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Differences in verbal and performance IQ in conduct disorder: Research findings from a Greek sample

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Abstract

Background: Conduct disorder reflects a persistent and repetitive pattern of antisocial behavior of children and adolescents and is among the most frequent factors for referral to child-psychiatric services. According to the existing literature, conduct disorder is associated with lower IQ, mainly verbal intelligence, in relation to the general same-age population.

Objective: This study aimed to examine the differences in verbal and performance intelligence, on children and adolescents with and without conduct disorder in a Greek sample.

Methods: The sample consisted of 121 Greek children and adolescents. Seventy-nine (65.3%) of the participants were girls and 42 (34.7%) were boys, age range between 9 and 17 years (Mean=13.43, SD=2.63). Fifty-five (45.5%) of the participants had a diagnosis of conduct disorder and 61 (54.5%) were healthy (control group). Conduct disorder diagnosis was made using the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children- Present and Lifetime version (K-SADS-PL), while Intelligence (IQ) was estimated using the vocabulary and block design subscales of the Wechsler Intelligence Scale for Children-IV.

Results: For the whole sample, IQ scores (verbal IQ, performance IQ and total IQ) ranged within the normal values. No statistically significant differences on IQ scores were found based on participants' gender and age. Participants with conduct disorder showed significantly lower scores on the performance and total IQ in relation to the scores of the participants of the control group.

Conclusion: This study highlights the correlation between CD and cognitive abilities, especially low IQ, something that has not been given much attention so far.

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Introduction

Conduct Disorder (CD) is among one of the most frequent treated psychiatric conditions in children [1]. The prevalence rates of CD may vary from 2% to higher than 10% in the general population; CD is more common in males than in females [2,3]. The disorder is considered either as childhood-onset type (when it is first diagnosed in children under the age of 10 with clinically significant impairment in social or academic functioning) and adolescent-onset type (when it is first diagnosed in ages 10 or older, based on the absence of any CD criteria prior to age 10) [4].

CD in childhood often involves aggression and it seems to have a strong correlation with criminal behavior and later problems in adolescence and adulthood, such as physical health problems (poor respiratory function), mental health problems (substance abuse), legal problems (high risk for arrest), educational problems (poor academic performance, school dropout), and many social problems (poor job performance, poor marital adjustment) [5-7].

The relationship between CD and intelligence is supported by many studies, based on the dual model which usually includes both a verbal and a performance dimension. Cross-sectional and prospective studies have shown that low IQ is associated with an increased risk for the development of conduct problems across the life course, even when other relevant risk factors are statistically controlled (e.g. race, differential detection, socioeconomic status) [8-13]. The majority of these studies have been conducted with adolescents, but this association has also been found with preschool children [14,15].

A vast amount of research has linked conduct problems with a deficit in verbal abilities across many different types of samples and using many different methodologies [16-20]. Several theories have been proposed to explain the link between verbal deficiencies and CD. First of all, deficits in verbal skills have been associated with difficulties in engaging in private speech (i.e. self-verbalization), which is necessary for regulating, organizing, and inhibiting behavior [21]. As long as more than 50 years ago, Luria and Hamskaya [22] suggested that the development of language enables a child to analyze new situations while synthesizing past and current information in order to follow the behavioral rules and/or commands. They also outlined that self-verbalization is the necessary developmental process for the conversion of parental instructions into internal, verbal and self-control tools. Verbal deficits could lead to an inability to properly label the emotions of others and, consequently, to a misinterpretation of emotional reactions of others (i.e. as more aggressive/threatening) [23]. Finally, deficient verbal skills might have an effect on the way people anticipate consequences of behaviors and determine what is wrong or right [24].

Nevertheless, deficits in people with conduct problems are not limited to verbal abilities. Various research groups have demonstrated that people with antisocial behavior have significant reductions also in spatial cognitive abilities [15-29]. There is evidence that spatial deficits exist in specific subgroups of CD that exhibit callous/unemotional traits [21]. Researchers have found that visuospatial skills are linked to the right hemisphere, which is dominant for regulating nonverbal orientation, attention, affective facial recognition, arousal and emotional processes [15,30,31].

Furthermore, longitudinal studies have been developed in order to disentangle the interrelationship between conduct problems and verbal and visuospatial skills. Several longitudinal studies have found evidence for spatial deficits in antisocial children from community samples. Raine et al. [15] assessed whether cognitive and spatial deficits occur as early as 3 years of age and whether they are specific to antisocial individuals. Specifically, spatial and verbal abilities were assessed at ages 3 and 11 years in 330 male and female children, while antisocial behavior was assessed at ages 8 and 17 years. Antisocial individuals had spatial deficits in the absence of verbal deficits at age 3, and spatial and verbal deficits at age 11 years. These findings demonstrate that spatial deficits arise early and contribute to antisocial behavior during childhood.

Taken as a whole, the association between verbal and visuospatial skills and CD is a complex relationship that changes across development. This is very important as it will enable practitioners to develop targeted preventions and effective interventions. Thus, the aim of the current study is to examine the association of verbal and performance intelligence with conduct problems in a sample of Greek children and adolescents, who participated in the European multinational study «Neurobiology and treatment of adolescent female conduct disorder: The central role of emotional processing (FemNAT-CD)». The FemNAT-CD study aimed to identify the causes of CD and examine potential gender differences by mainly focusing on girls with CD.

Methods

Participants

The sample consisted of 121 Greek children and adolescents, who participated in the FemNAT-CD study. Seventy-nine (65.3%) of the participants were girls and 42 (34.7%) boys. The age range of the participants was between 9 and 17 years (*Mean*=13.43, *SD*=2.63). Of the participants 55 (45.5%) had a diagnosis of CD and 61 (54.5%) were healthy (control group).

Regarding medical history reports, 40 (33.1%) of participants' mothers were smoking, 3 (2.5%) used alcohol, and 32 (26.4%) were in relationship with an aggressive and/or violent partner during pregnancy. Furthermore, 17 (14.0%) of the participants had a preterm (<37 weeks) birth time, 18 (14.9%) an unsuccessful breastfeeding in early life, and 7 (5.8%) a single-parent family during the first year of life. Based on delayed developmental milestones, 9 (7.4%) of participants achieved free walking after 18 months of age, 4 (3.3%) achieved first sentences after 33 months, and 4 (3.3%) achieved day and night toilet control later than 60 months of age. Concerning school life, 18 (14.9%) of the participants started school late, 22 (18.2%) repeated at least one grade, and 7 (5.8%) dropped out school.

Regarding household life, 117 (96.7%) of participants lived with their biological mother, 84 (69.4%) with their biological father, and 105 (86.8%) of participants had at least one full sibling (range 0 to 5). According to parents' education and employment status, 29 (24.0%) mothers and 29 (24.0%) fathers did not attend/complete primary education, while 22 (18.2%) mothers and 10 (8.3%) fathers were currently unemployed.

Measures

CD diagnosis was made using the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Age Children- Pres-

ent and Lifetime version (K-SADS-PL) [32]. K-SADS-PL is a semi-structured diagnostic interview, administered independently to the adolescents as well as their caregivers to screen and assess the history and/or current presence of any psychiatric disorder. Intelligence (IQ) was estimated using the vocabulary and block design subscales of the Wechsler Intelligence Scale for Children-IV (WISC-IV) [33]. The vocabulary reasoning subscale requires a definition for words of increasing difficulty, and measures verbal fluency, word knowledge, and word usage. The block design subscale includes nine red and white square blocks and a spiral booklet of cards showing different color designs that can be constructed with the blocks. The examinee is required to arrange the block in order to match the design created by the examiner or that shown on cards. The block design measures based both on accuracy and speed, the ability to analyze and synthesize an abstract design and then reproduce it. In this way, WISC-IV, the most often used test of intelligence, provides an estimation of the visuospatial skills.

Statistical analysis

Descriptive statistics were calculated for initial data analysis. Because of failure of the IQ score variable (dependent) in Kolmogorov-Smirnov normality test, non-parametric (Mann-Whitney *U*, Kruskal-Wallis *H*) tests were applied in order to compare differences between the levels of each categorical variable, including gender, age (groups: 9-12, 13-15, 16-17) and CD status. All analyses were conducted using IBM SPSS version 22.0, at 5% level of significance.

Results

For the whole sample, IQ scores ranged within the average general population IQ levels being (Mean±SD) 103.27±10.28 for total IQ, 104.88±11.98 for verbal IQ and 101.16±12.82 for performance IQ. No statistical differences were observed between girls and boys in verbal (U= 1567.0, p= .613), performance (U= 1565.5, p= .608) and in total IQ score (U= 1650.5, p= .963).There were no significant differences in verbal ($H(2)$= 3.37, p= .186), performance ($H(2)$= 3.90, p= .142) and total ($H(2)$= 1.39, p= .498) IQ scores between age groups of participants. Regarding the comparison between the two research groups, significant differences were found for total and performance IQ scores, which were, on average, higher in healthy controls than in participants with CD (Table 1).

Discussion

Results indicated that Greek children and adolescents with CD had a lower total and performance IQ score, compared to the control group.

The finding that the participants with CD had a lower total IQ score compared to the control group is consistent with previous studies demonstrating the association of lower IQ with an increased risk for the development of conduct problems [8-13,34-36].

Moreover, the finding that participants with CD had lower performance IQ compared to the control group is consistent with some previous studies demonstrating that children with antisocial behavior have spatial deficits [37,38]. Various theories have emphasized the effect of deficient visuospatial functioning on attention, emotional processes, arousal, nonverbal orientation regulation and affective facial recognition [15,30,31]. Consequently, researchers have suggested that the aforementioned deficiencies might have a negative influence on the attachment between the mother and child [39], as well as on social information processing [40,41] which, in turn, might lead to antisocial behavior.

The finding that there was not any significant difference on verbal performance between the participants with CD and the control group was unexpected, as previous research has indicated that there is an association between conduct problems and deficits in verbal abilities [17-20]. One possible explanation for the contradictory result might be related to methodological differences between the current study and previous ones. First of all, the score of verbal intelligence was solely estimated using the vocabulary subtest, whereas other studies have estimated the score of verbal intelligence by the aggregation of multiple subtests of verbal intelligence. Another possible reason for the lack of verbal deficits in adolescents with CD in our study might derive from the characteristics of the sample. The FemNAT-CD study aimed at including CD subjects only within the normal IQ range. This might possibly be a factor explaining to some extend our finding, since subjects with low IQ (and, possibly, especially low verbal IQ) were excluded from recruitment, something that might not have been the case in the earlier studies which showed the association of CD with low verbal ability.

A number of limitations of the study need to be outlined. First, the sample size was relatively small and recruited with the use of incentives, thus, increasing the possibility of sampling bias. Second, the scores of both verbal and performance IQ were obtained through a single subtest, instead of an extensive use of all the relevant subtests of the WISC-IV. Similarly, the findings of the current study, being a cross-sectional one, do not allow us to infer any conclusions about the mechanisms that may underlie the association between cognitive deficits and CD. Nevertheless, the strengths of the study were the inclusion of a control group, as well as the stringent inclusion and exclusion criteria.

There is in CD a need to develop preventive approaches and interventions that aim to reduce the development and progression of the disorder. Since low verbal and performance abilities seem to be associated with CD, such interventions could include providing intellectual stimulation, enhancement of cognitive abilities, school adaptation and achievement, tailored to specific needs of subgroups of children and adolescents suffering from or in risk of developing CD. Such a CD subgroup could be children and adolescents who show a lower performance IQ. Future longitudinal studies should examine the effect of lower performance IQ on the development of CD in order to shed light on the underlying mechanisms that account for this association and provide appropriate guidance to any interventions.

Conclusion

The present study supports the growing body of research suggesting that there is an association between CD and cognitive abilities, highlighting the association of this condition with low performance IQ, something which has not been up to now particularly prominent. Further research using longitudinal designs, is necessary in order to gain a deeper understanding of this relationship.

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Conflict of interest

The authors declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

Tables

Table 1: Mean (standard deviation) and median IQ scores for participants with and without CD.

IQ	CD	Mean (SD)	Mdn	Mann- Whitney *U*	*p*
Verbal				1468.0	.068
	Yes	102.82 (11.50)	105.00		
	No	106.59 (12.19)	105.00		
Performance				1313.5	**.009**
	Yes	97.91 (11.37)	95.00		
	No	103.86 (13.41)	105.00		
Total				1324.5	**.010**
	Yes	100.64 (9.06)	100.00		
	No	105.47(10.77)	108.00		

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