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An investigation of individual typologies of attention-deficit hyperactivity disorder using cluster analysis of DSM–IV criteria

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Abstract

Cluster analysis was used to investigate empirical typologies of inattention and hyperactivity-impulsivity traits and whether these traits would correspond to DSM–IV ADHD typologies. Parents rated 104 male and female children, aged 5 to 14.7 years, on a scale developed to operationalise *DSM-IV* (American Psychiatric Association, 1994) criteria. Cluster analysis revealed four ADHD typologies with possible developmental changes in hyperactive-impulsive behavior as children mature as well as two 'normal' subgroups. Results indicated that DSM–IV defined ADHD characteristics where present in a cross section of individuals including nonpsychiatric controls. The structure of ADHD characteristics reflected the *DSM-IV* Combined and Inattentive types but failed to support a robust hyperactivity-impulsivity subgroup. *Post hoc* analysis suggested this may be a result of developmental factors; wherein hyperactivity-impulsivity traits decrease with age and inattention remains relatively stable. Cluster analysis also suggests that ADHD symptoms are normal personality traits that become pathological at relatively high levels.

Keywords: Typologies; Cluster analysis; ADHD

Attention-deficit hyperactivity disorder (ADHD) is an early-onset behavioral disorder comprising developmentally inappropriate levels of inattention, impulsivity and hyperactivity [*Diagnostic and Statistical Manual of Mental Disorders,* DSM-IV, (4th ed.). American Psychiatric

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Association, 1994]. ADHD affects 3–5% of all children (NIH, 2000) and has significant, adverse social, individual and family consequences including financial costs of treatment; familial stress and breakdown; adverse academic and vocational outcomes; psychological implications for both the individual and families; and increased risk of substance abuse (Faraone & Biederman, 1998; NIH, 2000).

ADHD characteristics are prevalent in a cross section of the population but do not inevitably progress into pathology. Studies indicate a continuity of ADHD behaviour between individuals diagnosed with ADHD and individuals without ADHD. Hence, it is vital to continue to clarify and refine the assessment and theory of ADHD. Replication of results across studies using varying samples is the optimal way to accomplish such clarification.

DSM-IV (1994) diagnostic criteria for ADHD distinguish three ADHD subtypes, namely, predominantly inattentive, predominantly hyperactive-impulsive and combined. Subtypes are delineated by different patterns of severity on two independent symptom dimensions of inattention and hyperactivity-impulsivity (McBurnett, Lahey, & Pfiffner, 1993).

In this study our aim was to verify the structure of inattention and hyperactivity-impulsivity within a cross-section of individuals from various areas in New South Wales, Australia. We sought to ascertain if the DSM-IV two-dimensional structure of ADHD would hold when individual children are statistically allocated to the three DSM-IV subtypes on the basis of individual symptom profiles and how these typologies manifest in a population sample of individuals. Cluster analysis was used as it objectively allocates *individuals from an entire sample to smaller* subgroups (or typologies) thus showing the profiles of inattentive and hyperactive-impulsive traits (Hair, Anderson, Tatham, & Black, 1995). Cluster analysis is a useful tool for classifying individuals into meaningful sets based on a previously determined structure (i.e., hypothesis testing) (Aldenderfer & Blashfield, 1984).

Psychometric research, using factor analysis, has directly investigated the multidimensional symptom structure of ADHD characteristics. Factor analytic studies have generally supported a two-dimensional *symptom* structure for ADHD (e.g., Bauermeister, Alegria, Bird, Rubio-Stipec, & Canino, 1992; Hudziak et al., 1998; Lahey & Carlson, 1991; Lahey, Carlson, & Frick, 1997; McBurnett, 1997) although Gomez, Harvey, Quick, Scharer, and Harris (1999) found a three-factor model that fitted the data slightly better than a two-factor model. However, some studies show departures from two independent domains of hyperactivity/impulsivity and inattention. DuPaul (1991) found hyperactivity items defined both an ''Inattention-hyperactivity'' and an ''Impulsivity-hyperactivity'' factor, whereas Healey et al. (1993) reported that variance in impulsivity was shared between inattention and hyperactivity factors.

Holland, Gimpel, and Merrell (1998) employed a new assessment measure of DSM-IV (1994) criteria. However, scale items were derived from expert clinicians' judgements rather than directly on the diagnostic criteria of DSM-IV itself. Moreover, the study employed two to five items to tap each criterion of DSM-IV, which may affect weighting of factor analytic dimensions.

A unique feature of our study was the development of a scale based on specific DSM-IV (1994) criteria wherein each scale item represented an individual DSM-IV criterion with accompanying examples of behaviours taken from DSM-IV descriptors.

Cluster analytic studies have to some extent been consistent with the DSM-IV (1994) defined typologies of ADHD (Lahey & Carlson, 1991; Lahey et al., 1997). Lahey et al. (1988) reported three clusters including participants high on both inattention and hyperactivity-impulsivity, those