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Anxiety disorders in 8-11-year-old children: Motor skill performance and self-perception of competence

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Abstract

This study investigates motor skill performance and self-perceived competence in children with anxiety disorders compared to children without psychiatric disorders.

Motor skills and self-perception were assessed in 329 children aged 8 to 11 years, from the Bergen Child Study. The Kiddie-SADS PL diagnostic interview was employed to define a group of children with an anxiety disorder without comorbid diagnosis, and a control group (no diagnosis) matched according to gender, age, and full-scale IQ.

Children in the anxiety disorder group displayed impaired motor skills and poor self-perceived peer acceptance and physical competence compared to the control group. Two-thirds of the anxious boys scored on the Motor Assessment Battery for Children (MABC) as having motor problems.

The present study demonstrated impaired motor skills in boys with "pure" anxiety disorders. Anxious children also perceived themselves as being less accepted by peers and less competent in physical activities compared to children in the control group.

Anxiety disorders occur in about 5 to 18% of the population (James, Soler, & Weatherall, 2005). Although one of the most common psychiatric problems, many questions regarding our understanding of childhood anxiety disorders remain unanswered. Recently, neurodevelopmental impairments, such as delayed childhood motor skills, have been identified as risk factors for subsequent development of anxiety symptoms (Sigurdsson, van Os, & Fombonne, 2002). Impaired motor skills and anxiety are both thought to affect children's ability to master their environment and hence their self-perception of competence (Skinner & Piek, 2001). Every day, children encounter situations in social and physical play activities that challenge their motor skills. These motor challenges can trigger fear responses in children with impaired motor abilities, which in turn can lead to future avoidance of similar situations (Schoemaker & Kalverboer, 1994). In a British birth cohort study (Sigurdsson et al., 2002), young boys with delayed motor skills were found to have more than three times increased risk of receiving reports of anxiety symptoms at 11 and 16 years of age, and subtle motor deficits (soft signs) have been associated with an increased risk of later anxiety and depressive disorders in young children (Pine, Wasserman, Fried, Parides, & Shaffer, 1997; Shaffer et al., 1985). Only a few studies have explored a more specific relationship between impaired motor skills and anxiety disorders: A Norwegian study found that children with social anxiety were characterized by poorer motor skills than controls (Kristensen & Torgersen, 2008), and impaired balance was reported in a clinical case-control study of anxious children although a significant proportion of these children also fulfilled a comorbid diagnosis of ADHD (Erez, Gordon, Sever, Sadeh, & Mintz, 2004).

Children with poor motor skills tend to avoid motor activities, for fear of failure or peer criticism. This will not only give the children less opportunities to practise motor skills and to participate socially, but may also affect their self-perceived social and physical competence. According to Harter (Harter, 1987), the children's poor self-perceived

competence will negatively affect their continued interest in an activity and new mastery attempts, further maintaining the avoidance. Consistent with this theory low ratings of self-perceived social competence were reported by socially anxious youth (Chansky & Kendall, 1997; Smari, Petursdottir, & Porsteinsdottir, 2001), and a recent study of adolescents reported that lack of perceived social acceptance predicts subsequent social anxiety and fear of negative evaluation (Teachman & Allen, 2007). Perceptions of social acceptance has also been found to be low in children with poor motor coordination (Rose, Larkin, & Berger, 1997; Schoemaker & Kalverboer, 1994), and coordination problems in children have been associated with a poor self-concept (Henderson & Sugden, 1992; Piek, Baynam, & Barrett, 2006; Skinner & Piek, 2001), a poor physical self-perception (Piek et al., 2006; Piek, Dworcan, Barrett, & Coleman, 2000), anxiety to participate in motor tasks (Piek, Barrett, Allen, Jones, & Louise, 2005; Piek et al., 2006; Skinner & Piek, 2001), and socializations problems (Schoemaker & Kalverboer, 1994). Thus, access to important socialization processes and coping experiences available in athletic and play activities may be limited for children with poor motor skills, affecting their emotional well-being and self-perceived competence. Still, the impact of poor motor skills has received very little attention in research on children's emotional and psychosocial adjustment and most studies of such an impact have selected children from clinical populations (Dewey, Kaplan, Crawford, & Wilson, 2002; Smyth & Anderson, 2000).

Commonly studies of anxious children recruit their participants from clinical samples, including children with comorbid diagnoses, making it difficult to decide if motor impairment and poor self-perception are due to the anxiety disorders or the comorbid disorders. Participants in these studies may display one of several diagnoses which are known to be associated with motor coordination problems such as ADHD (Harvey et al., 2007; Kadesjo & Gillberg, 2001), autism spectrum disorders (Green et al., 2002; Wisdom, Dyck, Piek, Hay, &

Hallmayer, 2007), and learning disabilities (Hendriksen et al., 2007). The same is true for ratings of self-perceived competence; low perceptions of general competence have been found to be associated with depression (Jacquez, Cole, & Searle, 2004; Smari et al., 2001), the relationship between ADHD and depression has been found to be mediated by appraisal of self, as well as other appraisals of social competence (Ostrander, Crystal, & August, 2006). Thus, it has been suggested that future studies of anxiety disorders should recruit participants from epidemiological samples (James et al., 2005), that include children with "pure" anxiety disorders i.e without comorbid disorders.

The present study investigated whether impaired motor skills and poor self-perception were more frequent in children with "pure" anxiety disorders, selected from a population based screened sample of 8–11 year-old children (n = 329). This was examined by comparing motor function and self-perception in a group of anxious children without comorbid disorders with a control group of children displaying no psychiatric disorders. The two groups were matched according to gender, age and full-scale IQ. Our main hypothesis was that children in the anxiety group would display poorer motor skills than children in the control group. It was further hypothesized that children with anxiety disorders would perceive themselves as less competent socially and, thus report lower self-competence in the peer acceptance domain (Chansky & Kendall, 1997; Smari et al., 2001). A lower rating of self-perceived physical competence was also expected as this domain has been found to be affected in children with motor problems. Self-perceived cognitive competence and maternal acceptance were also examined, as those domains are known to be important in childhood, but they were not expected to be selectively poor in anxious children. Finally, we examined if children with a "pure" anxiety disorder tend to display both impaired motor skills and poor self-perceptions.

Methods

Population sample

The children included in the present study were participants in the third stage of the Bergen Child Study (BCS). The protocol and population of the BCS are described in detail in separate publications (Heiervang et al., 2007; Posserud, Lundervold, & Gillberg, 2006), and only a short description will be given here. The BCS is a prospective longitudinal total population study of the children who attended the second to fourth grades in all public, private and special schools in the Bergen and Sund municipalities (Norway) during October 2002. The original BCS included three stages and was approved by the Regional Committee for Medical Research Ethics in Western Norway.

In the first stage of the original BCS, a four-page screening questionnaire was sent to all parents and teachers of the children in the total population sample, and in the second stage, a sample of parents was interviewed according to the Development And Well-Being Assessment (DAWBA) (Goodman, Ford, Richards, Gatward, & Meltzer, 2000). In a third stage, an in-depth clinical evaluation of a small case-control selected sample was performed (n = 329). Based on clinical information gathered during this stage children were assigned child psychiatric diagnoses in accordance with the DSM-IV criteria (American Psychiatric Association, 1994), and their intellectual function was assed by a Norwegian translation of WISC-III (Ellertsen & Johnsen, 2003) These two measures were used in the current study to select the anxiety and control groups (see Figure 1).

(Insert Figure 1 here)

Participants

Anxiety group: Of the 57 children who received an anxiety disorder diagnosis according to the Kiddie-SADS PL interview (Kaufman, Birmaher, Brent, & Rao, 1997)

during the third stage of the BCS (n = 329), 30 received one or more comorbid diagnoses. The present study included the 27 children (12 female and 15 male) with a "pure" anxiety disorder diagnosis (see Figure 1). These children obtained diagnoses within the following DSM IV categories: specific phobias (n = 15), social phobias (n = 7), generalized anxiety disorder (GAD) (n = 3) and separation anxiety (n = 2). Their mean age was 9.62 years (SD = .77; range 8–11 years) and their mean full-scale IQ score was 90.7 (SD = 15.38; range 66–119).

Control group: The control group included 27 children (12 female and 15 male) with a mean age of 9.68 years (SD = .81; range 8–11 years) and a mean full-scale IQ score of 91.9 (SD = 12.78; range 65–117). They were selected from the same sample of 329 children as the anxiety group, using the inclusion criterion of no psychiatric diagnosis according to the Kiddie-SADS PL. In both groups, the inclusion criterion was a full-scale IQ score at or above 65. This IQ range was used since it has been suggested that the inclusion of children with a wide range of IQ levels in studies of anxiety disorders creates a more diverse and clinically relevant population (James et al., 2005; Lundervold, Posserud, Sorensen, & Gillberg, 2008). Children in the control group were matched to those in the anxiety group: First according to gender, then age group (8, 9, 10 and 11 years) and finally, according to their full-scale IQ score (65–69, 70–79, 80–89, 90–99, 100–109 and 110–119) using the random sample select function in SPSS. Thus, the groups were not statistically different on any of the matching variables.

Measures

Schedule for Affective Disorders and Schizophrenia for School-Age children, Present and Lifetime version (Kiddie-SADS PL) (Kaufman et al., 1997). Kiddie-SADS PL is a semi-structured diagnostic interview that provides DSM-IV Axis I child psychiatric (present and lifetime) diagnoses. Previous studies have reported sufficiently high values of interrater

reliability and test–retest reliability (Ambrosini, 2000; Kaufman et al., 1997). Clinicians trained in using the instrument conducted the interviews, first with the parent(s), and later on the same day with the child. The interviewers had no prior knowledge of the inclusion status of the children they interviewed (screen positive or screen negative). All information provided by the parent(s) and the child during the interviews was used by the clinician to generate diagnostic information, which was coded into four different categories: 1) no diagnosis, 2) possible diagnosis, 3) diagnosis in remission, and 4) definite clinical diagnosis. The final clinical report listed all diagnoses according to DSM-IV criteria.

The Wechsler Intelligence Scales for Children; third version (WISC-III) (Wechsler, 1991). WISC-III is a standardized test of cognitive skills that includes several verbal and nonverbal subtests. The full-scale IQ score, age-adjusted according to Swedish norms (Sonnander, Ramund, & Smedler, 1998), was used in the present study.

The Movement Assessment Battery for Children (MABC) (Henderson & Sugden, 1992). MABC is a standardized, two-part, structured, motor ability screening test. The assessment battery consists of a parent/teacher report checklist for assessing everyday movement ability and an individually administered performance test. In the present study, we used the standardized performance test, which evaluates children's performance on each of eight different tasks using a 0 to 5 rating scale, in four age bands (4–6, 7–8, 9–10 and 11–12 years). Three areas of motor skills are assessed: Manual Dexterity, Ball Skills, and Static and Dynamic Balance. Four scores are obtained, a Total Impairment score used in the current study, and performance scores for each subset of motor skills. The total impairment score ranges from 0 to 40, with higher ratings representing more impairment. Children performing at or below the 5th percentile on the Total Impairment score are considered to have motor problems, scores between the 15th and 6th percentiles are viewed as borderline performance (Henderson & Sugden, 1992).

The Pictorial Scale of Perceived Competence and Social Acceptance for Young Children (PSPCSA) (Harter & Pike, 1984) is a self-perception scale for young children (grades 1 and 2). Still, we found this interview to be appropriate in the present study, since the sample includes children with language problems (Lundervold, Heimann & Manger, 2008) and the pictorial format of the scale obviates the need for reading by providing the children with more concrete stimuli.The Harter scales specifically measures perceived competence, and are domain-specific across multiple areas of youths' functioning. Reliability and validity of the scale appear to be acceptable, and it has been found to be stable over 3 years (Winters, Myers, & Proud, 2002). The interview consists of 24 pairs of statements with accompanying pictures, six pairs of statements being associated with each of the four domains; peer acceptance, maternal acceptance, physical competence and cognitive competence. The interviewer asks the child questions after showing two pictures of either a boy or a girl (the same sex as the child) and reading statements about the child while pointing to the first picture, for example in the cognitive competence scale, "This boy is good at adding". Then the interviewer points to the next picture and says, "This boy is not so good at adding". The child is then asked to indicate which picture that best correspond to his/hers experience. The interviewer points to the four circles under the appropriate picture and asks more descriptive questions, which the child answers either verbally or by pointing to one of the circles under the pictures. The response is then scored on a four-point scale, where a response of 3 or 4 indicates a high level of acceptance or competence, whereas a score of 1 or 2 would designate the least competent/accepted alternative.

Data analysis

Main effects of motor ability (MABC) and self-perception (PSPCSA). An overall Multivariate Analysis of Variance (MANOVA), using the model, Group, Gender, and Group

× Gender, was performed to investigate differences between anxious children and children in the control group regarding motor skills and self-perceptions. Five dependent variables were used: Total Impairment score (MABC) and the four domains of self-perception from the PSPCSA (peer acceptance, maternal acceptance, physical competence and cognitive competence). Separate ANOVA analyses were computed to examine each of the five dependent variables. Effect sizes of group differences were calculated using the partial η^2.

A chi-square test was used to examine the association between the groups and MABC performance categories. All statistic analyses used SPSS version 13.0.

Associations between motor coordination and self-perception within the groups. Spearman correlation coefficients were computed to examine associations between the Total Impairment score (MABC) and the four self-perception domains (PSPCSA).

Attrition. There were no missing data on the MABC. In the PSPCSA interview, data were missing for one boy in the anxiety group.

Results

According to the overall MANOVA, there was a statistically significant difference between children in the anxiety and control groups on the combined dependent variables, Total Impairment score (MABC) and the four domains of self-perception (PSPCSA), $F(5, 45) = 2.89$; $p = .024$; Wilks' Lambda.= .76; $\eta^2 = .24$. This indicates that 24 percent of the total variability between the groups is attributable to the dependent variables. There were no statistically significant gender differences.

Motor impairment in anxious children

Total Impairment score (MABC). A significant difference was noted in motor performance between children in the anxiety and control groups, as measured by the MABC

Total Impairment score (Table 1). Children with anxiety disorders obtained a higher Total Impairment score than children in the control group. When comparing children with specific phobias (n = 15, M = 14.6) to children with social phobias, separation anxiety, and/or GAD (n = 12, M = 11.9), no significant differences in obtained total motor score was found.

(Insert Table 1 here)

Table 2 shows the percentage of children in the anxiety and the control groups, with motor performance being categorized as either acceptable, borderline or as indicating motor problems. The assigned performance category was influenced by group membership (χ^2 (n = 54) = 9.5; $p < .01$). There was a significant gender difference (χ^2 (n = 54) = 6.1; $p < .05$), caused by the high frequency of anxious boys displaying motor problems according to this definition (χ^2 (n = 30) = 9.6; $p < .01$).

(Insert Table 2 here)

Self-perceptions in anxious children

Children with anxiety disorders reported significantly lower self-perception in the domains of peer acceptance and physical competence compared to children in the control group (Table 1). No statistically significant differences were observed in the children's self-perceptions in the other two domains, cognitive competence and maternal acceptance. Comparisons of children with specific phobias (n = 14) to children with social phobias, separation anxiety, and/or GAD (n = 12), did not show any significant differences on the measures of self-competence.

Associations between motor coordination (MABC) and self-perception (PSPCSA)

There were no statistically significant correlations between motor coordination and self-perception in the anxiety group. In the control group an exploratory analysis revealed a significant negative correlation between the cognitive domain (PSPCSA) and the MABC Total Impairment score (r = −.53; *p* = .005).

Discussion

The present study investigated if motor skills and self-perceived competence were poorer in 8–11 year-old children with anxiety disorders compared to children without psychiatric disorders. This was examined by comparing an anxiety disorder group without any comorbid psychiatric diagnosis with a matched control group on measures of motor skills (MABC) and self-perception (PSPCSA). The main contribution from the present study is the demonstration of the high frequency of motor problems in boys with a "pure" anxiety disorder diagnosis. The group of anxious children also perceived themselves as being less accepted by peers and less competent in physical activities than children in the control group. The poor rating of physical competence was a new finding in children with anxiety disorders. However, there were no significant correlation between impaired motor abilities and a poor self-perception among the children in the anxiety group.

Two-thirds of the anxious boys obtained a motor score below the 5th percentile on the MABC, while the anxious girls' performance was similar to those in the control group (Table 2). The importance of this finding is emphasized by the results from the British birth cohort study (Sigurdsson et al, 2002), showing that boys with delayed motor skills had more than three times the risk of receiving reports of persistent anxiety symptoms. Our finding suggests that anxious boys are more at risk of having coexisting motor problems. This should be

examined in future studies of motor skill performance in children with anxiety disorders. Although, motor coordination plays a central role in childhood activities, few studies have investigated the impact of motor impairments in anxious children (Kristensen & Torgersen, 2008), or the psychosocial impact of having a development coordination disorder (Skinner & Piek, 2001). Thus, future longitudinal studies designed to explore casual pathways between motor impairment and emotional disorders are warranted.

As hypothesized, children with anxiety disorders perceived themselves as being less accepted by peers. This hypothesis was based on earlier studies showing that anxious youths display low self-perceived social acceptance (Chansky & Kendall, 1997; Smari et al., 2001), and is consistent with the Rapee and Heimberg (1997) model, which argues that distortions and biases related to the perception of social/evaluative information is common in children with social anxiety. Actually, Harter (1987) found social acceptance to be the second largest contributor to self-worth. According to her theory of perceived competence, lowered self-worth found in children is a strong predictor for emotional well-being. A more recent study (Skinner & Piek, 2001) supported this notion by showing that poor self-perceived competence was related to higher levels of anxiety and to poor self-worth in children with coordination problems. However, this study did not replicate the strong contribution of social acceptance to self-worth; instead it was found that athletic competence was a determinant of self-worth in young children.

Another contribution of the present study is the demonstration of a high frequency of poor self-perceived physical competence in children with anxiety disorder diagnoses. A study of adolescents found a very weak association between social anxiety and adolescents' perception of physical competence (Smari et al., 2001), and a study of children found a negative correlation between symptoms of social phobia and self-perceived athletic competence (Muris, Meesters, & Fijen, 2003). Children with motor coordination problems

have been known to report low ratings of self-perceived physical competence (Piek et al.,

2006; Piek et al., 2000). Thus, the low ratings of perceived physical competence as reported

by the anxious children in our study could be interpreted as reflecting their motor

coordination problems. However, our results do not support this explanation since no

significant correlations were found between self-perception and motor skills in the group of

anxious children. When inspecting our data more closely, we observed that four boys in the

anxiety group with high scores on motor impairment (MABC) rated themselves as good or

very good in the physical competence domain (PSPCSA). It suggests that some of the anxious

boys in our sample did not recognize their motor problems. A probable explanation could be

that anxious children in this age-group are more preoccupied with physical activities, as

shown by the reported association (Skinner & Piek, 2001) between lowered global self-worth

and perceived athletic competence in young children. Moreover, children's ability to

differentiate self-perceptions varies with age and depends on more specific competencies in

childhood (Harter, 2006), making physical activities a central domain for their self-

evaluations.

Our findings show that evaluations of motor skills and self-perceived competence are

important when attempting to understand social and emotional functioning in childhood

anxiety disorders. This is consistent with recent research on anxiety disorders, with an aim to

go beyond behavioral inhibition to examine the multiple pathways required for the

development and maintenance of anxiety symptoms (Manassis, Hudson, Webb, & Albano,

2004).

Strengths and limitations

In the present study, confounding factors were reduced by including anxious children with no

comorbid diagnoses and using a control group matched according to gender, age and full-

scale-IQ. Our "pure" anxiety disorder group allowed an examination of the unique contribution of anxiety symptoms to motor coordination and self-perceived competence. However, using a "pure" anxiety group also lowers the study's power because of a smaller sample size available. Furthermore, a cross-sectional design, like the one used in the present study does not allow any causal explanation of the association between childhood anxiety disorders, impaired motor skills, and self-perceived competence. Thus, several explanations are possible in addition to the one already suggested, that motor impairment limits access to important socialization processes and self-enhancing experiences, affecting children's emotional well-being and self-perceived competence. For example, anxious children may be prone to avoid physical activities and social play situations because of fear and anxious reactions, and this lack of exposure can hinder development of motor skills, and self-perceptions of competence. Moreover, a common organic factor may underlie both the motor impairment and anxiety symptoms (Kristensen & Torgersen, 2008). Hence, one should be careful when generalizing the results to broader clinical populations, and longitudinal studies of the casusal relationship between anxiety disorders, motor skills, and self-perception is warranted. Nevertheless, our findings confirms the observations from a recent Norwegian study reporting that nearly half of the socially anxious children displayed impaired motor abilities (Kristensen & Torgersen, 2007), and emphasize the importance of the findings from the British birth cohort study (Sigurdsson, 2002), showing that impaired motor skills is a risk factor for persistent anxiety in boys.

Conclusion

In conclusion, the current study indicates a high frequency of impaired motor skills in boys with "pure" anxiety disorders, as two-thirds of the anxious boys displayed motor problems according to the MABC. Anxiety and motor impairment may both have adverse social and

emotional implications for children as indicated by the anxious children's poor ratings of self-perceived peer acceptance and physical competence. The poor rating of peer acceptance is in line with earlier studies showing that anxiety in youth is associated with low self-perceptions of social competence (Chansky & Kendall, 1997; Smari et al., 2001); the poor perception of physical competence is a new finding in children with anxiety disorder diagnoses. The influence of motor impairments and self-perceived competence should be addressed further in longitudinal studies of anxious children to enable a more comprehensive understanding of their impact on social functioning and emotional development.

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Table 1

*Motor Impairment Scores on the MABC and Perceived Competence Scores on the PSPCSA
(Mean and SD) by Group*

	Anxiety group		Control group		F	*p*	η^2
	M	SD	M	SD			
MABC							
Total Impairment score	13.41	8.90	7.74	4.59	8.57	.005	.15
PSPCSA							
Peers	3.00	.65	3.40	.32	7.62	.008	.14
Maternal	2.78	.50	2.85	.42	.39	ns	–
Physical	2.94	.42	3.23	.38	7.33	.009	.13
Cognition	3.09	.53	3.27	.52	2.0	ns	–

Table 2

Overall Motor Performance according to the Movement Assessment Battery for Children grouped by Gender

MABC performance	Percentile score	Anxiety group (n)				Control group (n)			
		Boys	Girls	All	%	Boys	Girls	All	%
Acceptable	< 15	5	9	14	51.9	11	7	15	66.7
Borderline	15 – 6	0	1	1	3.7	2	4	6	22.2
Motor problems	≥ 5	10	2	12	44.4	2	1	3	11.1

Figure Caption

Flowchart, describing sample selection in the current study, the third stage of the Bergen

Child Study (see text for details).

Figure 1