Research in Developmental Disabilities 33 (2012) 951–963

Contents lists available at SciVerse ScienceDirect

Research in Developmental Disabilities

Youths with ADHD with and without tic disorders: Comorbid psychopathology, executive function and social adjustment

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ARTICLE INFO

Article history:
Received 29 December 2011
Accepted 4 January 2012
Available online 27 January 2012

Keywords:
Attention deficit/hyperactivity disorder
Tic disorders
Executive functions
Psychiatric comorbidity
Social adjustment

ABSTRACT

Attention deficit/hyperactivity disorder (ADHD) and tic disorders (TD) commonly co-occur. Clarifying the psychiatric comorbidities, executive functions and social adjustment difficulties in children and adolescents of ADHD with and without TD is informative to understand the developmental psychopathology and to identify their specific clinical needs. This matched case-control study compared three groups ($n = 40$ each) of youths aged between 8 and 16 years: ADHD with co-occurring TD (ADHD + TD), ADHD without TD (ADHD − TD) and typically developing community controls. Both ADHD groups had more co-occurring oppositional defiant disorder than the control group, and the presence of TD was associated with more anxiety disorders. TD did not impose additional executive function impairments or social adjustment difficulties on ADHD. Interestingly, for youths with ADHD, the presence of TD was associated with less interpersonal difficulties at school, compared to those without TD. The potential various directions of effects from co-occurring TD should be carefully evaluated and investigated for youths with ADHD.

1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a common developmental neuropsychiatric disorder of childhood, with a world-wide pool prevalence of 5.29% (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007) and a prevalence rate of 7.5% in the Taiwanese child and adolescent population (Gau, Chong, Chen, & Cheng, 2005). ADHD is characterized by early-onset functionally impairing attention deficits, hyperactivity and impulsivity. Commonly occurring together with ADHD, tic disorder (TD) is also an early-onset neuropsychiatric condition, characterized by episodic motor or/and vocal tics. According to the presentation and course of symptoms, it is further classified into Tourette's disorder, chronic tic disorder, transient tic disorder and tic disorder, not otherwise specified. Tourette's disorder shows persistent motor tics and at least one kind of vocal tics persisting for more than one year, with a symptom-free period less than three consecutive months. Chronic tic disorder, a milder form of Tourette's disorder (Leckman et al., 1998), is defined by either motor and/or vocal tics lasting more than one year. Transient tic disorder is defined as having motor and/or vocal tics with a duration of at least four weeks but

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doi:10.1016/j.ridd.2012.01.001

less than one year. The prevalence is around 5–23% for all tic disorders (Khalifa & von Knorring, 2003; Kurlan et al., 2001; Wang & Kuo, 2003) and 0.6–3.8% for Tourette's disorder (Hornsey, Banerjee, Zeitlin, & Robertson, 2001; Khalifa & von Knorring, 2003; Wang & Kuo, 2003).

ADHD and TD commonly co-occur. Children with ADHD have high rate (8–14%) of concurrent TD (Biederman et al., 2005) and around 35–50% of children with TD also meet the diagnosis of ADHD (Freeman, 2007; Kurlan et al., 2002; Wang & Kuo, 2003). The high co-occurrence of these two disorders has raised significant clinical attention (Carter et al., 2000; Erenberg, 2005; Khalifa & von Knorring, 2003; Kurlan et al., 2002; Nijmeijer et al., 2008). Although many studies have tried to clarify the overlap of these two disorders with regard to psychopathological, psychophysiological (Rothenberger et al., 2000; Yordanova, Dumais-Huber, & Rothenberger, 1996; Yordanova, Dumais-Huber, Rothenberger, & Woerner, 1997) and neuropsychological (Brand et al., 2002; Harris et al., 1995; Roessner, Becker, Banaschewski, & Rothenberger, 2007a; Sherman, Shepard, Joschko, & Freeman, 1998; Shin, Chung, & Hong, 2001) aspects, the pathophysiological mechanism underlying this comorbidity is still unclear (Roessner, Becker, Banaschewski, & Rothenberger, 2007b).

Nevertheless, the relationship between comorbid psychopathology and social function in the two disorders are rather commonly acknowledged. ADHD, with or without Tourette's disorder, is associated with higher rates of other psychopathology than Tourette's disorder-alone (Brand et al., 2002; Carter et al., 2000; Sukhodolsky et al., 2003). Furthermore, ADHD is associated with disruptive behaviors, but TD (including Tourette's disorder) is with anxious or depressive symptoms (Freeman, 2007; Roessner et al., 2007b; Spencer et al., 2001). Children with Tourette's disorder co-occurring with ADHD present worse psychosocial outcome than with those without (Carter et al., 2000; Spencer et al., 1998). Interestingly, co-occurring Tourette's disorder has little impact on the psychosocial outcomes of children with ADHD (Spencer et al., 1999). Taken together, it seems that ADHD contributes most to the social and behavioral impairments for children with co-occurring ADHD and TD (Robertson, 2006).

In children with ADHD, TD, and ADHD plus TD, the neuropsychological functions, rather than the motor symptoms, contribute most to their functional impairments (Cohen, Friedhoff, Leckman, & Chase, 1992; Dykens et al., 1990). Tourette's disorder is characterized by impairments in visuomotor integration (Schultz et al., 1998), sustained attention (Harris et al., 1995; Sherman et al., 1998; Shucard, Benedict, Tekok-Kilic, & Lichter, 1997), inhibition (Channon, Pratt, & Robertson, 2003; Muller et al., 2003), reaction time and verbal fluency (Schuerholz, Baumgardner, Singer, Reiss, & Denckla, 1996) and real-life problem-solving (Channon, Crawford, Vakili, & Robertson, 2003). Nevertheless, these studies seldom controlled for comorbid conditions (Shin et al., 2001). The deficits are often associated with comorbid ADHD, which typically presents deficits in inhibition, sustained attention, self-control, time perception and other executive functions (Barkley, 1997; Berlin, Bohlin, & Rydell, 2003; Coffey et al., 2004; Gau & Shang, 2010; Hwang, Gau, Hsu, & Wu, 2010; Nigg, 2005). Studies accounting for the presence of ADHD often report no differences on general intelligent ability between children with and without TD (Roessner et al., 2007a). In a few studies investigating executive functions, ADHD is suggested to be the main impairing factor on neuropsychological performance for children with concurrent ADHD and Tourette's disorder (Banaschewski, Neale, Rothenberger, & Roessner, 2007). Paradoxically, some studies reported a better performance of children with ADHD co-occurring with Tourette's disorder than those with ADHD alone, indicating plausible protective or compensatory mechanisms (Greimel, Herpertz-Dahlmann, Gunther, Vitt, & Konrad, 2008; Sherman et al., 1998). Studies are required to disentangle the relationship between these two disorders in terms of executive functions.

Most studies to date investigated the relationship between ADHD and Tourette's disorder (and/or chronic tic disorder), but rarely included transient tic disorder. However, transient tic disorder is even more prevalent and commonly associated with ADHD (Khalifa & von Knorring, 2005). In addition, two community-based studies showed that children with tic symptoms had similar psychopathology as those with Tourette's disorder (Gadow, Nolan, Sprafkin, & Schwartz, 2002; Kurlan et al., 2002). Investigating how TD in general (i.e., including transient tic disorder, chronic tic disorder and Tourette's disorder altogether) has an impact on ADHD better reflects the actual clinical complexity of ADHD and provides more ecologically valid inferences. Therefore, this study aims to compare children and adolescents with ADHD with and without co-occurring TD on aspects of comorbid psychopathology, executive functions and social adjustments. Based on findings reviewed earlier, we hypothesized that (1) for comorbid psychopathology, children and adolescents with ADHD and co-occurring TD (ADHD + TD group) are more likely to have comorbid anxiety disorders than those without TD (ADHD − TD group); furthermore, both ADHD + TD and ADHD − TD groups have more disruptive behaviors than the control group; and (2) the ADHD + TD group has similar or better executive function and social adjustment compared to ADHD − TD group, and both ADHD +/− TD groups have poorer executive and social functions than the control group.

2. Methods

2.1. Participants

Participants included three age-, sex- and IQ-matched groups of children and adolescents aged between 8 and 16. The ADHD + TD group included 40 participants diagnosed with both ADHD and TD at the child neurology and child psychiatry clinics of the National Taiwan University Hospital. The ADHD − TD group included 40 participants diagnosed with ADHD alone, at the child psychiatry clinic of the same hospital. The control group included 40 typically developing participants without either TD or ADHD, selected from the same school districts as the former two groups (rather than from