Examining the relationship between anxiety and pathological demand avoidance in adults: a mixed methods approach

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Introduction: Pathological demand avoidance (PDA) is characterised by extreme avoidance of everyday demands. A recent study identified anxiety and intolerance of uncertainty (IU) as explanatory frameworks for understanding PDA in children, while anecdotal evidence suggests that anticipatory responses to uncertainty are also influential in the development and maintenance of PDA. Previous studies have relied upon parent-report of child representations of PDA; the lack of adult representation in the literature means that little can currently be said for how demand avoidance behaviours manifest in adulthood. The present study aimed to further an understanding of underlying mechanisms involved in the development and maintenance of PDA by recruiting a non-clinical adult cohort.

Methods: Experiment 1 utilised a correlational survey design in order to ascertain the extent to which MASQ-D30, IUS-12, and SBI scores could be used to predict EDA-QA scores (N = 163). In experiment 2, a subsample of participants from experiment 1 (n = 13) gave their experiential perspective on anxiety, uncertainty, and anticipation.

Results: Regression analysis found only MASQ-D30 and IUS-12 scores to significantly predict that of the EDA-QA. Additionally, interpretive phenomenological analysis of participant transcripts revealed four main themes (*approach-avoidance behaviour, factors influencing anticipatory bias, vulnerability factors associated with demand avoidance, and development*).

Discussion: Taken together, results from experiments 1 and 2 support the notion that anxiety and IU continue to play a role in the maintenance of PDA behaviours in adulthood, while participant descriptions implicate the role of anticipatory responses to uncertainty in the maintenance of demand avoidant behaviours in adults.

1. Introduction

'Pathological' Demand Avoidance (PDA) is a term that was initially coined by Elizabeth Newson to describe a unique pervasive developmental profile characterised by obsessive avoidance of everyday demands, use of fantasy/role-play, socially strategic behaviour and positive responses to spontaneity (Newson et al., 2003). Though considered

"reminiscent of autism", characteristics associated with PDA differ markedly from that of autism (O'Nions et al., 2014, p. 538). The DSM-5 describes Autistic Spectrum Disorder (ASD) as a collection of neurodevelopmental conditions (American Psychiatric Association [APA], 2013) characterised by impaired socio-communicative skills (e.g., "unusual social interactions") and restricted/repetitive patterns of behaviour (e.g., "stereotyped or repetitive speech"). Contrary to socio-communicative aspects diagnostic of ASD, PDA individuals have been described using socially strategic behaviour to avoid or control situations (Newson et al., 2003). In addition, children identifying with PDA are considered to have greater difficulty with emotional regulation compared to those with an ASD diagnosis (O'Nions et al., 2014; Malik and Baird, 2018).

At present, the DSM-5 does not acknowledge PDA, and thus, the profile is without formal diagnosis (American Psychiatric Association [APA], 2013). As such, there is a lack of professional consensus regarding PDA diagnostic criteria, which has encouraged the formation of numerous conceptualisations. Some believe that PDA represents an ASD subgroup; "reminiscent of autism", but requiring different educational approaches (Newson et al., 2003; Christie, 2007; O'Nions et al., 2014, p. 538). Indeed, leading UK organisations the National Autistic Society and PDA Society subscribe to this interpretation (National Autistic Society, 2020; PDA Society, 2023). Conversely, some argue that PDA is a common mental health condition prevalent in the general population; there are examples of non-autistic individuals (i.e., individuals who do not meet diagnostic criteria for ASD) meeting thresholds for descriptive measures of PDA behaviours (Reilly et al., 2014; O'Nions et al., 2016; see Woods, 2021 for a full review of PDA interpretations). Despite growing national recognition (National Autistic Society, 2020; PDA Society, 2023), little is currently known about PDA and its causes (O'Nions et al., 2014; Green, 2020).

This disparity has led to criticisms of PDA as a framework for understanding behavioural acquisition. For instance, some claim that PDA and autism lack differentiation, and that PDA is not different from autism, but rather an example of autistic self-advocacy (Milton, 2013; Moore, 2020). It is understood that many autistic individuals experience hypo/hyper-sensitivity to their sensory environment (American Psychiatric Association [APA], 2013). Thus, demand avoidant behaviours can be understood as a rational attempt to avoid aversive stimuli. The term 'pathological' is a label that assumes PDA behaviours to be incongruent with societal (i.e., neurotypical) norms (Moore, 2020). This view assumes a 'correct' set of behavioural criteria; behaviours that are deemed 'normal'/acceptable by society. When an autistic individual deviates from these behaviours attempting to exercise their agency (i.e., attempting to avoid aversive stimuli), they are dismissed as poorly behaved- this is frequently the case for PDA children in school settings (Truman et al., 2021; Doyle and Kenny, 2023). This type of pathologizing fails to acknowledge that demand avoidant behaviours are reactive, they represent an individual's attempt to navigate stimuli perceived to be unpleasant in their environment; when demands are anticipated to cause significant distress, avoidance is a judicious course of action (Green et al., 2018; Woods, 2018; Moore, 2020).

A transactional approach acknowledges demand avoidant behaviours as the product of an interaction between an individual and their environment (Green et al., 2018; Malik and Baird, 2018).

A transactional approach posits that PDA behaviours are adopted as a way of interacting with hostile environments; when met with aversive stimuli, demand avoidant behaviours facilitate rational avoidance of perceived threat (Green et al., 2018). In-keeping with this view, it has been argued that vulnerability factors associated with extreme affective responses to environmental exchanges may influence the development of avoidance behaviours (Green et al., 2018; Malik and Baird, 2018; O'Nions and Noens, 2018). Among those vulnerability factors are: fluctuating autonomic arousal, poor tolerance of uncertainty, a need for sameness, reduced response to social reinforcement/punishment, and difficulty predicting outcomes. It is thought that these vulnerability factors increase the likelihood that perceived demands (e.g., routine tasks such as brushing ones' teeth) become conditioned stimuli that trigger anxiety (Green et al., 2018; Malik and Baird, 2018). Once these emotions are primed, behaviours that are successful in terminating demands (i.e., distraction, diversion and excuses) are reinforced (O'Nions and Noens, 2018). Thus, by influencing anxiety, it is likely that these vulnerability factors contribute toward the development and maintenance of demand avoidant behaviours.

Though PDA research is in its infancy, and its relationship to ASD is contentious, anxiety and a need to control the environment have been theorised as driving PDA behaviours (Newson et al., 2003; O'Nions et al., 2014). The prevalence of comorbid presentation of anxiety and ASD has been estimated at around 40%, which has led some to recognise anxiety as an inherent component of ASD; diagnoses of specific anxiety disorders for ASD individuals must be sufficiently explanatory over and above ASD (Van Steensel et al., 2011; Masi et al., 2017). Indeed, 'control' has been identified as a distinct underlying drive for children with a diagnosis of ASD identifying with PDA behaviours (O'Nions et al., 2018). Research found that a need to "conform to expectations" and "anxiety about the unknown" were major causes of behavioural "meltdowns" among PDA groups (O'Nions et al., 2018, p. 225). Given that anxiety has an established association with ASD, it provides a promising avenue for the investigation of underlying mechanisms driving PDA behaviours (Hwang et al., 2020; Stuart et al., 2020). A greater understanding of anxiety and how it relates to demand avoidance has the potential to inform a more comprehensive understanding of PDA.

Intolerance of uncertainty (IU) has demonstrated an important cognitive mechanism underpinning the development and maintenance of anxiety in both autistic and neurotypical populations (Maisel et al., 2016). IU refers to the "tendency to react negatively on an emotional, cognitive and behavioural level to uncertain situations and events" (Buhr and Dugas, 2009, p. 216). Individuals with high IU believe that unexpected events are negative and something to be avoided; it is the uncertainty surrounding the event (i.e., anticipation of the event), rather than the event itself that causes distress (Boulter et al., 2014; Freeston and Meares, 2015). A recent meta-analysis found a positive association between IU and anxiety in a sample comprised of autistic children and young adults (4–24 yrs); higher anxiety was associated with greater intolerance of IU (Jenkinson et al., 2020). Moreover, the strength of this association is thought to be stable across neurotypes; comparable in both autistic and neurotypical populations (Osmanağaoğlu et al., 2018). There is also evidence that IU mediates the relationship between autistic symptomology and anxiety in adults with intellectual impairments (Sáez-Suanes et al., 2020). This has encouraged increasing acceptance of IU

as a transdiagnostic construct for understanding anxiety in both autistic and neurotypical populations (Treanor et al., 2011; Boulter et al., 2014).

Furthermore, characteristics of IU such as avoidance of unexpected events and the desire to make life as predictable as possible seemingly compliment those of PDA (e.g., obsessive avoidance of everyday demands and controlling behaviour; Newson et al., 2003; Stuart et al., 2020), suggesting possible utility for understanding PDA behaviours. This is an important avenue of study as targeting transdiagnostic mechanisms like IU have demonstrated significant treatment utility; mindfulness-based interventions that target IU by directing focus to the present moment and encouraging acceptance of the emotions generated by uncertainty, have been shown to successfully alleviate adult presentations of anxiety in a variety of conditions (e.g., Generalised Anxiety Disorder; GAD and Social Anxiety Disorder; SAD), including ASD (Treanor et al., 2011; Hjeltnes et al., 2017; Rodgers et al., 2018; Parr et al., 2020). In addition, Kildahl et al. (2021a) generated an intervention for an autistic adolescent case-study that aimed to increase certainty and predictability. Outcomes were positive; the authors report reduced anxiety symptoms, and a reduced reliance on self-injurious behaviours. If anxiety and IU can provide a framework for understanding the acquisition and maintenance of PDA behaviours, it is possible that support methods that have been designed and tested for autistic individuals, that aim to increase tolerance of uncertainty, could be operationalised for individuals identifying with PDA.

Stuart et al. (2020) found measures of anxiety and IU to be significant predictors of PDA behaviours in children and adolescents (16.7%); IU emerged as a stronger predictor than anxiety, accounting for 15.3% of the variance in PDA behaviours where anxiety offered an additional 1.4% of unique variance. Additionally, Stuart et al. (2020) broke PDA behaviours down into three factors (i.e., *attempts to control*, *withdrawal to fantasy* and *meltdown*); the authors found that the extent to which anxiety mediated the relationship between IU and PDA behaviours varied as a function of behaviour type. The authors propose a hierarchy of anticipatory responses to IU, in which a child first attempts to increase certainty of a situation by adopting controlling behaviour. When control fails to increase certainty, a withdrawal to fantasy offers retreat from the situation. If unable to retreat, the child resorts to meltdown behaviour; anxiety has increased to an uncontrollable level as a result of failed attempts to control or withdraw from uncertainty. The authors conclude that both anxiety and IU seemingly provide explanatory frameworks for understanding PDA behaviours. However, anxiety and IU together accounted for 16.7% of the variance in PDA behaviours, leaving much of the variance unaccounted for. In order to better understand PDA behaviours, other potentially influential factors must be considered.

Relating to poor tolerance of uncertainty and anxiety, 'maladaptive' anticipatory responses to uncertainty (also referred to here as *anticipation*) provide a paradigm with which to further investigate the development and maintenance of PDA behaviours. Indeed, anecdotal reports suggest anticipatory responses to uncertainty also influence anxiety in PDA (Cat, 2018). The 'Uncertainty and Anticipation Model of Anxiety' (UAMA) considers aberrant and excessive anticipatory cognitive, affective and behavioural responses to uncertainty to be at the heart

of anxious pathology (Grupe and Nitschke, 2013). When proportionate to the likelihood and severity of a future outcome, anticipatory processes perform an important adaptive function, allowing one to brace for, or avoid, potentially negative outcomes (Rosen and Schulkin, 1998). For example, the ability to effectively predict the emotional impact of a future outcome (i.e., affective forecasting) allows one to appropriately prepare for potential negativity by bracing themselves emotionally (Hoerger et al., 2010). The UAMA posits that anxiety disorders are associated with a number of processes that bias one toward overly conservative (i.e., effective but not efficient) preparatory behaviour in the face of uncertainty (Grupe and Nitschke, 2013). For example, anxious individuals show a tendency to overestimate the cost or probability of future outcomes (i.e., judgement bias), which is thought to influence the use of avoidance behaviours (Loewenstein et al., 2001).

The UAMA argues that avoidance behaviours triggered by excessive anticipatory responses to uncertainty prevent exposure to evidence that may contradict negative predictions about the future (Grupe and Nitschke, 2013). Thus, avoidance behaviour becomes a conditioned response to uncertainty, perpetuating negative beliefs about outcomes (MacLeod et al., 1997). As such, anticipatory processes are thought to influence negative beliefs about both future and past events (e.g., judgement bias; MacLeod et al., 1997). In context with Stuart et al. (2020), behaviours purposed to control or avoid uncertain outcomes (i.e., *attempts to control*, *withdrawal to fantasy* and *meltdown*) likely prevent the acquisition of evidence that could contradict negative assumptions about uncertainty. Without access to evidence to contradict negative predictions about the future, avoidance behaviours reinforce beliefs held about outcomes (e.g., that uncertainty is negative and something to be avoided). By perpetuating overly conservative preparatory behaviour, 'maladaptive' anticipatory responses to uncertainty have been found to play a key role in the development and maintenance of anxiety, and by extension, likely play a key role in the development and maintenance of demand avoidant behaviours (Heimberg et al., 2004; Grupe and Nitschke, 2013). However, to date, any potential relationship between anticipation and PDA remains unstudied, making it a pertinent area of investigation.

If avoidance behaviour limits the way in which PDA individuals acquire knowledge about the world, it follows that aversive attitudes toward uncertainty are likely to be maintained. If this is the case, anxiety and IU likely have a prolonged effect on PDA individuals that may last beyond childhood. Though little is currently known about the developmental trajectory of PDA, Stuart et al. (2020) found the use of demand avoidant behaviours decreased between childhood and adolescence, while levels of IU increased. This somewhat counterintuitive finding is thought to demonstrate the acquisition of strategies aimed at managing behaviours. The authors argue that with age comes a greater understanding of self, which influences the development of strategies that might help an individual regulate their emotions. However, without exposure to evidence that might contradict aversive attitudes toward uncertainty, IU is likely to increase with age. Theoretically, a decreased use of avoidance behaviour should allow an individual access to evidence that might refute negative predictions about the future, influencing a reduction in IU. The finding that the use of PDA behaviours decrease between childhood and adolescence, while levels of IU levels increase, seems disparate in relation to

theory, making the developmental trajectory of PDA a pertinent area of research.

The developmental trajectory of PDA behaviours, and their associated mechanisms, have far reaching implications that affect all aspects of life. For example, many have noted that PDA children face considerable challenges in education (Christie, 2007; Gore Langton and Frederickson, 2016, 2018; Truman et al., 2021), which has been attributed to poor management of emotional (incl. anxiety) and behavioural difficulties experienced by PDA children at school (Gore Langton and Frederickson, 2016). While this valuable research goes a long way to provide an understanding of the challenges faced by PDA children, and how anxiety relates to these challenges, it does not necessarily extend to adults identifying with PDA; again, if the relationship between anxiety, IU, and PDA behaviours changes over time (Stuart et al., 2020), adults identifying with PDA likely experience a unique set of challenges that differ from those experienced in childhood. If this is the case, much of the literature pertaining to how PDA is experienced in childhood cannot be extrapolated to experiences of PDA in adulthood. Given that the challenges faced by PDA adults are likely unique, it is important that research considers the developmental trajectory of PDA behaviours, and the impact they have on day-to-day experiences in adulthood. The present study aimed to further an understanding of how anxiety and IU relate to the developmental trajectory of PDA behaviours in adulthood.

Additionally, Stuart et al. (2020) rely upon parent-report. While parents provide a valuable perspective on the experiences of their child, weak correlation between parent and child-report have been documented during studies of anxiety and IU in ASD (Boulter et al., 2014; Neil et al., 2016). It has been noted that parents show a tendency to underestimate their child's internalising symptoms such that child-parent agreement for internalising symptoms is lower than externalising symptoms (Van Steensel et al., 2011). While able to identify externalising symptoms (e.g., autonomic arousal), parents likely miss many internalising symptoms (e.g., emotional regulation). In order to generate a comprehensive understanding of PDA behaviours and their developmental trajectory, internalising symptoms must be accurately represented. Though the demand avoidant nature of PDA makes direct participant testing difficult, it is imperative that first-hand experiential accounts are considered if further insight into how anxiety and IU relate to the development of PDA behaviours is to be gained (Newson et al., 2003; Van Steensel et al., 2011). By recruiting an adult cohort and utilising self-report measures, the present study aimed to address the disparity between child and parent-report and gain a greater insight into the development of demand avoidant behaviours.

Given the disparity regarding conceptualisations of PDA (i.e., PDA is a common mental health disorder, PDA is a subgroup of ASD, PDA is not different from ASD, etc.), it is important to acknowledge that we assume: (a) because non-autistic individuals have been reported meeting thresholds for descriptive measures of PDA behaviours (Reilly et al., 2014; O'Nions et al., 2016), that PDA behaviours are present in the general population (albeit probable that there exists qualitative and quantitative differences between autistic and non-autistic experience), (b) that PDA behaviours are a rational/appropriate response to aversive stimuli (Green et al., 2018; Malik and Baird, 2018), and (c) that anxiety, IU, and anticipation likely contribute

to the development and continued use of PDA behaviours (Grupe and Nitschke, 2013; Stuart et al., 2020). These assumptions justified our recruitment of a student population sample. It is important to note that despite these assumptions, the research design and data analysis of this study was undertaken within the existing frameworks/conceptualisations of PDA, not assuming any given interpretation to be correct; we sought a data driven interpretation of lived experience pertaining to anxiety, uncertainty, anticipation and demand avoidant behaviours.

Without a formal diagnosis, studies that consider PDA have been criticised for their inherent circularity; investigating an entity that lacks nosological validity necessitates collecting evidence from a self-identifying sample, which relies upon *a priori* assumptions regarding the validity of PDA as a construct (Green et al., 2018; Malik and Baird, 2018; Green, 2020). Furthermore, by relying on self-identifying samples, studies are susceptible to reporting bias (i.e., those who identify with a PDA profile are more likely to give answers that support their own interpretation of PDA). For this reason, a student population sample was deemed appropriate for the descriptive measures utilised in this study; using descriptive measures to collect data from a broad student sample, we hope to negate self-selection and reporting biases. Experiment 1 sought to investigate the relationship between anxiety, IU, anticipation and PDA behaviours, and to inform an inceptive understanding of how PDA manifests in adulthood. A battery of self-report questionnaires and hierarchical multiple regression were utilised. It was hypothesised that descriptive measures of anxiety, IU and anticipation would all highly predict that of PDA behaviours. Experiment 2 aimed to explore the experiential qualities of anxiety, uncertainty and anticipation using one-to-one semi-structured interviews. For the investigation of phenomenological experiences, qualitative methods are considered the most insightful (Willig, 2013). Given that uncertainty is inextricably linked to the phenomenological experience of anxiety arising from unpredictability, the use of qualitative methods was justified (Grupe and Nitschke, 2013).

2. Materials and methods

2.1. Experiment 1

2.1.1. Participants

For this study, a non-clinical adult cohort ($N = 170$) was recruited through the University of Aberdeen online participant recruitment platform, SONA, as well as via online social media platforms (e.g., Facebook). Thus, the sample consisted of both student and non-student participants; 26 males and 144 females took part in the study, with an age range from 18 to 66 and a mean age of 25. There were no demographic criteria (e.g., socioeconomic status) required for this study.

2.1.2. Materials

A survey was developed using Google Forms, consisting of measures pertaining to PDA behaviours (EDA-QA- questions 1–26), anxiety and mood (MASQ-D30- questions 27–56) IU (IUS-12- questions 57–68), and savouring beliefs, measuring beliefs held about future, present and past focused events (SBI- questions

69–92). Because anticipatory processes are thought to influence maladaptive beliefs about both future and past outcomes (e.g., judgement bias), the SBI was considered appropriate for the purpose of this study (MacLeod et al., 1997).

Extreme Demand Avoidance Questionnaire Adapted (EDA-QA). The EDA-QA is considered a reliable ($a = 0.92$) self-assessment tool for identifying PDA traits in adults (Egan et al., 2019). The EDA-QA consists of 26 items relating to behaviour associated with PDA (e.g., "I am driven by the need to be in charge" and " I sometimes use outrageous or shocking behaviour to get out of doing something"). Answers are given in the form: not true; some-what true; mostly true; very true. Scoring for all items follows: 0 = not true; 1 = some-what true; 2 = mostly true; 3 = very true, except for items 14 and 20, which require reverse scoring. A total possible score for all items (accounting for reverse scoring) is 78.

Mood and Anxiety Symptoms Questionnaire Short-Scale (MASQ-D30). The MASQ-D30 has been shown to provide a reliable ($a = 0.87$) descriptive measure that represents the dimensions of the tripartite model of depression and anxiety (Clark and Watson, 1991; Wardenaar et al., 2010). The MASQ-D30 consists of factors; general distress (e.g., "Felt confused"), anhedonic depression (e.g., "Felt successful"), and anxious arousal (e.g., "Startled easily"), with good discriminant validity between measures of depression and anxiety ($r = 0.45$; Reidy and Keogh, 1997). Individuals rate how much in the past week they have experienced "feelings, sensations, problems and experiences that people sometimes have" on a 5point Likert scale, from 1 (e.g., "not at all") to 5 (e.g., "extremely"). Accounting for items 11–20 that require reverse scoring, the MASQ-D30 allows for a total score of 110, with higher scores indicating more severe psychopathology (Schulte-van Maaren et al., 2012).

Intolerance of Uncertainty Scale 12-Item (IUS-12). The IUS-12 shows good internal consistency ($a = 0.91$), and a strong correlation between the 12-item IUS and the original 27-item IUS ($r = 0.96$), thus providing a useful descriptive measure of IU (Khawaja and Yu, 2010). The IUS-12 consists of two factors, prospective anxiety and inhibitory anxiety, where items are scored on a 5 point scale ranging from 1 (e.g., "Not at all characteristic of me") to 5 (e.g., "Entirely characteristic of me") with a total possible score of 60 (Carleton et al., 2007).

Savouring Belief Inventory (SBI). Demonstrating good test-retest reliability ($r = 0.84$), the SBI provides a descriptive measure of savouring belief comprised of subscales 'anticipation' (e.g., "Don't like to look forward too much"), 'savouring' (e.g., "Find it hard to hang onto a good feeling") and 'reminiscing' (e.g., "Don't like to look back afterward"; Bryant, 2003). Individuals rate "how true [are] the following statements for you", indicating how much they agree as a rating 1–7, 1 being 'strongly agree' and 7 being 'strongly disagree'. Accounting for items that require reverse scoring, the SBI allows for total scores ranging between -72 and +72.

2.1.3. Design

In order to examine the relationship between anxiety, IU, anticipation and PDA, a correlational survey design was employed. The study implemented a hierarchical multiple regression model; EDA-QA scores were adopted as the criterion variable, while gender and age as well as MASQ-D30, IUS-12 and SBI scores were predictor variables. Gender and age were entered as control

variables at stage 1. In line with the UAMA, and supported by the notion that anxiety and IU offer explanatory frameworks for PDA behaviours, MASQ-D30 and IUS-12 scores were entered into the regression at stage 2 and 3, respectively. To date, there has been no research focused on how anticipation relates to PDA thus, SBI scores were entered at stage 4.

2.1.4. Procedure

The survey was made accessible via online platforms (see *Participants* section above) for a period of 5 months (Nov. 2019–Mar. 2020). After completing a consent page, participants were informed that they had the option to omit any of the subsequent questions, but were asked to answer as many as possible to the best of their knowledge. Participants were then asked to provide their age and identified gender before completing the EDA-QA, MASQ-D30, IUS-12 and SBI, in that order. At the beginning of each questionnaire, detailed instructions were offered on how to answer each section (e.g., "Please rate how true the following statements are for you"). The survey took approximately 20 min to complete. Upon completion of the survey, participants were offered two debrief pages before submission; one with non-technical language, the other with technical language. Both debriefs included the contextual information relevant to the study and contact information of the researchers.

2.2. Experiment 2

2.2.1. Participants

For this experiment, a non-clinical adult cohort ($n = 13$; determined by theoretical saturation point) was recruited via the University of Aberdeen online participant recruitment platform, SONA, and through word-of-mouth. The sample consisted of both student and non-student participants; 3 males and 10 females, with an age range from 18 to 66 and a mean age of 28 (Supplementary Table 3). Having completed experiment 2, participants were asked to participate in experiment 1. There were no demographic criteria (e.g., socioeconomic status) required for this study.

2.2.2. Data collection

Each participant attended a one-to-one semi-structured interview lasting 20–45 min held throughout January and February 2020. Interviews were conducted by the primary researcher and were held in a quiet room of the Psychology department at the University of Aberdeen. Interview protocol included five primary open-ended questions (e.g., "Can you describe for me a time when you've had to plan for, or accommodate, uncertainty about an upcoming event?") with sixteen follow-up questions (e.g., "Are there any strategies you've developed to help you cope with this sort of uncertainty?") designed to elicit in-depth descriptions pertaining to the experiential quality of anxiety, uncertainty and anticipation. Additional probes were implemented in order to elicit further detail from participants when deemed necessary by the interviewer (i.e., if participants' initial response lacked detail or if the participant viewed the subject as important). Interviews were recorded using AudioLab running on a Lenovo 5s and transcribed using nVivo, after which recordings were destroyed and transcripts made anonymous.

2.2.3. Data analysis

Interview transcripts were analysed in accordance with the principles of interpretive phenomenological analysis (IPA; Willig, 2013). IPA places focus on the individuals experience and understanding; the researcher interprets in the sense of being in the participants shoes rather than introducing personal perspectives or pre-existing theory. Transcripts were analysed one by one, each transcript read multiple times. Units of meaning were then coded (e.g., "I was, like, shaking" was coded as, "shaking"); these codes were later grouped into themes before relationships between themes were examined in line with current literature. Themes were then integrated across transcripts in order to detect themes shared across participants. The experiential quality of anxiety, uncertainty and anticipation being the focus of the study provided parameters for what was included in the final analysis; as we were interested in commonalities in experience, themes that were poorly represented by participant responses (e.g., only two participant contributed to the theme, "normalising others' behaviour") or that lacked theoretical interest (e.g., "participant digressions", which included a participant defining a colloquialism) were dropped from the analysis. Throughout the process, consultation and feedback from the senior qualitative supervisor was sought on theme formation and interpretation of results.

3. Results

3.1. Experiment 1

Due to omitted survey items, data included some missing values: 0% for demographic variables and EDA-QA data, 0.14% for MASQ-D30 data, 0.05% for IUS-12 data and .15% for SBI data. The problem of missing data was addressed by using multiple imputation analysis (MIA) including all analysis variables with missing values under the assumption that missing values were missing at random (Schafer and Graham, 2002). Multiple imputations were generated using Multivariate Imputation by Chained Equations (MICE) in Rstudio; 5 datasets were imputed using 50 iterations and randomly generated seeds. Analyses run on each dataset were pooled according to Rubin's (1987) rules. Imputed values compared reasonably to observed values (Manly and Wells, 2015).

Before a hierarchical multiple regression was run in SPSS, relevant statistical assumptions were first tested. A sample size of 10–12 participants per predictor variable is considered sufficient for regression analysis (Pallant, 2013), therefore justifying the present sample ($N = 170$). Correlational analysis (Supplementary Table 1) showed that age ($r = -0.26$, $p < 0.001$), MASQ-D30 ($r = 0.58$, $p < 0.001$), IUS-12 ($r = 0.46$, $p < 0.001$) and SBI scores ($r = 0.35$, $p < 0.001$) were all significantly correlated with EDA-QA scores. Apart from age and SBI scores ($r = -0.08$, $p = 0.158$), all continuous predictor variables were significantly correlated with each other ($p < 0.001$); both tolerance and variance inflation factor (VIF) scores were found to be within acceptable limits (Tolerance > 0.5; VIF < 2), meeting assumptions for singularity and multicollinearity (Berry and Feldman, 1985). With regards to multivariate outliers, seven observations with Cook's distance scores greater than 4 times the mean were classified as influential and were subsequently

removed from the data set ($N = 163$; Chatterjee et al., 2000; McDonald, 2002). The data met the assumption of independent errors (Durbin-Watson value = 2.149) and scatter plots supported the assumptions of normality, linearity and homoscedasticity to be satisfied (Berry and Feldman, 1985).

Hierarchical regression was performed with EDA-QA scores as the dependent variable (Supplementary Table 2). Gender and age were entered at stage 1 as control variables. MASQ-D30 was entered at stage 2, followed by IUS-12 scores at stage 3 and SBI scores at stage 4. Age emerged as a significant predictor at stage 1, explaining 6.8% of the variance in EDA-QA scores. Examination of regression coefficients revealed that increasing age was associated with a decline in EDA-QA scores. The overall model was significant [$F(5, 157) = 18.446$, $p < 0.001$, $R^2 = 0.37$, R^2 Adj. $= 0.35$] and explained 37% of the variance in EDA-QA scores. Neither gender ($\beta = 0.062$, $p = 0.381$, 95% CI [-1.663, 4.326]) nor age ($\beta = -0.102$, $p = 0.151$, 95% CI [$-0.141, 0.022$]) were significant predictors, accounting for 0.2 and 6.8% of variance in EDA-QA scores, respectively. MASQ-D30 scores significantly predicted that of the EDA-QA ($\beta = 0.433$, $p < 0.001$, 95% CI [$0.101, 0.229$]), accounting for 27.8% of the variance, and IUS-12 scores significantly accounted for an additional 1.9% of the variance ($\beta = 0.163$, $p = 0.044$, 95% CI [$0.003, 0.231$]). SBI scores accounted for an additional .3% of the variance, which did not significantly improve the model (($\beta = 0.063$, $p = 0.414$, 95% CI [$-0.026.064$]). In addition, the final model revealed that MASQ-D30, IUS-12 and SBI scores accounted for 5.85, 18.36, and 11.98% of shared variance in EDA-QA scores, respectively.

3.2. Experiment 2

Theme development was driven by participant responses. Analysis of interview transcripts identified four main themes (and their constituent themes) relating to the areas of focus (i.e., uncertainty, anticipation, and anxiety): *approach-avoidance behaviour*, *factors influencing anticipatory bias*, *vulnerability factors associated with demand avoidance*, and *experienced-based development* (Supplementary Table 4).

3.2.1. Approach-avoidance behaviour

When faced with uncertain situations, all thirteen participants described utilising *approach* behaviour in a bid to reduce unknowns. *Approach* behaviour ranged from checking one's phone or Google maps, to engaging in what the researcher has termed *troubleshooting*, which involved performing inductive mental assessments of the situation ("... actually looking out for, as I say, that first clue where I can latch onto and think, ah right, there's a chain of events that I can take from here."). In addition, several participants indicated that when others' were involved in organising an event, the desire to reduce uncertainty increased ("Like if others plan it, I want to know, like, I have to know everything with details and everything"), which influenced more drastic *approach* behaviours ("Like if that means tracking down the person who's like running it, and sending them angry emails, I'll definitely do that").

When *approach* behaviours failed to reduce uncertainty, or revealed unpleasant outcomes, participants reported using

avoidance strategies; *avoidance* behaviour was reported in many forms by all thirteen participants and broadly fell into two categories, *cognitive* and *physical avoidance*. Many participants reported deploying cognitive strategies in a bid to shift attention away from uncertain outcomes ("I also try to, just try to avoid thinking about it as much as I can" and "...that's my coping strategy, to try to distract myself with other things"). By distracting oneself, one can avert attention away from the distressing stimulus, in this case, uncertainty. Another tactic utilised by participants to reduce distress was *physical avoidance*. *Physical avoidance* is best exemplified by a participant who described postponing an appointment upon discovering she needed a blood test ("...when I found out I needed a blood test I managed to postpone it for a month"). By postponing the appointment, the participant was able to reduce distress caused by her negative assumptions about the future for a limited period of time ("the first few weeks, I was like fine, I'd actually forgotten about").

3.2.2. Factors influencing anticipatory bias

Factors considered to be influential in the formation of anticipatory bias (Hoerger et al., 2010; Hall et al., 2018), including *attention and vigilance*, *emotional regulation* and the *cost and probability* of an event, were frequently cited by all thirteen participants. With regards to anxiety caused by the anticipation of a doctor's appointment, one participant described feeling greater negative affect as a result of prolonged *attention and vigilance* ("... and then like, more you think about it, the worse it gets in your brain..."). In keeping with the notion of prolonged *attention and vigilance,* other participants reported experiencing obsessive thoughts ("... it can go to a really obsessive level of imagining things again and again and again..."), noting that obsessive thoughts often lead to a sense of reduced control ("... yeah, you feel a lack of control over what's going on in your own mind...") and could even influence their actions ("Like, I would not do things that I wanted to do just because of thinking things over and over again").

Participants frequently spoke of heightened emotional responses to anxiety, uncertainty and anticipation, describing both positive and negative experiences of *emotional regulation*; while nine participants described being able to enjoy "excitement" when anticipating positive events such as going on holiday, twelve participants reported struggling with *emotional regulation* ("I find that really difficult to handle... especially at Christmas like such like an emotional time..."). One participant discussed the influence other people had on their ability to regulate emotions, explaining that though loved ones provided motivation to regulate negative emotions ("... making sure I didn't F and blind and swear and lose my temper while I'm doing it, keep everything jolly"), other people often inspired provocative emotional responses ("I don't accommodate other people very well, you know, almost waiting for them to say something so I can snap at them").

Finally, the *cost and probability* of an up-coming event was often described as influencing participants' emotional and behavioural responses to anxiety, uncertainty and anticipation. Many participants reported *life impact* as a factor contributing toward the perceived *cost* of an event ("... there are other things that I'm really stressed over, like it depends on how much the thing influences my, impacts my life"). One participant explained that when an event is perceived as having low *life impact*, the

emotional response to uncertainty surrounding the event is easier to accommodate ("... not knowing whether to take an umbrella, it's not really something that I dedicate a lot of mental energy to because it's like, you know, if, if it rains then you know, I'll just get wet and like, you know, it'll be unpleasant but like, I'll get over it"). Another participant noted that when an event is perceived as important, they like to allocate additional *attention* ("Other things I just like to think about in extreme depth, just in case but it's always like important things").

3.2.3. Vulnerability factors associated with demand avoidance

As described by O'Nions and Noens (2018), vulnerability factors associated with demand avoidance include: fluctuating *autonomic arousal*, *poor tolerance of uncertainty*, a *need for sameness*, reduced response to *social reinforcement/punishment* and *difficulty predicting* outcomes. All thirteen participants frequently spoke of issues pertaining to the aforementioned vulnerability factors.

Fluctuating *autonomic arousal* was discussed in varying forms; one participant described feeling "really shaky" and physically ill followed by an abrupt recovery ("I remember wanting to throw up in the car park, outside of Graham court in Hillhead. But once I was in and once I met my flatmates, everything was a lot better. I felt immediately fine."), while another participant described feeling "sweaty" and "fidgety" ("... until the actual train turns up it's, as I say, an actual physical reaction, I start to sweat"). In both cases, fluctuating *autonomic arousal* was experienced while in states of uncertainty. Fluctuating *autonomic arousal* was described in tandem with *poor tolerance of uncertainty*; one participant reported suffering from panic attacks, the unpredictable nature of which influenced a perpetual fear of uncertainty ("I wouldn't say that I've learned to cope with uncertainty more that I'm constantly in fear of uncertainty").

Similarly, a *difficulty predicting* outcomes was often reported alongside a *need for sameness*. Several participants described the unpredictability of going to new places, explaining that anything could happen, often focusing on potential issues that could arise during transit ("... leaving the house to get to the airport is like just the absolute climax of like my anxiety. Because I'm thinking, like anything could happen"). One participant spoke of restricting the places they travel to in a bid to reduce potentially negative outcomes ("I don't usually go to places I necessarily haven't been before.... I mean, my sense of direction is terrible"), while another noted that the anxiety caused by the unpredictability of travel could be reduced upon return journeys ("... but once I've been somewhere once, it's miles better to think about going there. So, somewhere I don't know can be difficult"). Many participants found that by familiarising themselves with scenarios, *difficulties predicting* outcomes could often be overcome. Familiarity was reportedly achieved both by physically acquainting oneself with a scenario, or by imagining an event before it happened ("I'm just imagining what is the realistic thing to happen. I need to familiarise myself with it").

Unlike the aforementioned vulnerability factors, few participants reported any extreme experiences of reduced responses to *social reinforcement/punishment*. One participant spoke about their retirement from teaching and described being frustrated with the obligations of social convention. In this

instance, the participant disliked receiving praise from peers and felt inspired to physically avoid them ("My retirement day was taken up with avoiding the negative sides; having to stand up and make a speech, being stopped in the corridor by the staff and them waffling at me and me thinking, "you don't give a shit and neither do I"). Conversely, another participant described a scenario that involved damaging their car. This participant considered the event in context with the financial implications and their mother's negative response, demonstrating an appropriate response to anticipated parental disapproval ("...who's going to pay for it? My mum is going to be so angry").

In addition, many instances where participants reported experiencing vulnerability factors (e.g., *difficulty predicting outcomes*), *feelings of self-consciousness* were also reported. Here, we define *feelings of self-consciousness* as the feeling associated with self-judgement and/or judgment from others. For example, one participant explained that a lack of confidence lead to feeling foolish when met with uncertainty ("... if you're not very confident about your intelligence, your looks, your place in society, and you're suddenly put in a position where you don't know what's happening, you look a t**t and you really feel it"). Here, the participant implicates the impact of judgement from others (e.g., "not very confident about [...] your place in society", and "... you look a t**t..."") influencing *feelings of self-consciousness* (e.g., "... you really feel it"). *Feelings of self-consciousness* were often described leading to *avoidance*; one participant explained that shame provoked by *poor tolerance of uncertainty* lead them to isolate from their friends ("... you do feel like a shame about what's going on in your head, and you can kind of isolate yourself a bit"). Though there is currently no mention of self-consciousness in the literature pertaining to vulnerability factors associated with demand avoidance, participant responses in the present study seem to suggest a connection. Thus, driven by participant response, the decision was made to include *feelings of self-consciousness* as a subtheme under *vulnerability factors associated with demand avoidance*.

3.2.4. Experience-based development

All thirteen participants reported age related changes in their affective responses toward, as well as in their ability to strategically cope with, anxiety, uncertainty and anticipation. Participants described adapting their perspective, such that their view of the world changed with *experience-based development*. One participant described this change in perspective, noting that with experience came the ability to forecast a broader range of possible outcomes ("When I was younger, it seemed like there was only one possible route that it could go, but then experience tells you that it's not like that"). With *experience-based development*, participants commented on their ability to cope with anxiety, uncertainty and anticipation; all thirteen participants described *strategies* that they had implemented in order to facilitate tolerance. Many of these *strategies* involved attentional control, focusing on "living in the moment" ("... so, there's a phrase I have in my mind all the time lately and it's like if you don't know how it's gonna go, do it first and then plan... just be happy right now. Do whatever you can right now. And I think that this strategy has helped me be happier"). Many participants also described being *motivated* by stress, claiming that without stress, they would fail to achieve

their goals ("Well, if I didn't feel stress before, I wouldn't get anything done").

4. Discussion

The aims of the present study were (1) to examine the relationship between anxiety, IU, anticipation and PDA and in doing so inform an understanding of how PDA manifests in adulthood, as well as (2) to document experiential qualities pertaining to anxiety, uncertainty and anticipation. Regression analysis conducted in experiment 1 found that the overall model, MASQ-D30, IUS-12 and SBI scores combined accounted for 37% of the variance in EDA-QA scores. The hypothesis that scores on the MASQ-D30 and IUS-12 would highly predict that of the EDA-QA was supported, with MASQ-D30 and IUS-12 scores accounting for 27.8 and 1.9% of the variance in EDA-QA scores, respectively, after controlling for gender and age; much of the variance remained unaccounted for. That SBI scores did not add significant predictive power to the final model stands in contrast to the hypothesis that SBI scores would highly predict EDA-QA scores. In addition, the present study found anxiety to be a stronger predictor of PDA behaviours than IU (accounting for 27.8 and 1.9% of variance in EDA-QA scores, respectively), which contrasts previous research that found IU to be a stronger predictor of PDA behaviours than anxiety (Stuart et al., 2020).

Stuart et al. (2020) found IU to be a stronger predictor of PDA behaviours than anxiety, arguing support for the notion that IU underpins anxiety in PDA. IU has been shown to underpin anxiety in adult populations, both autistic and neurotypical; greater IU is associated with elevated anxiety (Maisel et al., 2016; Cai et al., 2018; Osmanağaoğlu et al., 2018; Ouellet et al., 2019; Jenkinson et al., 2020). In addition, successful interventions that aim to reduce anxiety, in both adult autistic and GAD populations, by increasing tolerance of uncertainty are testament to the transdiagnostic nature of IU (Bomyea et al., 2015; Torbit and Laposa, 2016; Rodgers et al., 2018). That the present study found anxiety to be a stronger predictor of PDA behaviours than IU, stands in contrast to previous findings. That said, the present study found IU to account for 18.36% of overlapping variance in PDA behaviours; as MASQ-D30 and IUS-12 scores were highly correlated ($r = 0.57$, $p < 0.001$), it is likely that a portion of this variance overlapped with anxiety. If this is the case, it is possible that the MASQ-D30 and IUS-12 were measuring some commonality, suggesting that there is some underlying relationship between anxiety and IU (Boulter et al., 2014). However, because shared variance cannot be accurately attributed to any specific variable, this interpretation is purely speculative. Moreover, despite its likelihood, no causal claims can be made about the relationship between anxiety and IU. Thus, the findings of the present study do little to support or refute claims that IU represents a transdiagnostic construct for understanding anxiety. Nevertheless, both anxiety and IU were found to significantly predict PDA behaviours, which is in keeping with the notion that anxiety and IU offer explanatory frameworks for understanding PDA.

Stuart et al. (2020) propose a hierarchy of anticipatory responses to IU, in which a child first adopts controlling behaviour in order to reduce uncertainty and attenuate anxiety; unable to

control or retreat, the child resorts to meltdown behaviour as a result of heightened anxiety. Similarly, all 13 participants in experiment 2 reported using *approach-avoidance behaviour* in order to cope with uncertainty and reduce anxiety (**Supplementary Table 4**); *approach* behaviour was described in order to illicit control and reduce uncertainty ("I'll put more of a concerted effort into finding out about the uncertainty, if that means tracking them down and sending them angry emails, I'll definitely do that"), followed by *cognitive* or *physical avoidance* of uncertain or unpleasant outcomes ("… we might go here, we might go there… I'm like, well I'm just not going to go"). Characteristic of anxiety disorders, such as GAD, the desire to reduce unknowns and subsequent avoidance of uncertainty associated with *approach-avoidance behaviour* echoes a hierarchy of responses to IU associated with PDA. Indeed, controlling behaviours purposed to reduce uncertainty observed in PDA by Stuart et al. (2020), resemble approach behaviours characteristic of GAD described by Buhr and Dugas (2009, 2012). Furthermore, retreat behaviours, such as avoidance or use of fantasy/role-play that Stuart et al. (2020) describe in PDA, echo the avoidant behaviours associated with GAD noted by Buhr and Dugas (2009, 2012). Arguably, *approach-avoidance behaviour* described by participants in experiment 2 is in keeping with the incremental approach to uncertainty demonstrated by PDA individuals in previous studies; attempts to control/reduce uncertainty, followed by avoidance (O'Nions et al., 2018; Stuart et al., 2020). The present study furthers previous findings by demonstrating the continued relevance of anxiety and IU as explanatory frameworks for understanding demand avoidance in adulthood.

Contrary to the hypothesis, SBI scores failed to significantly predict that of the EDA-QA. Oglesby and Schmidt, 2017 found that for adults high in IU, anxiety does not change as a result of greater certainty; these individuals report similar levels of anxiety for an uncertain versus certain threat. Similarly, Reuman et al. (2015) found adults reported experiencing similar levels of anxiety when faced with high-threat situations irrespective of certainty. Taken together, these findings suggest a ceiling effect; anxiety caused by the risk of an outcome outweighs the effect of IU (Reuman et al., 2015; Oglesby and Schmidt, 2017). Here, anticipatory cognitive reasoning (i.e., the belief that an outcome is sufficiently threatening to pose serious risk) influences anxiety over-and-above anxiety caused by uncertainty. The UAMA considers excessive anticipatory cognitive, affective and behavioural responses to uncertainty to be at the heart of anxiety (Grupe and Nitschke, 2013). Indeed, if anxiety and IU both play a role in the maintenance of PDA behaviours, one might expect anticipation to also be influential. However, despite anxiety and IU significantly predicting PDA behaviours, anticipation failed to add any significant predictive power to the final regression model. The SBI is comprised of three subscales; *anticipation*, *savouring* and *reminiscing*, thought to represent beliefs held about future, present and past focused events (Bryant, 2003). Because anticipatory processes are thought to influence beliefs about both future and past outcomes (e.g., judgement bias), the SBI was considered appropriate for the purpose of this study (MacLeod et al., 1997; Grupe and Nitschke, 2013). However, it is possible that because only 8 items explicitly focus on anticipation, the SBI might not have been a specific enough measure. At the time of study, there was not a more precise self-report measure of anticipation available. Future research may

benefit from the development of a measure that is specific in tapping factors relating to maladaptive anticipatory responses to uncertainty.

Despite SBI scores failing to significantly predict PDA behaviours, experiment 2 noted *factors influencing anticipatory bias* (**Supplementary Table 4**), a theme that supports the role of anticipatory responses to uncertainty in the maintenance of avoidance behaviours (Hall et al., 2018). According to Grupe and Nitschke (2013), anxiety disorders are associated with a number of 'maladaptive' anticipatory processes that bias one toward overly conservative preparatory behaviour in the face of uncertainty. Indeed, anxious individuals demonstrate a tendency to perceive uncertainty as threatening, and thus, bias their attention toward the detection, and avoidance, of uncertain stimuli (Derryberry and Reed, 2002). By doing so, anxious individuals are less likely to attend to, and benefit from, evidence that might contradict negative predictions about the future (e.g., that uncertainty is negative and something to be avoided; Bar-Haim et al., 2007; Grupe and Nitschke, 2013; Ouellet et al., 2019). One participant in experiment 2 noted that by allocating excessive *attention* to the uncertainty surrounding a future event, they were less likely to engage in *approach behaviours* (e.g., talking to others) that might provide evidence to refute negative prediction about the future ("I feel like in the case of like when I had my blood test I like socialised less, like talked less. I feel like I was focused on one thing"). Without evidence to contradict negative predictions about the future, the participant resorted to avoidance ("… they wanted to do [the blood test] that afternoon and I said no, and like I postponed it for a month"). Importantly, this avoidance tactic did not reduce anxiety caused by the impending event long term; anxiety persisted until the blood test had concluded ("I couldn't enjoy anything. I was like, I'm gonna have to do that at the end of the week"). These findings support the notion that anticipatory responses to uncertainty are influential in the development and maintenance of avoidance behaviours (Grupe and Nitschke, 2013; Hall et al., 2018).

Of note, when describing *attention and vigilance,* 4 participants reported experiencing obsessive thoughts ("… it can go to a really obsessive level of imagining things again and again and again…"), noting that obsessive thoughts often lead to a sense of reduced mental control ("… yeah, you feel a lack of control over what's going on in your own mind…"). Given that 'need for control' has been identified as a key source of anxiety underpinning avoidance behaviours, difficulties relating to *attention and vigilance* that influence a sense of reduced mental control likely cause further distress (Reilly et al., 2014; O'Nions et al., 2018). Indeed, one participant reported that obsessive thoughts influenced his desire to avoid activities ("Like, I would not do things that I wanted to do just because of thinking things over and over again"). Another participant reported benefiting from cognitive behavioural therapy (CBT), explaining that learning techniques aimed at improving cognitive control helped to alleviate anxiety ("I used to go to CBT therapy years ago, and I felt that some of the sort of coping mechanisms that I learned there really helped me"). This involved refocusing the situation away from negative outcomes and attending to potential opportunities for growth ("… to look at sort of unpleasant situations as like as sort of capacity for growth and trying to not try to, try to see it more as a learning experience rather than an unpleasant one"). While participant reports potentially support the notion that poor cognitive control

influences anxiety and the subsequent use of avoidance behaviours, they also highlight the potential for intervention (Green et al., 2018; O'Nions et al., 2018). While more research is needed to confirm the efficacy of such interventions, there is evidence that CBT and mindfulness-based therapies can beneficially impact anxiety for some autistic adults (Menezes et al., 2022). If difficulties with *attention and vigilance* contribute toward anxiety, techniques aimed at improving attentional control may be beneficial for some PDA individuals; future research might consider the utility of tailored CBT and mindfulness-based interventions for helping PDA individuals manage anxiety.

Age was found to be a significant negative predictor of EDA-QA scores at stage 1, suggesting that age was associated with a diminishing use of extreme demand avoidant behaviours. This finding supports that of Stuart et al. (2020) who report age to be associated with a decline in the use of PDA behaviours between childhood and adolescence. It is plausible that increasing age is associated with the development of strategies that may help to reduce anxiety, such that demand avoidant behaviours become less explicit over time. Indeed, participants in experiment 2 discussed the acquisition of *strategies* associated with *experience-based development* (**Supplementary Table 4**), explaining that, as one gets older, they acquire skills necessary to better cope with affective responses to uncertainty and gain a greater degree of control over their behaviour. One participant noted that with age comes a broader understanding of possible outcomes that help to inform more accurate predictions about the future ("So as you get older, you start to realise that there's going to be lots and lots of different possibilities..."), while another reported "compartmentalising" as an effective technique for coping with uncertainty and reducing anxiety. Thus, participant reports support the notion that age is associated with the development of effective strategies for coping with anxiety, which likely mitigates the use of extreme avoidant behaviours (Stuart et al., 2020). Moreover, that age was found to negatively predict PDA behaviours in adults extends the findings of Stuart et al. (2020) by suggesting that reliance on PDA behaviours continues to diminish beyond adolescence and into adulthood.

An age-related structural change in how anxiety and IU drive PDA behaviours might account for the disparity between results found in experiment 1 (i.e., that anxiety emerged as a stronger predictor of PDA behaviours than IU in adults) and that of Stuart et al. (2020) (i.e., that IU emerged as a stronger predictor of PDA behaviours than anxiety in child and adolescent cohorts). The UAMA posits that avoidance behaviours prevent exposure to evidence that might contradict negative assumptions about the future, reinforcing beliefs held about outcomes (e.g., that uncertainty is negative and something to be avoided; Grupe and Nitschke, 2013). In experiment 2, adults reported having "accepted [uncertainty] as part of [their] life", and that they had "gotten used to being uncertain about things" as a consequence of experience. It could be that, as one gets older, they gain more exposure to evidence that contradicts negative assumptions held about future outcomes, such that they become more tolerant of uncertainty; the role of IU in maintaining PDA behaviours becomes less influential with age (Grupe and Nitschke, 2013). This interpretation is in keeping with the notion that avoidance behaviours reinforce aversive attitudes toward uncertainty (i.e., IU), and that utilising avoidance

behaviours less would likely facilitate a reduction in IU (Grupe and Nitschke, 2013; Ouellet et al., 2019). This might explain why Stuart et al. (2020) found IU to be a stronger predictor of PDA behaviours than anxiety in child and adolescent cohorts, while the present study found anxiety to be a stronger predictor of PDA behaviours than IU in adults. However, this interpretation is speculative; to inform a greater understanding of the developmental trajectory of PDA behaviours, future studies might consider longitudinal designs that are better suited to documenting changes in behaviour over time.

Age-related changes in the use of extreme demand avoidant behaviours may also relate to increased agency. As previously mentioned, a transactional approach posits that PDA behaviours are the result of a bi-directional interaction between an individual and their environment, a relationship that changes over time (Green et al., 2018; Kildahl et al., 2021b). A child has little agency, while adults who, through no fault of their own, often misinterpret the child's internal state, have all the agency. When encouraged to interact with their environment in a way that causes or exacerbates distress (e.g., forced to have a blood test), with no agency, a child relies on, oftentimes extreme avoidant behaviours to circumvent unpleasant stimuli. The extremity of these behaviours is determined by the severity of aversion caused by the perceived *cost and probability* of an outcome. As a child grows, they garner a greater sense of agency, allowing them a greater degree of control over their life, which likely reduces their reliance on extreme demand avoidant behaviours. For example, a participant in the present study describes postponing an appointment upon discovering she needed a blood test ("...when I found out I needed a blood test I managed to postpone it for a month"). As an adult, this participant was able to exercise their agency by postponing the appointment, something a child would likely have had to resort to extreme behaviours in order to achieve. An increased sense of agency would likely reduce perceived uncertainty about ones' environment; one is able to experience the effects of their agency and feel a degree of control. Moreover, an age-related reduction in PDA behaviours might be better understood as a diminishing need for extreme behaviours caused by a change in the individual-environment relationship; extreme avoidance tactics used to communicate distress by those that lack agency, are later replaced by less extreme avoidance tactics.

However, demand avoidant behaviours are not mitigated entirely by age. Vulnerability factors associated with extreme affective responses to environmental exchanges (e.g., fluctuating *autonomic arousal*, *poor tolerance of uncertainty*, a *need for sameness*, reduced response to *social reinforcement/punishment* and *difficulty predicting* outcomes) that have been theorised as influential in the development of PDA behaviours in children, are here reported by adults (Green et al., 2018; Malik and Baird, 2018; O'Nions and Noens, 2018). All 13 participants described *vulnerability factors associated with demand avoidance* to some degree (**Supplementary Table 4**), often citing *difficulty predicting* outcomes with a *need for sameness*, and fluctuating *autonomic arousal* alongside *poor tolerance of uncertainty*. This seems intuitive; a *need for sameness* is likely inspired by anxiety resulting from *difficulty predicting* outcomes, while *poor tolerance of uncertainty* likely influences fluctuating *autonomic arousal* (Malik and Baird, 2018; O'Nions and Noens, 2018). However, these causal claims are speculative, future study may wish to consider the relationship between these vulnerability

factors and the extent to which they contribute toward PDA behaviours. While *vulnerability factors associated with demand avoidance* are theoretically influential in the development of PDA behaviours in childhood, their role in maintaining these behaviours in adulthood had yet to be considered (Eaton and Banting, 2012; O'Nions and Noens, 2018). The present study extends previous theory by documenting these vulnerability factors in adults for the first time, implicating their role in the maintenance of avoidance behaviours in adulthood.

Of note, all 13 participants in the present study reported experiencing *feelings of self-consciousness* alongside *vulnerability factors associated with demand avoidance. Feelings of self-consciousness* were described as a trigger for social avoidance; one participant described feeling ashamed about their mental health, leading them to isolate from their friends (e.g., ". . . you do feel like a shame about what's going on in your head and, and you can kind of isolate yourself a bit"). Despite previous reports that PDA children lack the desire to maintain social 'status' among their peers, *feelings of self-consciousness* documented in the present study are supported by first-person anecdotal reports from PDA adults that note being anxious of being judged by others (O'Nions et al., 2014; Cat, 2018). *Feelings of self-consciousness* might represent an age-specific factor influencing avoidance behaviour in adults, but not children. Indeed, age has been associated with an increase in chronic tendencies to focus on ones' own thoughts, emotions and attitudes; it is thought that increased self-attention influences feelings of social judgement, thus, it is possible that feelings of self-consciousness might be more prevalent in adulthood (Fenigstein and Vanable, 1992; Rankin et al., 2004). It might also be that feelings of self-consciousness are influential in childhood and that a seeming lack of desire to maintain social 'status' demonstrated by PDA children is being misinterpreted (O'Nions et al., 2014), and in fact represents a child's awareness of the relationship between themselves and their social environment.

Indeed, self-consciousness is inherently transactional; feelings of self-consciousness are reactive, they are a response to perceived social judgement (Jankowski and Pfeifer, 2021). Adherence to, or deviation from, social judgement provides feedback that facilitates ones' understanding of acceptance or rejection, respectively (Lewis, 1997; Leary, 2007). In this way, exposure to social judgement informs internalised expectations of one's own behaviour. For example, when a child behaves disparately to social 'norms' (e.g., utilises extreme demand avoidant behaviours), they are often dismissed as poorly behaved (Moore, 2020). Being dismissed influences ones' understanding of 'self' (e.g., it reinforces the notion that they, the child, have behaved 'inappropriately'). It follows that those children whose behaviour often deviates from the 'norm', as is often the case in PDA, are judged more frequently, which leads to elevated feelings of being judged (Green et al., 2018). This not only impacts a child's desire to interact with their social environment, but has further ramification in adulthood (e.g., low self-esteem and/or worries of being judged by others; Cat, 2018). Moreover, self-consciousness is something that develops over time; increased exposure to social judgement facilitates self-judgement (Lewis, 1997; Leary, 2007). It is therefore unsurprising that in the present study, adults, who have had more exposure to social judgement than children, report *feelings of self-consciousness* (O'Nions et al., 2014; Cat, 2018).

Given the negative experiences of self-consciousness described by participants in this study, further investigation is necessary. Future studies might compare child and adult cohorts in order to benefit a broader understanding of the role played by self-consciousness in the development and maintenance of PDA behaviours.

4.1. Limitations and future directions

PDA is currently without formal diagnosis. It is argued that investigating an entity that lacks nosological validity by collecting evidence from a self-identifying sample relies upon *a priori* assumptions regarding the validity of PDA as a construct; this process likely influences self-selection and reporting biases (Green et al., 2018; Malik and Baird, 2018; Green, 2020). By collecting data from a non-clinical student sample, we hoped to negate these biases. However, recruiting a student population sample does limit the generalisability of results. For example, despite all 13 participants in experiment 2 described engaging in *approach-avoidance behaviour* when met with uncertainty, echoing behaviours associated with PDA (i.e., a hierarchy of responses to IU; Stuart et al., 2020), it is likely that there are qualitative and quantitative differences in the way PDA and general population cohorts experience anxiety and IU (Malik and Baird, 2018; O'Nions and Noens, 2018). Indeed, although all 13 participants mentioned *vulnerability factors associated with demand avoidance*, there were only 4 mentions of *IU* and 8 of *difficulty predicting outcomes* (**Supplementary Table 4**). Given that high levels of IU are associated with PDA, the poor representation of experiences pertaining to IU noted here by a student sample likely represents differences in how PDA and general population cohorts experience anxiety (O'Nions et al., 2018; Stuart et al., 2020). As such, future studies should recruit both PDA and general population cohorts in order to ascertain any differences that lie between phenomenology pertaining to anxiety and IU.

Moreover, without professional consensus regarding PDA diagnostic criteria, it is difficult to know which behaviours are exclusively attributable to PDA and which are attributable to other conditions (e.g., ASD). The EDA-QA attempts to offer a descriptive measure of behaviours that are associated with PDA. However, the EDA-QA was constructed under the assumption that PDA represents a distinct ASD (O'Nions et al., 2014). Green (2020) argues that by relying on measures that reinforce *a priori* assumptions about PDA, studies are inevitably subject to confirmation bias. By relying on a measure generated under the assumption that PDA is an ASD, the EDA-QA is likely part of the circularity inherent in the PDA literature; assumptions are reinforced by data collected from self-identifying samples, which subsequently bolsters the interpretation of PDA as a construct and strengthen the belief that the EDA-QA is in fact measuring said construct. Moreover, it is argued that these studies do little to objectively discriminate between PDA and generic patterns found across numerous other conditions (Green, 2020; Woods, 2020). As the specificity and validity of the EDA-QA remains unclear, the results of the present study should be viewed with caution. If PDA is to be better understood, future research must identify ways to recruit participants that avoid such biases.

Additionally, the present study employed different measures to that of Stuart et al. (2020); the present study used the MASQ-D30 and the IUS-12, Stuart et al. (2020) utilised The Revised Children's Anxiety and Depression Scale: parent report version (R-CADS-P) and Intolerance of Uncertainty Scale: parent report (IUSP). While the present study found anxiety to be a stronger predictor of PDA behaviours than IU, Stuart et al. (2020) found IU to be a stronger predictor of PDA behaviours than anxiety. Though it is possible that this discrepancy is attributable to differences in measures, it seems unlikely. The IUSP and the IUS-12 are adaptions of the same scale measuring IU, and both the MASQ-D30 and R-CADS-P are considered reliable measures of trait anxiety and depression (Wardenaar et al., 2010; Wigham et al., 2012). Thus, attributing confounding results to differences in measures seems unfounded. Given that the present study utilised first-hand accounts while Stuart et al. (2020) used parent-report, it is possible that the discrepancy between findings is attributable to differences in first-hand and third-party perspectives. Indeed, weak correlation between behavioural observations and subjective phenomenology has been documented in literature pertaining to anxiety in ASD (Boulter et al., 2014; Neil et al., 2016; Joyce et al., 2017). Given their inherently subjective nature, PDA research should continue to focus on first-hand accounts of anxiety and IU (Joyce et al., 2017). In doing so, future studies may help to better understand factors influencing PDA behaviours.

4.2. Conclusion

The present study found MASQ-D30 and IUS-12 scores to significantly predict that of the EDA-QA, which alongside participant reports from experiment 2 relating to *approach-avoidance behaviour* and *vulnerability factors associated with demand avoidance*, support the notion that anxiety and IU continue to play a role in the maintenance of demand avoidant behaviours in adulthood. Despite SBI scores refuting the hypothesis by failing to significantly predict EDA-QA scores, participants in experiment 2 reported *factors influencing anticipatory bias*, supporting the role of anticipatory responses to uncertainty in the maintenance of avoidance behaviours in adults. In addition, age related changes in factors contributing toward PDA behaviours were identified, which together with participant reports from experiment 2 regarding *experienced-based development*, support the theory that with age comes the development of strategies for better coping with uncertainty, such that there is a diminishing need for extreme demand avoidant behaviours over time. Despite criticisms that question the usefulness of PDA as a framework, the authors here argue that a transactional approach to demand avoidance offers a helpful means of understanding the acquisition, maintenance and necessity of avoidant behaviour. Understanding the mechanisms that drive PDA has the potential to inform better practices and interventions for those in need.

Data availability statement

The original contributions presented in the study are included in the article/**Supplementary material**, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by School of Psychology Ethics Committee, University of Aberdeen. The participants provided their written informed consent to participate in this study.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2023.1179015/full#supplementary-material

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