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A qualitative study of noise sensitivity in adults with autism spectrum disorder☆

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ABSTRACT

Background: Individuals with autism spectrum disorder (ASD) may respond to environmental stimuli more intensely and less conventionally than typical peers. Research has generally focused on sensory sensitivity broadly, rather than individual modalities. Thus, experiences of noise sensitivity (NS) have not been specifically documented in detail. This study documents the experiences of NS in adults with ASD.
Method: Semi-structured interviews were undertaken and recorded with 10 participants. The resultant data were analysed using a descriptive thematic approach to summarise the patterns in the participants' experiences.
Results: The analysis identified four themes emphasising the unique way those with ASD experience sound, and the impacts of noise sensitivity on them.
Conclusions: Documenting experiences such as these is an important early step towards a better understanding and hence supporting those negatively experiencing sound. The present results are both useful for those affected and those working with them, in terms of developing improved methods of coping and clinical interventions. The results are also consistent with recent neurophysiological research.

1. Introduction

Until very recently autism spectrum disorder (ASD) was described as a constellation of deficits across three core domains: language and communication, prosocial behaviour, and restricted interests and repetitive behaviours (APA, 2000). It was not until the release of the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) that sensory issues, first described by Asperger over 70 years ago, were considered in the clinical diagnosis of ASD. In the DSM-5 (APA, 2013) the 'fixated interests and repetitive behaviour for ASD' criterion was broadened to include hyper- or hypo-reactivity to sensory input or unusual interests in sensory aspects of the environment. It is not known whether sensory issues manifest as a core trait of ASD, or as core traits of comorbid disorders (e.g., anxiety), and as such they are treated as correlates of ASD traits (Horder, Wilson, Mendez, & Murphy, 2014). However, Hazen, Stornelli, O'Rourke, Koesterer, and McDougle (2014) report sensory symptoms are increasingly being viewed as core features of ASD, sharing common aetiological mechanisms and contributing to the broader developmental and behavioural issues.

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Miller, Anzalone, Lane, Cermak and Osten (2007) noted that sensory symptoms associated with ASD could be grouped into three categories of 'sensory modulation', each associated with maladaptive responses to sensory stimulation. Those categories were 1) sensory over-responsivity/hyper-responsivity (negative response to sensory input), 2) sensory under-responsivity/hypo-responsivity (less pronounced or delayed response to sensory input), and 3) sensory-seeking behaviour (unusual cravings for certain sensory experiences). These categories are not mutually exclusive and those with ASD may experience a combination of sensory symptoms, commonly being both under- and over-responsive (Hazen et al., 2014; O'Neill & Jones, 1997). Considering the auditory modality, Stiegler and Davis (2010) added hyperacusis, though this condition is associated with inner ear or vestibular damage and is unlikely to be related to ASD. Without reference to specific sensory modalities, estimates of the prevalence of sensory issues in ASD vary widely, research indicates that sensory issues differentiate children with ASD from neurotypical controls and children with other intellectual disabilities (Dahlgren & Gillberg, 1989). Mazurek et al. (2013) report that estimates of sensory over-responsivity in children with ASD range between 56 and 70%. Others have noted high rates of sensory over-responsivity across the breadth of the autism spectrum (Hazen et al., 2014), and there appears to be no link between intellectual functioning and sensory reactivity in those with ASD (Elwin, Ek, Kiellen, & Shröder, 2013).

Robertson and Simmons (2013) identified a positive relationship between ASD traits and sensory processing difficulties. Pertinently, their data also indicated variability in sensory issues across the five modalities, with the auditory modality associated with the highest levels of sensory-related disturbance. As this is not an isolated finding (see also Talay-Ongan & Wood, 2000) it would be useful to examine the modalities in isolation. The present research focuses on the auditory modality and, in particular, hyper-sensitivity to sound. Hyper-sensitivity to sound is common to many psychological disorders, albeit with a different label: *Noise Sensitivity* (NS), and this standardised term is adopted here. Examples of clinical conditions associated with NS include tinnitus (Schwartz, Leyendecker, & Conlon, 2011), Traumatic Brain Injury (Dischinger, Ryb, Kufera, & Auman, 2009), schizophrenia (Tregellas, Smucny, Eichman, & Rojas, 2012), Lyme disease (Coyle & Schutzer, 2002), Williams syndrome (Barozzi et al., 2012), anxiety (Hadjipavlou, Baer, Lau & Howard, 2008) and depression (Stansfeld, 1992). In both the clinical and epidemiological literature the definition of NS is relatively homogenous, with noise sensitive individuals more likely to attend to sound, evaluate sound negatively, experience enhanced emotional reactions to sound, and subsequently have greater difficulty habituating to sound (Stansfeld, 1992). This definition mirrors that found in the ASD literature, albeit with reference to broader sensory processing abnormalities (e.g., Chamak, Bonniau, Jaunay, & Cohen, 2008; Elwin et al., 2013).

As with other clinical conditions, with the exception of tinnitus, NS in ASD individuals cannot be explained by peripheral hearing abnormalities, such as hearing loss or over-sensitive hearing (Gravel et al., 2006; Tharpe et al., 2006). Elwin et al. (2013) ascribed NS in ASD to deficits in core cognitive processes, such as selective attention or sensory gating (Marco, Hinkley, Hill, & Nagajaran, 2011). Gomes, Rotta, Pedroso, Sleifer, and Danesi (2004) appealed to psychological mechanisms, arguing that NS in individuals with ASD emerges from anxiety. In support, White and colleagues (White, Oswald, Ollendick, & Scahill, 2009; White, Ollendick, & Bray, 2011) reported that anxiety is a common comorbidity in ASD, which in children seems to co-vary with sensory hyper-responsivity (Lane, Reynolds, & Dumenci, 2012). Furthermore, in an epidemiological sample, Persson, Bjork, Ardo, Albin and Jakobsson (2007) found significant associations between NS and anxiety. However, Horder et al. (2014) reported robust relationships between ASD traits and sensory processing abnormalities even after controlling for anxiety, though they did not report associations with individual sensory modalities.

The neurobiological origins of NS in individuals with ASD remain to be identified (Hazen et al., 2014; Horder et al., 2014). Stiegler and Davis (2010) argued there was "virtually no evidence of true physiological differences in auditory systems of individuals with ASD" (p.67). However, recent evidence shows some differences in functional anatomy (Courchesne, Campbell, & Solso, 2011; Courchesne, Redcay, & Kennedy, 2004), connectivity (Alexander et al., 2007; Pryweller et al., 2014; Shukla, Keehn, Lincoln, & Müller, 2010), the planum temporal network (Kulesza & Mangunay, 2008; Rojas, Bawn, Benkers, Reite, & Rogers, 2002; Rojas, Camou, Reite, & Rogers, 2005) and brainstem architecture (Kulesza, Lukose, & Stevens, 2010) in ASD compared to typically developing individuals, and that these morphological differences in ASD brains contribute to dysfunctional auditory processing. Furthermore, neurophysiological studies (see Hazen et al., 2014; Horder et al., 2014; Iarocci & McDonald, 2006; Marco et al., 2011) show behavioural and electrophysiological differences between individuals with ASD and typically developing individuals. A review by O'Connor (2012) suggests that individuals with ASD have deficits in processing complex auditory information that is vital to successful social interaction and communication, but appear to have spared or enhanced processing of simple auditory stimuli.

The clinical treatment of health conditions is enhanced by precise aetiology, which is usually developed from quality clinical descriptions. In the broader domain of ASD-related sensory processing deficits, the existent explanatory frameworks can be considered conjectural. Thus, future model building would benefit from richer descriptive data pertaining to experiences along single sensory dimensions. Currently, and across clinical conditions, NS is often treated by practitioners as a neurotic trait, specifically negative affectivity. This often leaves those with sound-related difficulties feeling belittled, ignored or humiliated (Landon, Shepherd, McGarry, Theadom, & Miller, 2016; Landon, Shepherd, Stuart, Theadom, & Freundlich, 2012). Autobiographical sources indicate that for individuals with ASD, NS reduces health and well-being, and professional awareness is essential if educational, social, and vocational outcomes are to be improved (Ashburner, Ziviani, & Rodger, 2008; Stiegler & Davis, 2010). Furthermore, the development of effective treatments is of clinical importance given the high prevalence of sensory processing deficits within ASD individuals (Billstedt, Gillberg, & Gillberg, 2007; Mazurek et al., 2013). Current treatment approaches are few, with sensory integration therapy common. However, this approach cannot be