Is hyperactivity ubiquitous in ADHD or dependent on environmental demands? Evidence from meta-analysis

Michael J. Kofler, Joseph S. Raiker, Dustin E. Sarver, Erica L. Wells, Elia F. Soto

Clinical Psychology Review, April 2016
DOI: http://dx.doi.org/10.1016/j.cpr.2016.04.004.

Abstract

Hyperactivity, or excess gross motor activity, is considered a core and ubiquitous characteristic of ADHD. Alternate models question this premise, and propose that hyperactive behavior reflects, to a large extent, purposeful behavior to cope with environmental demands that interact with underlying neurobiological vulnerabilities. The present review critically evaluates the ubiquity and environmental modifiability of hyperactivity in ADHD through meta-analysis of 63 studies of mechanically measured activity level in children, adolescents, and adults with ADHD relative to typically developing (TD) groups. Random effects models corrected for publication bias confirmed elevated gross motor activity in ADHD (d = 0.86); surprisingly, neither participant age (child vs. adult) nor the proportion of each ADHD sample diagnosed with the Inattentive subtype/presentation moderated this effect. In contrast, activity level assessed during high cognitive load conditions in general (d = 1.14) and high executive functioning demands in particular (d = 1.39) revealed significantly higher effect sizes than activity level during low cognitive load (d = 0.36) and in-class schoolwork (d = 0.50) settings. Low stimulation environments, more rigorous diagnostic practices, actigraph measurement of movement frequency and intensity, and ADHD samples that included fewer females were also associated with larger effects. Overall, the results are inconsistent with DSM-5 and ADHD models that a) describe hyperactivity as ubiquitous behavior, b) predict a developmental decline in hyperactivity, or c) differentiate subtypes/presentations according to perceived differences in hyperactive behavior. Instead, results suggest that the presence and magnitude of hyperactive behavior in ADHD may be influenced to a considerable extent by environmental factors in general, and cognitive/executive functioning demands in particular.