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Correlating derived relational responding with linguistic and cognitive ability in children with Autism Spectrum Disorders

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ABSTRACT

Many children with Autism Spectrum Disorders (ASD) show substantial deficits in linguistic and cognitive ability. When considered from the perspective of Relational Frame Theory (RFT), it is possible that these deficits are rooted in a deficiency in the capacity to derive relations. One key aim of the Training and Assessment of Relational Precursors and Abilities (TARPA) protocol is to assess derived relational responding. A number of previous studies have shown correlations between TARPA performance and linguistic ability in children with ASD. The current study has extended this work by (i) showing correlations between TARPA performance and cognitive as well as linguistic ability in a larger ($n = 35$) sample of children with ASD; (ii) providing evidence of TARPA test–retest reliability; (iii) providing additional evidence indicating differences in visual and auditory performance in children with ASD.

1. Introduction

Early intervention programmes have been successful in teaching children with Autism Spectrum Disorder (ASD) important language skills, including functional requesting (mands) and labelling (tacts) through explicit training. However, despite intensive and prolonged training, many children with ASD show relatively little linguistic 'generativity'; that is, they find it challenging to produce or understand totally new sentences and hence to engage in novel conversational language (Greer & Ross, 2008). Traditional behavioural treatment research has made substantial progress in programming for generalisation across stimuli, people, and settings, but much more research is needed on establishing generativity across complex language and relational skills (see, e.g., Barnes-Holmes & Murphy, 2007a; Barnes-Holmes & Murphy, 2007b; Luciano et al., 2009).

1.1. Relational Frame Theory

One theory that offers a potentially useful approach to understanding generativity is Relational Frame Theory (RFT; Hayes, Barnes-Holmes & Roche, 2001). According to RFT, language is based on learning patterns of contextually controlled derived relational responding (referred to as *relational frames*) and once a child is able to respond in accordance with these

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patterns then this greatly enhances the possibility of emergent performance.[1] An example of derived relational responding is mutual entailment in accordance with a pattern or frame of coordination in which, having been taught that A goes with B, a child can derive that B goes with A without further training. A slightly more advanced example is coordinate combinatorial entailment in which two taught coordinate relations are combined to allow derivation of novel additional coordinate relations (e.g., if taught that A goes with B and B goes with C then the child can derive that A goes with C and vice versa). Furthermore, coordination is just one such pattern or frame (others include distinction, opposition, comparison, etc.). According to RFT, the ability to engage in a variety of such patterns of derived relations is what underlies the immense generativity of human language and cognition. Typically developing children learn this type of responding through exposure to the natural language environment (see e.g., Lipkens, Hayes, & Hayes, 1993; Luciano, Gomez-Becerra, & Rodriguez-Valverde, 2007). However, research suggests that many children with ASD do not easily learn these patterns (e.g., Rehfeldt, Dillen, Ziomek, & Kowalchuk, 2007) and thus specific targeted training is critical (see, e.g., Rehfeldt & Barnes-Holmes, 2009).

1.2. Training and Assessment of Relational Precursors and Abilities (TARPA)

Recently, a novel protocol for assessing and training derived relational responding has been developed. This protocol, the Training and Assessment of Relational Precursors and Abilities (TARPA; Kishita, Ohtsuki & Stewart, 2013; Moran, Stewart, McElwee, & Ming, 2010; Moran, Stewart, McElwee, & Ming 2014), tests a number of key forms of responding that are critical (from an RFT perspective) to the development of this repertoire and thus generative verbal behaviour. These forms include (i) basic or simple discrimination; (ii) non-arbitrary [i.e., based on formal or physical properties] conditional discrimination; (iii) arbitrary [i.e., experimenter-designated] conditional discrimination; (iv) mutually entailed relational responding [e.g., deriving the symmetrical relation B → A from the trained relation A → B]; (v) combinatorial entailed relational responding [e.g., deriving the untrained relations A → C and C → A by combining the trained relations A → B and B → C]; (vi) transfer of function [responding to a stimulus in a new way not explicitly trained based on its participation in a derived relation of sameness with another stimulus]. In addition, the TARPA assesses these patterns of responding with both visual and auditory stimuli.

The aim of this study was to extend previous work that has used the TARPA to examine derived relational responding in children with ASD. Moran et al. (2010) measured the performance of five children with ASD on both the TARPA and the Vineland Adaptive Behavior Scales (VABS). A Spearman's rank correlation test showed a strong and significant correlation ($\rho = .97$; $p = .05$) between performance on the two instruments. Further tests were conducted to examine the relationship between derived relational ability as measured using the TARPA and scoring on the VABS sub-scales. These showed that TARPA performance correlated highly, though just outside significance, with the Communication sub-scale ($\rho = .947$; $p = .056$), while showing lower, more clearly non-significant correlations with the Daily Living ($\rho = .56$; $p = .25$) and Socialisation ($\rho = .56$; $p = .25$) sub-scales. Overall then, this pattern of results was consistent with the RFT perspective that derived relational responding is the key process involved in language. Lastly, Moran et al. (2010) also showed some differences in performance based on stimulus modality. For instance, a number of participants showed weaker responding on sections involving exclusively auditory stimuli than on sections involving at least some visual stimuli, irrespective of the strength of their overall performance.

Moran et al. (2014) recently extended this work by correlating a more comprehensive and systematic TARPA protocol with the Preschool Language Scale 4th Edition (PLS-4), a mainstream performance-based language assessment, in ten additional children with ASD (Experiment 1) and 13 typically developing children (Experiment 2). This study also involved conducting an order analysis of the TARPA. Results showed (i) a strong and significant correlation between TARPA performance and PLS-4 full-scale and subscales and (ii) evidence to support the hierarchical structuring of the TARPA. These findings support those of Moran et al. (2010) by providing further evidence of the link between derived relational responding and language as well as by further demonstrating the utility of the TARPA as a method for assessing the former.

1.3. The current study

The current research aimed to extend these previous studies in several respects. First, a larger sample of children with ASD was employed than in either of the previous studies. More specifically, whereas Moran et al. (2010) and Moran et al. (2014) used samples of ASD participants of 5 and 10 respectively, the current study employed a sample of 35. Second, in order to measure TARPA test–retest reliability, approximately half of the children assessed ($n = 17$) were retested with a completely new set of stimuli within 2 weeks[2] of the first test. The use of a completely new set of stimuli, while perhaps unusual within typical standardised testing, was done to ensure that the retested performance was derived without the influence of prior exposure. Third, a more extensive range of comparison assessments was used. In addition to the VABS and

[1] The RFT explanation of the nature of contextually controlled relational responding and its relationship with human language and cognition is beyond the scope of the current article but has been extensively laid out in other publications including Hayes et al. (2001).

[2] There was some variation across participants in the exact length of time between test administrations based on participant availability. However, the fact that the second administration of the TARPA always used a completely new set of stimuli means that this variability is less important than for a retest involving a standardised measure in which the items were the same.