



Use of the Psychomotor Vigilance Test (PVT) with Children with Autism Spectrum Disorders: A Pilot Study

Jyssica Seebeck¹, M.S.

&

Annette Estes², Ph.D.

¹Seattle Pacific University, Seattle, WA,
²University of Washington Autism Center (UWAC), Seattle, WA

Presented at the 25th Annual University of Washington Leadership Education in Neurodevelopmental and Related Disabilities (LEND) Day

Background

Overview

The current study aims to better understand sleep patterns in children with autism spectrum disorders (ASD) and to determine if the Psychomotor Vigilance Test (PVT) is accessible to children with ASD. Sleep disturbance has been well documented in children with ASD; up to 81.5% of children with ASD have sleep challenges (Deliens & Peigneux, 2019; Hodge et al., 2014; Verhoeff et al., 2018). By improving our understanding of sleep problems in ASD, new intervention approaches can be developed which may lead to improved behavior, health, emotion regulation, and attention.

Autism and Sleep

- Sleep disorders are a well recognized comorbidity of ASD (Deliens & Peigneux, 2019).
- Sleep problems are common in typically developing children (50% as assessed by the Children's Sleep Habits Questionnaire) but are more frequent (up to 81.5%) and more persistent across time in ASD (Hodge et al., 2014; Verhoeff et al., 2018).
- Sleep problems are linked to core symptoms of autism, and with internalizing and externalizing behaviors, hyperactivity, anxiety, and cognitive functions, such as executive functions, memory consolidation, and perspective taking skills (Deliens & Peigneux, 2019).
- Sleep problems in autism may be explained by:
 - (1) circadian disturbances; irregular sleep-wake rhythms, delayed sleep onset, frequent nocturnal awakenings, and early morning waking.
 - (2) neurodevelopmental alterations common to both ASD and sleep; disruption of GABA inhibitory functions, disruption of the melatonin pathway genes in ASD (Deliens & Peigneux, 2019).
 - (3) behavioral insomnia (Glickman, 2010; Reynolds & Malow, 2011); sleep difficulty from behavioral factors in the environment (e.g., lighting, temperature, noise, reliance on parents for comfort, etc.)

Autism, Sleep, and Sustained Attention

- Sustained attention is altered when one experiences partial sleep deprivation, but it is not currently known how reduced sleep affects attention in children with autism (Kaida et al., 2006).
- To date, there have only been a handful of studies published that utilize the PVT with children, and **none conducted with children with ASD**.
- This is the first study we know of to explore the use of the PVT in children with ASD.

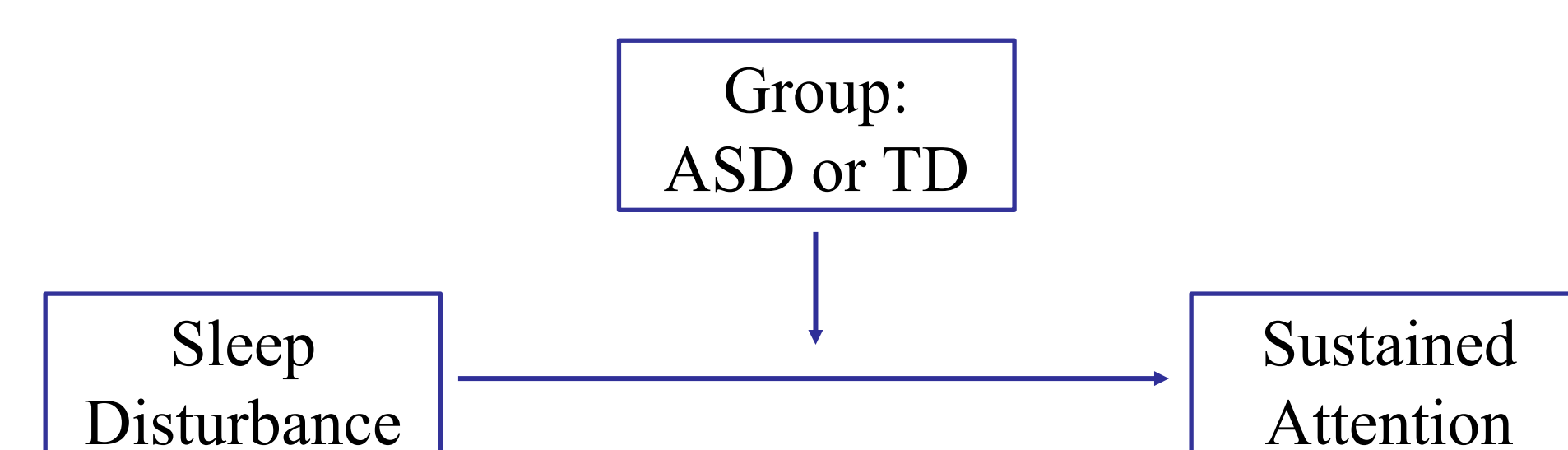


Figure 1. Hypothesized moderation model depicting relationships between sleep disturbance (CSHQ) and sustained attention (number of lapses of attention) with a diagnosis of ASD as a potential moderating variable.

Method

Participants

School-aged children, ages 7-11 years, with and without an ASD diagnosis will be recruited for this study. Parents of clients of the UWAC will be contacted via email by their clinician to assess interest. Participants must have access to an iOS device. A maximum of approximately 80 children (40 with ASD and 40 without ASD) and their families will take part in this study. All participants and their parents were provided informed consent, given opportunity to clarify their involvement in the study, and consented to their involvement. This study has been approved by the University of Washington Human Subjects Division IRB.

Measures

Sleep Habits (CSHQ): Child Sleep Habits Questionnaire (Owens, Spirito, McGuinn, 2000) is a retrospective, 45-item parent questionnaire that has been widely used to examine sleep behavior in young children. The CSHQ includes items relating to a number of key sleep domains that encompass the major presenting clinical sleep complaints in this age group:

- Bedtime resistance
- Sleep onset delay
- Sleep duration
- Anxiety around sleep
- Behavior occurring during sleep and night wakings
- Sleep-disordered breathing
- Parasomnias
- Daytime sleepiness

Parents are asked to recall sleep behaviors occurring over a “typical” recent week. The CSHQ produces a Total Sleep Disturbance Score ranging from 33 to 99, with a score of over 41 indicating a pediatric sleep disorder (this cutoff has been shown to accurately identify 80% of children with a clinically diagnosed sleep disorder; Owens, Spirito, & McGuinn, 2000).

Sustained Attention (PVT): The Psychomotor vigilance test (PVT; Dinges & Powell, 1985) is a widely used objective measure for assessing reduced alertness and attentional changes due to sleep loss (Grant et al., 2016). The PVT measures reaction time in response to a stimuli presented briefly on a screen.

For this study, we used PVT Research Tool (Texas A&M University System CSE, 2019) iOS mobile application which allows for a 3-minute, 5-minute, and 10-minute test trial option. The 5-minute version will be tested in this study. Users are shown a black screen with a cross and at various time points are presented with the red circle stimuli for the duration of the timed trial chosen. Users must touch the screen once they are presented with the red circle stimulus; the red circle does not move location on the screen. Reaction time (RT) measures used in this analysis include mean and median RT, standard deviation RT, number of lapses (defined as a reaction time of greater than 500ms), and total number of anticipations (false starts defined as a RT less than 100ms; Venker et al., 2007).

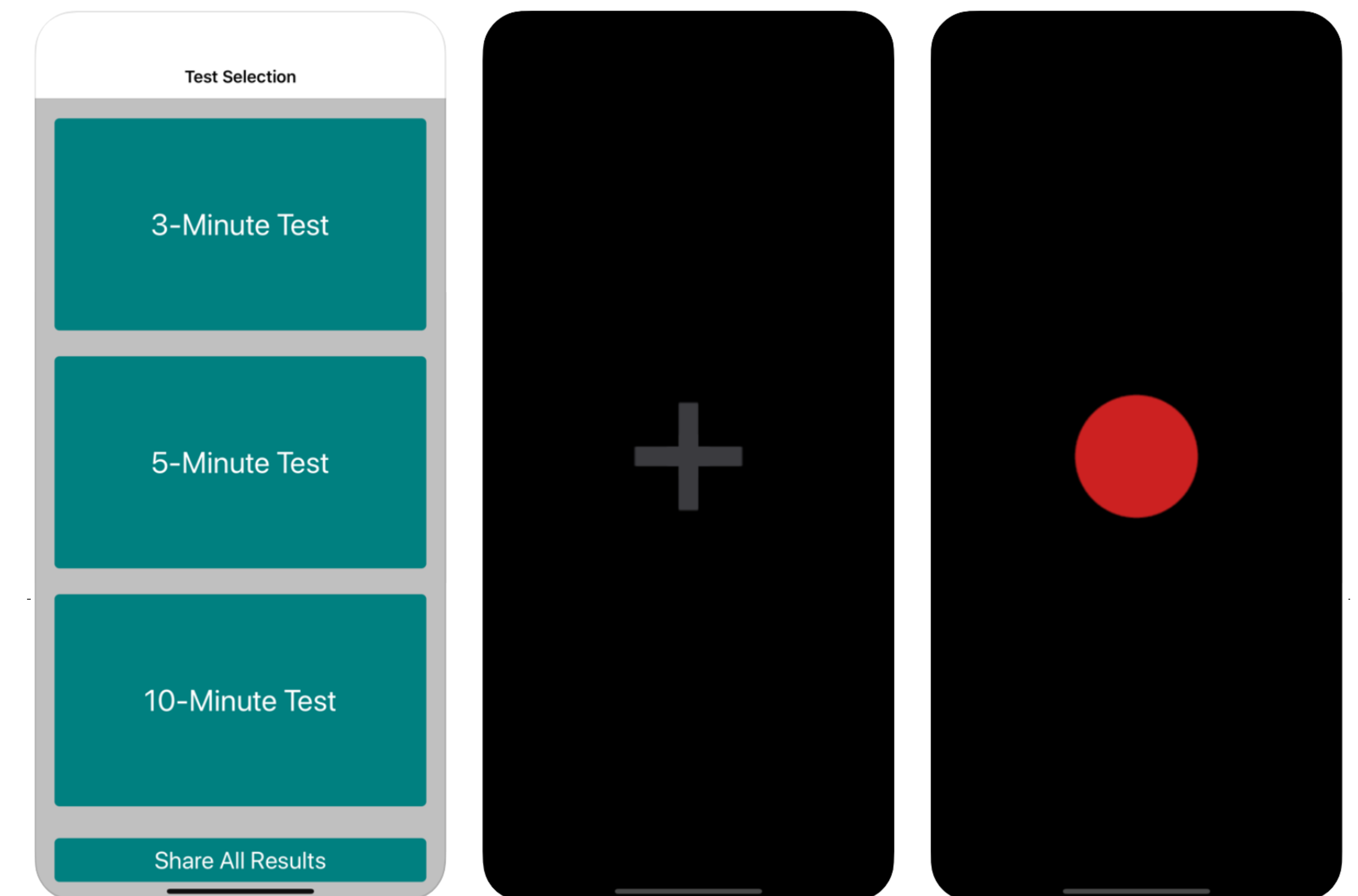


Figure 2. Photo showing the PVT Research Tool (Texas A&M University System CSE, 2019) iOS mobile application.

Procedure

Parents will download the PVT Research Tool to their personal iOS device. They will select the 5-minute test (shown in Figure 2), read and explain the instructions to their child, and begin the test. Once the child completes the test, the parents will share the results by uploading the file to an online Qualtrics survey, where the parent will answer demographic questions and complete the CSHQ.

Conclusions

Sleep is an important area of concern for children with ASD. Further research is needed to better understand the impact sleep may have on attention in children with ASD. Attention has been demonstrated to be highly affected in TD children and adults with reduced sleep, but information is limited with children with ASD. A major limitation in literature on sleep and ASD is the use of subjective assessment tools, variable cut-off scores, and low sample sizes. Data is in the process of being collected for the current study.

Implications for Practice

- Sleep disturbances are documented in up to 81.5% of children with ASD, with a wide variety of presentations, often changing depending on stage of development (Deliens & Peigneux, 2019; Hodge et al., 2014; Verhoeff et al., 2018).
- Sleep disturbance can be a significant consequence of ASD that may in turn reinforce the core symptoms of ASD.
- Clinicians should take care to thoroughly assess for sleep disturbances due to the impact it may have on behavior and health.

Full references, measures, and other information available upon request: seebeckj@spu.edu