

DIFFERENTIATING MOTOR ACTIVITY IN DEPRESSION AND ADHD AMONG CLINICALLY ASSESSED CHILDREN

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Introduction

- ADHD affects an average of 5% of children globally and is characterized by persistent symptoms of inattention, hyperactivity and impulsivity (APA, 2000).
- Hyperactivity has been found to be related to issues with parents, peers, and negative classroom behaviors (Feldman et al., 2014).
- However, several studies have found that ADHD-related hyperactivity has been shown to have a facilitating effect on cognitive functioning, such that working memory improves for children with ADHD as their motor activity increases. (Hudec et al., 2015; Kofler et al., 2016; Rapport et al., 2009).
- Similarly, depression features movement related symptoms (Bernard, 2018).
- Some studies have found that executive function (EF) may be impaired in individuals with mood disorders, affecting attention, memory, and problem-solving skills (Synder, 2014).
- The degree to which they function in the same capacity as hyperactivity does with working memory is still unclear.

The Current Study

- Explores the utility of Actigraphy as an objective measure of motor activity to differentiate movement among children with and without ADHD and depression.

Hypotheses

- Predicted that all groups would demonstrate higher activity levels during working memory tasks.
- Hypothesized that differences would be observed during high working memory conditions between children with ADHD and healthy control.
- Although previous evidence suggests that children with MDD exhibit decreased motor activity compared to healthy controls, no prior work has compared this movement to children with ADHD during working memory tasks; therefore, no hypotheses were provided regarding differences in motor activity among these groups.

Methodology

Sample Characteristics

- Sample of 251 clinically assessed children aged 8-13 years ($M = 10.24$, $SD = 1.39$)
- Group Assignment of four diagnostic groups (ADHD, DEP, ADHD+DEP, Healthy Control) based on psychoeducational evaluations.

Working Memory Tasks

- Baseline:** Microsoft paint for five minutes before and after psychoeducational evaluation tasks (C1) and (C2).
- Phonological Working Memory (PHWM):** Recalling and rearranging numbers and one letter; numbers from least to greatest and the letter must be said last
- Visuospatial (VSWM):** reordering black dots and one red dot in their respective locations on a field of nine squares.

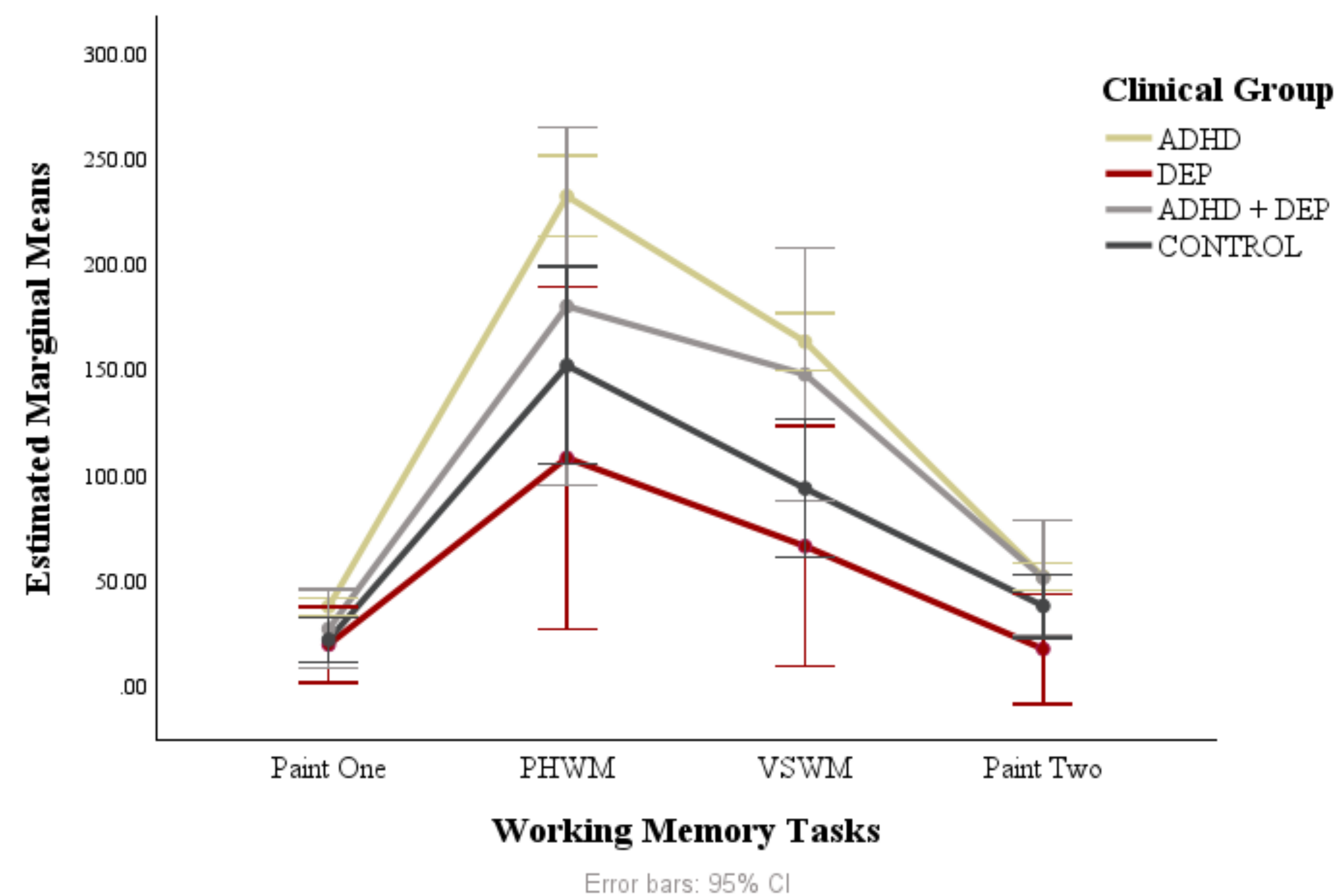
Activity Levels

- Motor activity was examined using Basic Motionlogger® actigraph devices (**Figure 2**) during two working memory conditions (phonological and visuospatial) and two control conditions
- Total Movement Level (TML) was determined by summing movement activity across three actigraph placements (non-dominant wrist, on chair, left ankle, right ankle) on the participant to create a total movement level for each task (Rapport et al., 2009; Kofler et al., 2018)

Results

- Mixed model ANOVA with total movement level as the DV was conducted.
- We found a significant group x task interaction ($BF_{10} = 7.8 \times 10^3$, $p < .001$, $d = .43$) See **Figure 1**.
- Post hoc analyses:
 - As hypothesized, all groups demonstrated higher activity levels during working memory conditions relative to baseline conditions (main effect of task; $BF_{10} = 1.43 \times 10^{14}$, $p < .001$).
 - ADHD group differed from control as hypothesized, but we also found that the ADHD-only group showed disproportionately higher activity level compared to children with depression during working memory conditions (all $BF_{10} > 7.00$, all $p < .05$, $d = .50$ to 1.2).
 - Children with depression did not significantly differ in motor activity relative to the control group ($BF_{01} = 1.31$ to 1.34 , all $p > .10$, $d = -.39$ to $-.84$).
 - In addition, pairwise comparisons were examined among the comorbid group (i.e., ADHD+DEP) relative to the other groups. During working memory conditions, the ADHD+DEP did not significantly differ from the other clinical groups (all $BF_{01} = .23$ to 2.92 , $p > .10$, $d = -.85$ to $.51$).

Fig 1. Mean Motor Activity Among Clinical Groups



Note. Graph demonstrating each clinical group at each time point during psychoeducational evaluation. The x-axis portrays each control (paint one and two) and both working memory tasks. The y-axis demonstrates TML means during each task. PHWM = phonological working memory; VSWM = visuospatial working memory.

Discussion & Conclusion

- First study to investigate the utility of actigraphy to differentiate movement levels between children with pediatric disorders that include measures of movement.
- Overall, more motor activity was observed for children with ADHD relative to the Control group as hypothesized, which has been observed in several prior studies (Kofler et al., 2016).
- Relative to children with depression, children with ADHD showed disproportionately higher movement during working memory conditions.
- Potential asymmetry in the severity of motor-related symptoms between the two disorders.
- Further research of movement symptoms of children with depression is needed.
- Actigraphy, when integrated into assessments for pediatric clinical disorders, can provide important insights into activity-based symptomology and the functional outcomes of any impairments that result from impairing levels of either inactivity or increased activity.

Fig 2. Actigraphy Watches Labeled



Note. Actigraphy watched labeled (CH=chair, LF=left ankle/foot, RF=right ankle/foot, NH=nondominant hand).

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