

Sex differences in child-onset, life-course-persistent conduct disorder. A review of biological influences

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Abstract

Sex is widely acknowledged to be an important factor in understanding many aspects of behavior, not the least of which is antisocial behavior. When antisocial behavior manifests itself in the domain of juvenile psychopathology, it often takes the form of a type of conduct disorder (CD) that begins in childhood and is life-course-persistent. There is an overwhelming consensus that there is a massive male preponderance in this type of CD and that biological variables are major influences on this difference. This review built on this consensual scaffolding in an attempt to provide some useful leads for identifying the biological contributions to the predominantly male complexion of life-course-persistent CD by linking it to three different levels of biological mechanisms. © 2007 Elsevier Ltd. All rights reserved.

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Sex is widely acknowledged to be an important factor in understanding many aspects of behavior (Stewart & McDermott, 2004). Indeed, as Thomas Insel, head of National Institute of Mental Health recently observed with regard to mental disorders: “It’s pretty difficult to find any single factor that’s more predictive for some of these disorders than gender” (Holden, 2005, p. 1574). The validity of Insel’s observation has no better illustration than conduct disorder (CD).

In the broad spectrum of conduct problems, CD captures the violent, overtly-destructive dimension (McMahon & Frick, 2005) that is codified in Diagnostic and Statistical Manual of Mental Disorders (4th ed., text rev. [DSM-IV-TR];¹ American Psychiatric Association, 2000). CD refers to the more severe antisocial and aggressive behaviors that result in serious violations of others’ rights (McMahon & Frick, 2005) and its very nature involves aggressive, violent, confrontational behavior (Hartung & Widiger, 1998). Its importance is underscored by the fact that the chronic, severe conduct problems captured by the DSM-IV-TR rubric of CD are the most common childhood difficulties both in the community and in referrals to child mental health facilities in the United States (Dodge & Pettit, 2003; Hill, 2002).

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¹ As the review was going to press, two research articles (Huizinga, Haberstick, Smolen, Menard, Young, Corley, Stallings, Grotper, & Hewitt, 2006; Widom & Bruzostowicz, 2006) implementing the recommendation for extension and replication were published which indicate that the link between MAOA and CD is not as robust as previous research has suggested.

The most widely accepted developmental taxonomy of CD is that which distinguishes between life-course-persistent versus adolescent-limited antisocial behavior (McMahon & Frick, 2005; Moffitt, 2006; Rutter, Kim-Cohen, & Maughan, 2006). Life-course-persistent refers to the childhood-onset of severe conduct problems (i.e., before age 10) which emerge from early neurodevelopmental and family adversity risk factors, tends to be life-course-persistent, and hence is almost always a prognosticator of poor adult adjustment (Moffitt, 2003, 2006). Life-course-persistent individuals in contrast to the adolescent-limited are "...few, persistent and pathological" (Moffitt, 2006, p. 571). However it is precisely these few individuals and families (10%) who commit more than 50% of crimes in the United States (Moffitt, 2005). Hence the importance of understanding the life-course-persistent type, i.e., the "few, persistent and pathological" can hardly be overstated. Note that for the purposes of this review the designation CD will refer to this type.

Apropos of Insel's observation, boys are about two to four times more likely than girls to develop a form of CD (Dodge, Coie, & Lynam, 2006; Earls & Mezzacappa, 2002; Eme & Kavanaugh, 1995; Loeber, Burke, Lahey, Winters, & Zera, 2000) and, astoundingly, 10 to 15 times more likely than girls to develop the life-course-persistent type (Moffitt, 2003, 2006; Moffitt, Caspi, Rutter, & Silva, 2001), thus prompting Moffitt (2006) to view it as almost exclusively a male phenomenon. This huge sex difference, which is real and not due to any methodological issues of sampling, measurement, or significance testing, is among the most stable of all findings regarding antisocial behavior (Robins, 1991; Rutter, Caspi, & Moffitt, 2003) and results in approximately 6% of male juveniles becoming chronically violent (Dodge & Pettit, 2003). Furthermore, this sex difference is also seen in violent juvenile crime (Dodge & Pettit, 2003; Hinshaw & Lee, 2003; Pettit & Dodge, 2003; Weist & Cooley-Quille, 2001) and in physical aggression (Archer, 2004; Arsenio, 2004; Earls & Mezzacappa, 2002; Hyde, 2005; Rutter, 2003a), thereby adding further support to its validity and importance.

In summary, it is difficult to exaggerate the importance of a thorough understanding of the sex difference in CD for the discipline of clinical child and adolescent psychology. For example, since such substantial sex differences in physical aggression occur as early as ages 2–3 (Archer, 2004; Dodge et al., 2006) and in conduct problems at age 4 (Keenan & Shaw, 2003), Lahey and Waldman (2003) declaimed: "Because the magnitude of these sex differences is considerable, any successful explanation of sex differences will greatly inform general models of the origins of conduct problems." (p.99). Unfortunately, though Moffitt (2006) has attributed the sex difference to the fact that males are more likely to have the neurodevelopmental risk factors that interact with family adversity, the contribution of biological influences to the differential risk in neurodevelopmental factors has been relatively neglected when compared to the attention accorded to psychosocial factors (Pettit & Dodge, 2003). The importance of addressing such neglect has been underscored by Rutter (2003a), when he speculated that CD might best be viewed as a neurodevelopmental disorder which shares a common etiology with other male preponderant disorders such as autistic spectrum disorders, attention deficit disorders with hyperactivity, and dyslexia. Hence, the goal of the present review is to remedy this neglect by focusing on some "good leads" (Rutter et al., 2003, p. 1092) for the biological influences that contribute to the sex difference in CD.

The Rutter et al. (2003) three level model for conceptualizing the mode of operation of the possible biological influences of the sex difference in CD will provide the basic structural organization for the review because this model, in contrast to other models dealing with biological variables, has been specifically proposed as an attempt to integrate biological variables with the variable of sex differences. In so doing, the review accepts as axiomatic that there is a profoundly complex interplay between biological processes and a myriad of psychosocial and contextual processes (Dodge et al., 2006; Dodge & Pettit, 2003; Granger & Kivlighan, 2003; Hill, 2002; Moffitt, 2005; Raine, 2002b; Rutter, 2003a,b, 2005; Rutter, Moffitt, & Caspi, 2006).). It chooses to focus on biological influences because of the relative neglect of this domain, because it is the logical first step for any kind of a comprehensive biopsychosocial model that attempts to integrate all the variables (Hill, 2002; Krol, Morton, & De Bruyn, 2004), and because any adequate treatment of the multiple complex interactions among these processes is beyond the scope of this paper. Also, note that, as with Dodge and Pettit (2003), this review proposes that biological influences result in predispositions that are probabilistically, not ineluctably, related to development of CD. Furthermore, the review will not address the topic of individual differences in developmental pathways to violence because once again, despite the undeniable importance of this topic, it is beyond the scope of the review.

In focusing on biological influences, the review will regard as relevant all of the literature on juvenile antisocial behavior which has been discussed under a wide variety of terms such as: acting-out, aggressive, antisocial, conduct disorder, conduct problems, criminal, externalizing, delinquent, undercontrolled, etc. (Hinshaw & Lee, 2003; McMahon & Frick, 2005). While these various categories cannot be equated and some attempts to give more taxonomic precision to the various terms have been made (Dodge et al., 2006; Hinshaw & Lee, 2003), there is sufficient

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