



Research

Fall 2017

News and Notes About
Scientific Research on ASD
and Other Developmental and
Behavioral Disorders



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Autism Education and Research

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Autism, Sleep and Problem Behavior

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Individuals diagnosed with an autism spectrum disorder (ASD) have been found to be more likely to have a number of other health problems (e.g., seizures, tuberous sclerosis, depression, anxiety, etc.) than their typically developing peers. Another commonly encountered health problem for persons with an ASD is disturbed sleep. It has been suggested that the sleep of children with autism is commonly disrupted, with between 40 and 80 percent of children with an ASD experiencing sleep problems compared with between 25 and 40 percent of typically developing children (Meltzer & Mindell, 2008; Reynolds & Malow, 2011). Research has identified a range of sleep difficulties among children with ASD, including reduced total sleep time, delayed sleep onset, early awakenings, and increased night awakenings (Hermann, 2015; Malow & McGrew, 2008).

Many of the students served by The New England Center for Children® present with sleep problems and there are many cases for which we have also provided sleep treatment. For all of our residential students data are collected every night on their sleep. A few years ago we were approached by Dr. Stephen Lockely and colleagues from the Division of Sleep Medicine at Harvard Medical School about collaborating on a project to collect and analyze sleep data for our residential students. There were a number of other collaborators, including some researchers from Monash University in Australia and some of our behavior analytic colleagues from Melmark

New England. There were two primary funding sources that supported this collaborative effort: The post-graduate scholarship (APA) and Australian Research Council (ARC) Autism Sleep grant awarded to Monash University (Grant number: DP120101414), and NIH award R00 HL119618.

Some of this work was published last month in *Scientific Reports*, which is one of the esteemed journal *Nature's* family of journals. Cohen and colleagues (2017) surveyed approximately 50,000 nights of caregiver sleep/wake logs (i.e., records of whether a student was asleep or awake during each hour of the night) on school days for 106 individuals with ASD. Each student's sleep was monitored for at least six months with most students having over two years of sleep analyzed. The analysis showed that there were two types of sleep patterns, unstable sleepers (41 students) and stable sleepers (65 students). Unstable sleepers had reduced sleep duration, earlier awakenings, and less stability in sleep generally. Those with unstable sleep were more likely to have more significant intellectual impairment, poorer communication and social skills, and more severity in problem behavior. This study provides foundational evidence for profiling and targeting sleep as a standard part of therapeutic intervention in individuals with autism. Despite sleep disturbance being a common complaint in individuals with autism, specific sleep phenotypes and their relation to adaptive functioning have not been well studied. This study was an important step in that it found

distinct sleep patterns and suggested they relate to adaptive functioning in individuals with autism. More research of this type is clearly warranted.

Hermann, S. (2015). Counting sheep: sleep disorders in children with autism spectrum disorders. *Journal of Pediatric Health Care*, 30, 143-154.

Malow, B. A. & McGrew, S. G. (2008). Sleep disturbances and autism. *Sleep Medicine Clinics*, 3, 479-488.

Meltzer, L. J. & Mindell, J. A. (2008). Behavioral sleep disorders in children and adolescents. *Sleep Medicine Clinics*, 3, 269-279.

Reynolds, A. M. & Malow, B. A. (2011). Sleep and autism spectrum disorders. *Pediatric Clinics of North America*, 58, 685-698.

Featured article: Cohen, S., ... McConnell, K., Ahearn, W.H., ... & Lockely, S. (2017). Behaviorally-determined sleep phenotypes are robustly associated with adaptive functioning in individuals with low functioning autism. *Scientific Reports*, 7, 14228. <http://dx.doi.org/10.1038/s41598-017-14611-6>

Research at The New England Center for Children

Eileen Roscoe, PhD, BCBA-D, LABA
Director of Behavior Analytic Research, NECC



Many individuals with autism and intellectual disabilities engage in motor and vocal stereotypy (e.g., flapping of the hands, rocking of the body, making repetitive non-communicative noises). This behavior is problematic because it often interferes with daily living skills, such as leisure engagement, vocational tasks, and other skill acquisition programming. Stereotypy is often found to persist in the absence of social consequences, suggesting that it is likely maintained by automatic reinforcement (or the sensory consequences it produces). Because the automatic reinforcer cannot be readily withheld or presented contingent on appropriate behavior, as is the case with social reinforcers (e.g., attention and escape), automatically reinforced problem behavior presents a unique challenge for treatment.

Two commonly used differential reinforcement procedures include differential reinforcement of alternative behavior (DRA) and differential reinforcement of other behavior (DRO). DRA involves delivery of a preferred item (e.g., an edible) contingent on an appropriate alternative behavior, whereas DRO involves delivery of a preferred item contingent on a period of time without the occurrence of problem behavior. Therefore, problem behavior emitted during a DRO involves the removal or delay of reinforcer delivery. DRA offers some advantages over DRO. Given that DRA includes a contingency for a specific appropriate behavior, it is more likely to result in increases in that behavior, which may effectively compete with the automatically reinforced problem behavior. Additionally,

because DRO involves the delivery of a reinforcer following an interval without the occurrence of problem behavior, the reinforcer may follow other non-target forms of problem behavior that occurred during the interval, resulting in accidental or adventitious reinforcement of other problem behavior. The removal or delay of reinforcers associated with DRO may result in negative side effects due to the loss of reinforcement (also referred to as negative punishment).

Given the relative advantages of DRA and DRO, Hedquist and Roscoe (in preparation) directly compared these two procedures for decreasing automatically reinforced motor stereotypy and increasing vocational task engagement and productivity in three individuals with ASD. Because the three individuals were teenagers who would soon be seeking vocational employment, an important educational objective was increasing their task engagement and work productivity. Therefore, a vocational task was identified for each participant that he or she could perform independently and for extended durations required in a vocational setting. During the treatment analysis, when DRA and DRO procedures were directly compared, only DRA was consistently effective in decreasing stereotypy and increasing task productivity. By contrast, DRO did not yield clinically successful treatment outcomes. This study suggests that DRA may have benefits over DRO and should be attempted first when treating automatically reinforced problem behavior.

Although DRA can be successful in treat-

ing automatically reinforced problem behavior, it is not always sufficient. It is often necessary to add treatment components that directly decrease automatically reinforced problem behavior, such as response blocking, redirection, overcorrection, and redirection. Verriden and Roscoe (in press) evaluated the use of an updated assessment tool for identifying such procedures when reinforcement-based interventions were not effective in decreasing the automatically-reinforced motor stereotypy for four individuals with ASD. An interview with a caregiver identified several socially acceptable reductive procedures, such as response blocking, overcorrection, response interruption and redirection, and contingent reprimands. Dependent measures during the treatment assessment included stereotypy, leisure item engagement, and emotional responding. NCR and DRA remained in effect while various potential punishers (e.g., response blocking, contingent demands, response cost, and hands down) were compared using a multielement design. For all participants, a procedure that resulted in low levels of stereotypy, high levels of engagement, and low levels of emotional responding was identified. These findings indicate that acceptable punishers can be identified and used in combination with reinforcement when reinforcement alone is ineffective.

Roscoe, E. M., & Verriden, A. (in press). An evaluation of a punisher assessment for decreasing automatically reinforced problem behavior. *Journal of Applied Behavior Analysis*.

Research Posters

EDITOR'S NOTE:

NECC staff presented several papers at the 38th annual BABAT conference, held October 2017 at the University of Massachusetts Amherst. The BABAT conference had more than 35 invited speakers, several symposia, and a poster session. Listed are a few examples of currently conducted research that were disseminated at this conference.

- **PLAY ENGAGEMENT SKILLS IN 1-YEAR-OLD, 2-YEAR-OLD, AND 3-YEAR-OLD CHILDREN WITH AUTISM**
- **DO EDIBLE AND LEISURE ITEMS DISPLACE ATTENTION?**
- **TEACHING SYMBOLIC PLAY TO YOUNG CHILDREN WITH AUTISM**
- **DIFFERENTIAL REINFORCEMENT OF ALTERNATIVE BEHAVIOR**

PLAY ENGAGEMENT SKILLS IN 1-YEAR-OLD, 2-YEAR-OLD AND 3-YEAR-OLD CHILDREN WITH AUTISM BEFORE AND AFTER EARLY INTENSIVE BEHAVIORAL INTERVENTION

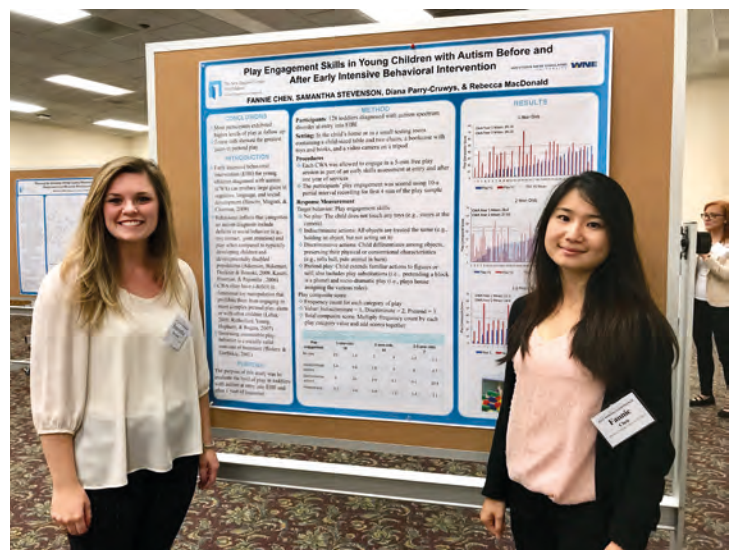
Chen, F., Stevenson, S., Parry-Cruwys, D., & MacDonald, R.

EDITOR'S NOTE:

Fannie Chen and Samantha Stevenson presented a poster describing a study they conducted on promoting play engagement during early intensive behavioral intervention (EIBI). They evaluated play engagement skills before and after one year of EIBI. After one year of EIBI, all participants showed increases in play levels, with the greatest gains for those who entered the program at the youngest age. These findings demonstrate the importance of EIBI and targeting play in toddlers with ASD.

The purpose of this study was to evaluate the level of play in toddlers with autism at entry and after one year of treatment.

This study included 44 1-year olds, 88 2-year olds, and 29 2.5-year olds. Each of the participants' play was scored as no play, indiscriminate actions, discriminate actions on single objects, pretend play, or repetitive play. Positive social behavior was also scored. The highest level of play was scored using partial interval recording in 10 s intervals for a total duration of 4 minutes. A total composite score was calculated by multiplying the frequency count for each play category, and then finding the sum. IOA was collected on 29% of samples and the data averaged 100% for no play (range, 100% to 100%), 88% for indiscriminate actions (range, 75% to 100%), 88% for discriminate actions (range, 67% to 100%), 98% for pretend play (range, 92% to 100%), and 91% for repetitive play (range, 75% to 100%). Results showed that all participants acquired higher levels of play after one year of treatment, with the 1-year-olds showing the greatest gains. EIBI can facilitate play in children with autism, with the greatest gains shown in the youngest children.

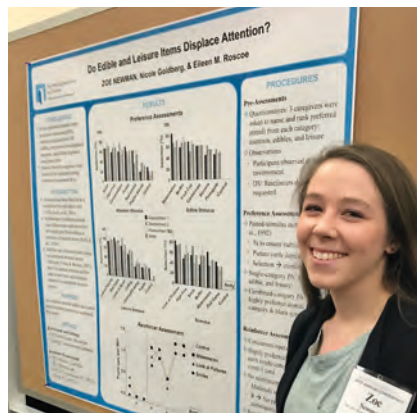


DO EDIBLE AND LEISURE ITEMS DISPLACE ATTENTION?

Newman, Z., Goldberg, N., & Roscoe, E. M.

EDITOR'S NOTE:

An important component of our teaching practices at NECC are the identification and use of reinforcers for increasing important skills. Preference assessments are often conducted to identify preferred edibles. However, it is important to not rely solely on edibles as reinforcers and to also identify preferred leisure materials and types of attention. In the study, NECC researchers compared preference assessment outcomes when a combined array of edible items, leisure items, and attention were included. A surprising outcome was that leisure and attention were found to be more highly preferred for this participant than edibles, indicating the importance of conducting preference assessments of non-edible items to promote variety in reinforcer type.



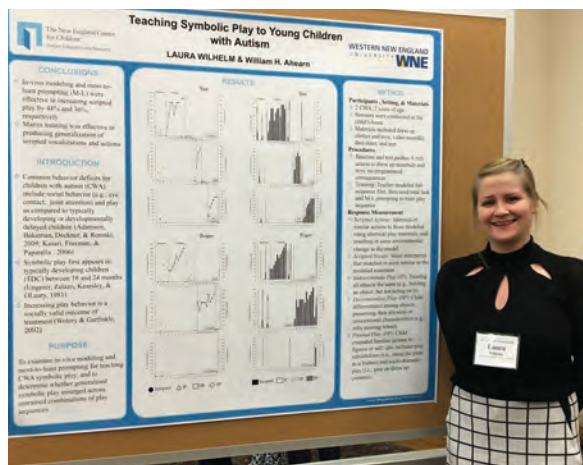
Attention is a naturalistic and practical reinforcer for use in educational settings. However, limited research has been conducted on identifying preferred forms of attention among individuals with autism spectrum disorder (ASD). In addition, it remains unclear whether attention may be displaced when included in stimulus arrays with leisure and edible items. We assessed the preference and reinforcing efficacy of edible items, leisure items, and forms of attention in an individual with ASD. Independent and combined pictorial-paired stimulus preference assessments of these three stimulus categories were conducted. Next, we conducted a concurrent- and single-operant reinforcer assessment to determine the relative and absolute reinforcing efficacy of the highly-preferred stimuli from each category. Reliability data were collected for 33% of sessions and averaged over 90%. Leisure and attention were found to be more highly preferred than edible items, and leisure was found to be more highly preferred than attention.

TEACHING SYMBOLIC PLAY TO YOUNG CHILDREN WITH AUTISM

Wilhelm, L. & Ahearn, W. H.

EDITOR'S NOTE:

An important focus of the early intervention program at NECC is the development of appropriate play skills. This is an important area of research because many children with ASD show deficits in play and increases in this skill are often associated with concomitant increases in social interaction. In the study below, Wilhelm and Ahearn compared two strategies, in-vivo modeling and least-to-most prompting, and both were found to be effective for increasing complex forms of play in two toddlers with ASD. These findings indicate that there are multiple effective behavior analytic interventions that can increase this important skill in young children with ASD.



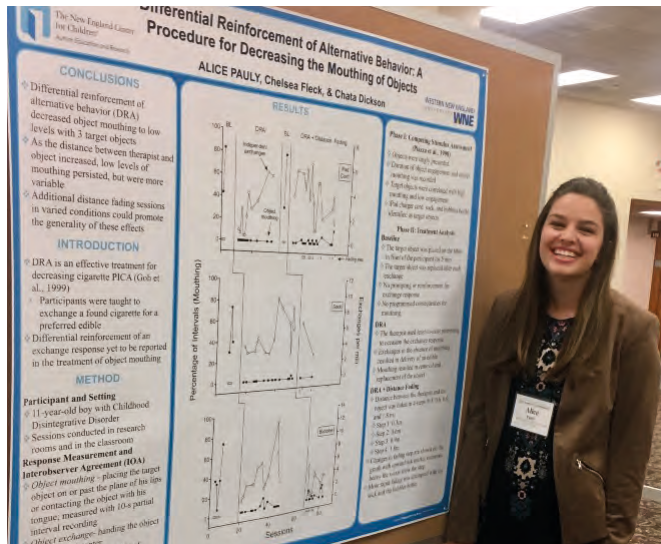
Many children with autism (CWA) demonstrate significant deficits in symbolic play. Previous research has demonstrated that in-vivo modeling and most-to-least prompting have been effective training tools for teaching a variety of play skills to CWA. The purpose of the current study was (1) to examine in-vivo modeling and most-to-least prompting procedures for teaching CWA sequences of play using dress up materials and toy play objects, and (2) to determine whether generalized symbolic play emerged across untrained combinations of dress up materials and toy play objects. During training, teachers used prompting, modeling, and response chaining to teach a play sequence to CWA. Once mastery levels were observed in training, teachers replaced trained objects with objects from another play sequence to test for symbolic play. Interobserver agreement was calculated for 50% of sessions and ranged from 66.66% to 100% and averaged 93% agreement. Results suggest both in-vivo modeling and most-to-least prompting were effective in teaching symbolic play to CWA.

DIFFERENTIAL REINFORCEMENT OF ALTERNATIVE BEHAVIOR: A PROCEDURE FOR DECREASING THE MOUTHING OF OBJECTS

Pauly, A., Fleck, C., & Dickson, C.

EDITOR'S NOTE:

An important step toward increasing NECC students' independence requires the development of effective treatment procedures for decreasing interfering problem behavior. One such technique involves differential reinforcement of appropriate behavior (DRA). In the study below, the authors evaluated DRA for decreasing a participant's automatically reinforced object mouthing. A nice feature of this study was that the authors trained the participant to hand the item to a therapist as the alternative behavior, and the therapist proximity was faded to enhance treatment practicality.



An 11-year-old boy was referred by teachers to participate in this evaluation of a reinforcement-based treatment for mouthing objects. A differential reinforcement of alternative behavior (DRA) treatment was implemented using a multiple baseline design across objects. On average the participant mouthed the iPad cord for 63%, the sock for 48%, and the bubble bottle for 37% of each 5 minute baseline session. In baseline sessions, no objects were exchanged. We taught the participant to exchange each object for a highly preferred edible. Next, we extended the treatment by systematically fading the therapist's proximity to the object that would be exchanged. Post-treatment, mouthing at the terminal step (6 feet away from each item) occurred between 0 and 4 times during the 5 minute sessions. Independent exchanges at the terminal step were between 0.6 and 3.6 per minute. Reliability was calculated for 10% of sessions with 99% agreement. The results suggest that DRA can be a useful procedure for reducing automatically maintained object mouthing.

recent publications

Farber, R.S., Dickson, C.A., & Dube, W.V. (2017). Reducing overselective stimulus control with differential observing responses. *Journal of Applied Behavior Analysis*, 50, 87-105.

Ahearn, W.H. (2016). What is best practice for treating automatically reinforced stereotypic behavior? *APBA Reporter*, 56.
<http://www.apbahome.net/newsletter.php?nid=56&aid=1903>

Ahearn, W.H. (2016). The New England Center for Children: Applied behavior analysis for treating all levels of ASD severity. In R.G. Romanczyk & J. McEachin (Eds), *Comprehensive Models of Autism Spectrum Disorder*. New York: Springer.

Cividini-Motta, C., Scharrer, N., & Ahearn, W.H. (2016). An assessment of procedures to teach echoic responding. *The Analysis of Verbal Behavior*, (), 1-23.
doi:10.1007/s40616-016-0069-z

Farber, R.S., Dube, W.V., & Dickson, C.A. (2016). A sorting-to-matching method to teach compound matching to sample. *Journal of Applied Behavior Analysis*, 49, 294-307.

Verriden, A.L., & Roscoe, E.M. (2016). A comparison of preference assessment methods. *Journal of Applied Behavior Analysis*, 49, 265-281.

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