Research in Developmental Disabilities 31 (2010) 350–361

Contents lists available at ScienceDirect

Research in Developmental Disabilities

Developmental coordination disorder and other motor control problems in girls with autism spectrum disorder and/or attention-deficit/hyperactivity disorder

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ARTICLE INFO

Article history:
Received 31 August 2009
Accepted 29 September 2009

Keywords:
Developmental coordination disorder (DCD)
Girls
Autism spectrum disorders (ASD)
Attention-deficit/hyperactivity disorder (ADHD)
Daily living skills (VABS-DLS)

ABSTRACT

Examine the rate, predictors, and effect on daily life skills of developmental coordination disorder (DCD) and other motor control difficulties in school age girls with autism spectrum disorder (ASD) and/or attention-deficit/hyperactivity disorder (ADHD), in preschool age girls with ASD referred to a neuropsychiatric clinic, and in a community sample of school age girls. The girls (131 in total) were examined with standardised test of motor function and parent interviews and questionnaires. The school girls were compared with 57 age-and IQ-matched girls from the community. DCD was diagnosed in 25% of clinic school girls with ASD, in 32% of those with ADHD, and in 80% of the clinic preschool girls with ASD. Parents reported more motor problems in the school age clinic group. Agreement between a brief motor screening test and a full comprehensive motor examination was moderate to good in the clinic group. Young age, autistic symptomatology, and low performance IQ predicted more motor coordination problems. Motor coordination problems were related to lower ability in daily life skills even when the effect of PIQ was controlled for. A large minority of school girls with ASD and/or ADHD, and a majority of preschool girls with ASD meet full diagnostic criteria for DCD. Their motor problems contribute to reduced activity in daily life even when the effects of IQ have been partialled out.

1. Introduction

Motor control problems are very common in attention-deficit/hyperactivity disorder (ADHD), and quite frequent in autism spectrum disorders (ASD) also. The overlap of these types of problems were noted by our group in the early 1980s (Gillberg & Gillberg, 1983), and repeatedly over the next decades, in cross-sectional and longitudinal studies (e.g. Gillberg, 1989; Kadesjö & Gillberg, 1998, 1999, 2001; Landgren et al., 1996; Pereira et al., 2001; Rasmussen & Gillberg, 2000). We have shown that developmental coordination disorder (DCD) is present in about half of all individuals with ADHD, and that about half of all individuals with DCD have ADHD. There is a strong interactive effect of ADHD and DCD in predicting ASD. DCD in ADHD tends to persist into adult age in a considerable proportion of all cases. Rather surprisingly, it is only very recently that DCD and its links with ADHD and ASD have come to the research attention of several other groups (e.g. Dewey et al., 2007; Green et al., 2009; Pan et al., 2009; Piek & Dyck, 2004; Sergeant et al., 2006; Toplak & Tannock, 2005).

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doi:10.1016/j.ridd.2009.09.017

Gaub and Carlson (1997) in their meta-analysis on ADHD reported similar rates of motor problems among girls and boys. Recently, Fliers et al. (2008) replicated these results for adolescents with ADHD. Our own studies of DCD in ADHD and ASD have usually included small numbers of girls, and most of our conclusions actually pertain to boys only. There is a general dearth of studies looking at motor control problems associated with ADHD and ASD in girls. There is only a very small number of studies of DCD that have included sufficient numbers of girls to allow firm conclusions. However, Piek's group has demonstrated that girls with DCD who are bullied tend to develop poorer self-worth than do boys with the same disorder (Piek et al., 2005). Also, in one study of differential effects of gender and DCD, girls with DCD were found to have lower risk of obesity compared to boys with the disorder (Cairney et al., 2005a, 2005b).

The present study represents an attempt to address some of the limitations in the available literature on DCD and related motor control problems in girls. It looks in depth at motor control functioning in a relatively large group of girls with ASD, ADHD or both (and a comparison group from the population). It aims to establish (1) the rate of motor control difficulties, including DCD, and (2) to analyse the contribution of certain predictors to the presence of motor control problems in these groups. An attempt will also be made to analyse (3) the effect of severity of ASD and ADHD symptoms on motor control difficulties, and (4) the relationship between motor coordination problems and daily living skills. Finally, we want to (5) determine whether a brief motor screening test can identify girls with DCD so that there would not be a need to submit all girls with ASD/ADHD to a full, time-consuming, examination of motor skills.

2. Methods

2.1. Participants

One hundred and fifty-seven girls were included in the study, 100 of whom were clinically referred girls with social and/or attention deficit (most of whom had either ASD or ADHD or a combination of the two, see below), and 57 non-clinically referred girls from the community. Neither group had prior suspicion of learning disability (LD). The former group ranged in age from 3 to 18 years, and the latter ranged from 7 to 16 years of age.

2.1.1. Clinically referred girls ("Clinic Girls")

The Child Neuropsychiatric Clinic (CNC) in Göteborg, Sweden, is a national/regional clinic for ASD, ADHD, and other neuropsychiatric disorders. For the present study, we included 100 consecutive girls, 3–18 years of age, not known to have learning disability (LD) (see below) who had been referred to the CNC during 1998–2001 (see Kopp et al., 2009). The following exclusion criteria were used: (1) LD established before the study, (2) parental inadequate command of Swedish, and (3) serious physical disorder in child (e.g. cerebral palsy or severe epilepsy). We originally targeted 139 clinically referred girls, but 39 were excluded for the following reasons: 14 because, in the event, prior test results did show LD after all, 7 girls "no longer had any problems", 2 had parents who were not fluent in Swedish, and 2 girls had severe physical disorders. In addition, 5 had mothers who refused, 5 did not respond to contact, and 4 had already received an in-depth neuropsychiatric assessment, and it was considered unethical to subject them to repeat examinations.

After the full assessment performed during the course of the study, 12 of the 100 remaining clinic girls were found to meet criteria for LD (9 of whom were under age 7 years at referral). They were retained in the study because they had not been diagnosed or suspected of LD before entering the study.

The clinic girls were grouped in three age-bands: 3–6 (preschool), 7–12, and 13–18 years, comprising 24, 38, and 38 girls, respectively.

2.1.2. Matched clinic girls (MClinG) and matched community girls (MComG)

All 60 clinic girls 7–16 years with a tested FSIQ$\geq$80 (n = 60) were selected and matched for age ($\pm$2 months) with 60 school girls from Mölnlycke, a community in the Göteborg region. This community group was selected from the local paediatric outpatient register and was approached by the local paediatrician, who only contacted parents with good Swedish language skills and with a daughter without any known serious medical illness or LD. No child in the families from this group had been assessed for suspected neuropsychiatric disorder. However, three of these 60 community girls were excluded after full assessment, two because they met full symptom criteria for ADHD and one because she had a FSIQ$<$80. Thus, the final matched community group comprised 57 girls. In order to recruit this group, 84 families had originally been contacted, but 24 had been excluded due to academic problems (n = 7), social-interaction problems (n = 3), and refusal (n = 14).

For the purpose of the present study we selected from the MClinG all girls (i.e. girls aged 7–16 years) with a main diagnosis of ASD (n = 20) (autistic disorder (AD) (10), Asperger's disorder (5), pervasive developmental disorder not otherwise specified (PDD NOS) (5)) and all with a main diagnosis of ADHD (n = 34) (combined (20), inattentive (9), hyperactive-impulsive (3)) for comparison with the MComG (n = 57). In the ASD group, all but one (95%) had ADHD in addition to ASD. In the ADHD group, 29% had some autistic features, but none met criteria for ASD. For other demographical and functional variables for the matched groups see Table 1.

2.1.3. Clinic preschool girls with ASD (ClinPG)

In the total clinic group (n = 100), 20 girls aged 3–6 years were given a main diagnosis of ASD (AD (14), childhood disintegrative disorder (1), Asperger's disorder (1), PDD NOS (4)). This group will be referred to as the ClinPG. Seven of these