



Relations among restricted and repetitive behaviors, anxiety and sensory features in children with autism spectrum disorders



Jane Lidstone^{a,1,2}, Mirko Uljarević^{a,1,*}, Jillian Sullivan^{b,3}, Jacqui Rodgers^c, Helen McConachie^d, Mark Freeston^c, Ann Le Couteur^d, Margot Prior^e, Susan Leekam^a

^a Wales Autism Research Centre, School of Psychology, Cardiff University, UK

^b Autism Research Centre, Department of Psychiatry, University of Cambridge, UK

^c Institute of Neuroscience, Newcastle University, UK

^d Institute of Health & Society, Newcastle University, UK

^e Melbourne School of Psychological Science, University of Melbourne, Australia

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ABSTRACT

The purpose of this study was to explore how atypical reactions to sensory stimuli contribute to the relation between restricted and repetitive behaviors and anxiety in children with autism spectrum disorders (ASD). In Study 1, factor analysis of restricted and repetitive behaviors was carried out using the Repetitive Behavior Questionnaire-2 (RBQ-2), completed by 120 parents of 2- to 17-year-olds with ASD. Two subtypes resulted: repetitive sensory and motor behaviors, and insistence on sameness, accounting for 40% of the variance. This two-factor solution was retained even when the sensory items of the RBQ-2 were removed. In Study 2, 49 of the same parents also completed the Spence Anxiety Scales and the Sensory Profile. The insistence on sameness factor was significantly associated with anxiety while the repetitive motor behaviors factor was not. The relation between anxiety and insistence on sameness was mediated by sensory avoiding and to a lesser extent by sensory sensitivity. Implications for arousal explanations of ASD and for clinical practice are discussed.

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1. General introduction

Restricted and repetitive behaviors (RRBs) are part of the core criteria for autism spectrum disorders (ASD). They form a heterogeneous class of behaviors that are characterised by invariant repetition and desire for sameness in the environment (Kanner, 1943). Factor analytic studies using the Autism Diagnostic Interview-Revised (ADI-R) consistently indicate a division into two subclasses: (a) *repetitive motor and sensory (RSM)* behaviors such as repetitive hand or finger movements and (b) *insistence on sameness (IS)*, including narrow interests, rigid routines, and rituals (Cuccaro et al., 2003; Honey,

* Corresponding author at: Wales Autism Research Centre, School of Psychology, Cardiff University, Park Place, Cardiff CF10 3AT, UK. Tel.: +44 029 208 74007; fax: +44 029 208 74858.

E-mail address: uljarevicm@cardiff.ac.uk (M. Uljarević).

¹ Joint first authors.

² Now at Psychology Department, Durham University, UK.

³ Now at Sensory Processing Disorder Foundation, Colorado, USA.

Rodgers, & McConachie, 2012; Richler, Bishop, Kleinke, & Lord, 2007; Szatmari et al., 2006). Subgroups of RRB have been proposed to represent different neural pathways (Langen, Durston, Kas, Van Engeland, & Staal, 2011) and show different presentations in early typical development (Arnott et al., 2010).

Early theoretical accounts considered the use of RRBs to be a coping mechanism for maintaining a homeostatic state of arousal, with RRBs helping to increase sensory stimulation when an individual is under-aroused and reduce stimulation or soothe when over-aroused (Kinsbourne, 1980; Ornitz & Ritvo, 1968; Zentall & Zentall, 1983). Consistent with this explanation, RRBs are often considered to be a marker for anxiety, forming a buffer to alleviate anxiety and distress in a similar way to the role of RRBs in young children (Evans et al., 1997) and compulsions in obsessive compulsive disorder (Zandt, Prior, & Kyrios, 2007).

To date, evidence supports the claim that RRBs are associated with anxiety in individuals with ASD (Joosten, Bundy, & Einfeld, 2009; Kamp-Becker, Ghahreman, Smidt, & Remschmidt, 2009; Rodgers, Glod, Connolly, & McConachie, 2012; Spiker, Lin, Van Dyke, & Wood, 2012; Sukhodolsky et al., 2008; Tantam, 2003). RRBs are also associated with sensory features (Boyd, McBee, Holtzclaw, Baranek, & Bodfish, 2009; Chen, Rodgers, & McConachie, 2009; Gabriels et al., 2008), even after controlling for age and IQ (Boyd et al., 2010; Gabriels et al., 2008). There is also evidence of an association between atypical sensory features and anxiety in ASD (Ben-Sasson et al., 2009; Green & Ben-Sasson, 2010; Green, Ben-Sasson, Soto, & Carter, 2012; Pfeiffer, Kinnealey, Reed, & Herzberg, 2005). However, little is known about the particular way in which atypical reactions to sensory stimuli contribute to the relation between anxiety and RRBs in children with ASD. Evidence from toddlers with non-specific ASD (PPD-NOS) suggests that the onset of sensory features developmentally precedes the onset of symptoms of anxiety (Green et al., 2012), but as yet the nature of the three way relation between sensory features, anxiety and RRBs remains to be characterized.

One proposal is that different subclasses of RRBs may function in different ways to either increase or reduce sensory stimulation and anxiety (Leekam, Prior, & Uljarević, 2011). To date only one published study has examined the relation between anxiety and each of the RSM and IS subclasses of RRB. Using the 38-item Spence Children's Anxiety Scale-Parent Version (SCAS-P; Spence, 1998) and the 33-item Repetitive Behavior Questionnaire (RBQ; Turner, 1996) with 8- to 16-year-olds with ASD, Rodgers et al. (2012) found a significant association between total anxiety score and IS. This association was especially strong among children meeting the cut-off score indicating clinical levels of anxiety. However RSM behaviors did not significantly relate to anxiety. More recently, Gotham et al. (2013) also explored the relationship between anxiety and IS in a very large sample of 5- to 18-year-olds, using the anxiety problems score of the Child Behavior Checklist, derived from six items based on DSM-IV criteria for anxiety disorders (Achenbach & Rescorla, 2001), and an IS score based on six items from the ADI-R (Rutter, Le Couteur, & Lord, 2003). Although this study found a weaker relation between IS and anxiety than shown in the Rodgers et al. study, nevertheless a modest and statistically significant relation existed. In this study, the relation between anxiety and RSM was not reported. Similarly, while a study of repetitive motor behaviors in ASD found that an elevated RRB score is associated with both sensory under-responsiveness and over-responsiveness (Gal, Dyck, & Passmore, 2002), this study did not include measures of either anxiety or IS.

The purpose of the current study was to explore the potential contribution made by atypical sensory features to the anxiety-RRB relation in children with ASD. Standard RRB questionnaire measures traditionally include a number of sensory items as these are part of the category of RRBs within diagnostic criteria for DSM-IV-TR (American Psychiatric Association, 1994). To enable comparison with previous research, in Study 1 we tested the structure of a RRB questionnaire, the Repetitive Behavior Questionnaire-2 (RBQ-2; Leekam et al., 2007), which includes a set of sensory items. We then removed these items in a second factor analysis. Study 1 also analyzed associations with age given longitudinal evidence of age changes in childhood using the ADI-R (Richler, Huerta, Bishop, & Lord, 2010). In Study 2, to avoid artificially inflating relations with other sensory measures, we studied the relation between these non-sensory RRB items and anxiety, and also an independent measure of sensory atypicality taken from the Sensory Profile (Dunn, 1999).

2. Study 1

Study 1 examined the factor structure of the RBQ-2 questionnaire, using this measure for the first time with a sample of children with ASD. To date, published data on the factor analytic structure and psychometric properties of the RBQ-2 has been confined to a typically developing sample at 15 and 24 months of age (Arnott et al., 2010; Leekam et al., 2007), with results showing that the items group into two factors (RSM and IS). Study 1 aimed to replicate this finding with an ASD sample, firstly using the full RBQ-2 and secondly using the RBQ-2 with sensory items removed.

2.1. Method

2.1.1. Participants

Parents of 120 children with ASD (110 males, 10 females), with ages ranging from 2 years 5 months (2;5) to 17;9 (M 7;7, SD 3;10), participated as part of their involvement in a research study being carried out in two different parts of the UK (South Wales, $n = 59$, and the South East of England, $n = 61$) investigating the association between RRB and other factors. The South Wales sample was aged 2;5–17;9 (M 9;11, SD 4;4, 54 males, 5 females) and the South East England sample was aged 2;9–8;5 (M 5;4, SD 1;2, 56 males; 5 females). All had a community multidisciplinary team assessment leading to a best estimate clinical diagnosis of an ASD (including autism and Asperger syndrome) according to DSM-IV-TR (American

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