Title. Preliminary item-level performance on developmental domain subtests with infants at low and high risk for autism

A. Description of project. The prevalence of autism spectrum disorder (ASD) in the pediatric population under 8 years of age has quadrupled since the early 2000s and increased rapidly in recent years. Currently, 1 in 36 children are identified with ASD (Maenner et al., 2023). According to the *Diagnostic and Statistical Manual of Mental Health Disorders,* ASD is defined by challenges in social communication and interaction that are present from early childhood and may involve repetitive and restricted patterns of behavior (DSM-5: American Psychiatric Association [APA], 2013).

The ASD diagnostic process differs from the typical diagnostic processes due to the unique ways ASD manifests. The diagnosis of ASD is based on an analysis of observable behavioral factors according to criteria outlined in the DSM-5 (APA, 2013). Understanding what behaviors are associated with ASD diagnoses is important so these behaviors can be reliably identified in early childhood. According to Clark et al. (2017), children who were diagnosed with ASD early (before 3 years of age) had higher cognitive functions at school age than children who were diagnosed later (after 3 years of age). This underscores the importance of early identification of ASD.

There are two infant groups potentially identifiable in early childhood who have a higher risk (HR) for an eventual ASD diagnosis than infants with typical development, or low risk (LR), these include infants born prematurely with low birth weight and infants who are younger siblings of older children diagnosed with ASD. The two high-risk groups have similarities, but also differences according to Mendez et al. (2023) which detection can improve diagnosis accuracy, efficiency, and intervention within the two populations. DeVeney and colleagues (2020; 2021) conducted a longitudinal study in which infants of HR, inclusive of both those with prematurity/low birth weight and younger siblings, were compared with a control group of infants with low-risk (LR). The researchers concluded that differences in vocalization behaviors were noted at 12 months of age.

When analyzing young, high-risk populations for ASD, there are skill sets other than early vocalization behaviors that can be assessed for diagnostic purposes. The Mullen Stages of Early Learning (MSEL) is a standardized assessment that includes various subtests of developmental skills including gross motor, visual reception, fine motor, expressive language, and receptive language. Landa et al. (2020) found children who were diagnosed with ASD at 36 months performed significantly worse on all subtests of the MSEL at 14 months than those who did not have the diagnosis by 36 months of age. Other researchers have conducted item analyses on certain MSEL and other standardized assessment subtests which leads to more specific information regarding how study participants categorized as HR or LR respond to individual assessment items. Iverson et al. (2019) studied 648 infants who were split into two groups, HR (437 infants) and LR (188 infants). The study used an item analysis on the fine and gross motor subscales of the MSEL at 6 months and 36 months. They concluded that infants at HR did not perform as well as infants with LR.

Currently, there is limited knowledge of the at-risk behaviors that occur throughout infanthood and toddlerhood associated with the early identification of children with ASD. Extending item analysis research with more specifically defined HR groups could help to highlight meaningful differences in performance between HR groups and compared to infants with LR. If infants can be identified earlier and with greater accuracy, they can be better connected with meaningful early intervention services.

The following research questions will be addressed: 1. Are there differences in item-level failure rates of MSEL subtests across high-risk and low-risk infant groups? 2. Are there differences in MSEL subtest performances across two high-risk groups, those born prematurely and with low birth weight and younger siblings of children diagnosed with ASD?

Activities/methodology

Participants. The present study will be conducted using an archival dataset of a longitudinal study (DeVeney & Kyvelidou, 2020; DeVeney et al., 2021). Participants included 44 children (23 males and 21 females) who were at least 4 months of age at intake. Participants include infants at high risk (HR) for a diagnosis of ASD, those born prematurely and with low birth weight (LBW) as well as infants who had an older sibling diagnosed with ASD (SB). Participants also include a comparison group of infants at low risk (LR) for a diagnosis of ASD. The participants and their participating caregiver(s) all spoke General American English (GAE), demonstrated typical sensory skills (e.g., hearing, vision), and had the ability to sustain independent sitting for at least 10 seconds at study intake. None of the participants had reported neuromuscular conditions affecting balance, head injury, genetic disorder(s) that are linked to ASD diagnoses, or exposure to prenatal illicit drugs or excessive alcohol use. Participants who were born prematurely were adjusted for their age according to the guidelines in the MSEL (Mullen, 1995). The MSEL was administered to each participant at three separate time points, at ages 4-5 months, 12 months, and 18 months.

Current Study Procedures. A secondary analysis will be completed using the existing data set (DeVeney & Kyvelidou, 2020; DeVeney et al., 2021). The analysis will consist of examining each individual MSEL performance score for all participants at the three time points, calculating error (failure) rate averages for each group (HR due to LBW, HR due to SIB, and LR) across all MSEL subtests - gross motor, visual reception, fine motor, expressive language, and receptive language - using procedures utilized by Iverson et al. (2019).

Analysis. Descriptive and inferential statistical analyses will be conducted. Descriptive analyses will include the calculation of mean and standard deviation for each participant group's performance across MSEL subtests. Inferential statistics will include statistical comparisons of each group's item analysis data across MSEL subtests and a comparison of item failure rates across groups for each subtest. Nonparametric inferential statistics will be used (e.g., Kruskal Wallis) to conduct the multiple-group comparisons due to the small sample size of the study and atypical data distribution patterns.

Project Timeline

Semester	**Month**	**Task**
Fall 2023	November	Update IRB application
	December	Identify participants from larger study; begin data coding
Spring 2024	January	Data coding
	February	Data analysis; apply to present at the Student Research Fair
	March	Plot visual analysis displays for student poster presentation
	April	Manuscript preparation for undergraduate research journal submission; apply to present at other conferences/meetings (e.g., ASHA, NSLHA)

Student/Faculty roles: I will code and analyze data that has been collected for the proposed study with close supervision from Dr. DeVeney who will be available throughout the outlined timeframe to provide support and assistance. We plan to meet regularly (weekly) for discussion and progress checks.

Previous internal/external funding: n/a - This is my first grant application.

B. Budget

Budget	Cost	Description
Student stipend	$2,000	Will allow student to work on the project throughout the spring semester. No budget is required for data collection.
Laerd Statistics	$15	Assistance with statistical calculations.

C. References

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D. Letter of Mentor Support

October 30, 2023

Dear FUSE Grant Selection Committee,

It is a pleasure to support Paige Peterson's FUSE Grant application. I first got to know Paige when she reached out to me about her interest in conducting research last fall before we'd even had a class together. Since that time, she completed one undergraduate course with me, and we have another course in-progress: *CDIS 4430 Articulation and Phonological Disorders* (final grade: A) and *CDIS 4480 Research Methods in Communication Sciences and Disorders* (current grade: A-). She has also worked with me as a research assistant on several faculty-led projects and has become a valuable contributor to our Toddler Communication Lab research endeavors.

I fully support her effort to secure FUSE Grant funding for her project, "Preliminary item-level performance on developmental domain subtests with infants at low and high-risk for autism." Paige has already completed CITI Training and is in the process of seeking IRB approval for the proposed project. I look forward to working with her on this project and am familiar with her work ethic and dedication based on the numerous hours she has already committed to assisting with communication disorders research since last year.

Although the content of Paige's study is associated with my primary line of research, early language and speech development of young children at risk for communication deficits, she is the lead investigator on this proposed project. My role as her faculty mentor is to supervise her work throughout the entire project, which revolves around a substantive secondary analysis of data that had been previously collected. Specifically, I will be available for regular meetings to discuss progress and problem solve issues as they arise, supervise data coding and analysis, supplement her knowledge base on the subject, and guide the dissemination of her findings.

In conclusion, Paige has consistently shown herself to be a skilled, diligent, and reliable investigator. She has demonstrated commitment and enthusiasm for conducting research to this point and I am excited to work with her further on the proposed study.

Warm regards,

Shari L. DeVeney, Ph.D., CCC-SLP
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E. Additional Travel Supplement – n/a