Alleviating Statistics Anxiety in Psychology: Learner and Educator Viewpoints Understood Using Brookfield's Reflective Model

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Abstract

Statistics for psychology is a challenging aspect of undergraduate psychology courses but poorly understood in experiential terms. Accordingly, we drew on Brookfield's 'four lenses for critical reflection' to acquire insights from first year psychology undergraduate free text survey responses (learner lens), and psychology educator survey free text responses (colleague lens) which were content analysed. Scholarly and autobiographical lenses were also generated via literature reviews and written activities, respectively. Wide-ranging relevant pedagogic processes and dynamics (e.g., peer-peer collaborative work, cognitive load; the importance of constructive alignment and verbal articulation) were highlighted from learner and colleague lenses. The scholarly lens underscored tendencies within the evidence base, and our autobiographies, suggested how educator learning experiences served to facilitate compassionate and inclusive learning to mitigate impacts of statistics anxiety. Study findings produce a much-needed holistic account of statistics anxiety, prompt future research directions, and suggest priorities for classroom practices.

Keywords

Content Analysis, Learner Research Partners, Reflection, Statistics for Psychology, Statistics Anxiety, Stephen Brookfield

Introduction

Undergraduate and postgraduate Psychology students make up a notable proportion of learners in UK higher education (HE). In 2021/22, there were 140,425 enrolled HE Psychology students (4.9% of the entire student body; HESA, 2023). In the UK, statistics within Psychology research methods is a mandatory feature of any British Psychological Society accredited UK Psychology degree programme. This is well-illustrated with reference to the Quality Assurance Agency's (QAA) current Subject Benchmark Statement for psychology which underscores the importance of: *"... quantitative skills includ(ing)… measurement and analysis, including the ability to conduct and interpret appropriate statistical tests... (using) software specifically designed to implement statistical tests and may additionally be exposed to software designed to run experiments..."* (Section 3.7, QAA, 2023).

Despite the unequivocal emphasis on statistics within undergraduate psychology degree training, a mismatch has been observed between student expectations about Psychology and the emphasis on statistics in their Psychology BSc studies (Ruggeri, et al, 2008). One consequence of this mismatch is that some students face difficulties, and sometimes even anxiety, about this aspect of their studies (Onwuegbuzie, 2004). Statistics anxiety is characterised by worry, intrusive thoughts, mental disorganisation, tension and physiological arousal when dealing with statistics. It can hinder academic performance by interfering with data manipulation and problem-solving within statistics (Zeidner, 1991). Evidence has supported a view that statistics anxiety is detrimental to the student experience and is associated with lower grades (Onwuegbuzie & Wilson, 2003) and may be linked to learner disengagement (Davies and Jackson, 2014). Educators therefore face a 'double challenge'; to reduce anxiety and enhance engagement in lectures and seminars. Given these concerns, the growing body of research on statistics anxiety within undergraduate research methods courses is unsurprising (e.g., Mensah et al., 2023).

Antecedents of statistics anxiety are typically categorized as dispositional, situational, and environmental (Onwuegbuzie & Wilson, 2003; Ralston et al., 2016). Dispositional explanations for statistics anxiety focus on personality traits (e.g., high trait anxiety), attitudes and beliefs about ability (e.g., low self-esteem and self-efficacy) and prior experiences (e.g., past failures or difficulties in

related subjects). These studies provide evidence that supports demonstrative associations, whether direct or indirect, between higher levels of procrastination and increased statistics anxiety (Onwuegbuzie, 2004; Paechter et al., 2017). Learning strategies have also been implicated with statistics anxiety, with evidence suggesting links with the tendency for learners to use meta-cognitive strategies and a reduced level of statistics anxiety (Cui et al., 2019). Meanwhile, situational antecedents may include diverse factors including prior familiarity with statistics, satisfaction with the research methods course, and course and instructor attitude (e.g., Pan & Tang, 2005). Evidence has suggested that statistics anxiety levels may be increased when statistics is taught at a faster pace (Chew & Dillon, 2014), or in response to more disorganised teaching approaches (Cook & Catanzaro, 2023; Lesser & Reyes, 2015). Conversely, statistics anxiety levels may be *reduced* when statistics is taught following an entertaining and humorous approach (Lesser & Iii, 2015).

While the extant literature comprehensively addresses the antecedents of statistics anxiety, a critical focal point is that statistics can pose a significant obstacle to the student experience and learning outcomes, especially in an era where HE can be associated with substantial financial, time-related, social, and mental health challenges. For instance, recent meta-analytic evidence from a systematic review of 17 studies identified various factors contributing to statistics anxiety, including learning strategies, self-efficacy, procrastination, and self-awareness, alongside conflicting evidence regarding the role of sociodemographic factors (e.g., gender, ethnicity, parental education; Trassi et al., 2022). Findings from this meta-analysis are valuable partly because they underscore what may help mitigate unhelpful impacts of statistics anxiety where experienced among psychology learners. However, review findings and the surrounding field of literature focused on statistics anxiety also serve to illuminate, as already mentioned, the absence of qualitative research to understand lived experiences of statistics anxiety. If educators are to help support psychology learners overcome difficulties relating to statistics for psychology (a mandatory and important part of BSc Psychology degree programmes), a finer grained and specialised empirical focus is urgently required.

The Current Study

Research to date has helped support understanding of statistical anxiety in Psychology degree studies, ways of mitigating the impact of statistics anxiety among learners (Trassi et al., 2022) and ways to overcome such anxiety from an educator perspective. From our own teaching practices, we were mindful that experiences of studying statistics in psychology, including study-related anxiety, may emerge from a constellation of factors relating to both the learner (e.g. past educational experiences, social identifying factors including SES, race and gender) and relating to the learning environment, the curriculum and to teaching approaches.

However, research focusing on 'statistics anxiety' alone risks ignoring other characteristics, dynamics, and interested parties within the learning environment. For this reason, we designed a qualitative research study which, instead of solely focusing on 'experiences of statistics anxiety', took a broader focus on understanding experiences of engaging in statistics for psychology during HE studies from the perspective of both learners and educators. Accordingly, we aimed to expand understanding of learner engagement with statistics for Psychology in HE from multiple perspectives to produce a holistic understanding of the phenomenon based on insights into recent lived experiences and relevant literature. Our starting point was to draw on a framework of understanding that could identify blind spots and foster our self-awareness as Psychology educators to nurture more successful, sensitive and inclusive practices to benefit experiences and successful outcomes among our Psychology learners.

To produce this holistic understanding, we drew on Brookfield's (1995; 2017) four lenses for critical reflection (the autobiographical, learners' perspectives, colleagues' perspectives, and relevant scholarly literature). The few published studies reporting explicit applications of Brookfield's reflective model attest to its value in promoting co-constructed, and inclusive HE learning environments. For example, U.S. scholars have reported using Brookfield's model to develop a sophisticated and immersive online educational experience via understanding student and educator viewpoints on promoting collaboration and creative changes to using social media and networking ('Web 2.0') tools (González-Acquaro & Preskill, 2011).

Following a similar approach, we sought to generate new empirical insights into learner and colleague perspectives, and to consider these insights alongside our own autobiographical reflections and a global appraisal of relevant scholarly literature. By integrating these four lenses we aimed to (1) develop theoretical understanding of factors underlying statistics anxiety among Psychology students and (2) develop practical understanding of how educators can successfully approach the learning environment and initiatives to enhance Psychology learners' statistics-related study experiences and outcomes. Therein, the guiding research question relating to our primary empirical investigation was: 'What are the experiences, reflections and views of engaging with learning statistics for degree-level Psychology in workshop environments among learner and educator research partners?'

Methods

Participants

Six educator responses were acquired. All educators taught statistics for Psychology workshop sessions at the time of completing the survey. Authors 1 and 2 contributed two of the six survey responses. Responses were from educators with around 1-10 years' experience teaching in HE environments, aged 26 to 47, who self-identified as White British (n=4), Black British (n=1) or White non-British (n-1). Forty-three responses from first year undergraduate Psychology learners studying at a North London university and attending Spring term Research Methods workshops were acquired. These learners were mainly female (n=38, 88% sample), male (n=3, 7%) and in some cases respondents did not answer (n=2, 5%). Participants were aged between 19 and 43 years (Mean age = 32 years). Learners self-identified as Asian or Asian British (n=5, 12%), Black, Black British, Caribbean or African (n=6, 14%), White British (n=21, 49%), Mixed or from multiple ethnic groups (n=7, 16%), or self-identified as from another ethnic group (n=4, 9%). In response to a binary survey question item, a slight majority of learner participants indicated that "no" they had not previously studied any statistics prior to starting their Psychology degree (n=25, 58% overall sample).

Procedure

Ethical approval from <INSTITUTION MASKED> ethics committee was secured for this study and all participants formally signed consent to participate. Participation was voluntary and anonymous for learners and educators alike. To gain insights into learner and educator colleague perspectives on statistics anxiety, we created two different, partner-specific, online surveys using Microsoft Forms. There was overlap in survey question content between partner group surveys but also differences to reflect the distinctive starting points for each group. Textual data containing insights into educator perspectives was generated via five question items (e.g. “What has been working well when facilitating these sessions?”; “What has been working less well?”), while six question items were included in the learner survey (e.g. “What have been the main challenges in terms of engaging as a learner in Psychology statistics workshops?”; "What have been the things you have enjoyed while engaging as a learner in Psychology statistics workshops?").

Data Analytic Approach

Our account here focuses on the approach taken to textual responses from each partner group (i.e., learner and colleague lenses), which were subjected to content analysis, following an inductive variant of Hsieh and Shannon’s (2005) defined content analysis approach. Our approach followed the *conventional content analysis* approach defined in Hsieh and Shannon’s framework, given that our starting point was observation (rather than theory or keyword identification), and codes were identified iteratively during the analysis (and not pre-defined, or theoretically determined, for example). For each partner group in turn we first collated relevant responses, standardising text where required (e.g. editing to adjust/ clarify meaning). Second, we read the full body of material carefully and then produced initial codes to capture the focus of each textual extract in turn. Where material closely matched a previously generated code, this was linked to the code and the code phrasing was adjusted where required to match the referent data extracts. Finally, codes were organised into broader thematic categories. All analytic activities were led by <FIRST AUTHOR> and were corroborated by other article authors. Where there were different views about thematic architecture or phrasing, ideas were discussed and resolved. This work completed; we then drew on the empirical material to produce

our own educator reflections (i.e., autobiographical lens). Finally, we located and summarised key characteristics of the relevant literature on statistics anxiety (producing the scholarly lens).

Results

In this section, we present Brookfield's four lenses for critical reflection. We orientate the phenomenon first by presenting an illustrative summary of relevant literature (the scholarly lens). We then present our empirical data (offering learner and colleague lenses) before turning to our autobiographical reflections connecting the empirical findings with our own experiences of statistics for psychology as previous learners and current educators. We close this section with an integrative synthesis of the four lenses.

Scholarly Literature Lens

Here we present the scholarly lens by summarising key illustrative relevant literature on statistics anxiety and related phenomena. Relevant work has mainly focused on learners' anxiety and attitudes towards studying statistics for psychology. Some work has distinguished between situational and dispositional antecedents to statistics anxiety (Onwuegbuzie & Wilson, 2003; Ralston et al., 2016). Many psychometric measures of statistics anxiety have been produced, with a recent systematic review of 28 studies reporting psychometric properties highlighting their potential but also important limitations of these instruments (Faraci & Malluzzo, 2024). Usefully, these measures draw attention to key sub-scales/ factors relevant to understanding the conceptual span of 'statistics anxiety' as a psychological construct. For example, the widely used Statistical Anxiety Rating Scale (STARS) contains six discrete subscales focusing on worth of statistics (to the learner), interpretation anxiety, test and class anxiety, computational self-concept, fear of asking for help and fear of statistics teachers (Onwuegbuzie & Wilson, 2003). More recent STARS research has drawn on evidence to build the case for an alternative factor structure including statistics anxiety (comprising test and class anxiety, interpretation anxiety, and fear of asking for help) as a construct distinct from learners' attitudes towards statistics (e.g., Chew et al., 2018). Other work has focused on factors which predict statistics anxiety among university students, evident in Trassi et al.'s (2022) meta-analysis which illuminated relevant pedagogical predictors (e.g., learning strategies), and relevant psychological skills and

qualities (e.g., self-efficacy, self-awareness). Review findings highlight that multiple interwoven psychological factors are likely to be involved in learners' experiences of learning statistics for psychology. For example, recently published evidence highlighted complex, non-linear links between Austrian psychology learners' course knowledge, skill and ability beliefs and their statistics anxiety (Kaufmann et al., 2022). Scholarly literature illustrated above helps clarify the scope and boundaries of statistics anxiety and draws attention to factors likely to amplify or mitigate against learners' experiences of statistics-related anxiety during HE studies. However, this work also demonstrates the tendency toward an intra-individual focus on statistics anxiety with less attention to contextual issues including the educator-learner relationship and features and dynamics of learning environments and the wider socio-cultural arenas in which learning takes place.

Learner and Colleague Lenses

Below we present five themes reflecting convergence between learner and educator partners, followed by four themes discrete to either learners or educators, reflecting divergences between partner groups. Participants are identified following each quotation including standard details concerning stakeholder group and participant number (e.g., Learner1 = learner partner, participant #1).

Convergent Theme 1: Working With Others: Challenges Versus Opportunities. Engaging with learning statistics, for both research partner groups, could involve a tension in terms of how working with others was understood and approached. Learner responses indicated that workshops involving small group work were mixed overall but often valued:

"Interactive activities helped me understand better the concept by engaging with the material actively." **Learner35**

"Groups of 3+ helped engagement to learn and understand better… we have few opportunities to talk otherwise." **Learner27**

"If I can't figure out a task, I will ask for help from my classmates or tutors" **Learner19**

“It helps when you work in a group, if someone knows the stuff, and we come together if we don't understand something.” **Learner21**

“It is nice when we work as colleagues and help each other understand what some stuff from the workshop means.” **Learner38**.

Educators saw considerable value in peer interactions during statistics workshops, emphasising the importance of these early on in Psychology students' studies as a key learning tool:

"I have also seen students helping out other students, which is great for building relationships, particularly in year 1, and a great learning tool for the person who is explaining to their colleague" **Educ6**

"Aim to get the students to help each other, I encourage the more capable students to help others, which builds confidence in both parties." **Educ1**.

Among learners, peer interactions could evoke anxiety around academic confidence yet peer interactive work was also valued:

“I felt like the only one who does not understand SPSS” **Learner22**

“Work in groups with other people to learn from each other” **Learner41**

“Interact as much you feel as that's helping you study” **Learner17**

“I prefer to be with people I know well in the workshops, who I can direct questions to” **Learner22**.

Relatedly, some learners wanted more interactivity, while others, for sometimes quite personal reasons, wanted less interactivity:

“Not enough group interaction… it would be good to help each other” **Learner15**

“I don't interact well with others and struggle with interaction all my life” **Learner17**.

Convergent Theme 2: Valuing High Quality Contact and Relationships with Educators.

Relational aspects of engaging with learning statistics was another feature of textual responses for both research partner groups, and a second theme concerned how a valued educator-learner relationship helped support understanding of statistics for psychology in workshops:

“It's been useful to have a teacher there to explain things if you don't understand them” **Learner9**

“It is good when the lecturer come to us individually and listen to us and give feedback” **Learner27**.

Having diverse educators at all experience levels was highly valued among learners and educators alike, for example the second-year student ‘Success Coaches’ educators:

“Having them 1-to-1 was very helpful” **Learner17**

“It really helps having a higher-level student who can explain things in nice clear language” **Learner24**

“Having the success coaches helps bridge the gap between 'lecturer' and 'learner'” **Educ1**

“Allows for the students to have someone potentially more relatable as someone who has recently finishing the module/university.” **Educ2.**

Part of educator-learner engagement concerned the role of teaching materials and approach which were instrumental in enhancing or impinging on workshop engagement:

“Are the PowerPoint slides humorous and do they demand attention, or do they look like someone word-vomited… these things help” **Learner20**

“(Learning is harder) when we do not have interesting tasks” **Learner36**.

This way of humanising workshops was also identified as key among educators and data illuminated why learners might not utilise contact time with educators and ask questions in workshops:

“Have fun with it, crack some jokes to destigmatise and destroy the SPSS myth… make a learning environment where students look forward to their journey together rather than fearing a dry and difficult task”. **Educ5**.

“It takes time to understand certain ideas, so I tend to keep quiet when I’m supposed to ask question, because I don't know what exactly to ask” **Learner7**.

This was mirrored by educator responses acknowledging difficulties engaging all learners and the need to proactively engage learners:

“Class participation tends to be consistently low, with many students hesitating to engage in conversations, especially when prompted with questions.” **Educ4.**

“Spend around half the session with individual learners” **Educ1.**

Convergent Theme 3: Being Able to the ‘Big Picture’ Via Constructive Alignment. Improved workshop engagement was helped via appeals to a ‘bigger picture’ beyond individual workshop sessions, sometimes evoking the teaching design principle of constructive alignment which emphasises the need to connect learning objectives, session activities and assessment formulations for successful educational experiences (Biggs, 2003). This could be through using workshop activities to better understand the research process and broader module appreciation:

“Clear explanation of the bigger picture of the research process in SPSS” **Learner19**.

“Making what I learn easily applicable outside the workshop” **Learner34**.

"Engaging in statistic workshop can really help to understand the module better” **Learner24**.

Appealing to learners to connect workshop activities to wider degree learning was underscored by educators:

“Relate it back to topics they are interested in and underscore that research methods underpins ALL of psychology to have buy-in and then talk about the student in their journey to working in this area (even refer to them as psychologists) … empower them!” **Educ5.**

“When getting push back from learners about why they need to learn about research methods ask them to think about how the content covered in their lectures (e.g., social psych, clinical, etc.) is made possible by conducting research and that having a critical mindset and knowing what method is best to use and in what circumstance is a core skill at university." **Educ6.**

Greater consistency of educators between sessions seemed to facilitate this alignment and between-session continuity was generally valued:

“We should have the same teacher for workshops so that they understand exactly what we need” **Learner23**.

“It sometimes feels like we are starting again in every workshop, making it impossible to build up knowledge… we never pick up from the last session which makes it difficult to actually learn it” **Learner26**.

“Focus in the class, revise at home, read additional books, watch videos to understand the topic better” **Learner12**.

“Play around with SPSS on your personal computer to get more familiar with it - this will make workshops a lot smoother” **Learner34**.

And also valued was recognising the ‘long game’ of successful learning, with educators partly appealed to learners to look beyond the sessions to wider subsequent study and practice:

“It takes time to understand how SPSS software really works” **Learner7**.

"Reiterate to students that this is all about practice - things may be tough to start with, but with practice, things become easier, and you will develop your skill” **Educ6**.

Convergent Theme 4: Learning How to Manage Cognitive Load Demands. Engaging with learning statistics, for both research partner groups, could also involve managing cognitive load demands within the learning environment. Management of cognitive load within statistics workshops was evident in different load managing strategies identified by research partners including ‘chunking’ and locating key resources to consolidate learning:

“Break down things in sessions that will work for them” **Learner8**.

“Read additional books” **Learner12**

“Read the recommended statistics book” **Learner28**.

And engaging with varied media including visual and video resources to process load demands:

“Using diagrams and screenshots of where to go help a lot” **Learner21**.

“I have enjoyed the videos uploaded by the instructors on (the VLE) which answer all your questions” **Learner16**.

Several educators placed similar stress on the need to chunk session contents:

“Taking breaks - these have been requested and do seem to revitalise things” **Educ1**.

“(Concerns about) working with the range of applications (e.g. SPSS, apps anywhere, VLE) can be a challenge – there a lot is going on and using the double screen computer (for teaching) is not always helpful” **Educ6**.

Managing cognitive load demands involved re-thinking the volume of information delivered within learning occasions given associated fatigue:

“Too much information on the same day” **Learner6**.

“Sometimes it's just difficult to stay awake” **Learner10**.

“Difficult to focus on lectures where lots of information was delivered” **Learner37**.

Relatedly, reconfiguring the teaching schedule was identified as important by many learners:

“Long lectures and seminars don’t help when we have already attended an early lecture that morning” **Learner20**.

“It would be better if statistics workshops and lectures were moved to days without any other lectures” **Learner36**.

Still relating to cognitive load, albeit with a different emphasis, was one educator response which emphasised applying an appropriate educator approach to manage load:

“Teach with compassion and patience... explain to the students SPSS is all new, they don’t need to understand it all straight away." **Educ2**.

Convergent Theme 5: Learning Statistics is Novel and Involves Multiple Layers. A final convergent theme suggested how engaging with learning statistics, for both research partner groups, could benefit from a multi-layered approach in which the novelty of learning statistics was explicitly recognised. Learners were excited about workshops as something new which nurtured multiple skills (e.g., mathematics, software applications, statistical conventions) in tandem:

"Enjoying learning something new" **Learner39**.

"It is fascinating to see how data analysis can uncover insights into human behaviour and cognition" **Learner35**.

"Using SPSS I could better understand results/graphs in journal articles I read" **Learner31**.

However, this multi-layered quality carried challenges in understanding statistical terminology, understanding mathematical principles, interpreting SPSS output, learning conventions and using computers:

"Sometimes I lose track if all terms and meanings of the words!" **Learner38**.

"Explaining jargon is needed" **Learner15**.

"It's hard to find where I'm supposed to be clicking etc." **Learner9**.

"I have never been good at maths and having to deal with it makes me feel anxious" **Learner32**.

"Being able to understand the meaning of the statistic" **Learner41**.

"I am not a computer person, and I was afraid that I would not be able to understand anything" **Learner22**.

"Editing graphs tables according to APA guidelines" **Learner16**.

Mirroring the concerns voiced in learner responses, educators suggested how the multi-layered demands of workshop learning could be exacerbated by unequal access to optimal resources, unequal I.T. familiarity:

"Downloading SPSS necessitates a laptop or with substantial storage space, and students with older laptops cannot meet these requirements meaning they cannot practice at home." **Educ4**.

"Sometimes you are dealing with more basic IT skills issues, i.e., just navigating around a computer." **Educ6**.

Overcoming this resource and skill diversity in classes was demanding:

"I.T. understanding has been a major distinction of ability, and you can lose more capable students if the session is too slow, or lose weaker students if this is too fast… finding a balance is hard" **Educ4**.

Most learners valued ‘stepped’ teaching via illustrations:

"Go through the process again to make sure everyone understood" **Learner7**.

"To be explained in a simple way, and how it can be applied based on its function with examples" **Learner28**.

Despite some concerns that stepped illustrations could result in:

“A to-do list of tasks, which cause tutors to spend lots of time encouraging students to participate or spend lots of time forcefully walking the room through the steps that time allows for, which discounts further discussion or added depth to the concepts we learn about" **Learner34**.

Like learners, most educators felt that the stepped, illustrations worked mainly very well as a primary feature within workshop delivery and identified risks of overly prioritising independent learning:

“Taking some time to do 'walk-throughs' of conducting relevant analyses on SPSS” **Educ1**.

“Taking a guided illustrative task approach proves highly beneficial… expecting students to independently work through tasks and only reach out if they have questions doesn't always yield the best results, as some students may not speak up and end up feeling lost during the session” **Educ4**.

Learner Theme 1: Vocal Articulation to Check Understanding. Deeper engagement in learning was partly supported, for some learners, through verbally articulating understanding. Many learner responses underscored the importance of vocalising understanding in workshops including the role of asking questions, and asking educators for help:

“Ask questions if you don’t understand even if you think is a silly question" **Learner7**.

“To remember it's not embarrassing to ask for help” **Learner9**.

Again, tied to previous themes, some learners spoke about the role of interactions holding distinctive advantages:

“Through interactions with others in my psychology statistics workshop, I have been able to learn new things about statistics” **Learner41**.

“Discussion concepts and group activities can provide opportunities to see how methods are applied in various research” **Learner35**.

“Sharing thoughts help to think at a higher level” **Learner2**.

Learner Theme 2: Sensitivity to Personal Learning Style. Among some learners, reflecting and tuning in to one’s own personal learning style connected closely with successfully engaging with learning statistics. Indeed, several learner responses attested to the importance of identifying personal approaches for understanding things:

“Try to think in own words to have a better understanding” **Learner2**.

“Write key guidelines by hand at first, it helps with understanding how to use the software” **Learner7**.

This could involve making sense of workshop content in their own terms or pursuing core learning in spaces beyond formal workshop environments:

“Trying to understand the words then convert it in my own words” **Learner2**.

“Having peace and quiet to be able to focus” **Learner12**.

“Coming up with my own understanding methods of how to calculate statistics and understand them” **Learner41**.

This partly involved judicious self-management during learning encounters and peer interactions:

“They all use big words, I feel stupid sometimes but don’t be afraid to look less smart than others” **Learner38**.

“It feels good to know I’m not the only one struggling” **Learner8.**

Educator Theme 1: Crossing the Divide by Disclosing Personal Challenges. One distinctive feature of educator responses concerned the value of considering disclosing personal challenges with learning statistics for psychology. For example, one educator, describing how they had spoken to classes about their own experiences as learners studying during the COVID-19 pandemic:

"(I gained) renewed appreciation of the practical time with SPSS due to the unavailability of the software at home and the value of having a dedicated space with computers and time for practice to build confidence in SPSS skills." **Educ4**.

"I got my first ever low mark in SPSS as a 1st year undergraduate, talking about how daunted by the topic I was, how I overcame it (especially as a working-class student and the challenges that brings) and how this reduced the barriers to the topic and makes you more relatable." **Educ5**.

Educator Theme 2: Inoculate Against Anxiety in Research Methods Teaching. Being proactive about anxiety was an important strategy identified among educators to address statistics engagement in learning environments. Indeed, educators also spoke about explicitly dealing with anxiety within the educational approach:

“I like to acknowledge anxiety around things like SPSS but then underscoring that after engaging in the hands-on experience, there is a genuine reported sense of accomplishment and a realization that it ‘wasn't all that bad’.” **Educ4**.

Positive reinforcement was also described as important for overcoming anxiety including:

"Verbal praise or a simple acknowledgement of a job well done to foster a positive classroom culture and encourages students to meet expectations." **Educ3**.

Another educator response referred to:

"Almost a generational student trauma" linked to statistics and struggles for academic confidence and links even to mathematics anxiety from school... you have to acknowledge this before you even start to tackle the topic." **Educ5**.

Autobiographical Lens

Following Brookfield’s formulation, the autobiographical lens encourages educators to reflect on their own backgrounds, personal experiences, biases, assumptions and emotions relevant to teaching practices and learner interactions (Brookfield, 1995, 2017). As authors, we drew on our current experiences as educators but also our own experiences as learners, who had battled with learning

statistics for psychology within research methods modules. For example, <AUTHOR 1> recalls facing the challenge of juggling multiple layers of understanding, including statistical concepts, SPSS manipulation, and communicating findings. For <AUTHOR 1>, the tense environment of statistics classes often created pressure to grasp concepts immediately and finding appropriate resources was frustrating due to varying expectations and narrative styles in textbooks. <AUTHOR 2> initially felt overwhelmed by statistics, likening it to a foreign language, and believed lecturers assumed prior knowledge, making students reluctant to seek clarification for fear of appearing incompetent. <AUTHOR 3> struggled to connect abstract concepts from statistics and research methods to real-world applications, making the material feel distant and less engaging. For <AUTHOR 3>, long, cognitively demanding classes further hindered focus and absorption. Therefore, the features of our learner and educator colleague perspectives textual data, particularly those concerning cognitive overload and the abstract nature of learning statistics for psychology, resonated deeply with our own experiences as psychology learners. In completing this autobiographical reflection, we also note the potential for ourselves (and for educators in general) to lose our connections, each of us individually, with our historical first engagements with statistics for psychology, with how these environments felt (the place, other learners, educators) and with how these experiences manifested emotionally, cognitively and physically for us.

Integrating the Four Lenses

Our findings provide a much needed '360 view' of statistics anxiety. The scholarly lens showcases our grasp, as an academic community, of the key components and drivers of statistics anxiety as relating to experiences and outcomes of learners' engagement with statistics for psychology. This lens also highlighted the tendency toward an intra-individual focus on statistics anxiety in prior research and, potentially, in how educators may position understanding of statistics-related anxiety among learners (e.g., via an individual differences paradigm). Learner and colleague lenses helped highlight wide-ranging features of statistics anxiety with points of convergence and divergence between groups. Moving beyond an intra-individual focus, research partner responses dealt with opportunities and challenges linked to working with peers and educators during statistics workshops. Managing

cognitive load, an individual level process, was also a consistent concern and valuing the connection of individual statistics sessions/workshops to something wider (via constructive alignment) was implicit in responses. Learner data oriented towards the importance of verbally articulating understanding within sessions and again oriented toward the dynamics of educator-learner relationships in relation to educators' sensitivity toward different learning styles. Educators, similarly, orientated toward sharing their own experiences of making statistics anxiety, as a personally experienced phenomenon, explicit within classes to mitigate its potential impact. The scholarly lens had highlighted conventional understandings of statistics anxiety, while stakeholder lenses provided a contextualised understanding of how statistics anxiety can operate within learning environments. From this foundation, the autobiographical lens (our biographical reflections) emphasised the value of recognising learners and educators' common ground in terms of shared experiences of statistics anxiety. These shared experiences suggested how psychology educators have much to draw on, far beyond statistics for psychology related knowledge alone, in terms of how to construct and facilitate successful, compassionate and inclusive learning environments.

Discussion

Undergraduate Psychology remains popular as a degree course in UK Higher Education (HE), which is increasingly characterised by diverse learner cohorts with varied learning needs and characteristics. Given this popularity, very little research has explored learner experiences of statistics for psychology despite research methods being commonly identified as a demanding feature of psychology degree studies. To address this gap, we aimed to explore, holistically, experiences and viewpoints of engaging with learning statistics for degree level Psychology in workshop environments among learners and educators. Accordingly, we drew on Brookfield's 'four reflective lenses framework' presenting (in the previous section) learner, colleague, autobiographical, and scholarly lenses and offering an integration of these lenses.

Our findings, reflecting learner and educator viewpoints on engaging with learning statistics for degree level Psychology, provided rich and distinctive insights. Research partners shared viewpoints on the range of challenges and opportunities undercutting the possibilities for working with other

people in statistics for psychology workshops and valued high-quality contact and relationships with educators (Convergent Themes 1 and 2). Other points of stakeholder convergence emphasised the importance of managing cognitive load demands and the multi-layered nature of statistics for psychology studies (e.g., learning specific SPSS commands in tandem with recognising statistical writing conventions in workshop sessions) (Convergent Themes 4 and 5).

Findings are concurrent with previous research that has shown strong educator-student relationships and managing cognitive load demands significantly enhance learning outcomes (Cui et al., 2019; Trimarco, 1997). Perhaps surprisingly, both educators and learners oriented to the importance of constructive alignment in the learning paradigm to maximise possibilities for creating helpful connections between sessions, across the module and threading through broader BSc studies (Convergent Theme 3). Constructive alignment has been shown to enhance learning within psychology degree courses (Biggs, 2003). Facilitators of statistics classes should encourage more active learning in workshops to reduce anxiety and increase academic achievement (Clark & Foster, 2023). Data also contained points of departure highlighting areas of emphasis evident among learners only (i.e., Learner Themes 1 and 2) and educators only (i.e., Educator Themes 1 and 2). Notably, learners particularly identified the importance of articulating ideas vocally to check understanding (Learner Theme 1) and highlighted the value of educators showing sensitivity to individual learning styles (Learner Theme 2). This finding aligns with the idea that providing students with additional support on meta-cognitive strategies can help reduce statistics anxiety and enhance their learning (Cui et al., 2019). Educator responses, meanwhile, underscored the perceived value of disclosing personal challenges engaging with statistics for psychology within learning sessions to 'cross the divide' between educators and learners (Educator Theme 1) and, relatedly, to explicitly raise the reality of statistics anxiety as part of research methods teaching to inoculate against its potential threat to learning experiences and outcomes (Educator Theme 2). This finding aligns with prior research that suggests sharing personal stories can be an engagement strategy to promote student learning (Rhodes, 2019). Our autobiographical reflections on these findings found us recognising features of current

learners' experiences in our own learning experiences historically. We now turn to consider study implications and future research directions stemming from this study.

Limitations, future research and implications

Our study drew on multiple perspectives, empowering student voices to understand statistics anxiety from the perspective of individual learners (Liu & Breit, 2013). However, our survey was arguably over-represented by female participants and likely reflects the convenience sampling approach taken to data collection. Trassi et al's meta-analysis of 40 studies involving human sciences learners has provided some evidence of a higher incidence of statistics anxiety among women. However, these findings may not be transferable to Psychology learners and future studies should investigate gender differences in statistical anxiety among psychology students to determine if a significant gender gap exists and to address local and cultural factors which may contribute to gender gaps, where found to be present. Relatedly, future qualitative research could explore whether and how statistical anxiety connects with intersections between gender identity, sexuality, socioeconomic status, or sociocultural background. We also acknowledge that our study findings have illuminated the viewpoints of two research partner groups at one institution and potentially have transferability to other institutional settings, this contribution should be developed through comparison with other institutions to broaden the scope of the findings. Furthermore, given the emphasis of our research findings on learners' sensitivity to interactions with peers and educators within learning environments (for better and worse), qualitative research would also be well placed to explore relational dynamics underpinning the in-session study of statistics for psychology. Future longitudinal research can drive understanding of interactions between statistics anxiety, learning outcomes, learning performance (i.e., grades) and mental health and well-being outcomes. Finally, we acknowledge that the self-selected nature of our sample, which comprised relatively older learners, may not have captured the experiences of those engaging least with their statistics for psychology studies, potentially due in part to their experiences of statistics anxiety. Given this issue of selection bias we underscore that future research should prioritise sampling learners identifiable as consistent non-attenders and non-engagers to understand the potentially distinctive supportive needs of this less visible cohort.

> INSERT TABLE 1 <

Table 1 presents recommendations for addressing statistics anxiety ranging from an interventional level that most readers can incorporate most readily (i.e., as practitioners, within individual workshops) to higher levels requiring dedicated organisational change and/ or institutional policy planning. Implications are considered in this way partly to showcase how different targeted strategies adopted at different levels would help ensure a comprehensive and cohesive plan to mitigate statistics anxiety and enhance the learning experience.

Conclusion

The present study contributes to theoretical understanding of statistics anxiety and provides practical guidance to support educators in mitigating impacts of statistics anxiety within psychology research methods modules. Overall, these findings suggest that policymakers and developers of the curriculum need to consider the balance of cultivating collaborative and supportive learning environments to reduce anxiety and promote academic wellbeing in students. Future work can explore draw on these recommendations to inform specific interventions designed to help learners draw on available resources (whether from peers, from educators or self-determined) to mitigate negative impacts of statistics anxiety and achieve success in their psychology degrees.

Word Count: 5,942 words

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Table 1. Recommendations for Reducing Statistics Anxiety at Different Educational Levels

Intervention Level	Recommendations
Institution wide	• Encourage the use of previous students as teaching practitioners to create relatable and approachable learning experiences. • Embedding of learning developers specialising in statistics to help students develop research methods academic literacies. • Foster collaborative and supportive learning environments involving diverse teaching teams.
Faculty wide	• Foster a collaborative departmental culture that encourages the sharing of best practices. • Promote open communication channels among faculty members. • Provide regular professional development opportunities focused on innovative teaching methods.
Course wide	• Break down complex statistical content into manageable segments and use varied resources (e.g., visual aids, videos). • Implement constructive alignment in workshop design to help students see the bigger picture. • Acknowledge and address student anxiety early in the program to normalize feelings.
Individual workshops	• Enhance learners' understanding through contextual learning by connecting statistics to broader psychological research and real-world applications. • Share personal experiences to foster open discussions about common challenges and to create a supportive atmosphere.