Child and Adolescent Mental Health Volume 8, No. 3, 2003, pp. 114–116

On the Intersection Between AD/HD and DCD: The DAMP Hypothesis

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The paper by Gillberg, 'ADHD and DAMP', provides an analysis of the scientific status of the concept of Deficits in Attention Motor Control and Perception (DAMP) in the light of the overlap between Attention Deficit/Hyperactivity Disorder (AD/HD) and Developmental Co-ordination Disorder (DCD), and the current uncertainty surrounding the significance of AD/HD – DCD co-morbidity.

Heterogeneity and co-morbidity in ADHD

Few researchers in the field now doubt the soundness of the scientific basis for the existence of AD/HD as a distinct and important mental health condition (Barkley et al., 2002). An impulsive/hyperactive/inattentive cluster of symptoms can be identified in groups of individuals right across the age range from pre-school to adolescence (e.g. Burns et al., 1997; Sonuga-Barke et al., 1997). This symptom cluster when present to an extreme degree is associated with significant impairment both at home and at school (Hinshaw, 2002). Furthermore, it can be distinguished from other related clusters such as those indicating conduct or learning problems in terms of psychological, socio-demographic and etiological factors (Leung et al., 1996; Taylor et al., 1991; Sonuga-Barke et al., 1994). In this sense, and leaving aside whether it represents a qualitatively distinct, discrete entity (i.e. a category) or simply the extreme of a continuum (i.e. a dimension; Sonuga-Barke, 1998), AD/HD is seen to represent a valid syndrome (but see Kendell & Jablensky, 2003).

While recognising the strength of this argument, it is hard at the same time not to be struck by how complex and messy the typical AD/HD presentation is. This is a product of both the heterogeneity within the AD/HD cluster and the overlap between it and other closely related childhood problems and developmental disorders. The DSM-IV sub-classification of AD/HD into hyperactive/impulsive and inattentive types (and their combination) has gone some way to address the problem of heterogeneity (Faraone et al., 1998). However, even within the subtypes great variation exists at the level of symptom expression. The situation is perhaps even more complex when underlying neuro-genetic factors are taken into account. In fact, it has recently been suggested that within the AD/HD combined type there may be cognitive and motivational subtypes (Sonuga-Barke, 2002). The problem of co-morbidity presents an even greater challenge. The level of overlap between AD/HD and other problems is extremely high, especially within referred populations (Kadesjo & Gillberg, 2001). While most research has focused on oppositional defiant and conduct disorder, there is also overlap with other problems such as anxiety (Perrin & Last, 1996), learning disabilities (Aaron et al., 2002) and clumsiness (Kadesjo & Gillberg, 1998). These high levels of overlap have led some to argue that AD/HD-co-morbid with other disorders is the normal clinical expression of the condition.

The variation within AD/HD and the overlap between it and other disorders has raised concerns about (i) the value of current diagnostic approaches and (ii) the very existence of an AD/HD syndrome. It is certainly the case that these problems of heterogeneity and co-morbidity are partly the result of the phenomenological and atheoretical approach adopted by the DSM-IV and the inevitably arbitrary and poly-thetic nature of its diagnostic categories (Sonuga-Barke, 1998). If this were the only reason for the problem then it could be addressed by adopting an alternative, perhaps more theoretically-based, diagnostic scheme. However, the fuzziness of the clinical AD/HD phenotype raises more fundamental questions in many minds; questions about the very existence of distinct disorders such as AD/HD (cf. Gilger & Kaplan, 2001). In order to respond to these concerns supporters of diagnostic approaches need to answer a question that goes right to the heart of this issue; how should diagnostic messiness be handled both scientifically (i.e. in terms of how we understand the nature and expression of different dimensions of psychopathology) and clinically (i.e. in terms of how best they should be managed)?

The DAMP hypothesis about the overlap between DCD and AD/HD

The emergence and persistence of the DAMP categorisation as described by Professor Gillberg in his paper represents a very practical expression of this question. DAMP is a controversial concept that challenges the current diagnostic orthodoxy and raises interesting questions about the structure of neuro-developmental disorders. Attempts to understand the significance of DAMP within current science and practice should focus on both its historical roots and its empirical status.

Historically, DAMP can be seen as a development of the earlier diagnostic category of minimal brain dysfunction (MBD; Rutter, 1982). In requiring the co-existence of AD/HD and Developmental Coordination Disorder it combines the features of these two major

Published by Blackwell Publishing, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA

derivates of MBD separated from one another in more recent diagnostic schemes (i.e. inattention/over-activity and clumsiness; Kalverboer, 1993). In fact it might be argued that DAMP is MBD but without the explicit aetiological assumptions. This is because DAMP differs from MBD in that it adopts a contemporary, DSM orientated, phenomenological approach to diagnosis. Assumptions about the neurological basis of the condition that were explicit in MDB are much less so in DAMP.

From an empirical/scientific standpoint DAMP should be considered a working hypothesis that challenges currently dominant categories of developmental disorder. What is the nature of the DAMP hypothesis? In answering this question we need to distinguish between necessary and sufficient elements that need to be satisfied if DAMP is to be deemed to have scientific credibility. First, there must be strong evidence for a consistent pattern of overlap between AD/HD and DCD within the normal population (i.e. in samples not subject to referral bias). Indeed, there is a growing body of evidence of a significant overlap between problems of attention, activity, impulse control and motor dyscoordination and clumsiness (Landgren et al., 1996). In community samples the diagnoses of DCD and AD/HD often co-occur (Kadesjo & Gillberg, 1999). Children diagnosed with AD/HD are often more clumsy than non-AD/HD children (Piek, Pitcher, & Hay, 1999; but see Leung & Connolly, 1998). Children with DCD often demonstrate attentional problems (Wilson & Maruff, 1999).

In demonstrating this overlap Professor Gillberg and other researchers have done a great service to the field by alerting both clinicians to the need to test for the presence of co-ordination disorders in AD/HD and scientists by prompting them to study the significance of this overlap.

However, such overlap is a necessary but not a sufficient basis for confirming the scientific validity of the DAMP construct. Demonstrating overlap between conditions does not provide a scientific justification for a distinct diagnostic entity. Such a justification depends on two other conditions being met. First, it must be demonstrated that there is something distinctive and unique about the co-ordination problems found in AD/HD compared to other disorders. If clumsiness and co-ordination difficulties are a general association of childhood behavioural disorders then their presence in AD/HD is of clinical interest but does not provide sufficient basis for the creation of a distinct diagnostic category. Second, even if the overlap between DCD is specific to AD/HD, the combination of AD/HD and DCD must represent more than just the summation of the characteristics of the overlapping disorders or their associated risks. For instance, if AD/HD is related to executive problems and DCD to problems in movement timing then it would not be surprising if, where AD/HD and DCD overlapped, children presented with both executive and timing problems. Such a finding would not represent sufficient evidence to establish a distinct diagnostic category as implied by DAMP. If, on the other hand, co-occurring problems present in the co-morbid case interact multiplicatively to produce significantly more severe executive or timing problems than would be expected from the presence of either single diagnosis, then this would suggest the presence of a separate disorder. If only the second of these criteria is met (i.e. multiplicative effect but not specificity of overlap) then we would have evidence for an AD/HD/dys-coordination subtype rather than a separate category.

Research to test these issues is still very much in its infancy. While there are a number of studies that provide suggestive evidence of the special status of the DCD/ADHD overlap (e.g. Vickers, Rodrigues, & Brown, 2002; Norrelgen, Lacerda, & Forssberg, 1999; Periera, Eliasson, & Forssberg, 2000; Tervo et al., 2002) the small scale of these studies and their methodological power limit the extent to which they can fully address these issues.

Summary and future directions

The DAMP concept has been important clinically and scientifically because it has focused attention on a currently overlooked phenomenon; AD/HD – DCD co-morbidity. However, the validity and utility of DAMP will remain unclear until stronger evidence of the special status of the overlap between its constituent disorders is provided. It is interesting to contrast the relative neglect of the overlap between AD/HD and DCD with the extensive literature on the AD/HD – Oppositional Defiant/Conduct Disorder overlap. In many ways, research in this area provides a model for future work in the area of DCD – AD/HD overlap. Fully factorial experimental designs (comparing children with pure AD/HD, pure CD, mixed CD AD/HD and no problems) have been used to test for multiplicative interactions between AD/HD and conduct problems (Molina, Smith, & Pelham, 1999; Schachar & Tannock, 1995). Other studies have used genetically informative designs to estimate the extent to which the co-morbid condition shares common genetic and environmental elements (Faraone et al., 1995; Nadder et al., 2002). Work on the DCD and AD/HD overlap should follow this lead.

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