

Symposium Title: Meaningful Differences in the Everyday Experience of Young Autistic Children (C4HPD7J8)

Chair: Lee Mason¹

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Overview: Language deficits are characteristic of individuals diagnosed with an autism spectrum disorder according to both the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition, and the International Classification of Diseases, Tenth Revision. In particular, the language of individuals with autism shows “stimulus overselectivity”, or disproportionate levels of strength across the environmental relations that control their verbal behavior. For educational and clinical service providers, the provision of services is contingent upon demonstrating an educational or medical necessity for intervention. However, prior attempts to measure stimulus overselectivity has been limited to selection-based language, and limited to highly controlled laboratory settings.

Teleological behavior analysis allow us to treat individual people as the universe from which different response populations can be sampled for experimentation and analysis. Using this approach, we can demonstrate how stimulus overselectivity influences verbal behavior by comparing language domains that are related; that is, structurally similar yet functionally independent. Here we extend the use of functional analysis technology to examine a variety of related language domains that demonstrate how stimulus overselectivity affects the verbal behavior of children with autism, along with implications for intervention focusing on transfer of stimulus control.

Paper 1 of 3

Paper Title: Referent-Based Instruction to Strengthen the Verbal Behavior of Children with Autism

Authors: Alonzo Andrews²

Introduction: The current study evaluates the use of precision teaching to address the verbal behavior deficits of children with autism and other language disorders. From 2013-2018, a high-research-activity doctoral university in the south-central United States operated a free clinic that provided applied behavior analysis to early learners in the local community. Participants received referent-based verbal behavior instruction to strengthen their functional language skills by systematically transferring stimulus control across four primary verbal operants: mands, echoics, tacts, and sequels. Referent-based instruction is premised upon the notion that proportionate levels of strength among these four operants provides the relational flexibility of naturalistic speaking observed in typically language development. Relative strengths and weaknesses were identified in the verbal repertoire for each participant, and individualized fluency aims were subsequently developed.

Methods: Forty-nine participants received 13 weeks of intervention for 90 min a day, four days a week. As described by Mason and Andrews (2014), RBI is a treatment package that combines both natural environment training (NET) and frequency building to strengthen verbal behavior. Referent-based instruction emphasizes transferring of stimulus control across the verbal operants within the context of shaping novel responses. The overarching goal of referent-based instruction is that for every item of interest, the child should be able to request it, label it, name it, and identify it by its primary feature(s). To achieve this goal, we used a combination of milieu and discrete trial training, dividing each 90-min instructional session into nine 10-min intervals. Every interval consisted of 9 min of natural environment training followed by a 1-min fluency probe.

Results: Results of pretest and posttest comparisons show that a large effect size was found within the verbal behavior gains of participants who received precision teaching. A paired-samples t-test was used to determine whether there was a statistically

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significant mean difference between pre and post SCoRE assessments across 13 weeks of referent-based verbal behavior instruction. Participants demonstrated stronger verbal behavior on the posttest SCoRE ($M = 0.700$, $SD = 0.221$) when compared to the pretest SCoRE ($M = 0.463$, $SD = 0.255$), a statistically significant mean increase of 0.236, 95% CI [0.184, 0.289], $t(48) = 9.0916$, $p < .001$, $d = 1.30$. Surpassing the threshold of $\alpha = 0.05$, the significant difference between pretest and posttest values stipulates that the mean pretest and posttest SCoRE values are not the same after 13 weeks of RBI.

Discussion: After 13 weeks of intervention, the average SCoRE for participants across all four repertoire sizes increased to the next level. That is, the average SCoRE of the 11 emergent speakers increased from .08 to .46, effectively moving them into the practical range. The average SCoRE of the 11 participants who started with a practical speaking repertoire increased from .37 to .64, effectively moving them into the moderate range. The average SCoRE of the 23 participants who began with a moderate speaking repertoire increased from .62 to .80, effectively moving them into the moderate range. The average SCoRE of the four participants who began the study with strong speaking repertoires increased from .84 to .92. Each group's gains varied in accordance with their pretest SCoRE. The lowest performing participants made the most significant gains, perhaps because they had the most room to grow according to the SCoRE measure. Moreover, the logarithmic influence of reinforcement on behavior has been well established (Kubina et al., 2002). Implications for implementing referent-based instruction as well as future areas of research will be discussed.

References/Citations:

- Kubina, R. M., Morrison, R., & Lee, D. L. (2002). Benefits of adding precision teaching to behavioral interventions for students with autism. *Behavioral Interventions*, 17(4), 233-246.
- Mason, L. L., & Andrews, A. (2014). Referent-based verbal behavior instruction for children with autism. *Behavior Analysis in Practice*, 7(2), 107-111.

Paper 2 of 3

Paper Title: Increasing the Verbal Behavior of Preschool Students with Autism in South Texas

Authors: Janet Enriquez³

Introduction: For the 2018-2019 academic year, nine San Antonio area school districts were funded by the Texas Education Agency to provide verbal behavior training to preschool and kindergarten students with autism. At the start of the year we assessed participants using the Stimulus Control Ratio Equation (SCoRE; Mason & Andrews, 2019) to determine the extent to which mands, echoics, tacts, and sequels exerted disproportionate levels of control over each participant's verbal behavior. The results of the SCoRE were then used to develop individualized verbal behavior treatment plans for each student to be carried out in his/her home classroom. We subsequently trained more than 100 teachers and paraprofessionals to implement referent-based verbal behavior instruction, with a goal of balancing out the relative strength of these four primary verbal operants. In addition to providing direct classroom-based services for students with autism, the project included ongoing parent trainings conducted by district behavior analysts throughout the academic year. At the end of the year, students were reassessed with the verbal behavior SCoRE to analyze language gains. Here we present an overview of the project along with the results of our grant activities.

Methods: Across nine districts in South Texas, 116 students with autism were provided referent-based verbal behavior instruction (RBI) within the classroom for the duration of one academic semester. Prior to the start of the spring 2019 semester, a SCoRE assessment was conducted for each student. Teachers and paraprofessionals were trained to implement RBI in their own classrooms, using common objects typical to the preschool classroom. Each child received an individualized treatment plan for errorless language learning, which outlined a strategy for most-to-least prompting using the data from their pre-test SCoRE.

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At the end of the semester, post-test SCoRE assessments were conducted for each student and their language gains were analyzed.

Results: Our primary goal for this project was a 50% average increase in the verbal behavior Stimulus Control Ratio Equation (SCoRE) of students with autism as measured by pre/post assessments. The average pretest SCoRE for 116 students served through this award was 0.45. A 50% increase of 0.23 set our benchmark for posttest assessment at 0.68. Due to attrition and inability to conduct final assessments, posttest data was collected for 102 participants. We fell just shy of our goal with an average posttest SCoRE of 0.63. From pretest to posttest, our students increased an average of 0.18

Discussion: Overall, we found our efforts to be successful, though we did not quite reach our stated goal of 50% language improvement. A number of factors contributed to the results we achieved over the 2018-2019 academic year. Primarily, we employed individualized language instruction for each student participating in the project. The benefit of individualized treatment plans are that they prescribe an instructional guide specific to each student based on his/her present level of functional language at the start of the project. The cost of individualizing treatment was a lengthy delay from the time of assessment to return the individualized plans to each teacher.

References/Citations:

- Mason, L. L., & Andrews, A. (2019). The verbal behavior stimulus control ratio equation (SCoRE): A quantification of language. *Perspectives on Behavior Science*, 42, 323-343 doi:10.1007/s40614-018-0141-1

Paper 3 of 3

Paper Title: Cochran's Q Tests of Autistic Stimulus Control over Verbal Behavior

Authors: Lee Mason¹

Introduction: Cochran's Q test is a statistical analysis frequently used to measure the proportionality of different populations. Here we demonstrate the use of Cochran's Q to evaluate disproportionate levels of stimulus control over the verbal behavior of children with autism. In contrast to balanced neurotypical stimulus control, disproportionate stimulus control is the defining feature of autism. We reviewed the records of 181 participants whose language profiles met the assumptions for analysis with Cochran's Q. Specifically, the relative strength of mand, tact, echoic, and sequelic relations were measured for each participant. Our results showed that 86% of participants demonstrated statistically significant disproportionality across these four verbal operants. Additionally, a large correlation was found between Cochran's Q and the Stimulus Control Ratio Equation. Implications for the use of Cochran's Q test as a measure of autistic stimulus control, and the extent to which statistical significance can be used to determine medical necessity for behavior-analytic language intervention are discussed.

Methods: Records from 181 children who received educational interventions for ASD were reviewed. Participants were both male and female with a mean age of 3.5 years (range 2 - 6.5). SCoRE data for all participants were analyzed using Cochran's Q test according to the following procedures. For each participant, 15 one- to two-word samples were used as the units of analysis. Response samples were randomized through the use of free-operant stimulus preference assessments (Roane et al., 1998). The emission of each verbal response was dichotomously analyzed across four different sources of operant control, which served as categorical, related groups.

While 15 trials of each verbal operant were assessed for each participant, matched samples (n) that scored the same across related groups (k) - i.e., either all 0's or all 1's - were eliminated. Consequently, the data of 71 participants no longer met the minimum sample-size requirement of $nk \geq 24$ for Cochran's Q analysis (Tate & Brown, 1970).

Results: Of the 110 participants whose data we analyzed, 95 (86%) showed a statistically significant difference in responding across verbal operants. Figure 1 shows a comparison of SCoRE and Cochran's Q for each participant. A large negative correlation

was found between SCoRE and Cochran's Q, $r(108) = -.52$. Accordingly, 27% of the variance in Cochran's Q can be attributed to the participant's SCoRE. Participants with an inadequate sample size for analysis primarily demonstrated minimal functional language (SCoRE $\leq .33$, $n = 71$) or speaking fluency (SCoRE $\geq .88$, $n = 8$). The remaining two individuals for whom Cochran's Q test could not be conducted had SCoREs of .45. Accordingly, the null hypothesis - stating that the four assessed operant classes are proportionately equivalent - was retained for these participants. Of the 110 participants for whom an adequate sample size was achieved, only 4 (4%) found no significant difference when SCoRE fell below .80.

Discussion: Cochran's Q test found that eighty-six percent of the 110 verbal repertoires analyzed showed autistic stimulus control across one or more verbal operants. Additionally, a strong negative correlation was found between SCoRE and Cochran's Q. The effect sizes for SCoRE – used to describe various speaking repertoires - appear to be strong predictors of Cochran's Q. Emergent ($< .20$) and strong ($\geq .80$) SCoREs were unlikely to show the disproportionality of autistic stimulus control. Conversely, moderate SCoREs (.50 - .79) were unlikely to be proportionate. Only SCoREs in the practical range (.20 - .49) were more likely to require additional follow-up testing with Cochran's Q. Cochran's Q test may be useful in determining the significance of language impairments for individuals with ASD. To the extent that statistically significant differences are found across verbal operants, behavior-analytic language intervention should be considered medically necessary. Though sample sizes became problematic for participants with a SCoRE below .20, these global language delays also warrant behavior-analytic intervention despite not demonstrating autistic stimulus control. Importantly, while these findings show that ABA is not medically necessary to strengthen the language of speaker with strong SCoREs identified in this study, this does not mean that behavior-analytic intervention is not required to address other behavioral excesses and deficits.

References/Citations:

- Tate, M. W., & Brown, S. M. (1970). Note on the Cochran Q test. *Journal of the American Statistical Association*, 65(329), 155-160.