

Testing a computer-based protocol for the assessment of generative verbal behavior in children with ASD

Siri Ming, Ian Stewart & Laura Moran; School of Psychology, National University of Ireland, Galway
John McElwee; VB3

Introduction

Understanding and accounting for the ability to produce and understand completely novel sentences- accounting for the generativity of language is critical to any account of language development (Malott, 2003), and to the creation of programs for teaching flexible and fully functional language repertoires.

Relational Frame Theory (RFT; Hayes, Barnes-Holmes & Roche, 2001) explains linguistic generativity in terms of learned contextually controlled relational responding referred to as relational framing. Typically developing children learn relational framing through natural language interactions during which they are exposed to contingencies that establish these response patterns (e.g., Lipkens, Hayes & Hayes, 1993; Luciano, Gómez & Rodríguez, 2007). However, children with autism spectrum disorders (ASD) do not easily learn this key form of responding (e.g., Rehfeldt, Dillen, Ziomek, & Kowalchuk, 2007). Nonetheless, they can benefit from training of this repertoire (e.g., Murphy & Barnes-Holmes, 2009).

The ability to derive relations is implied in assessments of verbal behavior that look for novel responding and response generalization (e.g., Sundberg, 2008), but direct testing of relational framing abilities is not yet typical in applied behavior analytic educational programs.

This research represents an initial stage in the development of a comprehensive, computer-based protocol (Training & Assessment of Relational Precursors & Abilities; TARPA) for the assessment and training of relational framing in young children with ASD. More specifically, this work is a preliminary test of the TARPA as an assessment tool for important behavioural precursors to relational framing as well as the emergence of the fundamental elements of sameness (coordinate) relational responding.

Methods

TARPA

The TARPA protocol has been designed to systematically assess and train a progression of key domains of responding critical to the development of generative language including (i) basic discrimination; (ii) conditional discrimination (similar stimuli); (iii) conditional discrimination (non similar stimuli); (iv) mutual entailment testing; (v) combinatorial entailment testing and (vi) transformation of function.

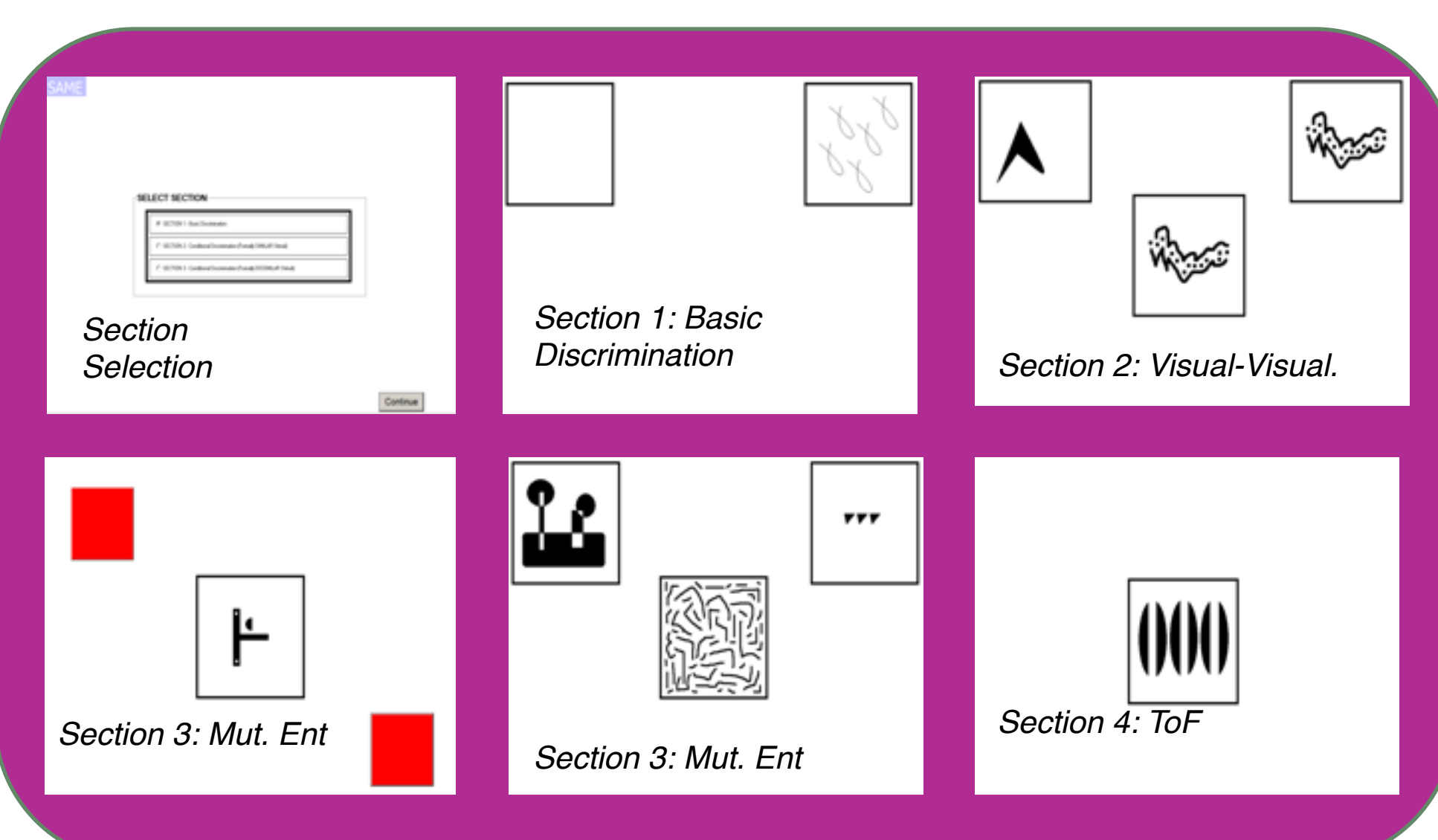


Fig. 1. Screenshots from the TARPA

Methods (cont.)

Each stage is further subdivided into multiple levels based on the manipulation of several variables including visual versus auditory content and trained / demonstrated versus trained and tested (multi-section) levels. Learners able to perform at the final stage, the most advanced stage of the protocol, have, from the RFT perspective, acquired the core repertoire needed for advanced flexible language use.

A regime of testing and developing the TARPA is currently underway and a number of small studies have been completed.

Study 1: Brief Report: TARPA (Moran, Stewart, McElwee & Ming, 2010)

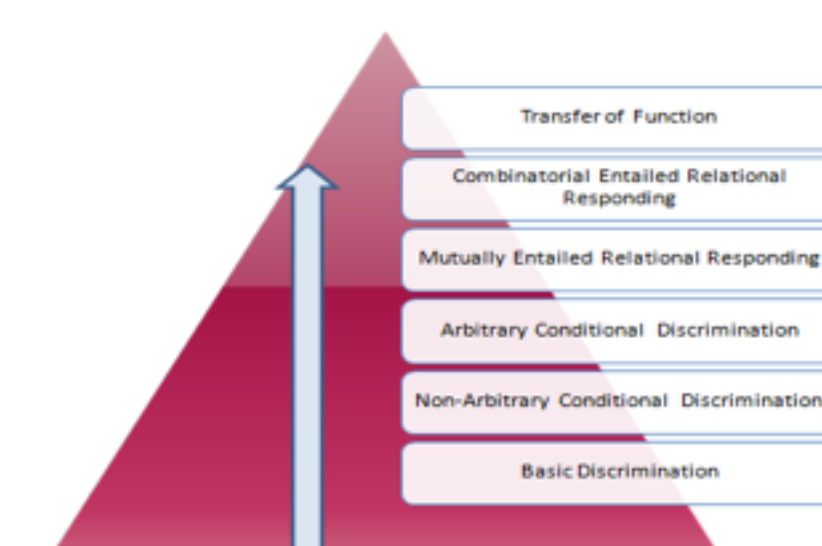


Fig. 2 Hierarchical structure of the TARPA

Participants

Five children (see Table 1 for ages and gender), each of whom had an independent diagnosis of autism, were recruited through a school for children with special needs at which the main researcher was employed.

Materials

Vineland II Adaptive Behavior Scales (VABS) & the TARPA

Procedure

The VABS was administered to the child's caregiver by the experimenter. The TARPA assessment was presented on a laptop computer and was administered by the experimenter to each participant over a number of sessions.

Results & Discussion

Table 1 shows each participant's score on the VABS and the TARPA. A Spearman's rank correlation test showed a strong and significant correlation ($r = 0.97$, $p = 0.05$) between performance on the VABS and the TARPA.

Pt.(Sex)	Age	VABS Scores				TARPA
		Communication	Daily Skills	Socialization	Composite	
1(M)	13:6	25	48	34	33	1
2(M)	6:4	38	55	55	52	1
3(M)	7:7	77	100	23	66	7
4(M)	7:9	77	65	71	70	11
5(F)	10:2	100	63	68	75	12

Table 1. Participant sex, chronological age and scores on the VABS and TARPA

Study 1 (cont.)

Results (Continued)

Further tests were conducted to examine the relationship between TARPA performance and scoring for each of the sub-scales of the VABS. These showed that the TARPA correlated highly, though just outside significance ($r = 0.947$, $p = 0.056$) with the Communication sub-scale, and that it showed lower, more clearly non-significant correlations with the Daily living ($r = 0.56$, $p = 0.25$); and Socialization ($r = 0.56$; $p = 0.25$) sub-scales.

Discussion

The purpose of this study was to provide a preliminary test of the TARPA protocol using children with ASD as participants. With regard to the main correlation, future research involving a larger participant pool will be required to substantiate this finding; nevertheless, this was a good preliminary result for the TARPA.

Even in this initial study, the TARPA performed in accordance with what might be expected of a language relevant protocol, since it correlated most highly (and closely approaching significance) with the Communication subscale of the VABS, while showing much lower correlations with the other sub-scales. On the basis of this study a more comprehensive version of the TARPA was developed, that included four different tracks that looked at the precursor skills to relational framing and relational framing itself across four different modalities or combination of modalities (i.e., visual-visual; auditory-visual 1; auditory-visual 2 and auditory-auditory).

Study 2: Pilot Testing a short version of the TARPA

Participants

10 students at Chrysalis Academy, Phoenix AZ participated in this study.

Materials

Short version of the TARPA (visual-auditory modality), Preschool Language Scale-4th Ed. (PLS-4) and the Verbal Behavior Milestones Assessment and Placement Program (VB-MAPP)

Procedure

The TARPA was administered by BCaBAs trained to fidelity (Chrysalis Academy staff). Participants were tested with PLS-4 and VB-MAPP.

Results & Discussion

Figure illustrates participants' scores on the TARPA and the PLS-4. Participants levels of attention are also graphed.

When students attended well and were motivated to use the computer program, high correlations were obtained with both PLS-4 and VB-MAPP scores; however, over half the sample did not perform as expected (see Figure 3) These children did not pass even TARPA Stage 2 (conditional discrimination) despite having well developed matching and listener discrimination vocabularies as evidenced by VB-MAPP and PLS-4 performance.

Study 2 (cont.)

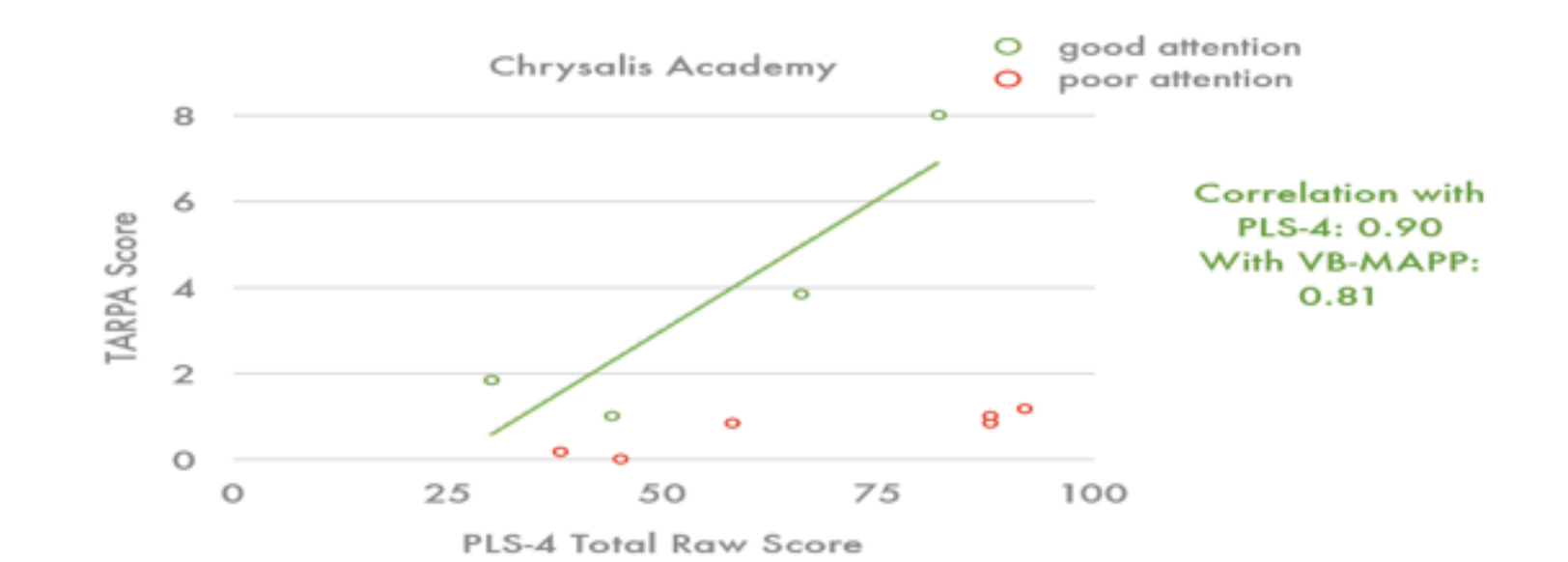


Fig. 3. Participants scores on the TARPA (short version), PLS-4 & attention

Further investigation revealed that neither the use of abstract stimuli nor a difficulty with acquiring novel discriminations had any effect on performance. The primary issues for children not performing as expected were i) not being able to perform selection-based rather than physical placement matching, and ii) not being motivated to attend to the computer program or not attending for long enough to complete the tasks to the set criteria (this was also an issue for very young children).

These pilot tests led to a number of changes, including clarifying the teacher protocol to allow for interspersal of other tasks, breaks, increased reinforcement, and any other teaching procedures needed to maintain motivation and attending. Pass criteria were loosened, transformation of function procedures altered, and the testing sequences were adjusted for smoother and quicker administration.

Conclusion & Current Work

Currently a more comprehensive test of the evolved TARPA using a larger sample size and controls is being conducted. Specifically, this involves testing typically developing children and children with ASD (aged 3-10) using the TARPA and the PLS-4.

The next stage of research will involve using the TARPA as a tool for remediation and extending the scope of the protocol to more complex forms of relational framing (i.e., frames of opposition and comparison).

Another line of research will be looking at teaching protocols for training derived intraverbal responding for frames of coordination, difference, and hierarchy. Initial training will be computer-based, with generalization testing through table-top procedures.

Table-top protocols are currently in development and being pilot-tested for training nonarbitrary and arbitrary responding for frames of difference and spatial relations.

Key literature cited

Hayes, S.C., Barnes-Holmes, D., & Roche, B. (2001). *Relational frame theory: A post Skinnerian approach to language and cognition*. New York: Plenum Press.

Malott, R.W. (2003). Behavior analysis and linguistic productivity. *Analysis of Verbal Behavior*, 19, 11-18.

Moran, L., Stewart, I., McElwee, J., & Ming, S. (2010). Brief Report: The Training and Assessment of Relational Precursors and Abilities (TARPA). *Journal of Autism and Developmental Disorders*, 40, 1149-53.

For further information

More information on this and related projects can be obtained at <http://vb3.co.uk/wpnu/>