly the same height and width. The same adjustment was also carried out for the Heinz and the Pot Noodle stand. The final stimulus array contained a total of 12 supermarket pictures, each containing two POP-stands in two different colours (see picture 1 for example of stimuli used).

In order to certify that the participants would respond to the 'issues' investigated, an A4 sized response sheet consisting of the following four open-ended questions was constructed:

1. Describe in detail what you saw.
2. Did you notice any particular colours?
3. Did you see any brand names?
4. Did anything in particular capture your attention?

Picture 1: Example of stimulus used

Red Twix stand and Turquoise KitKat stand

6.1.3 Design

The independent variables used were the 12 manipulated pictorial stimuli presented to the participants, and the dependent variable was the participants' responses. The following two hypotheses were tested here:

H52: POP-displays presented in either red or green will have higher attentional values than when other colours are used.

H53: KitKat will be noticed more than the other three brands.

6.1.4 Procedure

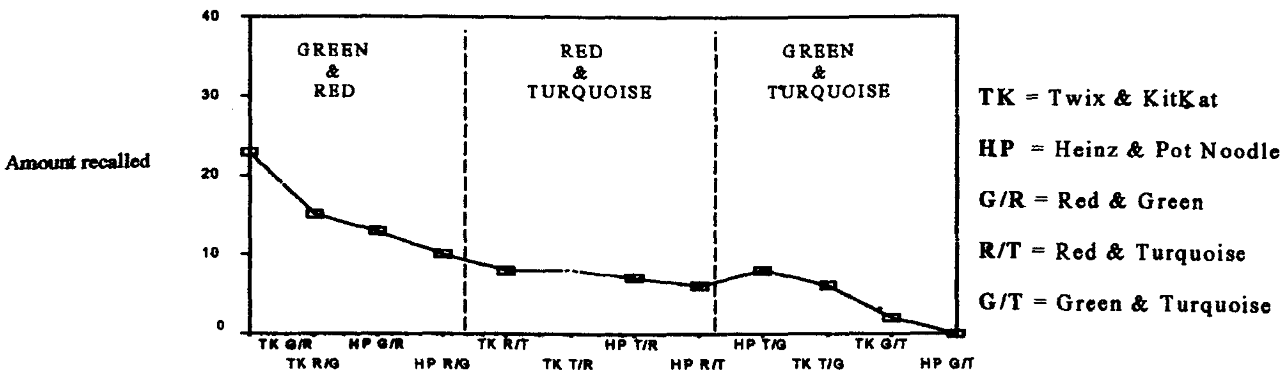
It was explained to the participants how the study was going to be conducted. They were then handed a response sheet, which was placed face down on the tables in front of them. The participants were asked not to turn it over until they had seen the pictorial stimuli. They were then shown the picture of the supermarket setting for three seconds. Once they had seen the pictorial stimuli they were asked to turn the response sheet over and answer the four questions.

6.2 Results

The data was divided into 3 categories (factors); colour, brand, and POP-display. In line with these categories the respondent's protocols were then analysed for content.

Chi-square was used to test if there was a significant difference between the three factors (colour, brand, and POP-displays), across the 12 conditions. It was found that there was a significant difference for colour ($X^2 = 84.989$, df = 22, p = .000), brand ($X^2 = 254.825$, df = 22, p = .000) and POP ($X^2 = 61.228$, df = 22, p = .000).

Figure 43: Relationship between the 12 conditions and both of the colours noticed



The figure shows that overall the colours green and red initiated a greater quantity and more detailed recall of the stimuli.

To establish whether there were any differences between the two types of POP-displays used, another two Chi-square tests were conducted. This was to investigate if there was a significant relationship between the KitKat / Twix stands, the Heinz / Pot Noodle stand and the three factors; colour, brand and POP-displays. For the KitKat and the Twix stands it was found that there was a significant relationship between the condition and colour ($X^2 = 46.530$, df = 10, p = .000), condition and brand ($X^2 = 24.955$, df = 10, p = .005), and condition and POP ($X^2 = 18.788$, df = 10, p = .043).

Figure 44a: Relationship between POP-displays and both of the colours noticed

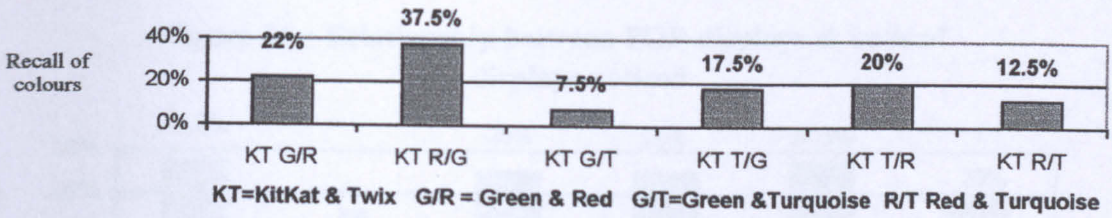
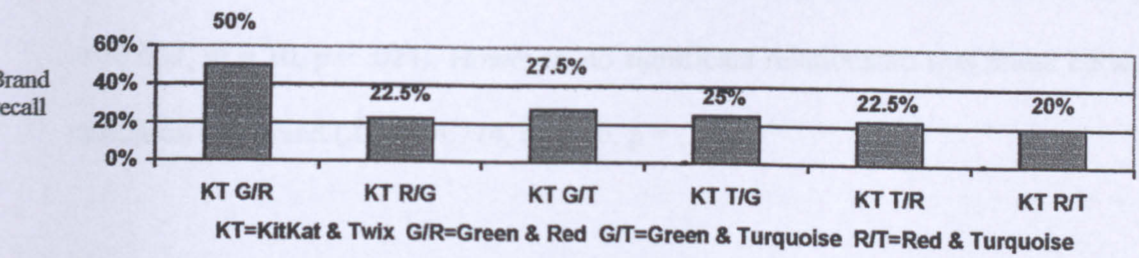


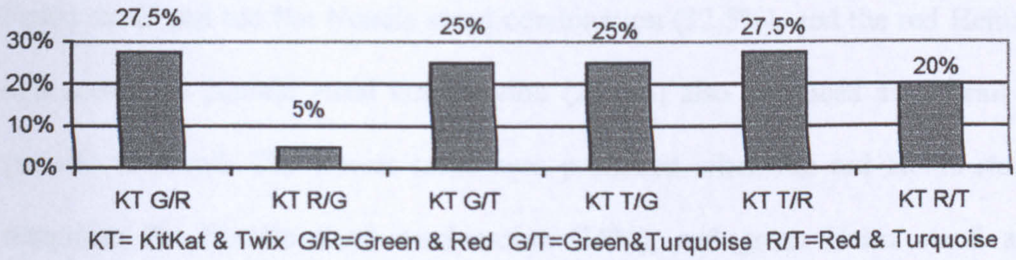
Figure 44a shows that a higher percentage of the participants noticed both the colours when the KitKat stand appeared in red and the Twix stand in green (37.5 %), followed by when the KitKat stand appeared in green and the Twix stand in red (22 %). The lowest recall rate appeared when the KitKat stand was presented in green and the Twix in the turquoise colour (7.5 %), this was followed by the red KitKat stand and the turquoise Twix stand (12.5 %).

Figure 44b: Relationship between POP-displays and both the brands noticed



From Figure 44b it can be seen that both brands were overall more frequently noticed when the KitKat display was coloured green and the Twix stand was red (50%). This was followed by the combination where the KitKat stand was green and the Twix stand was turquoise (27.5 %), and then by the turquoise KitKat stand and the green Twix stand (25 %). When both the brands were reported the least, the KitKat appeared in it's natural red colour and the Twix in turquoise (20 %), closely followed by the reverse combination (22.5%), and the red KitKat and green Twix stand (22.5%).

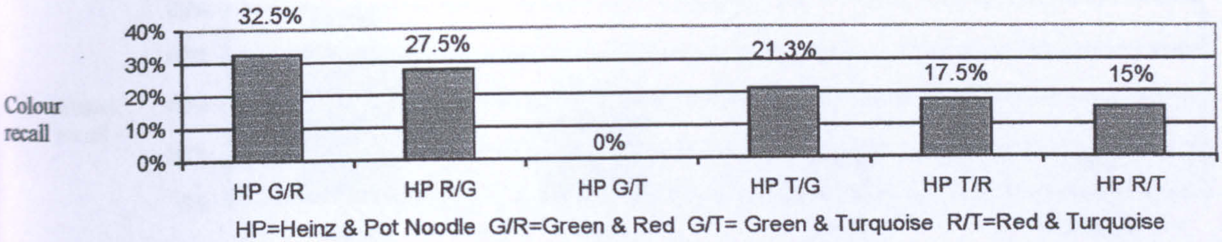
Figure 44c: Relationship between POP-displays & both of the displays noticed



From the above figure it can be seen that both of the POP-displays were more frequently noticed when they appeared in the colours of green and red (27.5%), and turquoise and red (27.5%) combinations. The least successful combination was when the KitKat stand appeared in red and the Twix stand in green (5%).

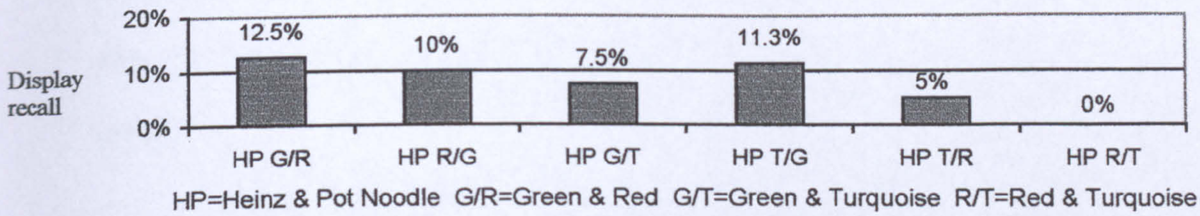
For the measurement of Heinz and Pot Noodle a significant relationship was found for the condition and colour ($X^2 = 25.082$, df = 10, p = .005), and condition and POP ($X^2 = 20.657$, df = 10, p = .024). However, no significant relationship was found between condition and brand ($X^2 = 14.774$, df = 10, p = .141).

Figure 45a: Relationship between POP-displays and both of the colours noticed



Similarly to the results in Figure 44a, it can be seen from Figure 45a that the green Heinz stand and red Pot Noodle stand combination (32.5%), and the red Heinz stand and green Pot Noodle stand combination (27.5%) also produced an overall higher percent of recall. The lowest recall was produced when the red Heinz stand and turquoise Pot Noodle stand combination (15%), and green Heinz stand and the turquoise Pot Noodle stand combination appeared (0%).

Figure 45b: Relationship between POP-displays & both of the displays noticed



Both of the POP-displays were more frequently recalled when they respectively appeared in green and red (12.5 %), followed by turquoise and green (11.3%), and then red and green (10%). The lowest recall rate occurred when the stands were presented in the combinations of turquoise and red (5%), and in red and turquoise (0%).

Figure 46: Overall percentages of Brand Recall

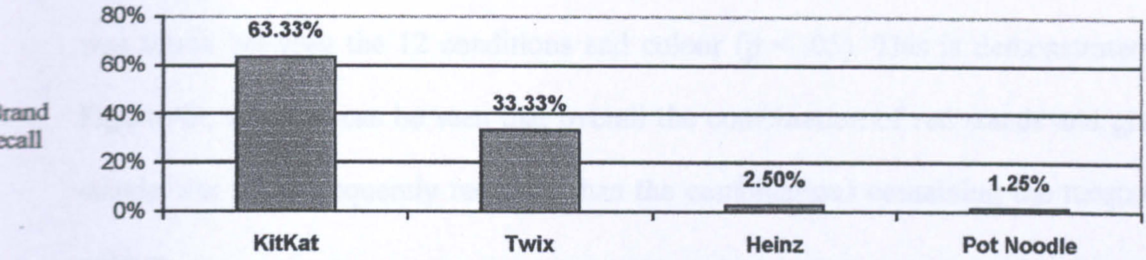
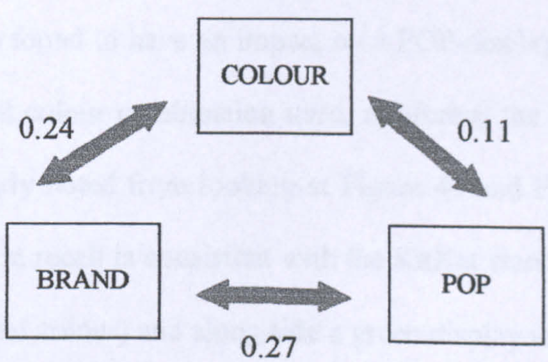


Figure 46 shows the percentage level of brand recall in the 12 conditions. It can be seen here that the brand with the highest recall value is KitKat (63.33%), followed by Twix (33.33%), Heinz (2.5%), and Pot Noodle (1.25%).

Sex differences were also tested for throughout the different conditions, but no significant differences were found.

To test if there was a correlation between the three factors, a Spearman's Rho test was also carried out. A significant positive correlation was found between colour and brand, (rho = .243, N = 480, p = .000, two-tailed), colour and POP, (rho = .108, N = 480, p = .018, two-tailed), and for brand and POP (rho = .274, N = 480, p = .000, two-tailed).

Figure 47: Overall relationship between the variables measured



6.3 Discussion

The results show that hypothesis 52 can be accepted, since a significant relationship was found between the 12 conditions and colour ($p < .05$). This is demonstrated in Figure 43, where it can be seen that overall the combination of red stands and green stands was more frequently recalled, than the combinations containing the turquoise colour.

The relationship between the 12 conditions and brand ($p < .05$), and the conditions and the number of times the POP-displayed noticed ($p < .05$) was also significant. This also points towards that colour has a significant impact in capturing the consumers' attention.

Also hypothesis 53 can be accepted, KitKat was the brand that was noticed the most. The comparison of the brand recall in Figure 46, confirms that branding which generates a higher level of involvement, will in turn also have a higher attentional value than a low involvement brand. Figure 46 shows that 63 % out of the 240 participants managed to recall seeing a KitKat POP-stand. This was followed by the Twix brand, which was noticed by 33%. This is in line with previous findings, which has suggested that consumers are more likely to engage in elaborative processing when their involvement is relatively high (Petty & Cacioppo, 1986).

Even though brand was found to have an impact on a POP-displays attentional value, it appears that the actual colour combination used, reinforces the likelihood of brand recall. This can be clearly noted from looking at Figure 43 and Figure 44a, where it shows that the increase in recall is consistent with the KitKat stand being presented in the colour red (its original colour) and along side a green display unit.

The low recall level of both the brands of the red KitKat and the green Twix display in Figure 44b (and similarly for the displays recalled in Figure 44c) is also confirms that colour has more of an overall impact than the brand. The drop in recall of both the brands simply demonstrates that the red KitKat display appears to be more of a prominent focal target, and therefore in turn the participants only recalled the Kit Kat brand. Figure 44c is also highlights that POP-stands are novel stimuli by their very nature. Apart from when the KitKat stand appeared in red and the Twix stand in green, the remaining combinations had an overall similar recall rate. Furthermore, it also demonstrates the importance of creating a POP-display which is not only presenting a recognisable brand, but it also that it is important to present the display in a colour which is already associated with the brand in question.

That POP-displays generates a similar level of recall overall, can also be seen from Figure 45b, where the percentage of recall is similar for all of the stands. With one exception of when the Heinz POP-display appeared in red and the Pot noodle stand appeared in turquoise. Why that did not generate any level of recall is not exactly clear. However since the reverse combination only generated a 5% recall level, it is not impossible that the colour combination is less eye-catching and with no high level involvement brand on the stands there was simply nothing there to captivate the participants' attention.

Figure 44a where 37.5% of the participants noticed both the colours of the POP-display also demonstrates that the colours immediately next to the focal point are more likely to be recalled. This can be noted since the red KitKat display appeared to be the focal point when the green Twix display was presented along side it. The explanation as to why the green colour was also recalled to a greater extent, may lie in previous research findings that has suggested that colour has a high level of perceptibility in the parafoveal regions of the visual field, where form tends to be indistinct (Carter, 1982).

When analysing Figure 45a and 45b it can be noted that the green displays and red displays generated a higher amount of recall, which again confirms that the primary colours used have a higher attentional value than does the turquoise colour. However, it is worth noticing when looking at Figure 43, Figure 44b, c, and Figure 45a and b, that the highest amount of recall appears to be linked to the combinations where the green POP-display was presented on to the left of the red display. This may indicate that the green colour may have a stronger impact on attentional abilities, however in order to confirm that this is the case, further research would have to be conducted.

Bearing in mind that neither of the brands Heinz or Pot Noodle were classified as high recognition brands, it was not particularly surprising that no significance was found between the condition and brand for the Heinz and Pot Noodle displays.

Additionally, significant correlations were found between colour and brand ($p < .05$), colour and POP ($p < .05$), and brand and POP ($p < .05$). This demonstrates that there is an interactive relationship between the three variables, and that the attentional value of the brand and the POP-stand is affected by colour, and that the POP- stand is more easily detected when it promotes a specific brand. Even though the correlations were not very strong, 0.24 for the relationship between colour and brand, 0.11 for colour and POP-displays and 0.27 for brand and POP-displays, it is worth noting that the relationships were highly significant. This points towards that even if colour does not have a strong relationship with the other two factors, it is clear that colour will be one of the contributing factors that can direct consumers' focal attention to a particular POP-stand.

6.4 Summary & conclusion

Although this piece of research is demonstrating that red and green are more influential than turquoise in captivating consumers' attention, it has to be remembered that there are millions of possible colour combinations that can be explored. Until further research has been undertaken, this study can only be used to highlight the fact that colour combinations are an important means of gaining consumers' attention in cluttered consumer settings, such as the FCMG environment. It does however provide us with a good starting point for understanding the interaction that customers have with the point of sale.

Chapter 7

Qualitative analysis of Study 5

The participants' recall of the stimuli they had seen for three seconds in experiment five also generated a large amount of qualitative data. Visual scenes typically contain more objects than can ever be remembered in a single glance. It has repeatedly been established that some kind of sequential selection of objects for detailed processing is essential if humans are to cope with the wealth of information. By conducting a qualitative analysis of the finer details of the participants' recall, some insight into what they focus upon can be outlined.

7.1 Method

It was decided here to analyse the qualitative data by using a thematic analysis. Due to the large amount of data gathered it was decided to only analyse the pictorial stimuli used that contained the KitKat and Twix POP-stands. Meaning that six out of the twelve pictures used in the study were analysed qualitatively.

Each part of the analysis was driven by pre-existing theories, reflecting the theoretical context of the research. Each one of the recall sheets that was produced from the 12 different pictorial stimuli was initially analysed in order to identify if there were any distinct attributions. The attributions were then extracted onto separate lists for each one of the pictorial stimuli used and sorted according to the themes of the analysis. The themes were then examined within one thematic category at a time, so that the general orientation could be identified.

Once this had been done the attributions were then compared across the six stimuli used and by doing so general themes and conclusions were drawn as can be seen in the analysis section.

7.2 Theoretical dimensions

Since the research focus was upon the impact of 'basic colours' (red and green) in comparison to 'non-basic colours' on consumers' focal attention, the primary interest here was to establish whether or not those colours also generated different kinds and amounts of information. It was decided to focus upon four main theories and consequently four theoretical dimensions were established for this purpose.

The first theoretical dimension was based upon the quantitative analysis previously produced. It is already known from the quantitative study that the red and the green stands were more frequently recalled in this study, which clearly supports the idea that attention can be directed by the context or by vivid stimuli themselves (Fiske & Taylor, 1991). Therefore it was theorised here that the participants' recall would have focused overall upon information related to the POP-displays.

Due to that the participants' attention would have been drawn to the red and the green coloured stands, it was also expected that they would not have had time to gather any detailed information about the features surrounding the displays. Consequently it was expected that the participants who had seen one of the pictorial stimulus containing one turquoise stand, along side a green or a red stand would describe the picture as a whole in more detail. This formed the basis for the second theoretical dimension.

A third theoretical dimension concerned the question of whether the 'basic colours' would have produced more favourable attributions overall than the turquoise colour. It was theorised here that if a participant had more clearly focused upon the red and the green stands presented because they automatically attracted their attention, they may also think of them in a more positive manner due to that they will be more clearly recalled. However colour research conducted early on has suggested that there is a general preference for 'short-wavelength' colours such as blue and green, over 'long-wavelength' colours such as red and orange (Guilford & Smith, 1959). If findings such as these were accurate then how can the successes of brands such as Coca-Cola and Marlboro be explained? Why are brands such as Pepsi and Camel that are predominantly blue not outselling the two previously mentioned? It should be remembered as stated earlier, that colour perception tends to be contextually driven and that it is also directly linked to how individuals have been socialised. It was expected here that the two more familiar colours of red and green would produce a more favourable attitude towards the POP-stands seen than the turquoise colour.

Finally the fourth theoretical dimension was concerned with apparent sex differences. Is there a difference in how women and men describe the elements they seen differently? In a study conducted by Rich (1977) where women and men of various ages and backgrounds were asked to name the colours displayed on 25 different cards, it showed that in general women use more elaborate words to name different colours than men do. This was also confirmed by Swaringen, Layman and Wilson (1978) who were at the time investigating colour related hobbies (e.g. painting) and by Simpson and Tarrant (1991) who found that women tend to use more elaborate colour names. Other colour-naming tasks have also demonstrated that women tend to be more accurate than men in both matching and describing elaborate colour terms (Greene & Gynther, 1995; Nowaczyk, 1982).

7.3 The analysis

The initial analysis clearly showed that similar comments were made for the pictures containing the same coloured POP-stands, irrespective of which brand appeared in what colour. For example when the KitKat and Twix stands were presented in a green and a red colour respectively the participants answers were similar to those of the participants that had seen a red KitKat stand along side a green Twix stand. Therefore the analysis concentrated upon the colour combinations rather than the minor individual differences found for the stands.

7.3.1 Can certain colours block out other elements?

The attributions for the first theoretical dimension showed that the participants that had seen the pictorial stimulus consisting of a red and a green stand mainly focused upon the POP-stands. It is indicating that the red and the green colours helps keeping the participants' attention focused upon those particular elements and in turn 'blocking out' the other elements in the scene. Typical comments included the following:

> " ..in prominence a "KitKat" promotional stand. I saw a red colour, which was the "KitKat" promotional stand."
>
> "KitKat stand - stood out, bright, caught my eye."
>
> " stalls of chocolate that were green and red, namely Twix and KitKat."
>
> "The first thing that captured my attention was the KitKat and Twix display at the top of the aisle."
>
> "There was a KitKat and Twix stand at the front of the photo."

On the contrary to the above it was evident from the attributions made in regards to the green and turquoise POP-stands that the participants focused upon a wider range of elements visible in the pictures:

> "Saw a few people shopping, lots of vegetables and fruit."
>
> "A child playing with a trolley."

"People in a supermarket near the veg area, a couple of women were holding basket to carry their food around."

"The entrance of a shop because it had fruit and veg, flowers, balloons, people with shopping baskets (mostly facing one direction which looked like going 'into' the shop, I think there were some stands).

"I noticed a yellow sign advertising something."

"It was a supermarket situation, with a group or two people gathered in the middle with trolleys."

"The balloons in the left hand corner captured my attention."

"It was a food hall with 2 women shopping."

Similarly to the pictorial stimulus containing the green and the turquoise POP-stands, it was also evident from the pictures containing the red and turquoise stands that the participants did not primarily focus upon the stands.

"It was a supermarket with a couple of people shopping. At the back was the fruit and vegetable section. At the top a sign said "It's easy"."

"People shopping in a big supermarket. Especially women with their children."

"A scene from a supermarket, with people pushing shopping trolleys, a stand containing fruit and vegetables, a woman in jeans, shelves with groceries on them."

"A supermarket, groceries section to be exact. Fruits stacked beautifully to catch buyers attention. People looking around, thinking whether they should buy the stuff or not."

"Specifically I noticed the angle at which the photograph was taken. It concentrated on a small bunch of customers gathered together."

"I noticed a yellow sign advertising something."

7.3.2 Are green and red POP-stands more prominent than turquoise stands?

In support of the quantitative analysis, there were some clear examples of how the red and the green colours drew the participants' attention toward the stand when presented alongside a turquoise coloured stand. The terminology used clearly demonstrates that the basic colours were much more prominent than the non-basic colour. When the KitKat stand was presented in green some of the following comments were representative for the participants' responses:

> "Point of purchases of KitKat and some other chocolate in a good size food store."
>
> "I noticed the green display at the front because my eyes (immediately) were set upon it."
>
> "Saw a mostly green stand with a dash of contrasting colours by what appears to be sweeties."

When the KitKat stand was presented in its original red colour, the qualitative analysis, just like the quantitative, also showed that the combination of the colour and the brand was particularly strong. Furthermore the attributions made also show that the emphasis was upon the red stand as opposed to the turquoise stand:

> "The KitKat candy bars were prominent, mainly because of the colours and the closeness."
>
> "The large amount of KitKat captured my attention."
>
> "KitKats. I like chocolate and this is one of my favourite products."
>
> "I saw the red display of KitKats at the front of the room."

"The KitKat stand was the closest in view and the colour sort of distracted me."

It was evident from the attributions made that when the Twix stand was presented in a red colour it was noticed more than the turquoise stand:

"The mixture of sweets (Twix chocs) with fresh fruit."

"The red POP stand because it was at the front of the image."

" I only saw Twix chocolates in a supermarket."

"Twix was a name that stood out."

" Noticed a green display at the front."

Similarly can also been noted when the Twix stand was presented in a green colour:

"The promotional stand of Twix chocolates captured my attention."

"It was an old fashioned supermarket with a chocolate stand of Twix."

"Noticed a green Twix stand."

"There was something green, a stand with sweets I think."

7.3.3 Do basic colours generate more favourable attributions?

The analysis of whether the stimuli presented would have generated more positive or negative attributions depending upon what colours the displays were, was not found to be according to prediction.

When the green and the red POP-displays were presented along side one another, there were a higher number of negative attributions made about the pictorial stimulus. The positive attributes that were made accounted for approximately 40 percent, and included the following:

"A supermarket with a fresh vegetable counter at the back."

"It was very well lit."

"Room light, it was a light and nice place."

The negative attributes accounted for just over sixty percent and examples are as follows:

" Supermarket, backs of people, horrible fluro lights, loads of chocolate!"

"An average day in an average typical supermarket."

"How boring and mundane it looks."

"It seemed boring."

"That it is a food shop - too crowded though."

"Dull and a bit non movement."

"Terrible colours and light - mostly reds and green.

Forty-two percent of the participants made either positive or negative attributions when shown a pictorial stimulus containing the green and the turquoise POP-displays. However of those, thirty percent were of a positive nature:

"Saw a few people shopping, lots of vegetables and fruit. Clean environment."

"The lighting was bright. Very clean and organised layout."

"Beautiful looking people with their trolleys."

"It was quite a busy/full image. Lots of things going on."

The most commonly occurring comments that indicated that the participants were not in favour of the picture presented to them were:

"It may be the photo but it seemed not very brightly lit."

"Old fashioned supermarket."

The most neutral condition was when the participants were presented with one red and one turquoise display. Out of the 80 participants only two made a positive attribution and two made negative attributions:

"I saw a supermarket, bright, well lit, atmosphere."

"Fruits stacked beautifully to catch buyers attention."

"It looked old fashioned and unappealing."

"Many kind of different products, a little bit too crowded picture."

7.3.4 Apparent sex differences

Table 18: Comparison between men and women and colours used to describe what they have seen.

Female participants	*Male participants*
Mustard	Yellow/green or (yellow/brown)
Denim	Blue
Turquoise	Green/blue
Light blue	Sky blue
Metallic	Silver
Maroon	Brown
Pink	(No equivalent)
Pastels	(No equivalent)
(No equivalent)	Purple
(No equivalent)	Indigo

The above table shows some of the more unusual colours used to explain what they have seen and the equivalent colour used by the opposite sex. The table does appear to support previous theories suggesting that women in general use more elaborate words to name different colours than men do (Rich, 1977; Tarrant, 1991).

7.3.5 Additional attributes

Other apparent attributes were also found that did not fit in to the four dimensions created. It was found that when the pictorial stimuli contained one stand in a basic colour and another in a non-basic colour, the participants were much more likely to try to state which supermarket the picture had been taken in, and whether or not it was an English or a foreign supermarket:

> "There was a sign saying Tesco."
>
> "I think the store is Morrisons or K-Mart."
>
> "I saw a big supermarket, it looks like a Sainsbury's to me."
>
> "It looks like an English supermarket."
>
> "Food shopping mall, a foreign one."

The participants were also more likely to state that they had seen other brand names and products that the picture did not contain such as Ariel, Mars Bars, milk, cans, toys, and Heinz baked beans. Furthermore it was found that when the POP-displays that were presented to the left (and also closer to the middle) were either green or red, slightly less information about the overall surroundings were recalled. However the participants still recalled more information than if both the displays had been presented in basic colours.

7.4 Discussion

It is apparent from this analysis that the attributions made about the pictorial stimuli containing basic coloured POP-displays differ from those containing one display of a non-basic colour. The analysis is partially supporting the findings from the quantitative analysis and additionally also presents a more in-depth understanding of what the participants focused upon. For the pictures with the green and the red stands, it is clear that the participants' attention was captured by the stands themselves since they recalled very few additional pieces of information from what they had seen. However on the other hand when the pictures contained a turquoise stand the information recalled included more information overall of what the pictorial stimulus looked like. It clearly shows that basic colours (provided they are captivating enough) stand a better chance of capturing the consumers' attention and in turn assures that they will not be distracted by competitive stimuli such as other competitors' brands.

The second section of the analysis which was focusing upon whether the red and the green stands were more prominent when appearing alongside a turquoise stand, showed that this indeed was the case. The participants reported having seen the turquoise stand much less frequently. Furthermore the phrases used by the participants included attributes that clearly showed that the red and the green stands had been the focal point. Again, this is in support of the previously conducted quantitative analysis.

The third theoretical dimension was a little bit more complex in that the results were not according to expectations and neither was it clear cut whether the participants really made more positive or negative attributions dependant upon the pictorial stimulus presented. There were a higher number of negative attributions made for the condition containing the red and the green stands. Perhaps the participants were negatively influenced by the fact that they did not have time to have a good look at the whole picture (due to focusing upon the two POP-displays). Clearly there is not a clear correlation between what captures focal attention and likeability.

The most positive attributions made were for the condition where the participants had seen the green and the turquoise displays. The participants then appeared to think that the environment was 'clean' and 'organised' with 'lots of things going on'.

On the other hand hardly any positive or negative attributions were made when the red and the turquoise displays appeared alongside each other. Only four out of the 80 participants indicated that they thought of the picture in a favourable or non-favourable way.

These results are somewhat more difficult to account for without conducting further research. It is however clear that it does not support previous studies that have suggested that colours such as blue and green are preferred to colours such as red (Guilford & Smith, 1959). If this was accurate, a higher number of negative attributions would be expected when the turquoise stand appeared along side the red stand, and more evenly distributed positive and negative attribution in the conditions where the red and the green stands occurred alongside one another. Exactly why the green and the turquoise stands produced more favourable attributions than the red and the turquoise stands is difficult to explain. There must however be an explanation as it appears to be unlikely that the 80 participants that were shown a picture containing a green stand and a turquoise stand would have recalled such similar elements and mainly given them favourable attributes. This can also obviously be said for the 80 participants that saw a stimulus containing a red stand and a turquoise stand, why would only four of them have given them positive and negative attributes? Again it appears unlikely that a total of 76 participants remained neutral in their responses.

When comparing the sort of words the male and the female participants in this study used to describe the elements they had seen, it was evident that there are some differences. The female participants used more elaborate terms than the male participants did to describe the colours they had seen. Examples included how the female participants described the lady shopping in the middle of the picture as being dressed in denim blue, whilst the men simply said she was dressed in blue. Several female participants also described the floor as being metallic coloured whilst the men suggested it was silver or in other cases grey. Other comparisons can also be seen from Table 18 where it is clear that out of the eight examples used for the female participants, all of the colour terms used were of a 'fancier' kind. This is clearly supporting previous colour studies conducted, where it has repeatedly been suggested that women are both more accurate when it comes to describing and using more elaborate colour terms (e.g. Greene & Gynther, 1995; Tarrant, 1991).

For the male participants only three out of the eight colour terms used were more elaborate. The majority of these words were used to describe elements from the stimulus that had one basic, and one non-basic coloured POP-display. When the stimulus contained two basic coloured POP-displays very few other colours were actually recalled other than the red and the green colour.

Some additional attributes were also included in the analysis due to their prominence. It frequently occurred that the participants who saw one red or green display alongside a turquoise display mentioned what supermarket they thought the picture had been taken in. None of the participants who saw the stimuli with a green stand and a red stand mentioned this. When the participants reported that they saw particular elements and brands that were not a part of the picture, it may be a reflection that due to not having registered a lot of familiar objects they simply wrote down anything that came to mind. Perhaps this was done due to a belief that they should have noticed something in particular. It is also possible that they noticed elements that 'triggered' associations, which they subsequently wrote down on the recall sheet.

On a final note it should also be mentioned why less information was recalled when the red or the green POP-display, where presented to the left of the turquoise display produced more information about the surroundings than when they were presented in the reverse positions. This may be linked to the idea that humans have a tendency to focus their visual searches towards the centre of the display (Parasurman, 1986). If the participants simply started their searches in the middle and consequently then saw the basic coloured stand first it may have brought the search to a halt. However they would still be able to provide some information as to what they had seen in the middle. This would explain why they could still produce more detail overall about what they had seen in comparison to the participants who had seen the pictorial stimulus containing two basic coloured stands which would automatically have 'grabbed' their attention.

7.5 Summary & conclusion

Overall this qualitative analysis supports the quantitative analysis in study 5. The participants were much more focused upon the two POP-displays when they respectively appeared in a red and a green colour. Their recall was clearly reflected by this as the comments they wrote mainly concerned the POP-displays. However when one of the stands was changed into a turquoise colour, the overall material recalled included a much wider range of elements that they had seen (or thought they had seen).

Chapter 8

Study 6: Are certain colour combinations more attractive?

This study seeks to explore if certain colour combinations may be rated as being more attractive than others. In particular three theories were tested here; 1) colour combinations that have the same value are considered to be more attractive than combinations of different values. 2) Colour combinations that have large saturation differences will be rated as being more attractive. 3) Colour pairs that consist of one basic and one non-basic colour will be considered to be more attractive, than pairs that consists of two basic or two non-basic colours. The third theory was based upon the qualitative analysis conducted for Study 5, where it was found that the participants were less likely to make negative attributions for the conditions where one basic colour had been presented alongside a non-basic one. Therefore it was hypothesised that the combination of a basic and a non-basic colour may produce a more favourable evaluation.

Bearing in mind that research conducted on colour preferences is a somewhat controversial area, this study was conducted on an experimental basis to test if it is possible to substantiate some of the previous research findings.

8.1 Method

8.1.1 Participants

One-hundred and fifty six participants participated in this study. Eighty-nine of the participants were male (mean age 24.7) and 67 were female (mean age 26.9). All the participants were students from the London Metropolitan University. Of the 156 participants that took part, 52 participants answered the response sheets that tested preferences for different value combinations, 53 answered the response sheets that tested preferences for combinations with different saturation, and the remaining 51 participants were tested for preferences dependant upon basic and non-basic colour combinations.

8.1.2 Materials

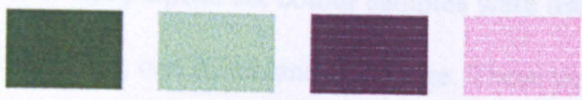
Three sets of different response sheets were created that consisted of twelve A4 sized papers. Each sheet consisted of one colour pair only, so that the participants would not be able to directly compare one colour pair with another. Next to each colour pair was a 10 item Likert scale, on which the participants were asked to circle the number that best represented how attractive they thought the colour combination was. Zero on the scale indicated that the colour combination was not attractive at all and ten that they found the combination to be very attractive.

There were two underlying reasons for using colour samples in this study. It has been pointed out by several colour researchers (e.g. Taft, 1996) that the most common way to communicate with colours is by using samples. For example designers tend to use colour samples when advising their clients on what colours are best suited for a particular design. The second reason being that colour samples provide a comparatively easy and inexpensive way of testing whether or not people have a preference for one combination over another.

The first set of response sheets were testing if colour pairs with the same value were rated to be more attractive than colour pairs with different values. For this purpose two green and two lilac colour samples were used.

The two green colour samples both had a hue value of 85 and the saturation was 255. The value for the two green samples was altered so that one had a value of 38 and the other 221. For the two lilac colour samples the hue was 213 and the saturation was 255. Also the value for the lilac colour samples was altered so that one was 38 and the other 221 (see colour samples in Figure 48). Each one of the samples was then paired off with another colour sample so that in the end there were a total of 12 colour combinations and all the samples appeared alongside all possible combinations. When the combinations were the same, the order of presentation was altered.

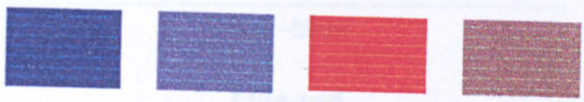
Figure 48: Sample of colours used to test value differences



Please note that the colours are not identical to those used in the study.

The second set of response sheets were testing whether colour pairs with large saturation differences will be rated as being more attractive. Similarly to the response sheets testing for value differences, four colour samples were also used here, two blue and two red ones. Both the blue samples had a hue of 170, and a value of 128, however the saturation for the samples were different, for the first sample it was 255 and for the second 55. For the red samples the hue was 0, the value was 128, and for the first sample the saturation was 255 and for the second 55 (see Figure 49). The colour samples were paired off so that they appeared alongside all of the other colour samples and all the colour pairs were also presented in the reverse order. For example if the green colour with a saturation value of 255 was presented to the left of the lilac sample with a saturation value of 55, then in another colour pairing it would be presented to the right of the lilac sample. In total there were 12 colour pairs presented to the participants.

Figure 49: Sample of colours used to test saturation differences



Please note that the colours are not identical to those used in the study.

In the third and final condition it was tested to see if colour pairs consisting of one basic and one non-basic colour would be preferred to those that consisted of just basic or non-basic colours. For this purpose six colour samples were used: one red, one blue, one green, one turquoise, one peach and one beige. These were the same colours as those used in Study three where participants were subjected to visual colour searches. Even though six colours were used here, it was decided to limit the combinations to only twelve. Since this study was a preliminary study into possible evaluation differences, it was simply meant to indicate whether there might be any differences in preference ratings or not. Six combinations were used and all of them also appeared in the reverse order. The twelve colour combinations used here can be seen in Table 19. Consequently twelve colour pairs were deemed sufficient to do so.

Table 19: Colour combinations used in the third testing condition

red -blue
blue-red
green-beige
beige-green
peach-red
red-peach
turquoise-green
green-turquoise
beige-red
red-beige
green-peach
peach-green

8.1.3 Design

The independent variables in this study were the colour pairs presented to the participants, and the dependent variable was the attractiveness rating of the combinations.

The following hypotheses were tested:

H54: Colour pairs with the same value will be rated as more attractive than colour pairs with different values.

H55: Colour pairs with large saturation differences will be rated as being more attractive.

H56: Colour pairs that consist of a mixture of a basic and a non-basic colour will be rated as being more attractive.

8.1.4 Procedure

All participants were handed twelve response sheets and were asked to look at each colour combination one at the time and rate on the Likert scale how attractive they thought the combinations were. The participants were also informed that they could not compare the combinations they evaluated. No time restriction was imposed for how long they could look at each one of the combinations. The presentation order of the colour combinations were alternated for every fifth participant, this was to control possible order effects from occurring.

8.2 Results

To investigate the dimensionality of the colour combinations, an exploratory Factor Analysis was conducted for all three of the conditions. Furthermore paired sample t-tests were also carried out to investigate whether or not any statistically significant results occurred between the colour samples tested.

8.2.1 Value differences

Principal components analysis revealed that five factors accounting for 84.19% of the variance, had eigenvalues greater than 1.00. Varimax rotation was considered appropriate in light of that Kline (1994) has suggested that it is the preferred method to initially use to test if a simple structure solution is provided. The rotation converged in nine iterations and five factors emerged. The five factors can be seen in Table 20.

Cronbachs alpha coefficient was used to measure the internal consistency of the five emergent factors to make sure that they produced a reliable scale. All of the factors had an alpha value above .8260, demonstrating that there is a high internal consistency.

Table 20: Factors that emerged for value differences

Colour combination *(the value appears in brackets)*	**Factor 1**	**Factor 2**	**Factor 3**	**Factor 4**	**Factor 5**
Green (38) - Lilac (38)	.848				
Lilac (38) - Green (38)	.714				
Green (221) - Lilac (38)	.702				
Lilac (38) - Green (221)	.620				
Lilac (38) - Lilac (221)		.921			
Lilac (221) - Lilac (38)		.880			
Green (221) - Lilac (221)			.805		
Lilac (221) - Green (221)			.789		
Green (38) - Lilac (221)				.822	
Lilac (221) - Green (38)				.692	
Green (38) - Green (221)					.810
Green (221) - Green (38)					.698

Table 20 shows that the colour samples that consisted of combinations containing the same value were rated the same, regardless of which order they had been presented in.

A series of paired sample t-tests were also conducted to find out if there were any significant differences in preference ratings between the factors found. The significant results that were found can be seen in Table 21.

Table 21: Significant differences in preference ratings for different values

Colour combination *(the value appears in brackets beside the colour and the mean for the sample appears underneath)*	**t**	**df**	**p-value**
1. **Green (38) /Lilac (38) - Green (221) /Lilac (38)** 9.18 6.2	4.030	44	.000
2. **Green (38) /Lilac (38) - Lilac (38) /Lilac (221)** 9.18 12.4	-3.977	44	.000
3. **Green (221) /Lilac (38) - Lilac (38) /Lilac (221)** 6.2 12.4	-6.650	44	.000
4. **Green (221) /Lilac (38) - Green (38) / Lilac (221)** 6.2 7.53	-2.087	44	.043
5. **Green (221) /Lilac (38) - Green (38) / Green (221)** 7.53 11.89	-7.459	44	.000
6. **Lilac (38) /Lilac (221) - Green (221) /Lilac (221)** 12.4 6.75	4.808	44	.000
7. **Lilac (38) /Lilac (221) - Green (38) / Lilac (221)** 12.4 7.53	5.131	44	.000
8. **Green (221) /Lilac (221) - Green (38) / Green (221)** 6.75 11.89	-6.051	44	.000
9. **Green (38) / Lilac (221) - Green (38) / Green (221)** 7.53 11.89	-6.159	44	.000

Table 21 shows that nine statistically significant differences occurred out of fifteen possible combinations. Only the comparisons of the colour pairs in condition 1 are in accordance with the hypothesis, none of the other colour pairings shows that combinations that have the same value are considered to be more attractive. Subsequently hypothesis 54 can not be accepted.

With the exception of combination 1 and 4 it can also be seen that the combinations are only rated to be significantly different when one colour pair that consists of one colour is compared against a colour pair that consists of two different colours. The highest mean ratings occurred when the two colours were paired off with the same colour, for the green colour pair it was 11.89 and for the lilac colour pair it was 12.4.

8.2.2 Saturation differences

Principal components analysis revealed that factors accounting for 83.847% of the variance, had eigenvalues greater than 1.00. As before Varimax rotation was considered appropriate since it is the preferred method to initially use to test if a simple structure solution is provided. The rotation converged in five iterations and three factors emerged. The colour combinations that were allocated to the three factors can be seen in Table 22.

Cronbachs alpha coefficient was used to measure the internal consistency of the five emergent factors to make sure that they produced a reliable scale. All of the factors had an alpha value above .8271, demonstrating that there is a high internal consistency.

Table 22: Factors that emerged for saturation differences

Colour combination *(the saturation value appears in brackets)*	Factor 1	Factor 2	Factor 3
Blue (255) - Red (255)	.910		
Red (255) - Blue (55)	.904		
Blue (55) - Red (55)	.890		
Blue (55) - Red (255)	.888		
Blue (255) - Red (55)	.870		
Red (55) - Blue (255)	.868		
Red (55) - Blue (55)	.856		
Red (255) - Blue (255)	.775		
Blue (255) - Blue (55)		.903	
Blue (55) - Blue (255)		.899	
Red (55) - Red (255)			.854
Red (255) Red (55)			.807

The above table shows that the participants in this study have rated eight out of the twelve variables in a similar manner, which is why they all emerge in Factor 1. Factors 2 and 3 shows that there is little differentiation between the colour pairs when they are of the same colour.

Table 23: Significant differences in preference ratings for different saturation values

Colour combination *(the saturation value appears in brackets and the mean below)*	t	df	p-value
1. **Red (255) /Blue (255) -Red (255) / Red (55)** 11.64 9.5	2.136	52	.037
2. **Red (255) /Blue (255) - Blue (55) / Red (255)** 11.64 10.8	2.782	52	.008
3. **Red (255) /Blue (255) - Blue (55) / Red (55)** 11.64 10.64	2.432	52	.018

Table 23 shows that only three comparisons of the different colour pairs (out of fifteen possible) were statistically significant. The three significant combinations are also in stark contrast to what was predicted, and therefore hypothesis 55 has to be rejected. No apparent pattern can be seen from the results shown in Table 23.

8.2.3 Basic and non-basic colours

Principal components analysis revealed that there were five factors accounting for 79.856% of the variance. All of the five factors had eigen values greater than 1.00. Again Varimax rotation was considered appropriate in light of that Kline (1994) has suggested that it is the preferred method to initially use to test if a simple structure solution is provided. The rotation converged in seven iterations and five factors emerged, as can be seen in Table 24.

Cronbachs alpha coefficient was again used to measure the internal consistency of the five emergent factors to make sure that they produced a reliable scale. All of the factors had an alpha value above .7142, indicating that the internal consistency is high.

Table 24: Factors that emerged for basic and non-basic colour differences

Colour combination	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
Peach - Red	.917				
Red - Peach	.767				
Turquoise - Green		.934			
Green - Turquoise		.748			
Beige - Red			.806		
Red - Beige			.626		
Green - Peach					
Peach Green					
Red - Blue				.924	
Blue- Red				.773	
Green -Beige					.799
Beige -Green					.659

Table 24 demonstrates that for the basic and non-basic colour combinations tested the preference ratings are also similar for the colour pairs consisting of the same colours regardless of which order the colours were presented in.

Table 25: Significant differences in preference ratings for basic and non-basic colours

Colour combinations *(the mean appears below each one of the samples)*	t	df	p-value
1. **Red/ Blue - Green/Beige** 13.39 7.5	6.182	50	.000
2. **Red/Blue - Peach/Beige** 13.39 7.9	5.267	50	.000
3. **Red/Blue - Turquoise/Green** 13.39 8.78	4.686	50	.000
4. **Red/Blue - Beige/Red** 13.39 9.41	4.410	50	.000
5. **Red/Blue - Green/Peach** 13.39 6.69	7.624	50	.000
6. **Green/Beige - Beige/Red** 7.49 9.41	-2.533	50	.014
7. **Turquoise/Green - Green/Peach** 8.65 6.7	2.373	51	.021
8. **Beige/Red - Green/Peach** 9.41 6.69	4.157	50	.000

From Table 25 it can be seen that the colour pair rated as being the most attractive was the red and the blue combination (13.39). Since it had been predicted that combinations consisting of one basic (i.e. one red, blue or green) colour and one non-basic (i.e. turquoise, peach or beige) colour would be more appealing, hypothesis 56 has to be rejected also.

8.3 Discussion

The results show that all three of the hypotheses tested in this study have to be rejected. No support can be offered for previous findings suggesting that colour combinations that have the same value are more favourably evaluated (Polzella & Montgomery, 1993) or that differences in saturation between colour combinations tend to be more aesthetically more pleasing (Helson & Lanford, 1970). Perhaps it is no great surprise that none of the hypotheses were accepted in this study, bearing in mind that a number of researchers have stated the inadequacy of using colour samples when testing for colour pair preferences (e.g. Whitfield & Wiltshire, 1991). Previous suggestions that colour preferences are contextually driven (e.g. Davidoff, 1991) may also explain why the positive attributions that were found for combinations consisting of one basic and one non-basic colour were not apparent in this study.

The significant results that occurred when comparing one colour pair with another pair to the participants, clearly shows that some preference for one pair over another existed. Since no apparent pattern emerged from these significant results, no conclusions can be drawn from such differences.

It should also be remembered that a limited number of colours were tested in all three of the conditions. Had a higher number of different colours been used, the results may also have been different. Some of the significant results may be because the actual colours that appeared alongside one another happened to 'look good' together and may not be due to saturation or value differences.

The overall results generated from the factor analysis demonstrated that the presentation order of the colour pairs did not make a difference to the preference ratings. In particular, this can clearly be seen from the factors that emerged from the conditions that tested for value differences in basic and non-basic colours. The factor analysis conducted on saturation differences showed that the majority of the combinations were rated similarly, which also explains why there were so few comparisons of colour combinations that were found to be significant.

The idea that overall attractiveness is linked to aesthetic composition of colour combinations can not be supported, at least not in regards to previous research findings on value, saturation and basic and non-basic colours.

8.4 Summary & conclusion

None of the hypotheses tested here were accepted. The results clearly demonstrate that aesthetic evaluations of how colours can be combined should not be taken into consideration when designing new POP-displays. Valid as some of them may be in certain cultures during certain periods of time, the majority of the results will be individualistic and consequently no formal theory of colour preferences is unlikely to be valid.

Chapter 9

Study 7: Can haptic properties alternate product evaluation?

Recent studies have suggested that whilst a person is looking at an object and simultaneously exploring it with their hands, vision and touch both provide information for estimating the properties of the object (e.g. Ernst & Banks, 2002b). Even though the emphasis is still on the idea that vision frequently dominates the integrated visual-haptic percept, some situations have been identified where the perception is clearly influenced by haptics. This points towards the possibility that aesthetic evaluation may also be affected by product touch. Therefore this study was undertaken as a beginning of an initial contribution to understanding if haptic properties, and in particular different textures, may alternate overall aesthetic product evaluation.

9.1 Method

9.1.1 Participants

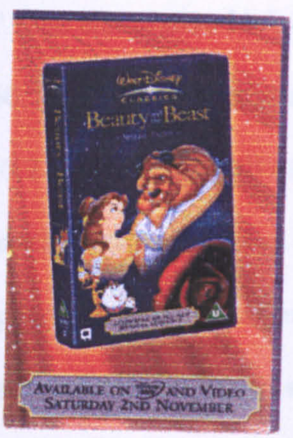
A total of 126 students from London Metropolitan University participated in the experiment. Of those, 22 students participated in condition 1 (11 women and 11 men), 18 in condition 2 (11 women and 7seven men), 24 in condition 3 (13 women and 11 men), 21 in condition 4 (10 women and 11 men), 21 in condition 5 (nine women and 12 men) and 20 in condition 6 (10 women and 10 men).

Just as in study 1 and 2 it was deemed particularly appropriate to use a student population since they tend to be consistent in their responses to intervals on a Likert scale (Sears, 1986). Another advantage of using a student population was that a larger proportion was of a younger age (mean age was 23.4), which would not be too dissimilar to the particular market of interest.

9.1.2 Materials

Coutts Retail Communications Ltd provided six genuine DVD and video boxes. The three video boxes were Walt Disney's cartoon; The Beauty and the Beast (see Picture 2) and the other DVD boxes were the special edition of the film ET (see Picture 3). Two different kinds of plastic material were then attached to the back of four of the boxes. One was a thick ribbed and slightly slippery plastic material which will throughout the report be referred to as 'A'. The second material was a matt plastic surface, which will here be referred to as 'B'. The end result being that for both types of boxes, there was one original unaltered box, one with material 'A' at the back, and the last one had material 'B' attached to the back.

Picture 2: Video box stimulus used



Picture 3: DVD stimulus used

A 10 item questionnaire in Likert scale format was constructed to measure the participants responses, as outlined in the *Questionnaire design* below, and all the participants used a pen to fill in the questionnaire.

9.1.3 Questionnaire design

A pool of questions was generated which tapped into the aesthetic evaluation of the product. A total of 26 questions were produced, which were then run through a Factor Analysis. Varimax rotation was used and three factors were found. The first factor consisted of six questions; I find this video box aesthetically pleasing; The cover is visually appealing; The presentation of the video box is fantastic; I am very attracted to this video cover; The design of the cover is very attractive; and, The colour schemes are appealing. This factor was labelled 'aesthetic appeal'. The second factor consisted of two questions; The design of this cover is ugly; and, The design of this cover is very unappealing, and this factor was named 'overall disfavour'. The third and last factor also consisted of two questions; It is an interesting design, and, I consider this video box being designed in an artistic manner, this factor was labelled 'artistic appeal'. The cumulative % for factor one was 45.97, factor two was 53.99 and factor three 60.72. These factors were then run through Cronbachs alpha, and an alpha value above 0.7 was found for all of the above.

Once the factors had been extracted the questions were mixed up so that they did not appear in any particular order and put on an A4 sheet. Each question appeared along side a five item Likert scale (see Appendix E), where 0 indicated that they did not agree at all and four that they agreed very much so.

9.1.4 Design

A within subjects design was applied to test the hypothesis that physical interaction with different textures would influence the overall aesthetic evaluation of the DVD and video boxes. The dependent variable being the visual evaluation of the stimuli, and the independent variable the alternating textures encountered upon aesthetic evaluation whilst holding the stimuli.

The following hypothesis were tested:

H57: Haptic interaction with different kinds of textures [on a video/DVD container] will affect overall aesthetic evaluation.

H58: The texture normally encountered on a video/DVD container will produce a more positive aesthetic response than the other two materials.

9.1.5 Procedure

All of the participants were asked to visually evaluate the front of either the ET DVD or the Beauty and the Beast Video box, by answering a 10-item questionnaire. After a three week interval the participants were again asked to fill in the same 10-item questionnaire (the order of the questions had been altered), whilst this time simultaneously holding the DVD / video that they were rating. To avoid order effect, half of the participants conducted the experiment in the reverse order, so that their initial evaluation of the DVD/video container were conducted whilst holding it.

9.2 Results

The three factors tested were divided into two categories, one positive and one negative, so that the participants that had a higher score on the aesthetic appeal, overall disfavour and artistic appeal factor were separated from those with a low score. Paired sample T-tests were then used to analyse the two categories of data separately.

TABLE 26 - MEAN SCORES FOR AESTHETIC APPEAL

	N	LIKEABILIY RATINGS	*N*	DISLIKEABILITY RATINGS
VIDEOS				
Control				
Visual	11	15.81	13	5.3*
Visual/Tactile		15.78		8.9*
Material A				
Visual	12	16.5	10	8.3
Visual/Tactile		16.43		9.5
Material B				
Visual	13	15.07*	7	9.14
Visual/Tactile		12.53*		9.14
DVD's				
Control				
Visual	13	16.84*	8	5.7*
Visual/Tactile		13.53*		9.3*
Material A				
Visual	14	15.5	6	6.83
Visual/Tactile		14.2		7.83
Material B				
Visual	15	15.06	6	7.0
Visual/Tactile		15.0		9.3

Please note the higher the rating, the more positively the participants rated the stimuli

*** T-test is significant at the 0.05 level (2-tailed).**

Table 26 shows the means for the aesthetic appeal factor. The table shows an overall pattern that the participants that rated both the DVDs and videos negatively during the visual evaluation rated the same boxes more positively during the haptic evaluation. The reverse can also be seen from the more favourable ratings, where the participants who rated the video and DVD boxes as being more aesthetic appealing during the visual evaluation rated them to be less appealing in the visual/tactile condition. There was only one set of results that remained identical and that was for the participants who rated the Video box with material A negatively, the mean value of 9.14 remained the same in both of the conditions.

TABLE 27 – MEAN SCORES OF DISFAVOURED EVALUATION

	N	LIKEABILIY RATINGS	N	DISLIKEABILIY RATINGS
VIDEOS				
Control				
Visual	12	.91	12	5.33*
Visual/Tactile		1.5		3.66*
Material A				
Visual	17	1.05*	5	4.8
Visual/Tactile		2.05*		3.4
Material B				
Visual	15	1.46	5	4.8*
Visual/Tactile		1.86		2.2*
DVD's				
Control				
Visual	15	.53 *	6	4.66
Visual/Tactile		1.73 *		4.00
Material A				
Visual	14	.57	6	4.83
Visual/Tactile		1.35		4.0
Material B				
Visual	17	.58 *	4	6.25
Visual/Tactile		1.47 *		4.25

Please note the higher the score, the more negatively the participants rated the stimuli.

* T-test is significant at the 0.05 level (2-tailed).

The above Table 27 shows that participants who rated the stimuli in a positive manner during the visual evaluation increased their dislike scores upon physical interaction with the stimuli. Whilst participants who rated the stimuli in a highly negative manner during visual evaluation, have rated the box less negatively during the haptic evaluation. This also supports the results that can be seen in Table 26.

TABLE 28 - ARTISTIC APPEAL MEAN SCORES

	N	LIKEABILIY RATINGS	*N*	DISLIKEABILIY RATINGS
VIDEOS				
Control				
Visual	13	5.0	11	1.27
Visual/Tactile		5.0		2.36
Material A				
Visual	12	6.08	10	1.9 *
Visual/Tactile		5.91		2.9 *
Material B				
Visual	12	5.16	8	2.12
Visual/Tactile		4.33		2.62
DVD's				
Control				
Visual	15	5.53 *	6	1.83 *
Visual/Tactile		4.53 *		3.83 *
Material A				
Visual	13	5.84	7	2.42
Visual/Tactile		5.3		3.14
Material B				
Visual	16	5.5	8	2.20
Visual/Tactile		5.43		3.20

Please note that the higher the score, the more artistic the participants rated the stimuli to be.

* T-test is significant at the 0.05 level (2-tailed).

Similarly to Table 26, Table 24 also shows an overall pattern that participants who did not rate the stimuli as being artistic during the visual evaluation, considerably increased the artistic rating upon the visual/haptic evaluation. However when rated more positively during the visual evaluation, the rating decreased whilst physically interacting with the stimuli. The only result that remained the same was the result for the control condition of the video container, where the mean of 5.0 was the same for both conditions.

The above results do not support hypothesis 57, since there is nothing that indicates that any of the textures used in this study significantly produces a different overall aesthetic evaluation to the others. Neither do the results support hypothesis 58 since the results for the control conditions were similar to the other two conditions using material A and B.

9.3 Discussion

Neither of the two hypotheses tested in this study has been accepted. None of the different textures that were attached to the back of the DVD and video containers produced any significantly different results. However the analysis still clearly demonstrates that the impact of touch has the capability to alternate the overall aesthetic evaluation.

The likeability scores in Table 26, shows that overall there is a clear pattern that when the participants visually evaluated the DVD and video containers in a favourable manner the scores decreased when the same participants evaluated the same containers both visually and haptically. This is particularly noticeable when the Beauty and the Beast video container was favourably rated during the visual evaluation. In the condition where material B was used, the visual mean rating was 15.07 but dropped to 12.53 when the participants also physically interacted with the stimulus.

The reverse can also be seen for the participants who where not in favour of the containers, since their ratings increased when they simultaneously evaluated them visually and haptically. When the participants did not really like the Beauty and the Beast control video in terms of appearance, their mean ratings went from 5.3 to 8.9 when touching the stimulus. Only one exception was found, this was for the dislikeability ratings for the condition where material B was used. Unfortunately at this point it is difficult to explain why this exception occurred.

The analysis of the results from Table 27 also supports the findings from Table 26 in that the opposite results occur when the participants were rating the stimulus on how much they disfavoured it. It can be seen that the visual likeability ratings increases when the stimulus underwent a visual and tactile examination. This means that the participants did not initially rate the stimuli to be disfavoured but that the disfavoured rating increased when they simultaneously looked at and touched it. The opposite also happens for the dislikeability ratings, showing that when they initially disfavoured the stimulus, the disfavoured rating decreased upon handling of the box.

Finally the analysis of Table 28 also confirms the already emerging patterns that can be seen from Table 26 and 27. It demonstrates that participants who did not rate the stimuli as being artistic during the visual evaluation, considerably increased the artistic rating upon haptic evaluation.

From the results section it can be noted that not all of the results were significant. However, those that were marginal, are still useful in the sense that they demonstrate the overall evaluation trend. It ought to be noted that some of these results may be due to the small sample of participants in some of the categories, and had the number of participants been higher it is possible that the results would have been significant. Unfortunately it is not possible to predict whether the participants' responses would be of a positive or a negative nature and consequently some of the categories had a small sample group. It is therefore proposed that further research should be undertaken in order to investigate this further.

It is difficult to say for certain without further research as to why these results may have occurred. Perhaps the different plastic textures that were used in this experiment were not distinct enough to be recognised as being different to the plastic texture that is normally used on the back of DVD and video containers? If the participants genuinely did not think that the texture was any different from what they normally would expect the texture to feel like, then the idea that consumers' previous experiences would affect their evaluation (Deliza & Mc Fie, 1996) would not be applicable here. Subsequently the textures were not used as a form of discrimination within the evaluation procedure, as could have been expected.

One way of determining whether or not the participants are able to discriminate between the different textures used here would be to conduct a blind haptic evaluation. This would also determine whether there is a haptic preference for any of the textures.

That people who have made a visually negative evaluation are more likely to become positively inclined towards the products when touching it, may have implications for whether or not a manufacturer or marketer wants to encourage the consumer to physically interact with the product. This may be of particular interest for product designers, as if they can make the consumer want to pick up the product, they can increase the overall likeability, provided the product was not so favourably rated in the first place. However, it has to be remembered that it can also decrease the likeability for a consumer who had already rated the product favourably. The question is which one is the one that will be influenced the most? In order to answer such a question, further research would have to be undertaken.

9.4 Summary & conclusion

There is a tendency for an initial positive evaluation to be diminished by a subsequent visual and tactile experience of the stimulus. Conversely an initial moderate evaluation is enhanced by a subsequent visual and tactile examination. Twelve of the 36 comparisons are significant at the 0.05 level. Although 34 out of the 36 show this paradoxical relationship. This clearly shows that the impact of touch has the ability to alternate aesthetic evaluation. However further research needs to be conducted in order to establish exactly why these results occurred.

Additional questions that would also be of interest to investigate further would be; Does the response to an enhanced aesthetic evaluation lead to increased dwell time and purchase probability? Are some textures rated as preferable? It could be that a more favourable texture could help prolong the consumer interaction and in turn increase the purchase probability. Future research is clearly needed to decipher what kind of materials, if any, tend to reinforce our visual perception of products, and which ones that may help increase dwell time. It would furthermore also be of interest to conduct studies with more diverse groups of subjects, such as different age groups and ethnic backgrounds.

In particular it is important to take the research of haptic properties further as product touch can clearly have implications for whether or not a product is rated more favourably. This study contributes a modest amount of information in regards to how haptic properties may alter human aesthetic evaluation, but hopefully it will prove to be a good starting point for future research undertaken within the area.

Chapter 10

Study 8: Haptic evaluation of plastic materials

In Study 7 it was found that tactile examination altered the overall aesthetic evaluation of a stimulus. The different plastic textures used in the experiment did not appear to affect the evaluation procedure. However it could not be determined in the previous study whether the plastic textures were in themselves distinct enough to influence the results. Therefore in this study it was decided to test whether or not the actual plastic textures used in the previous study have the capacity to produce different preference ratings. If the textures were to be found to produce ratings that are profoundly different, it would indicate that the usage of different textures might be contextually driven. For this purpose a blind haptic evaluation was conducted (i.e. when participants can only feel but not see the stimulus).

10.1 Method

10.1.1 Participants

One-hundred and fifteen undergraduate students from the London Metropolitan University participated in this study. Of those 52 participants were female and 63 were male. The age of the participants ranged from 18 to 41, and the mean age was 24.73 for women and 25.81 for men. The decision for using a student population was again deemed particularly suitable based upon the fact that students' cognitive test-taking abilities are stronger than the rest of the population (Sears, 1986). Since a Likert scale was used to measure the participants' responses, it was important that the participants would be consistent in their responses. An opportunistic sampling method was applied to recruit the students.

10.1.2 Materials

Three plastic rectangular swatches were used in this experiment (these were the same plastic textures as those used in Study 7). The first material was a thick ribbed plastic material, which had a slightly slippery surface. From here on, this texture will be referred to as texture 'A'. The second material had a plain matt plastic surface, which will be referred to here as texture 'B'. Texture number three was the plastic material normally used on DVD boxes, which is a thinner plastic material than the other two. From here on, this texture will be referred to as texture 'C'. All of the three textures were 8 x 15 centimetres in size, and had the same texture both at the front and the back.

A small table that was 16 centimetres high and 40 centimetres wide was placed upon a workbench. A light beige coloured fabric was used to put over the table so it could not be seen what was placed underneath the table.

Additionally there was also a response sheet that consisted of three identical questions (one for each stimulus). The questions asked the participants to rate on a seven point Likert scale how much they liked the material, one indicated that they did not like the material at all and seven that they liked it a lot.

10.1.3 Design

This study made use of a within-subject design where the independent variable was the three plastic textures used and the dependent variable was the participants' evaluations.

The hypothesis tested here was as follows:

H59: Aesthetic evaluations of different plastic textures will differ when evaluated using only tactile influences.

11.1.4 Procedure

The three plastic swatches were placed directly on the workbench underneath the small table. Since the small table was completely covered by a beige piece of fabric that was hanging down over the sides of the table, the participants could not see the three swatches.

It was explained to all the participants that they needed to put their hand under the cloth and touch the three textures one by one and then rate them on the response sheet provided for how much they liked the stimulus. If the participants wished to compare the swatches or touch them more than once, they were allowed to do so. All of the participants were also asked not to reorganise the order of the swatches.

10.2 Results

A repeated measure Anova was used to analyse the results from the blind haptic evaluation. Mauchly's test of sphericity was found to be non-significant ($p<0.05$), and consequently for the haptic evaluation factor, the Sphericity was assumed. The within-subjects effects showed that there was no significant difference in the preference evaluation of the three plastic swatches ($F(2,202)=.406$, $p=.667$). This means that the hypothesis for this experiment has to be rejected. Furthermore sex differences were tested for but no significant difference was found for the results between the men and the women.

Table 29: Mean values for the three textures evaluated

Texture A	Texture B	Texture C
4.189	3.904	4.069

The above table shows the mean values for the three textures evaluated.

10.3 Discussion

The analysis shows that there is no statistically significant difference in the evaluation of the three plastic textures used in this study. Consequently the hypothesis tested here has to be rejected since aesthetic evaluations of different plastic textures does not differ when evaluated using only tactile influences. The results will be due to that the participants in this study genuinely did not have a preference for one of the plastic textures used. Bearing in mind that research within the area of haptic discrimination has already established that human's tactile judgements of texture discrimination is as equally adept as visual judgements (e.g. Jones & O'Neil, 1985; Lederman & Abbott, 1981), it is highly unlikely that the results would be due to insufficient textural differences that could not be detected by the participants.

There is still a possibility that the usage of different textures can be contextually driven, perhaps in the case of DVD and video containers, consumer evaluations may be more affected if the texture had been something other than plastic. Moreover the participants in Study 7 had nothing else directly to compare with which may in turn also have affected the outcome. If they had been presented with, the opportunity to touch one of the other DVD or video containers and directly compare them, the outcome of the evaluation again may have been different. This would also likely occur in a retail environment, where consumers tend to touch products consecutively, and subsequently may also 'subconsciously' compare the products.

10.4 Summary & conclusion

This study demonstrated that a blind haptic evaluation of the different textures used in Study 7 did not produce statistically significant evaluations. The results also partially offers an explanation as to why the three textures were not individually found to affect the aesthetic evaluation of the DVD boxes and video containers in Study 7.

Chapter 11

Study 9: The influence of surface texture upon visual and haptic evaluation

Even though Study 8 showed that different textures, when subjected to a blind haptic evaluation, did not produce different preference ratings, it still leaves the possibility that the usage of different textures on a product may alter the preference if compared with a similar product made with a different texture. The analysis of Study 7 indicates that this is not the case. However, it needs to be remembered that in Study 7 the participants were only presented with one kind of texture when they conducted a simultaneous haptic and visual evaluation of the stimulus. Since they did not have the opportunity to compare the texture to another one, it still leaves the possibility that a consumer who is faced with the opportunity to compare two similar products may still discriminate between them based upon tactile influences.

The purpose of this experiment was to investigate whether the influence of one texture will have more of an affect upon overall aesthetic evaluation than another texture when they are evaluated consecutively.

11.1 Method

11.1.1 Participants

One hundred and twenty-one undergraduate students from the London Metropolitan University participated in the experiment. Of those 58 participants were female and 63 were male. Mean age for the female participants was 24.5 and 22.73 for the male participants. The students were recruited on a voluntary basis, from a wide range of different courses.

11.1.2 Materials

Three identical DVD containers were used for the experiment (all three were the special edition of the film ET, see Picture 3 for stimulus used). The usage of DVD containers as experimental stimuli also make the study ecologically valid, because when humans are looking at renting or buying a DVD it is common place to handle the box in an attempt to explore them further. Just as in Study 7, each one of the containers was dressed with a different plastic material at the back. The first material used, was the kind of material that is normally used on a DVD container, which is a thin, smooth plastic material. (This is referred to from here on as the 'standard' material.) On the back of the second DVD container was a thick, matt plastic material and on the third was a thick, ribbed plastic material (from here on the matt plastic material will be referred to as the 'matt' material, and the latter as the 'ribbed' material). It was expected that most of the participants would be familiar with the 'standard' material used. However, even though the 'matt' material had a different feel to it than the 'standard' material, the two materials had similar surfaces. The more unusual material used was the 'ribbed' one, and it was a distinct possibility that the participants had not come into contact with such a texture before.

A response sheet asked participants to circle the number that best represented how attractive each box was. Each question was followed by a Likert scale, which ranged from one to seven. One indicated that the participant did not like the DVD container at all, and number seven would indicate that they liked the DVD container a lot.

11.1.3 Design

A within-subject design was applied to this experimental condition. The independent variables were the different textures attached to the back of the DVD containers and the dependent variable were the participants' ratings.

The hypothesis tested in this study was:

H60: Simultaneous visual and haptic evaluation of a DVD box will be affected by the surface texture.

11.1.4 Procedure

The participants were placed in front of a bench where the three DVDs were placed. Each one of them was informed that the DVDs were slightly differently designed, and that they were not allowed to turn the containers over. They were then instructed to pick up pick up each DVD one at the time and have a close inspection of the DVD box. They were allowed to look at the boxes for as long as they wanted, but that they had to continuously hold them whilst looking at them.

Once they had finished the evaluation they were requested to rate on the Likert scale how much they liked it. The procedure was then repeated twice, so that each participant had evaluated all of the three DVD containers.

Throughout the experiment the presentation order of the DVD containers was randomised.

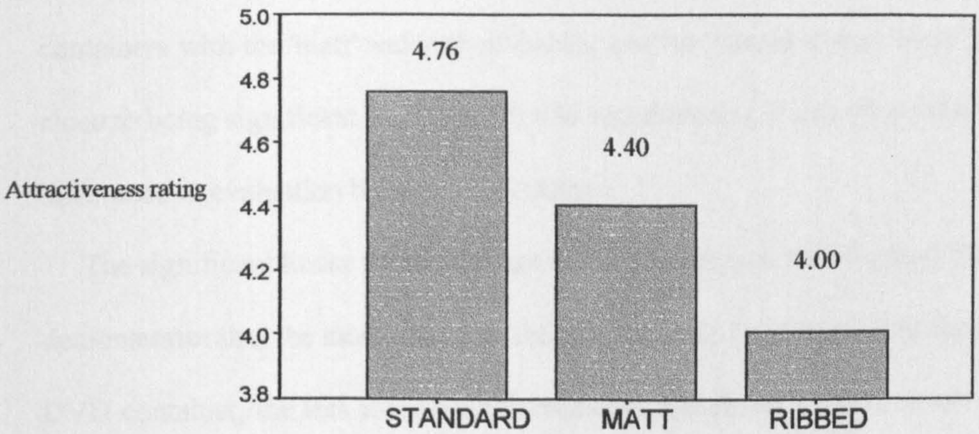
11.2 Results

A within-subjects analysis of variance was used to analyse the data. It was found that there was a significant effect for the type of texture used ($F(2,240) = 6.869$, $p<0.005$).

For these data a significant linear trend was found ($F(1, 120) = 12.067$, $p = 0.001$). No significant result was found for sex differences within the results.

The figure below shows the mean of each one of the DVD containers evaluated.

Figure 50 - Mean values for each stimulus evaluated



The plastic material used in the experiment that is normally used on DVD containers is indicated in the above chart as 'standard'. The thick, matt plastic material used is labelled 'matt' and the thick, ribbed material used is titled 'ribbed'.

A post hoc paired sample t-test was also conducted to clarify the differences found in the analysis of variance. The likeability rating of the 'standard' material was significantly higher than the rating of the 'ribbed' material ($t = -3.474$, $df = 120$, $p = 0.001$, two-tailed). However, no significance was found between either the 'ribbed' and 'matt' materials ($t = -1.918$, $df = 120$, $p = 0.057$, two-tailed) or the 'standard' and 'matt' materials ($t = 1.927$, $df = 120$, $p = 0.056$, two-tailed).

11.3 Discussion

From the analysis of the data it can be concluded that the influence of touch has an affect upon the aesthetic evaluation of stimuli. The analysis of variance showed a highly significant difference in overall evaluation of the three DVD containers ($p<0.005$). Further, it can be seen from the post hoc test, that the greatest difference in evaluation of attractiveness was found between the containers that had the 'standard' and the 'ribbed' materials attached to the back. This was also the only combination found to be significant. However, the significance level for the comparison of the containers with the 'matt' and 'ribbed' backs, and the 'standard' and 'matt' backs were close to being significant (0.057 and 0.056 respectively), thus still pointing towards a difference in evaluation between the textures.

The significant linear trend that was found (see Figure 50 for visual illustration), demonstrates that the more 'unusual' the material that was attached to the back of the DVD container, the less attractive the container was found to be. It is not surprising that the standard material used was overall the more favourably rated material. It is more than likely that all of the participants were already familiar with the feel of such a material, and there have been a number of studies that have demonstrated that familiarity increases likeability (e.g. Bornstein, Leone & Galley, 1987; Kunst-Wilson & Zajonc, 1980; Zajonc, 1968). This is also a feasible explanation for the other two materials used, considering that the DVD container with the 'matt' surface texture at the back would not have been completely unfamiliar to the participants, whilst the 'ribbed' texture is something they would have been far less likely to have encountered before.

There is also another possibility as to why these results occurred. Whilst visually exploring the DVD containers, it is possible that the participants felt that they had to allocate a different rating for each one of the containers, just to avoid the discomfiture of admitting that they did not notice any difference between them. To eliminate such possibility, it would be useful to conduct a follow up experiment using a higher number of containers with alternated front covers, and include a number of red herrings, and then ask the participants to rate each one of the containers in turn. That way, by the time they got to evaluate a box with the same cover as one of the others they would be less likely to remember exactly what it looked like.

Perhaps the attractiveness ratings between the boxes would have been even greater if the participants could have chosen whether or not (as opposed to being told to) to pick up the containers for a closer evaluation. This would link to the idea that humans are curious by nature and in turn have a desire to explore objects by touching. So in future experiments, it may be advisable to let the participants choose whether or not they would like to touch the stimuli. It may not be enough to simply select a stimulus that people would normally pick up to investigate further as was the case in this particular experiment, considering that in a real life situation they may not have chosen to have a closer look at the containers used for the experiment.

Although this piece of research assesses the combination of visual and haptic evaluation of stimuli, it would be useful to establish to what extent touch alone contributes to aesthetic evaluation. If this can be defined, would it be dependent upon the kind of stimuli that is being evaluated?

The study also raises a number of questions such as: Would the outcome of this study be applicable to all types of textures? Or is it simply limited to plastic materials? Would the usage of more extreme differences between textures (such as using velvet compared to sandpaper) produce greater differences in the results? As our results indicate, the smoother (and more familiar) the texture evaluated, the greater the preference for the stimuli. However, this is likely to be contextually driven. Just because the smoothest plastic texture was rated the highest here, there is nothing indicating that this would be the case if the same three textures were attached to completely different stimuli.

11.4 Summary & conclusion

From previous research it is known that vision generally dominates our sensory input (e.g. Ernst & Banks, 2002a; Warren & Rossano, 1991), but what is clear from this study is that even if vision plays a vital part in aesthetic preferences, one cannot disregard the impact of tactile modality. With time it may be concluded that aesthetic evaluation is one of the exceptions to general visual dominance, where haptic perception may be equal to our visual perception. Even though the experiment conducted raises a number of questions, it is unequivocal that this study presents evidence that surface textures that come in direct contact with the skin will influence overall aesthetic evaluation.

Chapter 12

Study 10: Vision or Touch? Which sense influences overall aesthetic evaluation the most?

Previous studies have shown that the tactile sensory system can on occasion compete with the visual perception (e.g. Jones & O'Neil, 1986; Lederman et al., 1986), however it is not known whether touch influences aesthetic evaluation. Therefore the present study tested whether the evaluation of aesthetic quality is influenced more by one modality than another.

12.1 Method

12.1.1 Participants

One hundred and fifteen students from the London Metropolitan University participated in three different evaluations. Of those 49 students were female with a mean age of 25.31 and 66 were male with a mean age of 27.1. All of the participants were volunteers that had been recruited from around the university campus for this particular experiment.

12.1.2 Materials

Six DVD containers and three different pieces of plastic material were used for the experiment. All six DVD containers had identical front covers (ET special edition - see Study 8, Picture 3 for a sample of stimulus used). Three out of the six DVD containers were used as visual stimuli, the remaining three DVD containers were dressed with a different plastic material at the back, just as in Study 10. The three materials used were; a standard plastic material that is normally used on DVD containers, a thick, matt plastic material, and a thick, ribbed plastic material (from this point onwards the first of the materials will be referred to as the 'standard' material, the second as the 'matt' material, and the latter one as the 'ribbed' material).

The same three types of plastic that was attached to the back of the DVD containers were also cut into three 'sample' swatches, so that there was three 8 x 15 cm rectangular samples which all had the same texture at the back and front.

All of the participants were given a response sheet that consisted of nine identical questions (one for each stimulus used), which asked the participants to rate on a seven point Likert scale how attractive they thought the stimulus was. One on the Likert scale indicated that they did not like the stimulus at all, and seven that they liked it a lot.

Additionally a video camera was used to film 57 of the participants hands whilst they were conducting the visual and haptic evaluation simultaneously.

12.1.3 Design

The dependent variables were the nine evaluations of the nine stimuli used in this study, and the independent variables were the DVD containers that was evaluated visually, the DVD containers that were subjected to both visual and haptic evaluation, and the three plastic textures that were evaluated by handling only.

The following two hypotheses were tested:

H61: Visual perception will affect overall aesthetic evaluation more than haptic perception.

H62: The texture usually encountered on a DVD container will be haptically explored for a shorter period of time than the other two materials.

12.1.4 Procedure

A total of six DVD containers were used in the study. Additionally three kinds of plastic textures on the outside of three of the DVD containers and three sample swatches of the textures were used. The first three DVD boxes were presented visually to the participants, they could look at all three containers for as long as they wanted. They were instructed not to touch them and they were only allowed to visually evaluate the front cover. This was followed by a blind haptic evaluation of the three different textured swatches (i.e. the participants could only feel but not see the swatches). During the blind haptic evaluation the participants were allowed to touch the swatches more than once if they wished to do so, and they were also allowed to hold more than one at a time so that the textures could be compared. Once the participants had rated how attractive they thought the first six stimuli were, they were then presented with the final condition of the experiment.

In the final condition the participants had to rate the three differently textured DVD containers by simultaneous visual and tactile evaluation. They were asked to hold the DVD containers (each one in turn) that had their backs altered whilst rating how attractive they thought the containers were. All the participants were instructed not to turn over the DVD containers at any time, but if they wished to hold more than one container at a time they could do so.

During the simultaneous haptic and visual evaluation 57 of the participants hands were also video filmed (only the participants who volunteered to be filmed were included). This allowed the experimenter to measure if the participants interacted with the DVD containers for different lengths of time depending upon which plastic texture was attached to the back of the container.

Each one of the evaluations was measured on a Likert scale. Both the order of the evaluations and the individual stimuli within each of the evaluations were changed throughout the experiment. Prior to the experiment the participants were only told that the experimenter was conducting a study into aesthetic evaluation. All of the participants signed a consent form and were told that they could withdraw at any time, should they wish to do so. Once the experiment was over each of the participants were debriefed and informed exactly what the study was about.

12.2 Results

12.2.1 Aesthetic evaluations

A multiple regression analysis was used to analyse the data. Using the enter method, a significant model emerged for the first texture which was the kind of plastic material normally encountered on a DVD ($F(2,112) = 11.948$, $p < 0.0005$). Adjusted R square = .176. No significant differences were found between the male and female participants. Significant variables are shown below:

Table 30: Significant variables for the standard material

Predictor Variable	Beta	*p*
Haptic evaluation	.400	$p<0.0005$
Visual evaluation	.166	$p=0.05$

The above table shows that the evaluation of the DVD container that had the standard material attached to it was overall more influenced by the haptic evaluation than by the visual one.

The results for the second texture which was a ribbed and thicker type of plastic were significant and the results were as follows: ($F_{(2,112)} = 20.264$, $p < 0.0005$). Adjusted R square = .253. Just as with the standard material no significant differences were found between the female and the male participants. The significant variables are shown below:

Table 31: Significant variables for the ribbed material

Predictor Variable	Beta	*p*
Haptic evaluation	.427	$p<0.0005$
Visual evaluation	.215	$p=0.01$

Similarly to the results that can be seen in Table 30, from Table 31 it can also be seen that when the ribbed material was attached to the back of the DVD container the haptic properties influenced the overall evaluation more than the visual properties did.

Also for the third and final texture, which was a matt plastic surface, a significant model emerged: ($F_{(2,112)} = 3.750$, $p = 0.02$). Adjusted R square = .046. No significant differences were found between the men and the women. Significant variables are shown below.

Table 32: Significant variables for the matt material

Predictor Variable	Beta	*p*
Visual evaluation	.240	$p=0.01$

(Haptic evaluation was not a significant predictor in this model.)

Table 32 shows that only the visual properties were found to be an influential factor when evaluating the DVD container with the matt material attached to the back. The mean value ratings for how attractive each stimulus were, are shown below in Table 33 (seven would indicate that the participants thought the stimuli was very attractive, and one that they did not find it at all attractive).

Table 33: Mean values for all nine stimuli

Evaluation condition	**Texture**	**Mean value**
Haptic evaluation	***Standard***	3.81
Visual evaluation	***Standard***	4.58
Haptic/Visual evaluation	***Standard***	4.77
Haptic evaluation	***Ribbed***	3.85
Visual evaluation	***Ribbed***	4.58
Haptic/Visual evaluation	***Ribbed***	3.97
Haptic evaluation	***Matt***	4.11
Visual evaluation	***Matt***	4.58
Haptic/Visual evaluation	***Matt***	4.39

From the above table it can be seen that all of the visual evaluations were identical. All of the haptic evaluations, which were conducted without seeing the materials, have lower mean values than the visual evaluations. When the containers were evaluated both by tactile and visual senses, the highest mean rating occurred when the DVD container had a 'standard' material attached to the back (4.77). The second highest rating was for the container with a 'matt' material (4.39), and the lowest mean rating was for the container with the ribbed material attached to it (3.97).

Bearing in mind that for the standard and the ribbed material used, the visual evaluation was not found to be as strong a contributor to the overall evaluation as the haptic evaluation, hypothesis 61 can not be accepted.

12.2.2 Evaluation of time differences for the visual/haptic evaluations

To analyse the data collected for the amount of time the 57 participants that were filmed had spent interacting with the stimulus, a within-subjects analysis of variance was used. A significant time affect was found ($F_{(2,110)} = 8.056$, $p<0.005$). For these data a significant linear trend was found ($F_{(1,55)} = 15.534$, $p = 0.000$).

Figure 51: Significant time differences

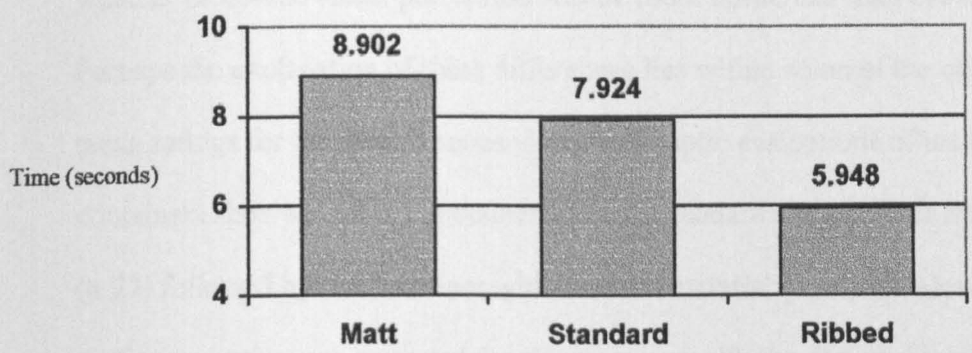


Figure 51 shows the mean for the time spent physically interacting with the DVD containers whilst conducting a visual and haptic evaluation. The 57 participants that were video filmed spent the longest interacting with the DVD that had a matt surface texture attached to the back (8 seconds and 902 milliseconds). The shortest interaction time was found for the DVD with the ribbed slightly slippery material (5 seconds and 948 milliseconds). Because the standard texture (the one that is normally used on DVD containers) was not explored for a shorter period of time than the other two plastic textures, hypothesis 62 has to be rejected.

Additionally a correlation was also used to test whether the overall aesthetic rating would increase linearly with the amount of time spent haptically exploring the stimulus. However no significant results were found.

12.3 Discussion

Neither of the hypotheses were accepted in this study. Hypothesis 61 was rejected on the basis that the regression analysis shows that overall aesthetic evaluation is influenced less by vision and more by touch in the conditions where the standard and ribbed materials were tested. However in the third condition when the matt material was tested, the haptic influence was not found to be significant. From this it can be concluded that the actual texture used on a stimulus is the determining factor of whether or not the visual perception will be more influential than our tactile senses. Perhaps the explanation of these differences lies within some of the other results. The mean ratings for the simultaneous visual and haptic evaluations of the DVD containers showed that the container with the standard material was rated the highest (4.77) followed by the container with the matt material (4.39). The lowest overall preference rating was occurred for the container with the ribbed slippery material at the back (3.97). These mean ratings might be indicating that when the participants either strongly like or dislike a particular texture, the tactile senses influence the overall ratings more. This might explain why the material that had an 'in-between' rating did not affect the haptic evaluation enough to be statistically significant. In turn, the mean ratings also disprove earlier made suggestions that novel elements can increase the appeal of a stimulus (e.g. Berlyne, 1974, 1971).

Furthermore, the results showed that the participants spent longer haptically exploring the matt surface texture (8 seconds and 902 milliseconds) than they did the standard material (7 seconds and 924 milliseconds) or the ribbed material (5 seconds and 948 milliseconds). That the participants spent longer exploring the matt surface texture may indicate that they were uncertain as to whether or not they actually liked it. This uncertainty may also be what influenced the participants to give the DVD container with the matt surface texture the lowest rating when whilst evaluating it by using both senses. In contrast to what was expected, the standard material was not explored haptically for the shortest time period, which is why hypothesis 62 was also rejected. It had been theorised that if the participants encountered a material they were familiar with, they would simply not spend a lot of time touching it, since their perception would already be in tune with what they had previously encountered (e.g. Fize & Marlot, 1996). It is not entirely unlikely that this is the underlying reason as to why they spent longer than expected touching it, maybe the familiar feel meant that it was more appealing to touch and therefore in turn they spent longer doing so.

However there is also an alternative explanation for the results that emerged from this study. The results from the blind haptic evaluation showed that the lowest preference rating was for the standard material (3.81), followed by the ribbed texture (3.85), and the highest preference rating was for the matt texture (4.11). Subsequently, in the third condition when the haptic evaluation was not found to be significant, it could also be an indicator that when the tactile impact of a stimulus is more favourably rated it has less impact upon the overall aesthetic evaluation (even though it should be noted that the ratings from the blind haptic evaluation were close together). If a person likes the overall texture, it may allow the person touching the stimulus to concentrate on the visual evaluation. The overall evaluation for the DVD container with a matt material attached to the back, only accounted for a total of 4.6 % of the total variance. This may demonstrate the importance of haptic influence in that

if a consumer is consciously evaluating the texture it may also be a stronger influence upon aesthetic evaluation than the visual perception. This also explains why the total variance in the other two conditions was considerably higher.
Naturally it is not possible to say which of the above theories is the most feasible without conducting a number of studies to investigate this further.

It is not surprising that none of the models accounted for more than 25% of the total variance. This is simply a reflection of the complex stimuli used in this study. When participants encounter a previously known stimulus they will automatically draw upon previous experiences and knowledge of the stimulus, which in turn will all be taken into consideration upon the aesthetic evaluation. However it still demonstrates that both tactile and visual evaluation plays an important part in how humans rate aesthetic quality, and to what extent tactile influences will be determined by what kind of surface texture that is used.

12.4 Summary & conclusion

Even though none of the models accounted for more than 25% of the total variance, it clearly demonstrates that both tactile and visual evaluation plays a part in how humans rate aesthetic quality overall. Furthermore it also shows that tactile influences can on occasion influence aesthetic evaluation of a product such as a DVD more than the visual senses. In two of the conditions tactile evaluation had a greater influence than that of the visual evaluation. In the third condition the haptic evaluation was not found to be significant, and the overall model only accounted for 4% of the total variance. It is difficult to say for certain as to why the results occurred without conducting further research. However the findings clearly demonstrates that by varying the texture of a stimulus one can influence the overall evaluation of a stimulus.

Chapter 13

13.1 Discussion of overall findings

There is little doubt from the studies undertaken that it is a complex task to try and create a clear conceptual framework for how humans respond to and evaluate certain aesthetic elements and how these elements affect dwell time, product contact and purchase probability when using POP-displays in retail environments. Bearing in mind that at present little is known about the elements that contribute to the aesthetics of POP-displays and therefore their capacity to increase the effectiveness of the displays, the findings from the studies outlined in this thesis provide a good starting point that indicates how research in this area might be taken forward.

In particular this thesis manages to provide some insight into how aesthetic concepts and elements can be used to capture consumers' attention, attract consumers to the displays and increase the consumers' overall aesthetic assessment. The research has also shown how simple elements can be used to design 'aesthetic concepts' such as mystery and complexity. Furthermore it has also demonstrated why the influence of touch should be considered when trying to create an overall aesthetically pleasing image of a product and how haptic evaluation can increase dwell time. It was also found that dwell time can be increased by using simple elements to create a display that is perceived to be 'interesting', 'complex' or 'mysterious'. Additionally, some differences that occurred throughout the study between women and men were intriguing and warrant further investigation. This sex difference can also be drawn upon when designing an effective POP-display for sex-typed goods.

Moreover, it was shown that both colour and shape generate strong interaction effects when it comes to overall evaluation of a design and in terms of how quickly a target can be identified (as can be seen from both studies 3 and 4). Consequently it appears logical to conduct further research into how one affects the other and whether it would be possible to create some sort of theory for how the combination of various colour and shapes can be utilised not only to compete more effectively within cluttered retail environments, but also to increase the overall likeability of a POP-display.

13.2 How to capture consumers' attention

The conscious information processing capacity of consumers is limited (e.g. Iyer, 1989) and their tendency to rely on peripheral cues (Bitner & Obermiller, 1985) is affected by time constraints as well as the in store-distractions that a high number of consumers are influenced by. The result being, as previously discussed, that only a small number of items within the retail environments are attended to with focal attention. Therefore one of the first things for a POP designer to consider is how the display can be designed to capture consumers' attention. It is crucial that a display is noticed amongst the high number of competitive stimuli that consumers frequently encounter within the retail environment. This was the underlying reason for conducting Studies 4 and 5. Based upon the tenets that there is a direct link between attention and purchase (Pieters & Warlop, 1999), Study 4 looked into whether visual searches conducted in cluttered settings are influenced by hue, shape and positioning. It was deemed appropriate to use visual searches to investigate if certain colours can capture the consumers' attention since visual attention has been defined as the activity of scanning the visual world and searching for targets (Wickens & Hollands, 2000).

The outcome showed that all three variables affect the visual search procedure in cluttered complex settings. In particular it was found that basic colours are identified more rapidly and accurately than non-basic colours, and that there was a strong interaction effect between colour and positioning. However positioning was not significant on its own. Similar results were also found for shape; there was a strong interaction effect between colour and shape but shape was not found to be significant on its own. The importance of interaction effects can not only be noticed from Study 4 but also from Study 3 where basic design elements were used to determine whether or not it is possible to create certain aesthetic concepts such as 'complexity' and 'familiarity'. It was then shown that the interaction between the design elements can affect how a particular display is perceived.

Study four also showed that certain colours such as blue and green have the capacity to be accurately identified irrespective of positioning. This of course is of particular value for any POP designer as they tend to have very little control over where displays are placed within a shop. It may be advisable to avoid the usage of colours such as turquoise and peach as they were consistently mis-identified regardless of the positioning. Bearing in mind that only six colours were tested in Study 4 it would be useful to conduct further studies that would test whether there are other colours that have the capacity to produce similar results. For example it is important to test all of the 11 basic colour that have been identified (Boynton, 1988; Davies & Corbett, 1995) to confirm that they all have the capacity to reduce visual search times in cluttered retail environments and whether or not they are affected by positioning. Furthermore it may be advisable to use a research instrument that has the capacity to measure the reaction times in milliseconds. For the purpose of simply establishing whether or not there was any difference between basic and non-basic colours the finer time differences were not deemed to be important. However it is possible that by measuring the differences in milliseconds, significant time differences between the basic colours may occur which may in turn be important for managing to capture consumers' attention as quickly and efficiently as possible.

The quantitative analysis of Study 5 also showed support for the premise that basic colours tend to capture consumers' attention better than non-basic colours. The research findings indicated that when a red and a green POP-display were presented alongside one another, they were more frequently recalled than when a red or a green display appeared alongside a turquoise display. This was regardless of which kind of POP-displays were used. A brand affect upon recall was evident in that KitKat was the most frequently recalled POP-display, followed by the Twix. The Heinz salad dressing display and the Pot Noodle brands were less frequently recalled. An overall relationship between the brand, the colour and the POP-display itself was also found. This was particularly evident when the KitKat display was presented in its original red colour, as it was then recalled by a larger percentage of the participants. The fact that the colour, the brand and the POP-displays were found to have a significant relationship shows that it is important to consider how one factor affects another upon designing a POP-display. For example it is important that the display is designed in a colour that consumers tend to associate with the product that the display is promoting, as it clearly enhances the possibility of more easily capturing the consumers' attention.

Previous research has shown that there are particular regions of our brains that respond to novel elements within environmental settings (Berns et al., 1997). Such research findings indicate that novel elements are more likely to be noticed within cluttered research environments. Bearing in mind that turquoise is not a colour commonly used, it might therefore have been feasible to presume that it would be more rapidly identified in Study 4 and more frequently recalled in Study 5. However in Study 4 it was found that the turquoise coloured targets were only the fourth most rapidly identified colour and the accuracy level was much lower than all the other colours.

What Study 5 fails to account for is whether the results in this study may have been due to contrast effects. Such contrast effects could have occurred both between the colour of the POP-displays that were presented alongside one another, and between the colour of the POP-display and the products present on the actual display. The latter out of the two is less likely to have influenced the study because four different displays were used and the results that occurred all point in the same direction. However it is still worth considering in studies undertaken in the future.

There were also some other methodological problems with this particular study that should be acknowledged. The pictorial stimulus used in this study could have been manipulated more extensively in order to make sure that none of the colours measured (red, green and turquoise) appeared anywhere else in the picture. In that way the data could have been simply coded upon the recall of a particular colour in contrast to the increased description of the POP-display that they had seen. It may also have been better to let the participants freely recall what they had seen as opposed to using four questions, which may have prompted the participants to recall certain elements.

Even though there are some flaws in the research methodology for Study 4 and 5, it is clear from both of the studies that basic colours are more effective when it comes to capturing a consumers' attention within a cluttered retail setting. The results from Study 5 is clearly supporting the findings from Study 4, and if the above methodological problems discussed would have been of a more serious nature, it is less likely that one set of results would have supported the other.

13.3 How to increase the overall assessment of POP-displays

Once a POP-display has captured the consumers' attention it must also make a 'good first impression'. If the display is not perceived to be appealing, the risk is that the consumer will rapidly move on and conduct another visual search. It should be remembered that consumers are increasingly consuming for pleasure and that the appearance of a product and/or a display can increase overall consumer pleasure (Creusen & Snelders, 2002). The idea that certain aesthetic elements can be applied to increase the overall evaluation of a POP-display is supported by the findings from Studies 1, 2, 3, 5 and 6. In the first study it was found that three design principles 'proportion', 'unity' and 'focal point' all have the capacity to influence 'attractiveness'. POP-displays that exhibit unity (as supposed to low level of unity), a proportion in line with the golden section, and a clear focal point were found to be more likely to generate a favourable evaluation. Since the idea of a focal point is that it calls attention to the most important areas of a POP-display and subdues the rest of the design, it may be further enhanced by the use of the 'right' colour. For example if the focal point is presented in a basic colour it may be more effective in capturing consumers' attention and may also in turn compete more effectively with other products and displays in a cluttered retail environment.

The study however not only shows that the three design principles can increase overall assessment but it also demonstrates that design features can trigger off consistent responses (Costley & Bruck, 1992). Previously it has been suggested that products can elicit moderate levels of aesthetic responses, and here it is confirmed that

POP-displays also have the capacity to elicit aesthetic responses in consumers too. It should be remembered that there are many possible design principles and characteristics that could be relevant for the design of POP-displays. The Gestalt movement alone, identified more than one hundred principles of possible innate design preferences (Bloch, 1995). Bearing in mind that Study 1 made use of only three POP-displays (there is a minor possibility that the participants thought that the displays representing the design principles were simply a good example of that particular display category) it would be useful to test a higher number of displays before determining for certain that the three design principles are applicable to POP design in general. Moreover it would be useful to compare the effectiveness of the three design principles to other previously established design concepts. Future research could also explore if the three design principles increase dwell time. It seems possible that design elements such as unity, proportion and focal point may have the capacity to capture the attention of consumers for longer periods of time, in addition to constructs such as 'mystery' and 'complexity'. From Study 1 it is clearly evident that all three design principles measured directly influence the visual evaluation in a positive way.

In addition to Study 1, the second study also identified aesthetic concepts that can influence the level of attraction. The second study demonstrated that aesthetic concepts such as 'clarity' and 'mystery' can influence the level of attraction to a POP-display upon visual evaluation. The 'concept' of clarity arose from the combination of the concepts of 'legibility' and 'coherence', which were the original two concepts postulated by the Kaplans' to affect aesthetic evaluations of environmental settings (e.g. Kaplan, 1975a; Kaplan, 1975b; Kaplan et al., 1989; Kaplan & Wendt, 1972, 1979). Also the concept of 'mystery' was altered slightly in Study 2, as it emerged that it contained elements of the Kaplans' original concept of complexity. 'Mystery' was also found to have a stronger influence upon evaluation than did 'clarity'. As previously mentioned it is not surprising that 'clarity' was found to be an important determinant of attraction, bearing in mind that if a display is 'unclear' it will be difficult to comprehend what it is promoting. Just like Study 1, Study 2 also underlines that design concepts can be utilised to influence consumers visual perception just as previously suggested by both Berlyne (e.g. 1974, 1971) and the Kaplans. The third study built upon the second study and attempts to test whether design concepts such as 'mystery', 'complexity' and how 'interesting' a stimulus is, influence how 'attractive' a stimulus is rated. It was found that pictorial stimuli were rated as being more 'attractive' when it was designed to be 'interesting'. The same study also showed that when a stimulus is perceived to be 'mysterious' or 'complex' the 'attractiveness' rating tends to decrease. These findings do not support the outcome of the second study, since it was found there that 'mystery' and 'clarity' both increase the overall evaluation of a POP-display. It is possible that the 'mystery' factor may have been interpreted as being 'interesting' by the participants in the second study, and by not providing an exact definition, the two may have been confused unintentionally. The two significant correlations found in the third study may offer some support for this (see Figure 34); the first one was between 'mystery' and how 'interesting' the pictures were perceived to be (.502), and the second correlation for 'complexity' and how 'interesting' the pictures were perceived to be (.622). The correlations are not very high, but they still indicate that how 'interesting' a stimulus is perceived to be can be influenced by how 'complex' and 'mysterious' it is. [Strong correlations are considered within social sciences to be 0.7 and above e.g. Coolican, (1999).] Perhaps it is an indicator that if a POP-display is to be perceived as 'interesting' by consumers there has to be elements of both 'mystery' and 'complexity' present. However it is also possible that the contradictive evidence found from the studies are due to methodological differences. 'Clarity' was not tested for in the third study. Instead all the elements used to measure the aesthetic concepts were clearly designed so that it was very clear to the participants what they saw on the screen.

What is clear from both the second and the third study is that 'complexity' is not a direct contributor to the attractive evaluation of a POP-display.

The qualitative analysis conducted in Study 5 also indicated that a POP-display may be rated as more attractive overall when it is designed in one basic and one non-basic colour. A weak pattern demonstrated that the participants made more positive attributions about the pictorial stimulus when it contained both one basic and one non-basic coloured POP-display. This ought to be treated with some caution however and needs to be explored in further detail before the results can be certified. As if to underline this caution, in Study 6 such colour combinations were not rated more aesthetically pleasing than other combinations. The outcome of Study 6 needs further investigation, as it has been hypothesised that colour samples in quasi-experimental conditions can not be used to produce valid evaluations of colour combinations (e.g. Whitfield & Wiltshire, 1990).

Furthermore Study 6 also failed to provide any evidence that colour pairs with the same value or large saturation differences are perceived to be more attractive (Helson & Lanford, 1970; Polzella & Montogmery, 1993). The results are not exactly surprising since there are numerous researchers that have stated that colour preferences are often culturally determined or completely idiosyncratic (e.g. Taft & Sivik, 1991, 1992).

The only thing that was found to be consistent throughout Study 6 was that regardless of which order the colours were presented, the colour pairs were rated to be equally aesthetically pleasing. Such findings may not be imperative to the design of POP-displays, but it may still be useful to know that it is not the presentation order of the colours that make them aesthetically pleasing but the actual pairing of colours themselves. If one was to continue to try and map out whether there are aesthetically pleasing colour combinations, it might be better to identify particular groups or sub groups that are likely to have been socialised in a similar manner and that may be of interest for marketers to specifically target. This however is likely to be very time consuming and not very cost effective. It is probably better to focus future research upon confirming whether or not a mysterious looking designed display can increase the overall attractiveness and how effective a clear and interestingly designed display would be in doing so.

13.4 Can 'aesthetic concepts' be designed?

The third study was investigating if simple design elements can be used to create images that are perceived to be 'mysterious', 'familiar', 'interesting', 'complex' and 'attractive'. Even though the analysis of the results from Study 2 suggested that there were two aesthetic concepts ('clarity' and 'mystery') that have the capacity to increase overall assessment of POP-displays, it was decided not to focus upon both of those elements. 'Clarity' was not included as all of the pictorial stimuli used in the study were designed to be as clear as possible with little chance of generating variance. It was found that 'mystery' was directly influenced by the number of elements used. The number of elements used increased linearly with the 'mystery' rating. A number of interaction effects between the number of elements used, the shape, the colour and whether the elements were partially hidden were also found to be determining factors of 'mystery'. It had been previously theorised that the hidden elements would in themselves be a significant contributor to whether or not a display was perceived to be 'mysterious'. Kaplan et al. (1989, p512) had described 'mystery' as being "a promise of new but related information". Basically it was thought that if the participants could not see all of the elements fully, they may think that the vista or view contained hidden information.

'Complexity' was also found to be influenced by number of elements used. Just as for 'mystery' the 'complexity' rating increased linearly with the amount of elements used in a display. This confirms the Kaplans' definition of 'mystery', but also demonstrates that it is not only applicable to environmental settings. (In addition, shape and when the elements were partially hidden, were also in their own right significant contributors to whether the pictures were perceived to be 'complex'.)

The number of elements used, the shape and whether the elements were partially hidden were the three factors that directly influenced how 'interesting' the pictures were. For example squares were rated to be significantly more 'interesting', than the unfamiliar shapes used in the study. Without conducting further research it is difficult to explain why the squares were rated to be more 'interesting'. Findings such as these demonstrate that shape plays an important part in the evaluation process. It may be a good idea to conduct further research in the area of shape to determine what kind of shaped POP-display would help create a particular perception as well as which elements used on the actual display can reinforce such a perception. Just as with the other aesthetic concepts, there were also a number of significant interaction effects.

The fact that some of the design elements that were found to significantly contribute to why the pictorial stimuli were perceived to be 'mysterious', 'complex' or 'interesting' were the same, may explain why significant correlations were found between the 'interesting' ratings and 'mystery', and the 'interesting' ratings and 'complexity'. Since there were only a few significant elements that were the same (there were less similarities between the 'interesting' rating and 'mystery'), this may also in turn explain why the correlations were not that high, .502 and .622 respectively.

What made a pictorial stimulus 'familiar' was found to be more complex. The number of elements used and the colour were the only two factors in their own right that were found to affect the 'familiarity' rating. Even though the blue colour (in both the shades) was rated as being more 'familiar', this is very likely to be dependent upon cultural influences and individualistic preferences such as previously discussed. Additionally a total of 21 interaction effects were found. The main underlying reason as to why so many interaction effects were found to be significant, will (similarly to the influence of colour) be due to that what consumers think looks 'familiar' will be largely dependent upon previous experiences. It is useful to be aware that 'familiarity' decreases the amount of time spent looking at a display, and if a POP designer is hoping to increase the dwell time it may be advisable to try to make the POP-displays not too similar to other marketing tools.

When the design elements were used to test how attractive the pictorial stimuli were rated to be, only the number of elements used, the shape and the colour appeared as significant contributors in their own right. Also for overall 'attractiveness' blue (in both shades) was rated as more appealing than red. Just as before, it does not mean that all consumers will have a preference for blue over red, but it does demonstrate how important it is to pick a colour that may have a broader appeal. It was not expected that it would be possible to determine here what kind of design elements have the most impact upon determining whether or not a POP-display is 'attractive'. 'Attractiveness' was included as it could then be compared if the same kind of elements that can be utilised to design an aesthetic concept such as 'mystery' also have a direct influence on how attractive something is rated to be.

Overall the results point towards the possibility of constructing complex aesthetic concepts, by using simple design elements. Naturally it is possible that other elements not used in this study may have a more profound effect upon the evaluation of POP-displays. The emerging pattern may lend some support for the idea that cultures tend to be homogenous in their aesthetic responses (e.g. Berlyne, 1971; Kaplan & Wendt, 1972, 1979) and perhaps also for the possibility that they are innate (e.g. Veryzer & Hutchinson, 1998).

Clearly the ratings for each one of the concepts measured in Study 3 was not very high which shows that further research is needed before it can be certain how to create a POP-display that is 100% 'interesting', 'mysterious', 'complex', or 'familiar'. However the findings are useful in that they demonstrate that such concepts can be designed by using simple design elements.

13.5 The influence of touch

There are a number of reasons as to why designers should be interested in what happens when consumers physically interact with the product from a POP-display. Humans tend to touch objects in order to make some form of discrimination (e.g. Bushnell & Noudreau, 1991; Piaget, 1952). Such discriminations may, in a retail context, be used as a form of validation. It is possible that consumers are more likely to purchase a product that has had the visual perception validated by the haptic evaluation. Such as in the case of clothes shopping. If a cardigan looks fluffy and soft but feels rough when touching it, the conflicting impact of vision and touch may deter the consumer from buying it. Provided the texture of a product does not feel considerably different to what the visual sense predicts, is it possible to make use of different kinds of textures to influence the overall aesthetic evaluation of a product? No support was found for this in the results that emerged from Study 7. An overall pattern showed that when a stimulus was initially rated to be visually aesthetically pleasing, the ratings decreased when physically interacting with the stimulus tested. It is difficult to account for the outcome of this study without conducting further research. However it is possible that the participants that had a more favourable perception of the DVD or video upon visual and tactile evaluation, simply did not think that the tactile input validated their initial visual evaluation. The reverse was also found in that when the participants rated the stimulus to be visually unappealing the ratings increased during haptic evaluation. This may show some support for Hornik's (1993) suggestion that when consumers touch a product they are more likely to purchase it. If a consumer does not have a favourable perception of a particular product perhaps the POP-display can then be designed in such a way that the consumer is still lured into touching the products on the display which then in turn may alter their earlier perception of the product.

There is also one other possible explanation why the results in Study 7 occurred. It may be that when people see something they like and they are prevented from exploring it further upon the first encounter, they are more likely to scrutinise the stimulus upon the second encounter when they are allowed to touch it. Subsequently a close scrutiny of the stimulus may result in a less favoured evaluation.

Neither of the textures used in the study showed any tendency to have more of an impact upon aesthetic evaluation. Even though no such results were found here, it is possible from the results to draw the conclusion that aesthetic evaluation is affected by both the tactile and the visual senses. The results also support previous findings that have suggested that our tactile senses can influence daily activities (e.g. Ernst et al. 2000; Heller, 1991,1982).

Study 8 supported the results that emerged in Study 7 in that the textures themselves, when rated by participants during a blind haptic evaluation, did not produce any significantly different results in terms of tactile preference. This result may reflect that people do not have any real preference for plastic textures and if the plastic textures had been compared to a texture that felt very different, it is more than likely that the results would have been different.

That aesthetic evaluation is affected by both tactile and visual senses was also supported by the outcome of Study 9. The findings showed that depending on which kind of plastic texture was attached to the back of the DVD container, the overall evaluation differed, even though the front of the containers were identical. (This was not in accordance with the outcome of Study 7, which raises the question that the different kinds of methodologies used may be partially responsible for the results.) The DVD with the standard material had a mean value of 4.76, the DVD with the matt texture was 4.40 and the DVD with the ribbed texture had a value of 4. Bearing in mind that Study 8 had shown a slight preference for the ribbed texture, but when it was attached to the back of a DVD box in Study 9 it produced the lowest rating, therefore it has to be assumed that it is not the texture itself that is rated but that it is the product that it belongs to that determines whether or not consumers like it. This is likely to be influenced by previous experiences, and our prior expectations would also create a bias towards certain textures.

The methodology of Study 9 could have been improved by mixing the DVD containers used in the study with a number of completely different DVD containers, so that they did not solidly focus upon the three DVDs. That way the possibility that the students felt obliged to rate the DVD containers differently may have been avoided. However the drawback would have been that they then could not have directly compared the three DVD containers, which in turn was beneficial in the sense that it may simulate what consumers do in the retail environment, where there is nothing preventing them from touching products simultaneously or directly afterwards.

In the final study that focused upon the influence of haptic evaluation, the prior two studies (Studies 8 and 9) were effectively combined with a visual only evaluation in the one study. This was done in order to find out to what extent our tactile senses influence the aesthetic evaluation of a product. The outcome of the study showed that when the standard material and the ribbed material were used, both haptic and visual evaluations contributed significantly to the overall aesthetic evaluation. In both conditions the tactile input was a stronger predictor than the visual input. For the condition using the standard material, the haptic evaluation had a beta value of .400, and the visual evaluation .166, and for the condition using the ribbed material, the haptic evaluation had a beta value of .427, and the visual evaluation .215. When the matt material was used the tactile input was not found to contribute to the overall aesthetic evaluation of the DVD container, whilst the visual senses still made a significant contribution which was slightly higher than in the other two conditions (β .240).

The mean values for the three kinds of evaluations conducted for the three different textures used, also show some support for the results that emerged in Study 9. The preference rating that emerged for the simultaneous visual/haptic evaluations in Study 10 are very similar to those in Study 9. The mean value for the standard material in Study 10 was 4.7 whilst it was 4.76 in Study 9. When using the matt material the mean value in Study 10 was 4.39 again similar to the mean value in Study 9, which was 4.40. The ribbed material presented the largest difference (even though it is minimal), the mean value for overall attractiveness in Study 10 was 3.97 and in Study 9 it was 4. Even though as previously discussed there were some methodological problems that should be taken into account when evaluating the results of the studies, the fact that the overall means were so similar may show that the ratings were due to the influence of touch. (As opposed to the participants feeling obliged to rate the containers differently.) The likelihood of having two sets of participants that rated the containers differently with no relevance to tactile influences appears to be somewhat unlikely. Furthermore, both the studies produced the highest mean value for the standard material, which lends support to the idea that familiarity increases likeabilty and that previous expectations tend to dictate which products consumers prefer.

The findings from Studies 9 and 10 both show that the usage of different textures can increase or decrease overall aesthetic evaluation of a product. If manufacturers and product designers are aware that a product gives negative sensory feedback whilst being subjected to a haptic evaluation, they may want to consider packaging them in such a way that a consumer can not touch them. Alternatively if the packaging is providing negative sensory feedback it may be advisable to design a POP-display that does not encourage the consumers to pick the product up.

Part of the analysis in Study 10 also suggests that haptic information can be more influential than the information that is taken in visually. If this would be the situation, when a particular texture provides negative sensory feedback the purchase likelihood is likely to decrease significantly.

The research findings from all of the four studies investigating the influence of touch suggests that our haptic system is one of importance in consumer behaviour. Most likely not all product purchase decisions will be based upon or indeed be influenced by touch, but in some cases haptic properties have the capacity to affect the overall evaluation. In all of the tactile studies conducted, complex stimuli were used to explore the influence of touch. It was decided to use such stimuli, as the participants were highly likely to already have encountered them before and subsequently already have a perceptual concept of whether or not they liked the stimulus presented to them. Since consumers will in 'real life' consumer settings have been previously exposed to the products or a similar product category, it is of particular importance to test whether such perceptions can be challenged by the usage of haptic properties. Since consumers automatically draw upon previous experiences to determine whether or not they find a product attractive, there will already be a high number of preconceived ideas that will influence overall evaluation (Eibl-Eibesfeldt, 1988) which may not be design related. Consequently by using 'real' products the study becomes more ecologically valid. The studies did indicate that it is possible to influence the consumers' overall perception by altering the surface texture, however such findings may change depending upon what kind of products are tested. However, it may be interesting in future studies to investigate in more detail whether aesthetic evaluation increases when the tactile senses are confirming what the visual senses have observed.

13.6 Dwell time

There are two specific reasons as to why dwell time can be of interest for manufacturers of POP-displays. Firstly the idea that there is a direct link between attention and probability of purchase would suggest that the more attention a consumer pays a display, the more likely it would be that they would purchase the product. This is also linked to the fact that the more time a consumer spends on focusing upon one particular display the less time they will have to look around for other products and will therefore in turn also increase the probability of purchase. The second reason why dwell time is important centres around the fact that customers are more likely to physically interact with the product if they spend more time at the POP-display, which in turn will further encourage the probability of purchase. This naturally will also be further helped by the usage of the right kind of texture as discussed earlier.

It can be seen from the third study (Figure 34) that a significant negative relationship was found between 'mystery' and 'familiarity', and 'familiarity' and 'time'. This means that when a consumer thinks that a POP-display appears to be 'familiar' they will spend less time looking at it. All of the other factors ('mystery', how 'interesting' it looks, and 'complexity') have the capacity to increase the time spent looking at the display. This means that upon designing a POP-display, it is worth designing it in such a way that consumers will perceive it to be 'mysterious', 'interesting' or 'complex', provided the aim is to increase the overall dwell time.

However even though the research findings indicates that there are specific concepts that have the capacity to increase the dwell time, it may not be advisable to apply such designs to all kinds of promotional displays without considering whether or not it will further enhance the product's image. It is possible that if a consumer is presented with a 'mysterious' looking display that is promoting a product that they would not consider 'mystical', their perception of the product may clash with the image presented to them and the outcome may not be a favourable one. Bearing in mind that the right product image can establish the product as a 'personality' (Jordan, 2002) which in turn can further enhance the overall evaluation of the product, it is important not to incorporate a design element that may upset the product's overall image.

Nothing was found to indicate that a favoured evaluation of touch can increase dwell time. This was demonstrated in Study 10 where 57 participants were video filmed whilst conducting the simultaneous visual and haptic evaluation of the DVD containers. It was found that the participants did indeed interact with the containers for different lengths of time depending on which texture was attached to them. Such time differences were not found to be related to the overall aesthetic ratings. The longest interaction time was found for the DVD container with a matt texture attached to the back (8 seconds and 902 milliseconds), however in the visual/haptic aesthetic evaluation it was only the second most preferred container (mean value 4.39). The standard material which produced the second longest interaction time (7 seconds and 924 milliseconds) was the most preferred DVD out of the three (mean value 4.77), and the shortest interaction time was for the ribbed material (5 seconds and 948 milliseconds) which was the least liked box (mean 3.97). Even though there was no apparent link between the time spent haptically exploring the containers and increase in overall aesthetic evaluation, it is not impossible that a highly unusual texture may be used to increase the overall dwell time more drastically, and in turn the evaluation may increase. However this would need to be explored further.

A correlation was also conducted in Study 10 to test if the overall aesthetic evaluation increased when the participants spent more time interacting with the box. However none of the correlations were found to be significant and consequently this theory could not be supported. This may also disprove Hornik's (1992) assumption that simply touching a product can influence consumers' attitudes towards a product in a positive manner. If Hornik was right then surely a prolonged physical interaction also ought to increase the overall likeability of the product?

It has been shown that there are a number of design elements that can be utilised to increase the overall dwell time, for example a mysterious display is likely to be explored for a longer time period. Furthermore it was found that if a POP-display is designed to look familiar the dwell time tends to decrease. Even though one may be particularly interested in dwell time based upon the assumption that the longer a consumer spends in front of a display the more likely they are to purchase the product, this relationship has not been sufficiently explored to be certain that this really is the case. Consequently it would be useful to test this assumption, preferably in a real retail environment.

13.7 Sex differences

Throughout the research a number of sex differences occurred. In the first study it was found that men put more importance on 'proportion' than did women. Women on the other hand evaluated the POP-displays more favourably when they presented a clear sign of 'unity'. There are a number of possibilities as to why men and women preferred different design principles, it may be due to cultural differences or perhaps they are innate differences. It would be relatively easy to test if such differences are due to cultural influences, and this could be investigated in a future study. A number of studies have shown that it is a common occurrence that men and women tend to evaluate aesthetic design differently (e.g. Holbrook, 1986, Rapoport & Rapoport, 1984).

Study 3 also showed a number of interaction effects that included gender for the aesthetic concepts tested. For example female participants rated both the blue and the red colour in a similar fashion when interacting with the various number of elements. Whilst the men rated the red colour to be far less attractive when there were only nine elements used in a display. No significant differences occurred for the elements that were displayed in a blue colour (regardless of how many elements were presented in the display). Clearly this demonstrates an overall preference for the blue colour. Such preference may be linked to that red is generally not perceived to be a 'masculine' colour.

Similarly to the results of Study 1, it is highly likely that men and women are socialised into perceiving aesthetic design differently.

It was also found that the visual searches that humans automatically conduct upon entering any environment (see Study 4) are subjected to sex differences. Men were found to identify blue coloured targets more rapidly than any of the other colours tested, whilst for women the shortest search time occurred for the green colour targets. On the whole the female participants also identified the non-basic coloured targets quicker than the male participants did. Also this may be linked to that women are more likely to be socialised to wear clothes and buy other products that are beige and turquoise. It is not unlikely that age differences may also have an affect upon visual search times. Different generations within the same culture or sub-culture are likely to be more accustomed to different colours due to particular colour trends being more or less influential during their upbringing. However no such differences were tested for in this study, but it may be advisable to take into consideration in future studies conducted in the area, as it does not appear to have been investigated by the researchers that have focused upon visual search procedures to date.

Finally the qualitative analysis of Study 5 also showed some support for previous studies that have shown that women tend to use more elaborate words to describe different kinds of colours (Rich, 1977; Tarrant, 1991). The findings discussed in this section supports previous findings that have suggested that women and men tend to have different aesthetic preferences (e.g. Laurie, 1981). The apparent sex differences demonstrate that it may be worthwhile to research your target audience carefully and adapt the designs of a POP-display accordingly. If a manufacturer wants to aim a particular product towards either of the sexes, it is important to be aware that men and women have different aesthetic preferences as it should dictate how marketing tools such as POP-displays are subsequently designed.

Figure 52: Conceptual framework based upon the research findings

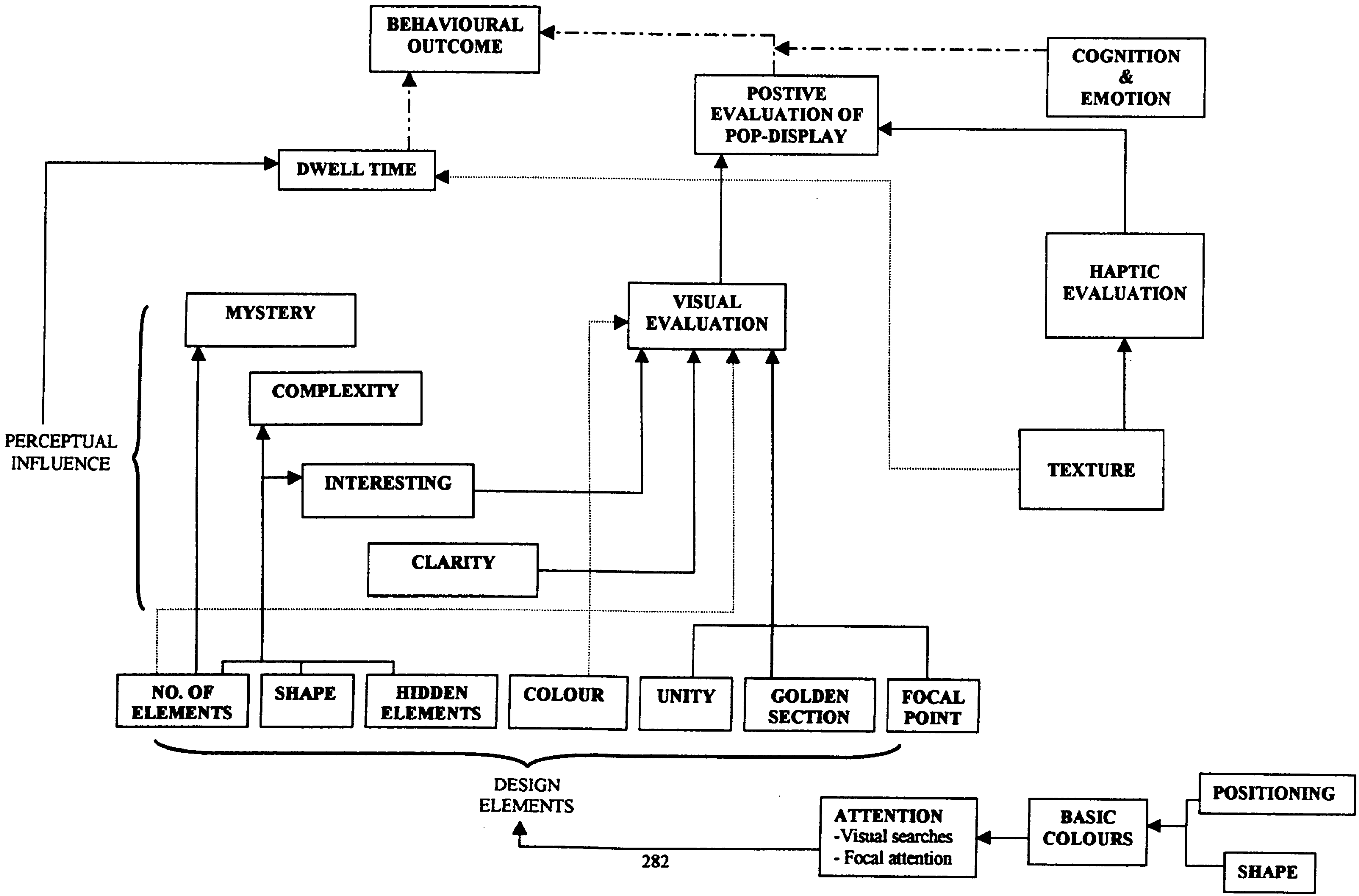


Figure 52 is shows how the outcome of the studies conducted link together. Starting from the bottom right it shows how positioning and shape influence how quickly a basic coloured stimulus will be detected. Once a consumer's attention has been captured there are certain design elements that should be given some consideration when trying to design an aesthetically pleasing POP-display.

It was found that design elements such as the number of elements used, the colour, the unity and the golden section all directly influenced the visual evaluation positively. The visual evaluation was also affected by perceptual factors such as how strongly the display was perceived to be 'interesting' and 'clear'. How many elements the display consists of, what shapes are used and when some of the elements are partially hidden, all determine whether or not a POP-display is perceived to be 'interesting'.

The amount of elements used was also found to influence whether or not a POP-display was perceived as being 'mysterious' or 'complex'. Furthermore the shape used and when the elements were partially hidden were also found to influence how 'complex' the displays were rated to be.

There are some doubts about whether or not 'mystery' affects overall 'attractiveness'. In the second study it was found that 'mystery' did increase the overall evaluation of the POP-display whilst in the third it was not found to increase linearly with the 'attractiveness' rating. It may be that 'mystery' has more of an impact upon the evaluation of a real POP-stand. In the second study the participants were shown real three-dimensional POP-displays, whilst in the third study they were evaluating abstract images. The results in the second study may also have occurred due to a combination of what the participants liked, what the display was advertising and whether the 'mystery' concept was suitable for those particular displays. The second explanation is the weaker of the two because the study used three rather diverse kinds of POP-stands. Without conducting further research it is difficult to determine whether mystery directly influences the overall rating of how attractive a display is. Consequently in this figure there is no arrow to indicate that 'mystery' affects the visual evaluation in a positive way.

The perceptual influence (e.g. 'mystery', 'complexity', 'interest' and 'clarity') was found to have the capacity to influence the dwell time. For example 'mystery' was found to increase linearly with dwell time ($r = .430$).

Also the type of texture used was found to have the capacity to increase the dwell time. The same textures also influenced overall haptic evaluation of a product, which in turn influenced the positive evaluation.

The purple coloured arrows at the top of the Figure 52 are hypothetical in that it is yet to be confirmed how dwell time and positive evaluation affect the behavioural outcome, i.e. probability of purchase. There is little doubt that a consumer's behavioural outcome will be affected by cognition and emotion, however since it was not actually tested here, it is still indicated to be hypothetical. The best way to test if dwell time and positive evaluation do in fact increase purchase probability would be within a real retail environment. However it would not be advisable to do so until it has been established what the most effective way is to increase dwell time and the overall evaluation of a POP-display.

13.8 Individual differences

The results presented throughout the thesis have been based on the participants' combined responses. That is not to say that individual differences would not be important to aesthetic evaluation of a POP-display. Clearly there will always be individual preferences for various design elements. It was decided not to focus upon such differences here, as it would be difficult to take individual preferences into account when constructing a framework for how POP-displays can be designed more effectively. Particular individual aesthetic preferences are likely to vary too greatly and would in turn require each POP-display to be tailor made to a particular individual. That is not to say that such differences are not of importance, but simply that when catering for a particular market, it is more useful to try and create a POP-display that has a broader appeal.

However, one would expect individual differences to be particularly prominent if one was measuring the impact of cognition and emotion upon the probability of purchase (as can be seen in Figure 52). In future studies it may be useful to research individual differences in relation to how people cognitively process stimuli encountered within the retail environment. Also by establishing whether there are design elements that generate individual responses more frequently than others, it will be possible to predict consumers' behaviour better. However, it may be safer not to include such design elements when creating a POP-display.

Furthermore (as previously discussed), it would be of great benefit to also explore if tactile interaction may affect aesthetic evaluation differently depending on whether consumers tend to have a desire to touch products or not. In this context it could also be explored whether there are individual differences in desire to touch and non-desire to touch and in turn how it affects aesthetic evaluation.

13.9 Wider implications of the research findings

Even though the research findings here are discussed in terms of their relationship to POP materials, it is possible that the results can be applied to areas beyond the environment in which POP-displays generally occur.

The outcome of Studies 3 and 4 may be useful to take into consideration when designing displays in museums or presentation of other vital information in complex environments such as warning signs on buildings sites or at train stations. It may also be useful for designing signs in larger institutions such as a hospital in order to provide clearer directions for visitors.

Also the influence of haptic evaluation may have wider implications in that the outcome of the studies may affect non-touch sales techniques such as the internet and mail order shopping. Perhaps (as previously discussed) it may be advisable that products that do not confirm a shopper's initial visual evaluation of what a product should feel like, are not made accessible to the consumer for a haptic inspection. It may be better to sell such products over the internet or through a catalogue. Similarly this may also be recommended for products that have textures that may not increase overall aesthetic evaluation.

From an ergonomic point of view, the idea of that certain textures may be favoured over others may be useful to take into consideration when designing tools, as it may indirectly make them more user friendly in that they would be more enjoyable to use.

13.10 Conclusion & final remarks

The aim of this thesis was to create a conceptual framework for how POP-displays can be made more effective within the cluttered and complex retail environments that they have to compete within. Whilst there is no doubt that POP-displays have the potential to increase sales figures of a product or service (e.g. Bemmaor & Mouchoux, 1991; Inman et al., 1990; Wilkinson et al, 1982), the question is how to do so in the most effective manner. This thesis illustrates the difficulty in investigating what it is that affects the effectiveness of POP-displays as a marketing communication tool, as there are almost an infinite number of factors that can be taken into consideration. Naturally it is impossible to cover all of the factors that directly or indirectly will influence a POP-display's effectiveness. Even so this thesis has managed to create a conceptual framework for factors that should be considered when trying to design a display that is not only aesthetically pleasing but that also has the capacity to increase the probability of purchase. In the process of doing so, it has also managed to address some of the questions that were posed at the beginning.

How can a POP-display effectively capture consumers' attention in cluttered retail environments? Evidence has been provided that basic colours can be used to reduce the visual search time in a cluttered retail environment. By making certain that a consumer rapidly and effectively finds what they are searching for, one is also indirectly preventing the possibility that other products and displays will distract the consumer. However if the consumer does not know what they are looking for the use of the right colour may also have the capacity to direct the consumer's attentional capacity to a particular POP-display. Again this is advantageous in that it minimises the chances that other stimuli will distract them and in turn therefore also increase the purchase probability.

This thesis also demonstrated that the overall evaluation of a POP-display can be positively affected by the use of aesthetic elements. Such aesthetic elements included different colours, shapes and the number of elements used, that could be utilised to create an image that can be perceived to be clear or interesting, which in turn is then rated to be more attractive than an image that is perceived to be complex. However as previously discussed, the use of colour is more often than not influenced by cultural, social and individual values which makes it difficult to predetermine how people will evaluate them. Other indirect evaluations such as those conducted upon touching the product promoted by a POP-display can also affect the overall image of a product. It was found that different textures have the capacity to influence the overall aesthetic evaluation of a product in both a positive and negative direction. Such findings are important when even if the display itself is effective in that it both manages to capture the consumer's attention and to lure them closer in order to explore the products on display further, the positive impression that may have been created may be undermined by the physical impact of the product/packaging. This suggests that it is not the design of POP-displays alone that will increase the purchase probability, but the combination of the design of the display and the design of the product. Subsequently it is imperative that they are both providing the consumers with 'same message'.

Even though it was found that only two aesthetic concepts (how clear and interesting a display is perceived to be) have the capacity to increase the attractiveness ratings of a POP-display, other concepts were found to have the capacity to prolong time exploration. From the study that investigated whether simple design elements such as colour and shapes can create aesthetic concepts such as 'mystery', it was concluded that certain aesthetic concepts such as 'mystery' and 'complexity' (in addition to how 'interesting' a display is rated to be) can increase the length of time a consumer spends in front of a POP-display.

Also the influence of haptic evaluation can be used to increase overall dwell time. This thesis has demonstrated that some textures have the capacity to make consumers interact with a product for a longer period of time. However, even though the results from the haptic evaluations shows that certain textures can increase the dwell time, it without conducting further research it is impossible to determine why and which ones have the capacity to prolong the dwell time.

At the beginning of the thesis it was suggested that an increase in dwell time is likely to increase the likelihood of purchase. So far there is no concrete evidence to support such a statement. It was not found that the increase of time in exploration of a haptic property also increased the overall evaluation of the product. However, it may still be possible that when a consumer is exposed to a display that they explore further out of curiosity whilst under time pressure, they may simply not feel that they have time to continue to search for alternative products. Consequently they may end up purchasing the product that they spent a longer time exploring. This may also be linked to memory effects in that even if they decide not to purchase the product immediately after exploring it further, they are more likely to recall it later on when they are running out of time and therefore may then return to the product and purchase it.

Overall this thesis demonstrates the complexity of the effects of design elements upon human perceptual responses. Furthermore it does also provide the groundwork for further studies that may be conducted to bring the influence of design elements upon human behaviour even closer together.

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Appendices

Appendix A

Factor one *(proportions)*

NBP 1	Level one	9 x 5.56" (golden section 1 x 1.618)
NBP 2	Level two	9 x 4.5"
NBP 3	Level three	9 x 3.6"

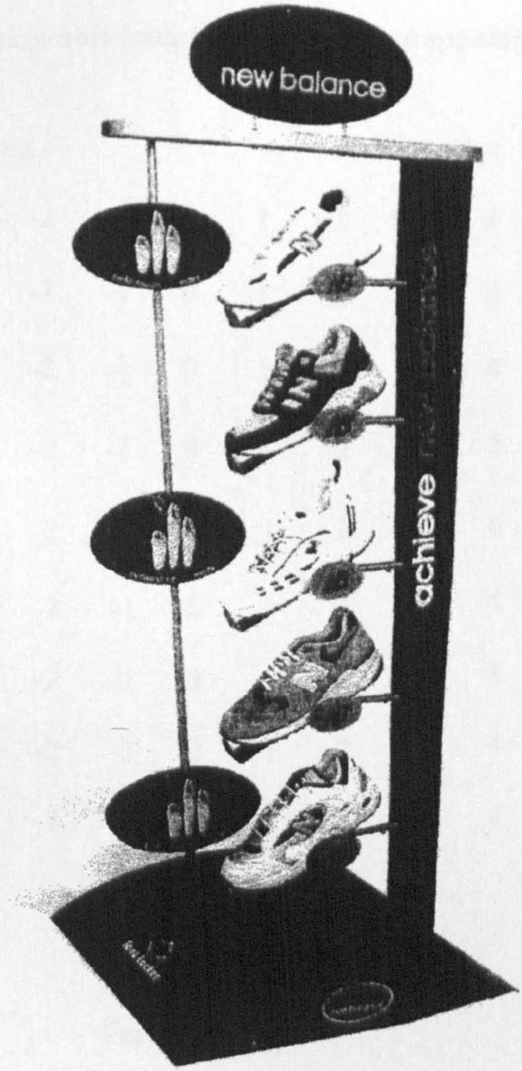
Factor two *(focal point)*

NBFP1	Level one	Large focal point (150%)
NBFP2	Level two	No focal point
NBFP3	Level three	Small focal point (100%)

Factor three *(unity/disunity)*

NBU1	Level one	Disunity
NBU2	Level two	Unity

Appendix B



Appendix C

There are 9 similar displays that I am going to show you one after another. Using the scale below please can you rate each one on the scales below (circle for how 'attractive' or 'unappealing' you find the particular POP-display.

Q: I find this display unit (point of purchase) unappealing/attractive?

	Unappealing							Attractive	
1.	-4	-3	-2	-1	0	1	2	3	4
2.	-4	-3	-2	-1	0	1	2	3	4
3.	-4	-3	-2	-1	0	1	2	3	4
4.	-4	-3	-2	-1	0	1	2	3	4
5.	-4	-3	-2	-1	0	1	2	3	4
6.	-4	-3	-2	-1	0	1	2	3	4
7.	-4	-3	-2	-1	0	1	2	3	4
8.	-4	-3	-2	-1	0	1	2	3	4
9.	-4	-3	-2	-1	0	1	2	3	4

Please tick:

Are you Male ☐ Female ☐

Appendix D

Questionnaire

Please circle the number you think most accurately describes the answer to the question.

Q1. **The overall design of this POP is plain and simple.**

Not at all — Very much so/ a lot

0 1 2 3 4

Q2. **I would find this POP easy to put into a category (similar to others I have seen).**

Not at all — Very much so/ a lot

0 1 2 3 4

Q3. **The different features of this POP hang together well.**

Not at all — Very much so/ a lot

0 1 2 3 4

Q4. **There is a lot of variation in this POP.**

Not at all — Very much so/ a lot

0 1 2 3 4

Q5. **This POP is a riddle to me.**

Not at all — Very much so/ a lot

0 1 2 3 4

Q6. **Overall, this POP is complicated.**

Not at all — Very much so/ a lot

0 1 2 3 4

Q7. **This POP is very intricate.**

Not at all — Very much so/ a lot

0 1 2 3 4

Q8. **This POP is made up of many features.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q9. **I think this POP contains secrets waiting to be discovered.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q10. **It is easy to work out the meaning of this POP.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q11. **I know there is more to this POP than meets the eye.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q12. **The different design features of this POP are connected well.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q13. **This POP is designed in an organised manner.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q14. **There is great harmony between the features of this POP.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q15. **The message of this POP is very clear.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q16. **I am very attracted to this POP.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q17. **I wish to uncover the secrets of this POP message.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q18. **This is a logical design.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q19. **I get very involved in looking at this POP.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q20. **This POP is distinctive from others I have seen.**

Not at all				Very much so/ a lot
0	1	2	3	4

Q21. **There is information in this POP that is suggested but obscured from view.**

Not at all				Very much so/ a lot
0	1	2	3	4

THANK YOU FOR YOUR TIME!

Appendix E

Please complete the following questions by circling the number you think best describes your responses. Please *DO NOT* leave any blanks, just answer the questions to the best of your ability. Thank-you!

	0 = Not at all				4 = Very much
1. The presentation of the DVD box is fantastic.	0	1	2	3	4
2. I find this DVD box aesthetically pleasing.	0	1	2	3	4
3. It is an interesting design.	0	1	2	3	4
4. The cover is visually appealing.	0	1	2	3	4
5. I am very attracted to this DVD cover.	0	1	2	3	4
6. The colour schemes are appealing.	0	1	2	3	4
7. The design of this cover is ugly.	0	1	2	3	4
8. I consider this DVD box being designed in an artistic manner.	0	1	2	3	4
9. The design of this cover is very unappealing.	0	1	2	3	4
10. The design of the cover is very attractive.	0	1	2	3	4

Please tick: Male ☐ Female ☐

Age: 18-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45 ☐

46-50 ☐ 51-55 ☐ 56-60 ☐ 61-65 ☐