

RESEARCH

SUMMER 2024

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



EDITORS:

*Bill Ahearn, PhD, BCBA-D, LABA
Director of Research*

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

PUBLISHED BY:

*The New England Center for Children®
33 Turnpike Road
Southborough, MA 01772
p: (508) 481-1015
www.necc.org*

Acetaminophen Use During Pregnancy and Risk for Autism

Bill Ahearn, PhD, BCBA-D, LABA
Director of Research

In April of this year, the *Journal of the American Medical Association* published an important study suggesting that acetaminophen, the generic name for Tylenol, used for pain relief during pregnancy did not seem to be associated with an increased risk of neurodevelopmental disorder, including autism when a sibling control analysis was used to examine this hypothesis (Ahlqvist et al., 2024). There have been a few studies that suggested acetaminophen exposure increased the risk of a fetus developing a neurodevelopmental disorder, specifically, autism and attention deficit hyperactivity disorder (ADHD). For example, Ji, Azuine, and Zhang et al. (2020) analyzed data from a “Boston Birth Cohort” of live births at Boston Medical Center. In this study, umbilical cord plasma samples were examined for acetaminophen metabolites. Groups of samples were examined with the groups consisting of children diagnosed with either autism, ADHD, both, other developmental disorders, and those that were neurotypically developing. The authors found that these metabolites in cord plasma were associated with a higher likelihood of an autism and/or ADHD diagnosis. There were several limitations, noted by the authors, one of which was the use of only a single plasma measure which would cover the peripartum (just before, during, and just after birth) part of pregnancy.

The potential risk to the developing fetus, and to the expectant mother experiencing pain during pregnancy, certainly makes this a pressing matter deserving of further research. Though the federal Food and Drug Administration and, a similar entity in Europe, had refrained

from cautioning pregnant mothers from using acetaminophen, others have suggested that pregnant mothers should refrain from using acetaminophen (Bauer et al., 2021). Additionally, a number of lawsuits have been filed against the manufacturer of Tylenol with some law groups advertising on television and in other media to recruit litigants. Most important is to have the best information possible available to pregnant mothers and their physicians.

Ahlqvist and colleagues (2024) conducted a nationwide cohort study with a sibling control analysis of the 2,480,797 children born between 1995 to 2019 in Sweden. The study was designed by researchers from Drexel University’s school of public health in collaboration with colleagues in Sweden. Data were available on these children and their developmental status through 2021. The use of a sibling control when analyzing this database allows for the researchers to better control for confounding by unmeasured family-level risk factors than can be present in standard cohort studies. They found that acetaminophen use was not associated with an increased risk of autism, ADHD, or intellectual disability. However, though this means that the general use of acetaminophen is not associated with increased risk, the unmeasured family-level risk factors require further analysis. We already know that genetics plays a significant role in the development of autism. It may be the case that there are certain conditions, genetic and otherwise (e.g., fever, infection), that may relate to the potential risk of acetaminophen use during pregnancy.



Ahlqvist VH, Sjöqvist H, Dalman C, et al. (2024). Acetaminophen Use During Pregnancy and Children’s Risk of Autism, ADHD, and Intellectual Disability. *JAMA*, 331(14):1205-1214. doi:10.1001/jama.2024.3172

Bauer, A.Z., Swan, S.H., Kriebel, D. et al. (2021). Paracetamol use during pregnancy — a call for precautionary action. *Nat Rev Endocrinol* 17, 757-766. <https://doi.org/10.1038/s41574-021-00553-7>

Ji Y, Azuine RE, Zhang Y, et al. (2020). Association of Cord Plasma Biomarkers of In Utero Acetaminophen Exposure With Risk of Attention-Deficit/Hyperactivity Disorder and Autism Spectrum Disorder in Childhood. *JAMA Psychiatry*, 77(2):180-189. doi:10.1001/jama-psychiatry.2019.3259

Identification of Preferred Social Interaction in Individuals with Autism

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



Individuals with autism often display challenges with communication and social skills. One way to increase these skills is by conducting training programs that use social interaction as a reinforcer. Social interaction is an important reinforcer to use for a variety of reasons. First, social interaction is prevalent and readily available in most settings, making it an efficient and low-cost reinforcer. Second, it has been found to be an effective reinforcer for individuals with autism for increasing socially important skills, including mands or requests for preferred items (Kelly et al., 2014). Third, identifying preferred forms of social interaction allows clinicians to interact with individuals with autism in ways that are reinforcing rather than using generic forms (e.g., praise), which may be ineffective. Another advantage to using social reinforcers is that their use allows for more variability in the type of reinforcers delivered and less of a reliance on the use of edibles, which may need to be limited due to health concerns. For this reason, it is important to systematically identify social interactions in a stimulus preference assessment.

Researchers at NECC (Maureen Kelly and advisor Eileen Roscoe) demonstrated a systematic approach for identifying preferred social interactions (Kelly et al., 2014). The researchers conducted a variety of pre-assessments (e.g., observations and caregiver interviews) to identify potentially reinforcing stimuli to include in the preference assessment array. Next, the researchers conducted a paired-stimulus preference assessment (PSPA) using cards that displayed photos of the participant receiving each form

of social interaction. During the PSPA, two cards that depicted social interactions were presented concurrently, and the participant was prompted to select one of the options. The PSPA identified highly preferred social interactions (i.e., those associated with a high percentage of selection) and less preferred social interactions (i.e., those associated with a lower percentage of selection). The authors subsequently conducted a reinforcer assessment and found that the highly preferred social interaction functioned as a reinforcer, that increased a mand or request for the social interaction, for all participants.

In a subsequent study, NECC researchers (lead author Nicole Golberg and advisor Eileen Roscoe) evaluated the preference of social interaction in relation to edibles and leisure items to determine whether social interaction may be displaced (or not identified as a reinforcer) when they are combined with other stimulus categories during preference assessments (Goldberg et al., 2022). Goldberg et al. (2022) replicated and extended previous research on preference assessments of social interaction by conducting both individual and combined category PSPAs of edible, leisure, and social interaction. First the researchers conducted PSPAs of only edibles, only leisure stimuli, or only social interaction. In each of these PSPAs, highly preferred stimuli were identified (i.e., those associated with a high percentage of selection). The authors then conducted a combined-category PSPA that included the two most highly preferred stimuli from each of the single stimulus categories (social interaction, edible, and leisure). During the

combined-category array, displacement effects were observed for social interaction for three of five participants. Displacement effects is a term that has been used to refer to a shift in the preference ranking from highly preferred to less preferred for a stimulus category. For example, the highly preferred social interaction stimuli (from the single category PSPA) shifted to a lower percentage of selection (i.e., a less preferred categorization) when they were presented in the combined-category array. Although social interaction was identified as less preferred for three of the five participants in the combined-category array, it functioned as a reinforcer (i.e., increased responding when it was provided contingently) for four of the five participants during a subsequent reinforcer assessment. The implication of this finding is that if one conducts only a combined-category PSPA, the potential reinforcing efficacy of stimulus categories identified as moderately or less preferred may go undetected as potential reinforcers. This may be particularly concerning when the stimulus is a form of social interaction and could be advantageous to the individual when used as a reinforcer in the natural environment. These findings highlight the importance of conducting a single-category preference assessment of social interaction to increase the likelihood of identifying them as potential reinforcers.

In the previously reviewed studies by Kelly et al. (2014) and by Goldberg et al. (2022), the utility of a preference assessment of social interaction was demonstrated. That is, a highly preferred form of social interaction (associated with a high percentage of selection)

was identified and then it was found to function as a reinforcer in a subsequent reinforcer assessment. Although these studies demonstrated increases in target responses, such as requests for items (Kelly et al., 2014) or completion of simple motor tasks (e.g., Goldberg et al., 2022), these skills were not critical to the development of their social behavior. In a subsequent collaboration study with NECC advisor Becky MacDonald, Fredericks et al. (2023) extended previous work on identification of social interactions by using them as consequences for a core social skill, joint attention initiations. After systematically identifying reinforcing forms of social interaction, the authors conducted a training program to teach three children with autism spectrum disorder to emit two important target skills of joint attention, gaze shifting and commenting. During the training, the social interactions that were systematically

identified as reinforcers were delivered as consequences for target skills (i.e., gaze shifting and commenting). Natural consequences (e.g., smiling, commenting) were provided during the follow-up probe sessions. Results showed that participants acquired gaze shifting and commenting during training and continued to display these skills when presented with untrained leisure stimuli during the follow-up probe sessions. In addition, these skills occurred at a level that was in range of their typically developing peers. These findings suggest that the use of social interaction as a reinforcer may facilitate the acquisition, maintenance, and generalization of important social skills in individuals with ASD.

Fredericks, B.M., Sng, S.S.Y., Parry-Cruwys, D. MacDonald, R.P.F. (2023). Teaching Joint Attention: Assessing Generalization and Maintenance Effects using Multiple Exemplar Training. *Journal of Autism and Developmental Disorders*, 53(3), 1117-1129. <https://doi.org/10.1007/s10803-022-05615-x>

Goldberg, N. M., Roscoe, E. M., Newman, Z. A., & Sedano, A. J. (2023). Single- vs. combined-category preference assessments for edible, leisure, and social-interaction stimuli. *Journal of Applied Behavior Analysis*, 56(4), 787-803. <https://doi.org/10.1002/jaba.1007>

Kelly, M.A., Roscoe, E.M., Hanley, G.P. and Schlichenmeyer, K. (2014), Evaluation of assessment methods for identifying social reinforcers. *Journal of Applied Behavior Analysis*, 47(1), 113-135. <https://doi.org/10.1002/jaba.107>



RESEARCH PRESENTATION HIGHLIGHTS

Several NECC researchers attended the association of behavior analysis international (ABAI) conference in Philadelphia, PA in May of 2024. Some of the titles and abstracts of presentations on a range of topics are highlighted below.

A Component Analysis of the Effects of Behavioral Skills Training on Car Seat Installation

EDITOR'S NOTE:

An important area of research at NECC is staff training. The staff who work with students at NECC are trained in a variety of skill areas, including important safety procedures to minimize potential risk to staff and students. Shannon Ward (Director of Research at the Mohammed bin Rashid Center for Special Education operated by NECC) presented a talk on a training procedure to teach NECC staff to correctly install a car seat. Training included written instructions, a video model, rehearsal, and feedback. All participants reached mastery performance of car seat installation when all training components were conducted.



SARAH C. MEAD JASPERSE (Emirates College for Advanced Education), Michelle Chioccola (The New England Center for Children - Abu Dhabi), BELEN INARAJA LOPEZ (Mohammed Bin Rashid Center for Special Education operated by the New England Center for Children), Shannon Ward (Mohammed bin Rashid Center for Special Education operated by The New England Center for Children).

Abstract: Given that motor vehicle accidents are the number one cause of death for individuals between the ages of 5 and 29 years old (WHO, 2018) and child restraint systems (CRS) have been proven to reduce the risk of death of serious injury by

71% for infants and 54% for toddlers (National Highway Traffic Safety Administration, n.d.), teaching caregivers how to correctly install CRSs is a critical task. In this study, we used behavioral skills training (BST) to teach five staff members at a special education center to install CRSs. We used a multiple baseline design across participants to demonstrate experimental control as we systematically evaluated the effects of each component of BST (written instructions from the CRS manufacturer, a video model, rehearsal and feedback). For all participants, rehearsal and feedback was required to reach a mastery level of installation. Possible implications for the training and supervision of staff members who are responsible for installing CRSs will be discussed.

Evaluating the Performance Diagnostic Checklist: Human Services to Improve Support Teacher Behavior in Specialized Classes

EDITOR'S NOTE:

In another symposium that reviewed staff training procedures, Johanna Hardy (with Advisor Cam Johnson) presented on the behavior of staff working with individuals with autism and other developmental disabilities. More specifically, Johanna presented data from the Performance Diagnostic Checklist-Human Services, an assessment tool used for determining areas in need of intervention. Results showed that staff exhibited low levels of prompting for student engagement during an art or music activity. A subsequent intervention of presenting feedback via a graph increased levels of staff prompting for encouraging student engagement. Concomitant increases in student engagement were observed.



JOHANNA HARDY (The New England Center for Children), Cammarie Johnson (The New England Center for Children; Western New England University; Simmons University).

Abstract: The Performance Diagnostic Checklist - Human Services (PDC-HS; Carr et al., 2013) identifies variables that lead

to unsatisfactory staff performance in human service settings. The purpose of this study was to use the PDC-HS to identify variables that led to unsatisfactory support teacher behavior in specialized classes and to use the recommended intervention to improve support teacher behavior to maximize student participation. Three teachers from two teams participated in

a nonconcurrent multiple baseline design. PDC-HS interviews were completed with the support teachers and the lead special teachers for the target response of encouraging engagement. For all support teachers, Performance Consequences, Effort, and Competition was identified as the domain of concern with the recommended intervention of graphed feedback. Results

indicated graphed feedback was effective in improving teacher performance and increased student engagement as well. Reliability measures on the dependent and independent variables were above 90%. A post-treatment social validity survey given to both lead and support teachers indicated that the procedures and outcomes provided important improvement.



EDITOR'S NOTE:

Two important aspects in promoting one's health and wellness are to consistently engage in an adequate duration of sleep and physical activity. However, research has shown that individuals with ASD often display difficulty initiating or maintaining sleep and many of these individuals do not meet the CDC recommendations for physical activity engagement. The following two presentations discussed practical strategies for addressing these issues. In the first paper, Zoe Newman (with advisor Eileen Roscoe) presented research on a treatment analysis for improving sleep-conductive behavior in a residential care facility. Zoe assessed levels of sleep-conductive behavior via a Fitbit watch, preventing the need for overnight live or video data collection. For the second presentation, Holly Wiggins (with advisor Eileen Roscoe) presented data on a training for teaching individuals to self-monitor their physical activity. Following competency, Holly will share results from a treatment analysis that evaluated the relative contributions of self-monitoring for increasing physical activity engagement.

A Practical Treatment for Improving Sleep-Conductive Behavior in a Residential Care Setting



ZOE A. D. NEWMAN (Regis College Autism Center), Eileen M. Roscoe (The New England Center for Children), Emily Stevens (The Autism Community Therapists, LLC), Shannon Campbell (The New England Center for Children; Western New England University).

Abstract: Individuals with autism often display long latencies to sleep onset or suboptimal durations of sleep. Sleep is often correlated with increases in challenging behavior (Goldman et al., 2011; Kennedy & Meyer, 1996) such as aggression (O'Reilly, 1995) and hyperactivity (Mazurek & Sohl, 2016). Although behavioral interventions have been effective in treating these problems for individuals

with developmental disabilities (e.g., Jin et al., 2013), the necessary and sufficient components of a sleep treatment have not been identified. The purpose of this study was to assess multiple components of a sleep treatment package for three individuals with autism living in a residential congregate-care setting. Data were collected on sleep-conductive behavior, defined as displaying minimal movement, using a Fitbit. Treatment components were sequentially introduced and included bedtime fading, bedtime routine, a sound machine, and delayed reinforcement with contingency review. Participants were adolescents who showed long latencies to sleep-conductive behavior following bedtime. For all participants, results showed that a bedtime routine alone was insufficient for improving sleep-conductive behavior. A contingency review with delayed reinforcement was an effective treatment component for two participants. Social validity surveys were conducted with clinicians and residential counselors to assess treatment goals, procedures, outcomes.

An Evaluation of Self-Monitoring for Increasing Physical Activity



HOLLY WIGGINS (The New England Center for Children; Western New England University), Eileen M. Roscoe (The New England Center for Children).

Abstract: The Center for Disease Control and Prevention reports that children who obtain at least one hour of moderate to vigorous physical activity per day show improved bone health, better academic performance, and reduced symptoms of depression (CDC, 2016). Given the importance of increasing exercise for improved health outcomes, behavior analysts should consider increased physical activity as a ther-

apeutic goal. Although self-monitoring has been demonstrated to be effective at increasing physical activity within a multi-component intervention, the relative efficacy of self-monitoring alone for increasing physical activity is unknown. Therefore, the purpose of this study was to extend upon the self-monitoring and physical activity literature by evaluating a systematic training procedure. Further, we conducted a component analysis of self-monitoring for increasing physical activity that evaluated self-monitoring alone prior to and subsequent to the self-monitoring training. Three individuals with autism participated in the study. If self-monitoring alone was ineffective at increasing physical activity, additional reinforcement components were evaluated. If multiple interventions were effective at increasing physical activity, a treatment preference assessment was conducted to identify the participant's most preferred intervention.

apeutic goal. Although self-monitoring has been demonstrated to be effective at increasing physical activity within a multi-component intervention, the relative efficacy of self-monitoring alone for increasing physical activity is unknown. Therefore, the purpose of this study was to extend upon the self-monitoring and physical activity literature by evaluating a systematic training procedure. Further, we conducted a component analysis of self-monitoring for increasing physical activity that evaluated self-monitoring alone prior to and subsequent to the self-monitoring training. Three individuals with autism participated in the study. If self-monitoring alone was ineffective at increasing physical activity, additional reinforcement components were evaluated. If multiple interventions were effective at increasing physical activity, a treatment preference assessment was conducted to identify the participant's most preferred intervention.



RESEARCH

33 Turnpike Road
Southborough, MA 01772-2108
508.481.1015
www.necc.org



The New England Center
for Children®
Autism Education and Research

ACE®
ABA Software System

ABAplus®
Online Learning from
The New England Center for Children®