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Sensory reactivity and intolerance to uncertainty: What characterises demand avoidance behaviours in children and adolescents with pathological demand avoidance?

Aaron J. Rai [a], Barbara Rishworth [a], Roberto Gutierrez [b], Amanda K. Ludlow [a,*]

[a] School of Psychology, Geography and Sports Sciences, University of Hertfordshire, Hatfield AL10 9AB, United Kingdom
[b] School of Psychology, University of Sussex, Falmer, BN1 9QH, United Kingdom

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ABSTRACT

The present study addressed the underlying factors contributing to Extreme Demand Avoidance (EDA) behaviours in autistic children and adolescents with and without Pathological Demand Avoidance (PDA). Data from 795 children between the ages of 4–17 years old were analysed. Parents of 475 of autistic children and adolescents + PDA, 171 autistic children, and 94 neurotypical children completed an online composite questionnaire consisting of the characteristics of EDA, autism, anxiety, intolerance of uncertainty (IU) and sensory processing patterns. The findings showed that higher levels of anxiety and autism corresponded to higher EDA behaviours for all three groups. While IU and sensory reactivity were not found to be associated with EDA in the autism group; higher levels of IU corresponded with higher levels of EDA for the neurotypical controls. Importantly, this was the first study to illustrate higher levels of sensory reactivity, namely sensory sensitivity and sensory seeking, to uniquely characterise EDA in the children and adolescents identifying with autism + PDA. It is suggested that significant sensory reactivity may play a major role in the ability to undertake and/or in the avoidance of certain demands and situations for children with a PDA. Understanding the key underlying mechanisms behind EDA behaviours, could lead to a strengths-based approach, tailoring more comprehensive management strategies for autistic children with PDA, including those that address environmental sensory demands.

Pathological Demand Avoidance (PDA) or extreme demand avoidance (EDA) are terms coined to conceptualise a cluster of traits, primarily characterised by an obsessional avoidance of the demands of everyday life (Newson et al., 2003), and behaviours that deviate from the social norms (Egan et al., 2020). Despite not being formally recognised as a diagnostic category in either the current Diagnostic Statistical Manual-5 (APA, 2013) or the International Classification of Diseases-11 (WHO, 2018), PDA has been considered as being a profile of autism (O'Nions et al., 2018), which is also consistent with the National Institute of Clinical Excellence guidelines (NICE, 2012), listing demand avoidance as being a sign and symptom of autism (Gillberg et al., 2015). In the absence of any clinical guidelines for PDA, it is important to understand why some children are demand avoidant and to identify factors that might help in their management. Therefore, this study aimed to identify drivers in demand avoidant behaviours comparing autistic children with and without PDA, specifically focusing on intolerance to uncertainty and sensory reactivity.

* Correspondence to: University of Hertfordshire, College Lane, Hatfield AL10 9AB, United Kingdom.
E-mail address: a.ludlow@herts.ac.uk (A.K. Ludlow).

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Newson et al. (2003) originally conceptualised PDA to describe children who met specific criteria such as ‘continues to resist and avoid ordinary demands of life’, ‘surface sociability, but apparent lack of sense of social identity, pride, or shame’, and ‘lability of mood, impulsive, led by need to control.’ With recent thinking now recognising PDA and its associated behaviours to be present across the lifespan (Egan et al., 2019), and that these demand avoidance behaviours can vary across individuals, depending on a range of factors, including the environment, their age and gender (Kildahl et al., 2021). For example, some individuals with PDA may have a more externalised or active presentation – where demand avoidance may be overt, physical, aggressive or controlling. Others may show more internalised and/or passive presentations – where demands may be resisted more quietly, anxiety is internalised, and difficulties are often masked (Green et al., 2018).

Despite the historical positioning of PDA as a profile within the autism spectrum, there remains continuing debate about how to determine the criteria for PDA and its classification. For example, Woods (2019) have argued that EDA is better characterised as a behaviour pattern observed across a variety of conditions such as ADHD, whereas Green et al. (2018) suggest it reflects (a combination of) already recognised conditions. In this regard, the finding that demand avoidance behaviours are a characteristic observed in many neurodivergent individuals, including autism and ADHD (Greaves, 2025), could be argued as being supportive of either viewpoint. However, PDA is currently best understood as a profile of autism, with an increasing number of families in the UK seeking assessment and support for their autistic children who also present demand avoidance behaviours (Nawaz & Speer, 2025).

Autistic individuals can exhibit demand avoidance without fitting the PDA profile (Gillberg et al., 2015). Often these avoidance behaviours are in a response to identifiable factors like anxiety, sensory overload, disrupted routines, or uninteresting tasks (O’Nions & Eaton, 2020). In contrast, PDA-related avoidance may differ, often centring on the act of being asked to do something, rather than the task itself (PDA, 2025; Stuart et al., 2020). However, the actual resultant EDA behaviours, including refusal, withdrawal, shutdowns, or escape, are perceived to be similar (Truman et al., 2024), and are noted as being driven by anxiety (O’Nions & Eaton, 2020; White et al., 2023). Since fear of the unknown and control issues often trigger meltdowns in those with PDA traits (Stuart et al., 2020), exploring how anxiety relates to demand avoidance, especially in autistic children with and without PDA, may offer insight into these behaviours and inform more effective support.

For example, anxiety in autistic individuals has been suggested to be driven and maintained by intolerance of uncertainty (IU) and sensory processing difficulties (Boelen & Reijntjes, 2009; Holaway et al., 2006; South & Rodgers, 2017). Intolerance of Uncertainty (IU) is a trait characterised by negative beliefs about uncertainty and a tendency to respond with distress to unpredictable situations (Dugas & Robichaud, 2007). While IU shown to have stronger impact in autistic individuals, with even minor uncertainty triggering significant anxiety (Ashburner et al., 2013; Chamberlain et al., 2013; Jenkinson et al., 2020), it has also been proposed as a key factor in understanding EDA behaviours in children with PDA, where parents report their children use IU-based strategies to manage anxiety (Stuart et al., 2020).

Sensory reactivity is also significant source of anxiety for individuals with autism (Uljarević et al., 2015; South & Rodgers, 2017) and are closely linked to intolerance of uncertainty (IU), even when general anxiety is accounted for (Neil et al., 2016). Sensitivity to stimuli like sound, light, and smell can become particularly distressing when influenced by past experiences or expectations (Goldstein Ferber et al., 2021). For those with heightened sensory sensitivity and high IU, sensory input may be perceived as unpredictable or threatening, increasing anxiety levels (McEvoy and Mahoney, 2012).

These sensory differences can vary across different settings and senses, such as vision, hearing, and touch. Those with hyperreactivity tend to process sensory information more profoundly and have greater awareness and reactivity to their environment (Gulla & Golonka, 2021). They may also reach the ‘threshold’ more easily at which sensory information becomes overwhelming and are unable to modify their reactions to be able to cope (Engel Yeger & Dunn, 2011). Those with sensorysensitivity may show a more diminished or absent response to sensory stimuli that most individuals would usually respond to, whereas those who are considered sensory seeking will under-respond to sensory input and actively seeks more stimulation to feel regulated. Whilst all types of sensory reactivity have been linked to anxiety in autism (Powell et al., 2025; Liss et al., 2006), a recent study identified core neurodevelopmental differences linked to autistic traits to lead sensory sensitivity and sensory-seeking behaviours. These sensory characteristics were found to contribute to increased intolerance of uncertainty, which in turn leads to heightened anxiety (Normansell-Mossa et al., 2021).

Sensory reactivity in relation to EDA behaviours have been given little consideration in the literature to date. However, an online survey of 1194 parents of children who either identified with or were suspected to have PDA, indicated anxiety amongst the key concerns of parents. Here, 96 % of parents reporting their child had a need to be in control; 80 % reported sensory issues; and 80 % reported their child had severe anxiety (PDA Society, 2018). Therefore, making sense of these specific constructs and how they relate to each other, may help differentiate EDA behaviours in autistic children with and without PDA. The current study aimed to build on previous research exploring anxiety in PDA (Egan et al., 2019; Stuart et al., 2020), by directly addressing the predictors of EDA behaviours in autistic children and adolescents with and without PDA and a group of neurotypical controls. Given that the relationship between sensory processing concerns and elevated levels of anxiety in autistic individuals has been well established (Wigham et al., 2015; Uljarević et al., 2015; Neil et al., 2016; South & Rodgers, 2017), this study specifically aimed to investigate the relative importance of sensory behaviours and IU in relation to demand avoidance behaviours, controlling for these levels of anxiety. It was hypothesized that both sensory reactivity and IU would predict demand avoidance behaviours in autistic children with and without PDA. However, it was also hypothesized that groups would be differentiated by higher levels of demand avoidance reported in the PDA group and that sensory hyperreactivity and IU would have a larger effect for this group.

Method

Participants

The study was advertised to parents who had either a child with autism, PDA and or identified them as being neurotypical. The study recruited 899 participants, with 96 removed from analysis for not having completed at least one full scale, and a further 8 removed for not meeting inclusion/exclusion criteria such as their child being older than 18 or younger than 4 years old. As PDA is not formally recognised in the UK as being distinct diagnosis from autism, a decision was made to only include autistic children and adolescents with and without PDA and a neurotypical control group. Therefore, 55 children who reported PDA with no formal diagnosis of autism and/or did not identity as having autism, were excluded from the analysis. Noteworthy, was that 36 of these 55 children, despite reporting no formal diagnosis nor self-identifying as autistic, scored above the autism symptomology threshold as measured by the Autism Spectrum Screening Questionnaire (ASSQ; Ehlers & Gillberg, 1993), so simply may not yet have had a diagnostic assessment. The data was analysed from the remaining respondents.

As such, the final count of participants included in the analysis were parents of 795 children between the ages of 4–17 years old (M= 11 years, 0 months; SD = 3 years, 5 months), with the majority of the participants (N = 454; 96 %) describing themselves as white or a combination of it (e.g., White British, White European). There were 475 children and adolescents with E/PDA and a formal diagnosis of autism (*Mage*=10.89; *SD*=3.23). For those who reported their gender 272 were Female, 173 Male, 5 transgender male, 20 transgender female and 1was non-binary. There were 171 who had a formal diagnosis of autism and no self-identified PDA (*Mage*=10.02; *SD*=3.72). This included 94 who identified as Female, 69 male, 3 transgender male, 2 transgender and 2 non-binary. They were compared to 94 neurotypical children (*Mage*=10.02; *SD*= 3.72), with no self-identified/diagnosed autism and/or PDA. This included 48 female, 42 male, 2 transgender female and 1 non-binary). There were 338 (71 %) of the autism +PDA who were reported as having at least one additional co-occurring diagnosis, with ADHD (148; 32 %) being the most identified, followed by selective mutism, hypermobility, anxiety, obsessional compulsive disorder (OCD), avoidant restrictive intake disorder, sensory issues. In the autism group, 103 reported at least one addition co-occurring diagnosis, with 37 (22 %) having ADHD diagnosis, followed by depression and anxiety, sensory issues. None of the neurotypicals had any neurodiversity diagnosis, anxiety and mood disorders were noted and 13 suspected ADHD traits.

Using a cut-off score of 17 (Posserud et al., 2009), 435 (92 %) of parents of children with autism + PDA, 155 (91 %) parents of children with autism and 68 (72 %) parents of the controls scored their child above the threshold for autism on the ASSQ and using a cut-of scores of 50 for those below 12-years-old and 45 for those above 12-years-old (O'Nions et al., 2014), all bar 64 scored their child above the threshold for high EDA-Q behaviours, 372 (78 %) autism + PDA; autism 89 (52 %); neurotypical controls 46 (48 %). A comparison of the additional scores and demographic data is shown in Table 2.

Procedure

The study utilized a purposive non-probability sampling method whereby participants were recruited via opportunity sampling and snowballing recruitment techniques. Recruitment was undertaken through the UK school system, a national third-sector organisation supporting children with PDA (i.e., PDA society UK) and through social media. Upon opening an online link, the participant learnt about the study via an online participant information sheet, and once participants completed a consent form with anonymity code, they were given access to the online survey. Demographic variables collected included: their child's age, gender, ethnicity, and any clinical diagnosis including co-occurring disorders. Finally, all caregivers were asked to complete the questionnaires, presented in the same order to each participant, and took approximately 25 min to complete. The questionnaire remained active for three months and participants volunteered to take part. At the end of the study, participants were provided with details of where to seek information and support for any concerns around PDA, autism and sensory concerns. Ethical approval for this research was obtained from the University of Hertfordshire University Health, Science, Engineering and Technology Ethics Committee with Delegated Authority (Protocol Number: aLMS/PGR/UH/05062(2) and the research was performed in accordance with the Declaration of Helsinki.

Measures

The Autism Spectrum Screening Questionnaire (ASSQ). Developed from the Asperger's Syndrome and High-Functioning Autism Screening Questionnaire (Ehlers & Gillberg, 1993) the ASSQ (Ehlers et al., 1999) consists of 27 items / statements scored using a 3-point Likert scale, with potential responses being: 'not true' (0 points); 'somewhat true' (1 point); and 'certainly true' (2 points). Responses from each item are summed to produce a total score ranging from 0 to 54, with higher scores indicating higher degree of autistic symptomology. Mattila et al. (2009) suggest that a valid cut-off score for parents' single score cannot be estimated; however, can be useful as a screening tool for research rather than a clinical diagnostic tool. The ASSQ showed a good degree of internal consistency (α=.869).

The Extreme Demand Avoidance Questionnaire (EDA-Q). The EDA-Q (O'Nions et al., 2014) is a 26-item parent report measure of demand avoidance traits in their child. The EDA-Q was developed as a checklist to quantify behaviours reported in the clinical accounts of pathological demand avoidance (PDA) as described by Newson et al. (2003). Each item is rated on a four-point Likert scale of how true a behavioural statement represents their child over the past six months: 0 (not true); 1 (somewhat true); 2 (mostly true); and 3 (very true). O'Nions et al. suggest a cut-off score of 50 in children aged 5–11 years old, and a score of 45 in children aged 12–17 years old would indicate elevated risk of parents reporting that the child had been clinically identified as having a profile resembling PDA.

The suggested eight dimensions in the scale are ‘avoiding demands and social manipulation’ for the purposes of: avoidance / controlling interactions; insensitivity to hierarchy praise/reputation with peers; emotional lability in response to demands or perceived pressure; need for control; lack of responsibility/blaming; mimicry and role play; distractedness; and passivity item), with high scores indicating ‘high EDA traits.’ The EDA-Q showed a good degree of internal consistency (α=.880).

Spence Children’s Anxiety Scale – Parent Version (SCAS-P). The SCAS-P (Nauta et al., 2004) is a 38-item parent report measure of their child’s anxiety, adapted from the original child version of the scale (Spence, 1997). Compared to the child version, parent–child agreement ranged from 0.41 to 0.66 in an anxiety-disordered group, and from 0.23 to 0.60 in a control group. The SCAS-P scores represent observable child behaviours based on their frequency. Respondents rate each item on a four-point Likert scale: 0 (Never), 1 (Sometimes), 2 (Often) and 3 (Always). Items are summed to create a total score ranging from 0 to 114, with higher scores reflecting greater levels of characteristics. Confirmatory factor analysis provided support for six inter-correlated factors that corresponded with the child self-report measure as well as the classification of anxiety disorders by DSM-IV (APA, 2000) at the time. These six inter-correlated factors are: 1) Panic attack and agoraphobia; 2) Separation anxiety; 3) Physical injury fears; 4) Social phobia; 5) Obsessive compulsive; 6) Generalized anxiety disorder / overanxious disorder. The SCAS-P showed a good degree of internal consistency (α=.933), which also applied to the sub-scales (α=.866; α=.785; α=.567; α=.802; α=.834; α=.790 respectively).

Short Sensory Profile (SSP). The SSP (McIntosh et al., 1999) is a shortened, 38-item adaptation of the Sensory Profile (SP; Dunn, 1999) representing caregiver report of children’s behavioural sensory processing that is scored on a five-point Likert scale ranging from 1 (‘Always’) to 5 (‘Never’) based on frequency. Scores are summed giving a range of 38–190, with lower scores indicating greater levels of sensory sensitivities. The SSP is made up of seven subscales: 1) Tactile Sensitivity (seven items); 2) Taste/Smell Sensitivity (four items); 3) Movement Sensitivity (three items); 4) Under responsive/Seeks Sensation (seven items); 5) Auditory Filtering (six items); 6) Low Energy/Weak (six items); and 7) Visual/Auditory Sensitivity (five items). Part of the development of the SSP included the removal of items in the SP that were related to social-communication and motor items. Thus, the SSP isolates sensory sensitivities that are less confounded by items overlapping with the diagnostic features of autism as described in the DSM-V, making the SSP ideal as a research tool within this population. The scale has shown good convergent validity with physiological measures and a discriminant validity of > 95 % in distinguishing children with and without sensory modulation difficulties. The SSP showed a good degree of internal consistency (α=.887), as did the sub-sections within the scale ranging from 0.697 to 0.943.

Intolerance of Uncertainty Scale – Parent (IUS-P). The IUS-P (Comer et al., 2009) is a 27-item parent report measure of their child’s tendency to react negatively on an emotional, cognitive, and behavioural level to uncertain situations and events. Respondents rate the extent to which the statement in each item is like their child on a five-point Likert scale from: 1 (Not at all); to 3 (Somewhat); to 5 (Very Much). The scale has been shown previously to provide good internal consistency (α = 0.97; Cornacchio et al., 2017). The IUS-P, developed in conjunction with the Intolerance of Uncertainty Scale–Child (IUS-C), was adapted from the adult version of the measure, the IUS (Freeston et al., 1994) which was found to have good psychometric properties in general population cohorts (Buhr & Dugas, 2002). All items in the IUS-P are directly parallel to the items on the IUS. Of note, where the IUS-C incorporated language to give the scale “child compatibility”, such as the replacement of the phrase “I can’t stand…” to “I don’t like…”, the IUS-P retains the language of the original (e.g. “My child can’t stand…”) meaning the IUS-P retains closer resemblance to the original IUS and it’s good psychometric properties. The IUS-P showed a good degree of internal consistency (α=.954).

Analysis

One of the main aims was to explore potential differences between the groups, especially to explore differences between levels of sensory reactivity and autistic traits. Therefore, analysis of variance was used to compare the main constructs under investigation. Hierarchical regression was used for to explore the main predictors of reported levels of EDA whilst controlling for shared variance between the predictors. Multiple linear regression analysis was carried out to explore the role of sensory domains as predictors of EDA.

Results

All the scales were scored to create an index on each of the investigated constructs (Anxiety, Autistic Traits, IU; sensory reactivity and EDA). The scores of the sensory domains were reversed, so that higher numbers indicated higher levels of each construct in all scales. We first investigated the potential effects of age and gender on the levels of EDA. A linear regression model was used entering age and the dummy-code of each gender, as well as the interaction effect of age with each term of dummy-coded gender. Results revealed a negative and significant effect of age (β=-.11, t = -2.20, $p < .03$), suggesting that reported levels of EDA diminish with age. The effect of gender was not significant (all $p > .11$), and all gender x age interactions resulted non-significant (all $p > .10$).

Pearson correlations on the indexes of these scales were used to investigate the relationships between these constructs. Results revealed a significant and positive relationship between EDA, anxiety, intolerance to uncertainty, all the sensory domains and levels of autism (Table 1). A series of one-way Analysis of variance comparing the total scores of each group on the explored constructs revealed significant differences in all the analysis. The mean and standard deviation of the total of each analysed construct, as well as the comparison between groups adjusted with a Bonferroni correction, is present in Table 2.

Differences in sensory reactivity between groups

It was expected that the reported levels of sensory behaviours would be different between the groups. A repeated measures analysis of variance was used to explore this prediction. The analysis had a within-participants factor (Sensory dimensions) with 7 levels x a

Table 1
Pearson correlations between EDA, Sensory Reactivity, Autistic Traits, Anxiety and Intolerance to Uncertainty.

	Mean	SD	Min	Max	Skewness	Kurtosis	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Extreme Demand Avoidance (1)	49.91	13.30	4	76	-0.65	.03															
Total Sensory Symptoms (SR; 2)	124.94	21.06	61	180	-0.27	.12	.48														
Tactile (3)	22.60	5.33	7	35	-0.21	-.39	.38	.67													
Taste/ Smell (4)	15.73	4.54	4	23	-0.95	-.08	.23	.48	.28												
Under responsive/Seek (5)	20.36	5.57	7	37	-0.03	-.37	.40	.67	.33	.18											
Auditory Filtering (6)	20.55	4.42	7	30	-0.03	-.29	.35	.62	.21	.08*	.51										
Visual/Auditory (7)	17.34	3.98	5	25	-0.27	-.27	.29	.75	.34	.21	.32	.47									
Low Energy/Weak (8)	18.88	5.40	6	31	0.09	-.79	.19	.71	.36	.23	.26	.26	.73								
Movement (9)	9.48	3.12	3	18	-0.12	-.62	.34	.63	.48	.21	.33	.3	.38	.37							
Autistic Traits (10)	27.92	9.56	2	53	-0.15	-.27	.61	.59	.41	.25	.46	.47	.39	.34	.39						
Social Interaction (11)	11.47	4.59	0	22	-0.11	-.54	.45	.44	.31	.20	.38	.35	.25	.24	.3	.84					
Communication Problems (12)	7.25	2.82	0	12	-0.39	-.54	.58	.40	.32	.14	.3	.34	.26	.2	.26	.74	.44				
Restricted/Repetitive Behaviors (13)	4.95	2.56	0	10	0.03	-.81	.47	.55	.3	.22	.41	.47	.44	.35	.31	.79	.49	.52			
Motor behaviors (14)	4.25	2.18	0	10	0.29	-.39	.45	.51	.38	.24	.34	.32	.35	.33	.37	.73	.45	.43	.59		
Anxiety (15)	47.14	20.53	3	105	0.29	-.38	.39	.45	.35	.23	.25	.13	.32	.34	.44	.34	.20	.25	.27	.41	
Intolerance to Uncertainty (16)	89.68	23.76	9	135	-0.47	-.40	.35	.42	.38	.16	.23	.17	.30	.29	.42	.35	.24	.26	.25	.38	.61

Note: * = $p < .05$, All other correlations were significant ($p < .001$)

Table 2
Mean, Standard deviations, and comparisons of total scores of EDA, Sensory Reactivity, Autistic Traits, Anxiety and Intolerance to Uncertainty by Group.

	Autism + PDA(*N* = 475)		Autism (*N* = 171)		Control (*N* = 94)		
	Mean	SD	Mean	SD	Mean	SD	*F* (2737)
Extreme Demand Avoidance	53.31 $_{(a)}$	11.00	45.16 $_{(b)}$	13.22	41.41 $_{(b)}$	17.19	51.92***
Total Sensory Symptoms	127.4 $_{(a)}$	19.67	126.02 $_{(a)}$	20.96	110.53 $_{(b)}$	22.48	27.29***
Autistic Traits	28.88 $_{(a)}$	9.15	28.37 $_{(a)}$	9.12	22.27 $_{(b)}$	10.52	19.97***
Anxiety	48.89 $_{(a)}$	19.74	47.08 $_{(a)}$	21.78	38.43 $_{(b)}$	20.11	10.45***
Intolerance to Uncertainty	91.68 $_{(a)}$	22.58	90.37 $_{(a)}$	24.26	78.34 $_{(b)}$	25.66	12.86***

Note: *** $= p < .001$, Means with different subindeces are significantly different with a Bonferroni correction

between-participants factor (Group) with 3 levels. Results revealed a violation of sphericity (Maulchy's test (W)= .36, $p < .001$), so all degrees of freedom were adjusted using a Greenhouse-Geiser correction (GG=.79). Results revealed a significant main effect of Group ($F(2, 737)$= 27.29, MSE= 59.14, $p < .001$), and a significant effect of Sensory domain ($F(4.75, 3498.18)$= 573.75, MSE= 15.10, $p < .001$). These effects were qualified by a significant interaction ($F(9.49, 3498.18)$= 2.10, MSE= 15.10, $p < .05$). Bonferroni adjusted comparisons between the groups on each sensory domain revealed that the Autism + PDA and the Autism groups did not differ significantly on any sensory domain, and that the Control group was significantly different than the other 2 groups on every domain, except auditory, where the neurotypical children and the group of autistic children did not differ significantly (Figs. 1 and 2).

Differences in autistic traits levels between groups

A repeated measures analysis of variance was used to explore differences in reported levels of autistic traits between the groups. The analysis had a within-participants factor (Traits) with 4 levels x 3 between-participants factor (Group) with 3 levels. The test for sphericity resulted significant (Maulchy's test (W)= .54, $p < .001$), so the degrees of freedom were adjusted with the Greenhouse-Geiser correction (GG=.71). Results showed significant main effects of Group and Traits ($F(2, 737)$= 19.98, MSE= 21.75, $p < .001$, and $F(2.13, 1566.35)$= 792.68, MSE= 5.75, $p < .001$, respectively), as well as a significant Group x Traits interaction ($F(4.25, 1566.35)$= 4.66, MSE= 5.75, $p < .01$). Comparisons between the groups on each trait revealed that the Control group scored significantly lower than the other 2 groups, who did not differ significantly on any of the traits.

Relationship between EDA and anxiety, autistic traits, sensory reactivity and intolerance to uncertainty

A hierarchical regression analysis was used to investigate the relative contribution of SR and IU on EDA over and above the levels of autistic traits and the levels of anxiety. The analysis was performed separately for each group. The effect of age was entered in the first step of the regression (Model 1), followed by the reported levels of anxiety in the second step of the regression (Model 2). The reported levels of autistic traits were entered in the third step of the analysis (Model 3). Finally, IU and SR were entered as simultaneous predictors in the fourth step of the regression (Model 4). Results showed that age was negatively associated with levels of EDA but only significantly in the Autism + PDA group ($F(1, 473)$= 19.15, $p < .001$, R^2= .04 $_{(Autism\ +\ PDA)}$; $F(1, 169)$= 1.13, $p = .29$, R^2= .006 $_{(Autism)}$; $F(1, 92)$= 0.13, $p = .72$, R^2= .001 $_{(Control)}$). Anxiety was a positive and significant predictor of EDA in the 3 groups ($F(2, 472)$= 41.58, $p < .001$, R^2= .15 $_{(Autism\ +\ PDA)}$; $F(2, 168)$= 22.04, $p < .001$, R^2= .21 $_{(Autism)}$; $F(2, 91)$= 15.29, $p < .001$, R^2= .25 $_{(Control)}$). Similarly, the levels of Autism traits were positive and significant in the 3 groups ($F(3, 471)$= 91.91, $p < .001$, R^2= .37 $_{(Autism\ +\ PDA)}$; $F(3, 167)$= 43.36, $p < .001$, R^2= .44 $_{(Autism)}$; $F(3, 90)$= 48.75, $p < .001$, R^2= .62 $_{(Control)}$). Importantly, results revealed differences in

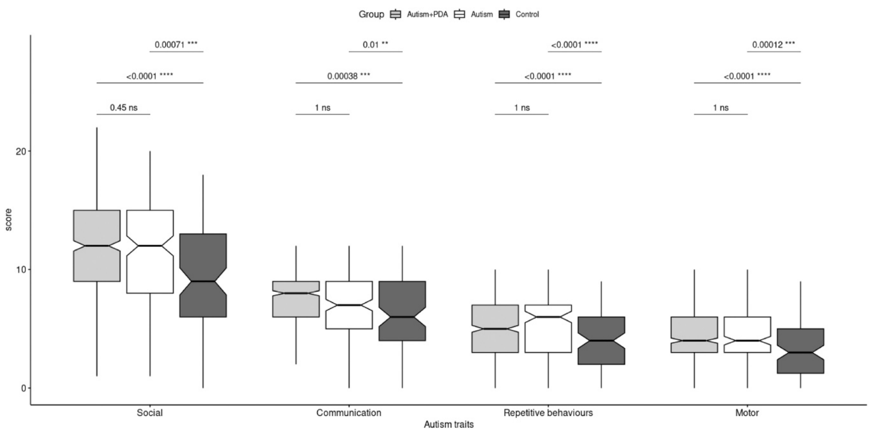

Fig. 1. Comparison of autistic traits by group.

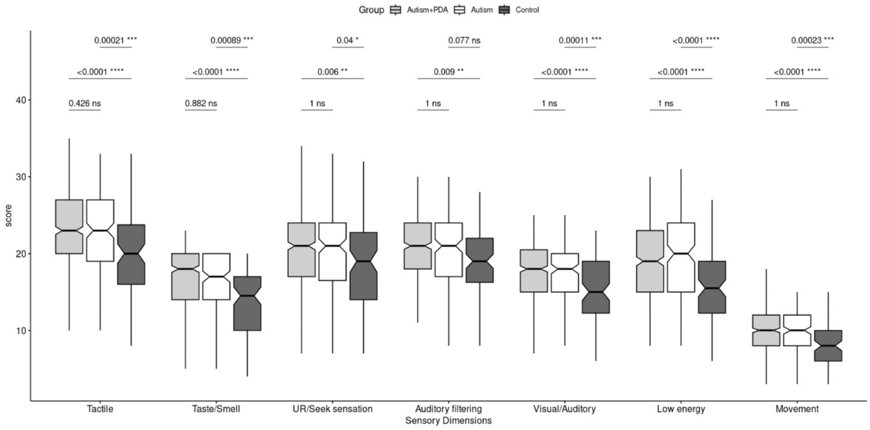

Fig. 2. Comparison of sensory dimensions by group.

the effects of SR and IU for each group. For the Control group, only IU was a positive and significant predictor of EDA levels. In contrast, SR was the only significant predictor of EDA levels in the Autism + PDA group. Finally, neither IU or SR were significant predictors or EDA levels in the Autism group ($F(5, 469)= 57.70$, $p < .001$, $R^2= .38_{(Autism + PDA)}$; $F(5, 165)= 26.79$, $p < .001$, $R^2= .45_{(Autism)}$; $F(5, 88)= 32.01$, $p < .001$, $R^2= .65_{(Control)}$). Standardised regression coefficients are in Table 3.

Relationship between sensory reactivity and reported levels of EDA

A multiple regression analysis was used to explore the relationship between reported levels of sensory behaviours and the levels of EDA separately for each group. Results revealed that in the Control group, only the movement dimension was a significant predictor of EDA ($F(7, 86)= 6.92$, $p < .001$, $R^2= .36$). Results also revealed that the dimensions of tactile sensitivity, auditory filtering and low energy were significant predictors of EDA in the Autism group ($F(7, 163)= 10.54$, $p < .001$, $R^2= .31$). Finally, the dimensions of tactile sensitivity, Taste/Smell, and UR/Seek sensation significantly predicted EDA in the Autism + PDA group ($F(7, 467)= 23.84$, $p < .001$, $R^2= .26$). (Regression coefficients are in Fig. 3).

Discussion

Pathological Demand Avoidance (PDA) is increasingly becoming recognised as a behavioural profile within the United Kingdom, with increasing numbers of referrals to CAMHS teams nationally for assessment and diagnosis. Without any clinical guidance to distinguish EDA, this study is one of the first, to directly address sensory reactivity patterns and IU as the predictors of EDA behaviours in autistic children with and without a PDA profile, compared to a group of neurotypical controls. Collectively, the findings provided further support for the theory that demand avoidance behaviours are anxiety-driven for both neurotypical and neurodiverse populations, inclusive of PDA (PDA, 2018), with EDA behaviours associated with higher levels of autism and anxiety (White et al., 2023). Sensory over-reactivity was found to uniquely distinguish EDA behaviours for those identifying with PDA. Specifically, tactile sensitivity and sensory seeking behaviours were found to predict EDA in the Autism + PDA group, strengthening previous anecdotal accounts of the importance of the relationship between EDA and sensory concerns.

Building on the autism literature (e.g., Wigham et al., 2015), it was speculated that being sensory over-reactive would lead to feelings of uncertainty and increased anxiety, and the consequence avoidance of demands/situations to be able to regulate their emotions. With the current finding showing tactile hyperreactivity and sensory seeking to distinguish those identifying with PDA. Sensory seeking behaviours may be indirectly linked to anxiety through sensory hyperreactivity and over-focussing behaviours (Liss et al., 2006), whereby heightened sensitivity to sensory input can make ordinary stimuli feel overwhelming. As a result, individuals may seek out intense sensory experiences to alleviate this discomfort, which can further exacerbate anxiety (MacLennan et al., 2021). The need to feel in control may provide children some protection from exposing themselves to less sensory demanding situations (Neil et al., 2016). In this context EDA behaviours become habitual quite often automatic responses to perceived demands or expectations, much like other defence mechanism, and represent a learned way of coping with this anxiety. While restrictive and repetitive behaviours are often described as an autistic individual's attempt to exert some control over the environment and to make the world more predictable (Joyce et al., 2017; Lidstone et al., 2014), it could be suggested that for individuals with PDA, heightened demand avoidance behaviours could serve a similar function as these repetitive behaviours, being a coping mechanism for anxiety, especially in overwhelming sensory environments (Malik and Baird, 2018; White et al., 2023).

The importance of recognising sensory reactivity in children and adolescents with PDA can be illustrated by the significant shortcomings in the current understanding and acceptance of EDA behaviours, with parental accounts arguing this leads to misunderstandings about the causes of children's distressed behaviours, the appropriateness of 'low demand' approaches, and often contributes to unfair judgements regarding permissive parenting (Nawaz & Speer, 2025). Understanding this connection between

Table 3
Standard regression coefficients of Age, Anxiety, Autistic Traits, Sensory Reactivity and Intolerance to Uncertainty as predictors of EDA by Group.

		Model 1 (Age)			Model 2 (Anxiety)			Model 3 (Autistic Traits)			Model 4 (Sensory Sensitivity, Intolerance to Uncertainty)		
	Predictors	Beta	Statistic	*p*	Beta	Statistic	*p*	Beta	Statistic	*p*	Beta	Statistic	*p*
Autism + PDA													
	Age	-0.20 ***	-4.38	< 0.001	-0.22 ***	-5.11	< 0.001	-0.16 ***	-4.21	< 0.001	-0.15 ***	-4.11	< 0.001
	Anxiety				0.33 ***	7.85	< 0.001	0.18 ***	4.72	< 0.001	0.13 **	2.77	0.006
	Autism Traits							0.50 ***	12.8	< 0.001	0.43 ***	9.55	< 0.001
	Total Sensory Symptoms										0.13 **	2.81	0.005
	Intolerance to Uncertainty										0.03	0.55	0.582
	R^2 / R^2 change	0.039 / -			0.150 / 0.11***			0.369 / 0.22***			0.381 / 0.01***		
Autism													
	Age	-0.08	-1.06	0.289	-0.21 **	-2.97	0.003	-0.14 *	-2.26	0.025	-0.15 *	-2.41	0.017
	Anxiety				0.47 ***	6.53	< 0.001	0.31 ***	4.89	< 0.001	0.24 **	3.02	0.003
	Autism Traits							0.50 ***	8.27	< 0.001	0.47 ***	6.85	< 0.001
	Total Sensory Symptoms										0.07	1.05	0.293
	Intolerance to Uncertainty										0.1	1.3	0.196
	R^2 / R^2 change	0.007 / -			0.208 / 0.20***			0.438 / 0.23***			0.448 / 0.1		
Control													
	Age	-0.04	-0.36	0.72	-0.09	-0.96	0.337	-0.13	-1.98	0.05	-0.15 *	-2.33	0.022
	Anxiety				0.50 ***	5.52	< 0.001	0.21 **	2.92	0.004	0.11	1.27	0.206
	Autism Traits							0.68 ***	9.32	< 0.001	0.73 ***	8.23	< 0.001
	Total Sensory Symptoms										-0.14	-1.51	0.134
	Intolerance to Uncertainty										0.21 *	2.32	0.022
	R^2 / R^2 change	0.001 / -			0.252 / 0.25***			0.619 / 0.37***			0.645 / 0.02*		

Note: *= $p < .05$, **= $p < .01$, *** = $p < .001$

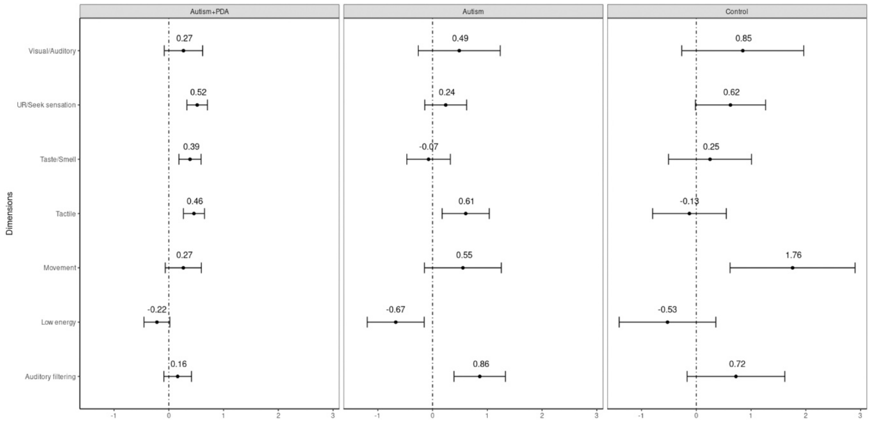

Fig. 3. Regression coefficients and 95 % confidence intervals of Sensory Dimensions as predictors of EDA by Group.

patterns of sensory reactivity and EDA behaviours is therefore crucial in helping to reframe EDA behaviours to be considered the child's response to their environment rather than as the resultant challenging behaviours, that have often been too readily considered and often leading to parental blame (Curtis & Izett, 2025). Furthermore, recognizing sensory differences particularly in education settings where children with PDA often struggle with their anxiety (Doyle and Kenny, 2023), would enable one to approach assessment and intervention from a strengths-based perspective to ensure students receive the support for their sensory needs (e.g., dimming the lights, providing noise-cancelling headphones, creating a quiet place for calm self-regulation; Donaldson et al., 2017).

As with previous research, showing demand avoidance behaviours may not be developmentally persistent (Woods, 2019), demand avoidance behaviours were found to decrease with increasing age across our samples, being more marked in the autism and PDA group. Whilst some authors have suggested that the decrease in EDA behaviours with increasing age invalidates the association of PDA with autism (Woods, 2018), others have argued that the reduction in demand avoidance might simply reflect the waning in severity of sensory interests, repetitive and sensory-seeking behaviours, that has been observed in autistic children, and that were also noted in our sample (Baranek et al., 2019; Grahame et al., 2020)

An older age was associated with fewer EDA behaviours. This finding may also reflect the different developmental trajectory observed in between autistic males and females. For example, Waizbard et al., (2025) observed from the ages of 3–11 years, that females decreased in total autism symptom severity and restricted/repetitive behaviour severity, while boys remained stable. Although it is possible the content of the study addressing constructs contributing to anxiety may have inadvertently led to a high representation of females in both the autism and PDA and autism groups. However, it may also reflect that currently there is an increasing number of females being diagnosed with autism at a greater rate than males (Harrop et al., 2024). Females may also be more likely to being identified/mislabelled with a PDA profile, such that PDA shares many similarities with autistic females, including better social skills, behaviour differences across settings (e.g. home vs. school), and anxiety-driven avoidance and need for control (Fidler, 2019). Although in the context of the study's current focus, there were no significant gender differences in any of the constructs under investigation (anxiety, EDA, IU and patterns of sensory reactivity (SR).

At the time of initial recruitment, we openly advertised for parents to complete the survey who identified as having a child with PDA, regardless of self-identifying/having a diagnosis with autism. Of the 530 parents who initially completed the survey and identified their child as having PDA, 90 % also reported identifying their child as also being autistic. Whilst this could be argued to provide further support for the overlap between PDA and autism symptomology, it is acknowledged that this relationship may also reflect the fact that PDA is viewed by professionals as being a profile of autism in the UK, to make it easier for people to get the right support (PDA, 2022). However, it was noted that a higher proportion of the autism group also showed high levels of demand avoidance behaviours, so without clear PDA criteria, there runs a risk of mislabelling individuals as having both autism and PDA, leading to potentially unnecessary assessments or unhelpful strategies (Woods, 2024). Moreover, nearly all children in the current study also identified as having multiple co-occurring conditions alongside their autism and PDA, highlighting the complexity of behaviours associated with EDA, and the need to consider EDA in relation to other common co-occurring neurodevelopmental diagnoses, such as ADHD (Egan et al., 2019), when further researching the PDA profile.

While there currently exist different opinions over whether PDA is an entity in its own right; including how it relates to autism (Gillberg et al., 2015; Newson et al., 2003), and while our research does not intend to solve these debates, it is important to note that the predictors of EDA varied for PDA compared to those not identifying with this label. For example, for the autism group only, the combination of higher levels of autistic traits together with high levels of anxiety, accounted for EDA behaviours, whereas sensory reactivity as predictors of EDA uniquely distinguished the Autism + PDA group. In contrast, higher levels of intolerance to uncertainty (IU) were associated with EDA for the neurotypical children, but notably not for either the children with autism or those with PDA.

There are shortcomings in our methods of recruitment to note, namely we recruited mainly through charities and from online PDA support forums; Thus, this self-selective sampling method may have led to overinclusion of those individuals who are actively involved in community groups and/or those more invested in seeking clarity and support regarding their children's PDA behaviours (Bonevski et al., 2014). However, in the absence of a formal diagnosis pathway for PDA in the UK, recruiting through these types of forums is often a necessity, as well as illustrating the increasing number of parents trying to access support for PDA in the UK.

The absence of cognitive and language measures is another important limitation, as it is difficult to determine where the children with PDA fall in the full spectrum of abilities and challenges faced by individuals with autism. It also may account for the lack of differentiation across the auditory sensory domains between the autistic children and the neurotypical controls. For example, there is growing evidence to suggests differences in auditory experiences between autistic and non-autistic people including hyper-responsivity to sound (Katikar et al., 2025) heightened perceptions to pitch (Heaton et al., 2008) and taking longer to adapt to auditory environments (Poulsen et al., 2025). However, a recent meta-analysis found no significant differences for autistic and non-autistic participants for auditory oddball task across perception, recognition and neural signatures (Vassall et al., 2025). The lack of consistency in the findings has been highlighted by Vassel and colleagues 2025 as being largely due to a lack of age and IQ matching between autistic and control participants, as well as lack of syndromic autism exclusion.

There are also several limitations in our methods, including the reliance on parental reports. Research has shown that when different informants (e.g. teachers and parents) rate a child's behaviours using the same measure, discrepancies often occur (De Reyes & Kazdin, 2005; Lopata et al., 2016) which is particularly evident from some of the PDA research (Brede et al., 2017). The ASSQ, although considered a reliable and validated measure; its language is reflective of historical misunderstandings (Bottema-Beutel et al., 2021). and future research adjust their language choice on items which could cause concern. Furthermore, in line with previous critiques of the EDA-Q, we acknowledge the tentative evidence for its content and discriminative validity along with measuring only observable behavioural avoidance, which has no specificity to autism (Woods, 2022). As such the measure was not used to screen participants, particularly as not all of children who identified with PDA reached the original cut-off scores (O'Nions, 2014).

Clearly, there is a need for a more accurate description of what constitutes demand avoidance behaviours along with better measurements to allow us to understand how best to characterises PDA. However, the current findings showing sensory processing differences to uniquely identify EDA in those aligning with a PDA diagnosis, suggests demand avoidance behaviours can help differentiate those identifying with this profile. In the absence of a clear classification and any appropriate diagnostic measures for identifying PDA, addressing transdiagnostic factors for demand avoidance behaviours may prove fruitful. For example, difficulties with sensory over-reactivity, both in the processing and filtering of stimuli (Harrison et al., 2019), may be considered a transdiagnostic risk factor of mental disorders (van den Boogert et al., 2022), and has been associated across the spectrum neurodiverse conditions. Moreover, effective sensory processing contributes to successful emotion regulation (Dhiman & Jaiswal, 2025) and therefore sensory interventions may also help manage and support commonly associated EDA behaviours. With the National Autistic Society already recommending that individuals, with marked demand avoidance, inclusive of those with atypical presentations of autism, are supported with 'personalised' approaches (NAS, 2024; Eaton, 2023; Fuentes et al., 2021). Our findings lend support to recognising the sensory needs of children and adolescents with PDA, to helping create a more individualised and tailored package of care and support, that consider adjustments to their environment, sensory processing support and therapeutic input.

CRediT authorship contribution statement

Aaron J Rai: Writing – review & editing, Project administration, Methodology, Data curation. **Roberto Gutierrez:** Writing – review & editing, Visualization, Software, Formal analysis. **Barbara Rishworth:** Writing – review & editing, Supervision. **Amanda K Ludlow:** Writing – review & editing, Writing – original draft, Supervision, Conceptualization.

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Declaration of Competing Interest

The authors declare no conflict of interest.

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Data availability

Data are available on reasonable request. Data is available on reasonable request by contacting the corresponding author.

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