### Title:
Behavioral Randomized Clinical Trial of Sleep Intervention to Improve Behavior in Sleep-Disordered Children with Down Syndrome

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### Introduction:
Sleep is an important concern among children with Down syndrome (DS), with 31-54% experiencing some form of sleep problem (Stores & Stores, 2012). Polysomnography (PSG) records show that 1/3-2/3 of children with DS suffer from obstructive sleep apnea (Bull, 2011). However, an equal number of children with DS (52-69%) experience behavioral sleep problems that may be missed by a PSG. This creates a concern as inadequate sleep in children with DS can lead to a variety of general behavior problems (Esbensen, 2017). Nonetheless, minimal work has been done on the treatment of behavioral sleep problems and behavioral consequences for this population. Thus, the purpose of this study was to design and test the efficacy of a manualized behavioral sleep treatment (BST) for children with DS and behavioral sleep disorders.

### Method:
Data were collected from 30 participants, ages 6-17 years, who had a diagnosis of DS and at least one behavioral sleep disturbance. Further inclusion criteria included a mental age of at least 36 months and English as a primary language in order to complete the assessment battery. Participants were randomly assigned to one of two groups: the BST or the enhanced standard of care condition (CON). The BST condition included five parent therapy sessions which emphasized behavioral principles and visual supports targeting behavioral sleep problems in children with DS. The CON condition involved treatment as usual enhanced with four educational sessions on non-sleep related topics relevant to families of children with DS. Behavioral outcomes were gathered by parent informant-reports. Scores from the Aberrant Behavior Checklist (ABC), the Vanderbilt ADHD Parent Rating Scale, and the Child Behavior Checklist (CBCL) were compared pre-treatment, post-treatment, and then again at an 18-week follow-up to the treatment.

### Result:
We hypothesized that the BST would show greater and sustained reductions in general behavior outcomes than the CON condition. However, we identified no statistically significant differences between the two groups from pre- to post-testing nor from pre- to post- to follow-up testing. Yet, both the BST and the CON conditions saw significant reductions in pre- to post-test levels of hyperactivity, as measured by the Vanderbilt ADHD Parent Rating Scale \( F = 6.44, p = .017 \) and the ABC \( F = 4.48, p = .043 \), and of oppositional behaviors as measured by the Vanderbilt ADHD Parent Rating Scale \( F = 5.56, p = .026 \). Further, both conditions saw reductions in pre- to post- to follow-up testing in the CBCL measure of internalizing problems \( F = 3.41, p = .040 \) and total problems \( F = 3.30, p = .044 \), as well as sustained reductions in levels of oppositional behaviors as measured by the Vanderbilt ADHD Parent Rating Scale \( F = 4.74, p = .013 \). Moreover, smaller subgroup analyses revealed that the highest scoring groups above clinical threshold did improve to below clinical threshold alongside those with scores that were not clinically significant.

### Discussion:
Though there were no statistically significant differences between the two groups, these findings are promising as they reveal that participant scores did get better after therapist intervention. However, as no waitlist group were included, it is to be determined if both treatment conditions were effective or were representative of a placebo effect (time and attention of a therapist) in improving behavior problems among sleep-disordered children with DS. Future trials with different control conditions are warranted to strengthen these findings and to further test the effectiveness of BST for children with Down syndrome who have behavioral consequences from sleep disorders.

### References: