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Knowledge of performance feedback among boys with ADHD

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ABSTRACT

Background: Children with attention deficit-hyperactivity disorder (ADHD) often experience delays in acquiring competence completing fundamental motor skills. The effects of augmented prescriptive knowledge of performance feedback (PKP) have not been explored as a possible component solution.

Aims: The purpose of this study was to test the motor learning effects of KP among boys with ADHD.

Methods and procedures: Thirty-one boys with ADHD, randomly selected into either a treatment or a control group, completed a series of cornhole games. It was hypothesized that PKP feedback administered to treatment group participants would increase motor learning. Dependent variables included cornhole scores and quality of performance measures.

Outcomes and results: Both groups improved in cornhole scores and improvement was not dependent upon KP. Treatment group participants performed significantly better in quality of performance of the underhand toss compared to the control group.

Conclusions and implications: PKP feedback improves motor skill performance learning among children with ADHD above knowledge of results feedback only. Recreational program directors should consider using KP feedback when teaching motor skills to boys with ADHD.

1. What this paper adds?

This study applied a motor learning factor hypothesized to partially explain motor deficits associated with children with ADHD. The findings extend motor learning about PKP theory to boys with ADHD, a significant cognitive disability among children in recreational and physical education settings. Results provide evidence that boys with ADHD can improve their motor performance product through increased practice trials, similar to children without a diagnosed disability. In addition, it provides evidence that PKP enhances qualitative performance among this population.

2. Effects of augmented feedback on motor performance of boys with ADHD

Recent increases of childhood sedentary behavior and obesity have resulted in several “calls to action” from public and private organizations (Hagan, Shaw, & Duncan, 2008; Institutes of Medicine, 2013; National Conference of State Legislatures, 2011; National Physical Activity Plan Alliance, 2014; USDHHS, 20011) that have identified these trends as significant public health issues (United States Department of Health and Human Services, 2011; Physical Activity Guidelines Advisory Committee, 2008) in the United States. A contributing issue is children’s unhealthy body mass tends to track into adulthood (Mamun, Hayatbakhsh, O’Callaghan,

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Table 1
Motor Skill Studies of Children with ADHD.

Study	Purpose	Sample	Statistical Analysis	Findings
Intergroup Comparison Beyer (1999)	Compared movement skills of boys with ADHD and boys with LD	112 boys: ADHD = 56, taking Ritalin; LD = 56, no meds; 7–12 years; DSM-IV	MANOVA; ANOVA	Significant multivariate age ($p < 0.001$) and condition ($p < 0.001$) main effects were found on the VOTMP-IP. ANOVAs revealed boys with ADHD performed bilateral coordination ($p < .001$), strength ($p < 0.001$), visual motor coordination ($p < 0.001$), and upper limb speed and dexterity ($p < 0.001$) significantly worse than their peers with LD.
Doyle, Wallen, and Whitmont (1995)	Examined movement skills and parental perceptions about their children's skills	38 children; 33 boys; 7–12; DSM-III-R; stimulant medication use was variable	Multiple independent t tests	82% of children with ADHD performed gross motor skills above the norms of the VOTMP-SF. Parents underrated the movement skill performance of their children using a 5-point Likert scale.
Wade (1976)	Described differences on stabiometer task between children with and without ADHD and examined effects of Ritalin when performing a stabiometer task	24 children; 12 = ND, 12 = hyperactive; 7; 7–11.8 years; genders not reported; diagnostic framework not reported; stimulant medication taken	Descriptive statistics	Non-diagnosed children spent, on average, more time on the static balancing task and performed more consistently than children with ADHD
Harvey & Reid (1997)	Described fundamental movement skills and fitness conditions	19 children; 17 boys; 5–12 years; DSM-III-R; 89% of sample on stimulant medication	Descriptive statistics, graphs	Children with ADHD performed locomotor skills (22.3 percentile) and object control skills (33.4 percentile) below the 35th percentile when compared to the age-matched norms of the TGMD.
Harvey et al. (2009)	Explored physical activity experiences of children with and without ADHD	24 boys, 12 with ADHD, 12 without ADHD; DSM-IV; Stimulant medication not reported	Descriptive statistics; Interviews	Children without ADHD scored significantly higher in locomotor and object control skills. Boys with ADHD reported playing with friends, paid little attention to details, possessed superficial knowledge about movement skills, and expressed negative feelings about physical activity.
Harvey et al. (2007)	Compared the fundamental movement skills of children with and without ADHD and assessed the effects of stimulant medication on the movement skill performance of children with ADHD	44 children; 22 in ADHD group, 22 comparison peers matched by gender and age; 20 boys in each group; Subtype of ADHD group = ADHD-PI (2), ADHD - pH (2), ADHD - C (18); Comparison group = oppositional defiant disorder (8), separation anxiety disorder (1), and depression (1); DSM-IV-R; 13 in children in ADHD group were stimulant naive before the study	Split-plot ANOVA; Repeated measures MANOVA	Children without ADHD were significantly more skilled than children with ADHD ($p < 0.001$). No medication interaction effects on the movement skill patterns of children with ADHD.
Intragroup Comparison Piek, Pitcher, and Hay (1999)	Investigated movement skills and kinesthetic processes of boys with and without ADHD	48 boys: ADHD-PI (16), ADHD-C (16), ADHD-ND (16), matched on age & verbal IQ; 8; 7–11.7 years; DSM-IV; 8 children form ADHD-C received stimulant medication	MANOVA; ANOVA	Boys with ADHD performed significantly poorer ($p < 0.002$) on the MABC than boys without disabilities. In comparison with the other groups, boys with ADHD-PI demonstrated significantly worse manual dexterity skills ($p < 0.01$) while boys with ADHD-C demonstrated significantly worse balance skills ($p < 0.01$).
Miyahara, Möbs, and Doll-Tepper (1995)	Identified movement and behavioral subtypes of HKS while estimating the comorbidity of HKS with DCD	12 Children; 21 boys, 4–12 years; German psychiatric textbook; stimulant medication taken	Cluster analysis; ANOVA	Significant univariate results were found between the free-from-severe motor impairment and manual incoordination motor clusters on manual dexterity ($p < 0.01$) and balance ($p < 0.01$) subtests of the MABC. 52% of the sample, 12 out of 23 participants, fell in the manual incoordination subtype and were thus considered as having DCD.
Kaplan, Wilson, Dewey, and Crawford (1998)	Described comorbidity between DCD, ADHD, and RD.	162 children; age & gender not reported 169 boys, 55 Girls = ADHD + LD; 105 boys, 50 girls = ND; 8–18 years; DSM-III-R; Medication not reported	Descriptive statistics; Pearson correlation coefficients; χ^2 ; ANOVA	Assessment instruments were the VOTMP, MABC, and an initial version of the DCDQ. Of the 162 participants with comorbidity, 47 children and no disabilities. There were pure cases of ADHD ($N = 8$), DCD ($N = 26$), and RD ($N = 19$). Comorbidity was identified for ADHD/RD ($N = 7$), ADHD/DCD ($N = 10$), DCD/RD ($N = 22$), and ADHD/DCD/RD ($N = 23$).

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