•ORIGINAL RESEARCH ARTICLE•

Executive Function Features in Drug-naive Children with Oppositional Defiant Disorder

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Background: Oppositional defiant disorder (ODD) that is characterized by markedly defiant, disobedient, and disruptive behavior in younger children has been regarded as disruptive behavior disorder (DBD), together with conduct disorder (CD). However, in contrast to CD, ODD does not include severe aggressive or antisocial behavior.

Aim: This study aimed to examine executive function (EF) features of children with oppositional defiant disorder (ODD).

Methods: Cross sectional design was used in this study. The EF of children with ODD and pure attention deficit hyperactivity disorder (ADHD) were compared with children without a psychiatric disorder, using the Stroop Color-Word Tests A and B, Wechsler Intelligence Scale for Children (Fourth Edition; WISC-IV), Wisconsin Card Sorting Test (WCST), and Cambridge Neuropsychological Test Automated Battery (CANTAB) corrected for age. Logistic regression analysis was conducted to identify risk factors for EF deficits characteristic of ODD and ADHD.

Results: The ODD group exhibited significantly lower scores in both Stroop Color-Word Tests, the backwards digital span of the WISC-IV, and the categories completed and perseverative responses of the WCST, and significantly higher scores in spatial working memory (SWM) between errors, and the strategy in SWM of the CANTAB compared with the control group. When the ODD group was designated as 1 and the ADHD group was designated as 0, digital span (X1) fit the regression equation very well.

Conclusions: Children with ODD perform substantially worse in EF tasks. Responsive inhibition appears to be uniquely associated with ODD development, while responsive inhibition and working memory appear to be associated with ADHD.

Key words: oppositional defiant disorder, executive function deficit, risk factor

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1. Introduction

Oppositional defiant disorder (ODD) that is characterized by markedly defiant, disobedient, and disruptive behavior in younger children has been regarded as disruptive behavior disorder (DBD), together with conduct disorder (CD).[1] However, in contrast to CD, ODD does not include severe aggressive or antisocial behavior.

Several classical facets of executive function (EF), such as response inhibition and working memory,[2] have been demonstrated to be impaired in children with ODD or DBD. For example, Schoemaker et al.[3,4] found that children with pure attention deficit hyperactivity disorder (ADHD) and DBD performed worse in inhibition; children with DBD exhibited impaired inhibition especially where motivational incentives were prominent. Additionally, Rhodes et al.[5] determined that several dimensions of working memory, including storage, central EF, and long-term memory, were impaired in patients with ODD.

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Nevertheless, the results of EFdeficits in children with ODD are inconsistent across studies.[6] In Van Goozen's study, children with a diagnosis of ODD or CD with or without comorbid ADHD showed no significant impairment in inhibition, working memory, or planning.[7]

Moreover, it is well established that there is considerable overlap in the clinical manifestations of ODD and ADHD. When the comorbidity of ADHD has been taken into account, the results are conflicting. For example, Barnett et al. compared several EF facets in children with ADHD with and without DBD. The findings suggested no differences in neurocognitive function between children with ADHD-CT with and without ODD or CD,[8] which suggested the comorbidity of DBD did not influence the EF performancedeficit of ADHD. Furthermore, Shuai et al.[9] demonstrated that children with DBD/ADHD performed significantly better in terms of interference suppression compared with pure ADHD children, which suggests the comorbidity with DBD partially improved the EF performance of ADHD children. An important issue to address is whether EF deficits in children with ODD are dependent on ADHD comorbidity.

On the other hand, it is also important to note that ADHD is a heterogeneous condition. The EF deficits associated with ADHD are substantially influenced by different symptoms.[10,11] Studies have also investigated the relationship between externalized behavior and EF deficits in ADHD children. Traini's study suggested individuals with ADHD who exhibited externalizing problems performed worse in EF tests.[12] Furthermore, Graziano demonstrated EF deficits were less likely to occur in children with ADHD and co-occurring internalizing symptoms,[13] which may also indicate that when we control for the effect of EF deficits from ADHD, the clinical performance should also been taken into account.

In this study, we aimed to provide additional evidence regarding the EF performance of school-aged ODD children. The EF performance of ODD children with or without ADHD was investigated with a set of classical EF measurement tools, using a case-control method. Furthermore, we attempted to clarify the differences in EF features between ODD and pure ADHD. We examined a pure ADHD-INA group without behavior problems, to avoid an overlap of clinical manifestations.

2. Methods

2.1 Participants and study process

All information regarding the study groups was obtained from a DBD database created by the out-patient clinic of the Child and Adolescent Psychiatry Department of the Shanghai Mental Health Center. This database was designed to collect information regarding drug-naïve DBD spectrum disorders, including ADHD, ODD, and CD according to DSM-IV. The data collection was initiated in 2012. Written informed consent was provided by the parents of the children prior to participation in this study.

The participants were invited to complete a battery of neuropsychological tests, including the Stroop Color-Word Test, the Wisconsin Card Sorting Test (WCST), the WISC, and finally, the Cambridge Neuropsychological Test Automated Battery (CANTAB). The participants were asked to finish a set of questionnaires about emotional regulation only when they were older than or equal to 10 years old. The parents of these children were simultaneously invited to complete questionnaire surveys, which included a general demographic information questionnaire that comprised the child's birth data, gender, and educational level, and the Conners Parent Symptom Questionnaire (PSQ).

The battery of neuropsychological tests was selected based on the former neuropsychological investigation on children with behavioral problems, aiming to measure their executive function. We preferred tests which required shorter testing duration, because the tolerance of children with behavioral problems was limited. Several facets of executive functioning according to Chan [2] have been measured as follows: response inhibition (Stroop color-word test), working memory (digital span test in WISC-IV and spatial span, spatial working memory tests in CANTAB), mental flexibility (WCST), planning and action monitoring (stocks of Cambridge tests in CANTAB). Long term memory has also been tested, but is not reported here.

We excluded children with organic mental disorder, neurodegenerative disorders, traumatic brain injury or cerebrovascular disease, with severe heart, liver, kidney dysfunctions, and those with a history of other major physical illness or drug dependence. We also excluded children with bipolar or psychotic disorders according to the Kiddie Sade Present and Lifetime Version (K-SADS-PL) score or a WISC total IQ score < 70.

Boys aged 6-12 years were included in this study. The participants were divided into diagnostic groups of ODD. We also identified a pure ADHD-INA subgroup without behavioral problems, which comprised individuals with a mean conduct PSQ factor score < 2 points. The study group comprised 43 individuals with ODD, which included 14 children with pure ODD, 29 children with ODD/ADHD with a mean conduct PSQ factor score of > 2 points, and 39 children with pure ADHD-INA, and a mean conduct PSQ factor score of ≤ 2 points.

For the control group, we recruited students from the elementary and middle schools of Zhabei and Hongkou Districts of Shanghai. We also collected data from healthy volunteers who were informed of the aims and process of the study. We excluded children diagnosed with DBD (ODD or CD) and ADHD, according to DSM-IV diagnostic criteria. We also excluded students whose mean conduct PSQ factor score was > 2 points. The remaining exclusion criteria and data collection procedures were the same as the study groups. The control group comprised 52 individuals. Details can be found in the flowchart (figure 1).

There was no significant difference in age between the ODD and control groups, whereas the pure ADHD group was significantly younger than the ODD and control groups. Moreover, the educational years of the pure group was significantly lower than the control group (See table 1).

This study was approved by the Ethics Committee of the Shanghai Mental Health Center.

2.2 Assessments

2.2.1 Conners Parent Symptom Questionnaire (PSQ)

The PSQ contains 48 items and four category rating scales (1-4 points) completed by their parents, which comprise six subscale scores that reflect conduct problems, learning problems, psychosomatic disorders, impulsivity-hyperactivity, anxiety, and hyperactivity. The higher the score the more severe the corresponding problem is. Previous research[14] has demonstrated that the PSQ has good reliability in China (Cronbach's α = 0.93) and may be used to evaluate Chinese children.

2.2.2 K-SADS-PL

The K-SADs-PL[15] is a semi-structured diagnostic assessment tool for children and adolescents with current and previous psychotic episodes based on the DSM-IV.

Figure 1. The flowchart of the study

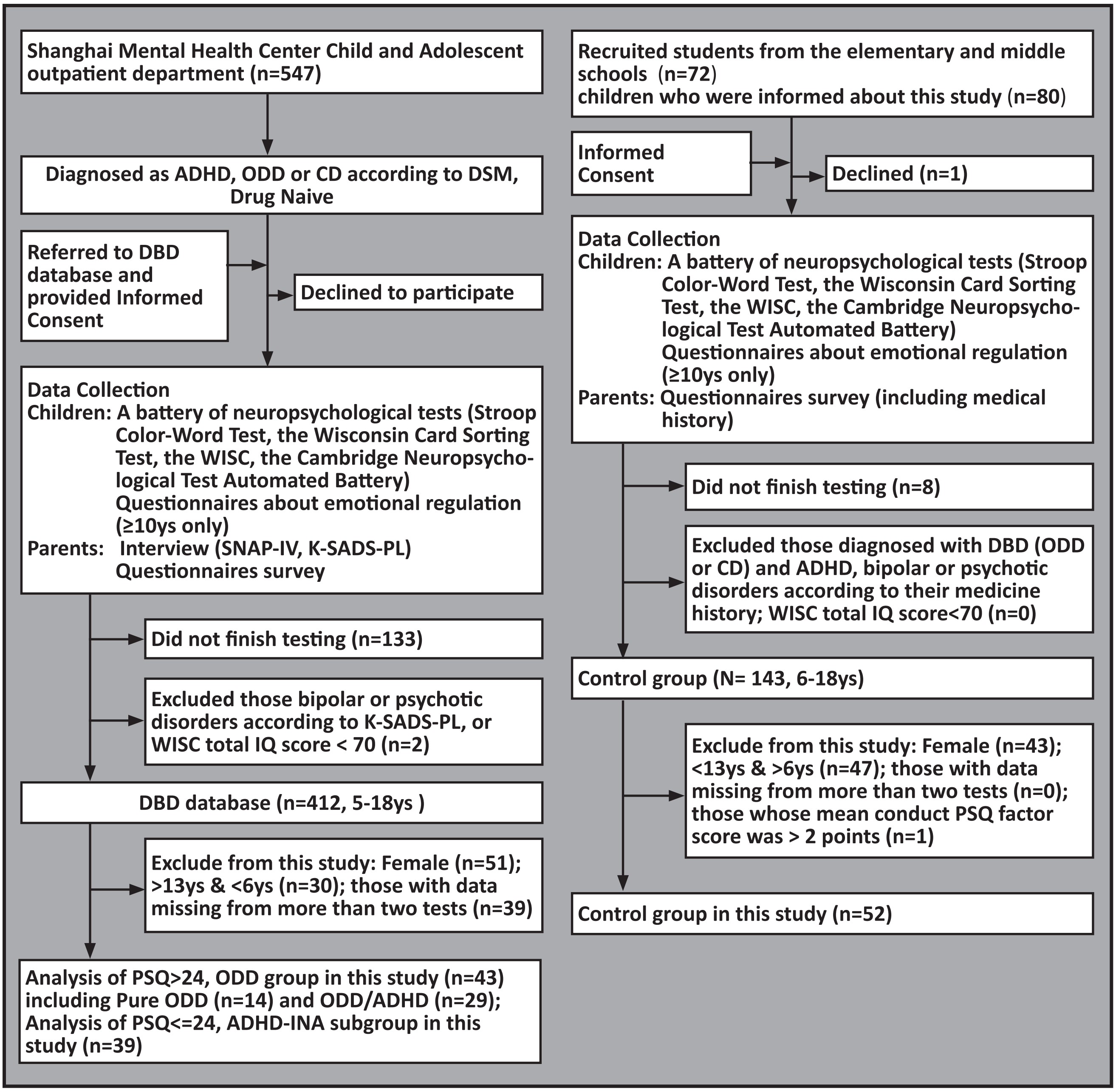

Table 1. General demographic, intelligence, and clinical manifestations (mean [sd])

	ODD [a] (n = 43)	Pure ODD (n = 14)	ODD/ADHD (n = 29)	Pure ADHD [b] (n = 39)	Control [c] (n = 52)	*F/t/p*
Age	10.03(1.78)	9.85(1.91)	10.11(1.74)	9.16(1.82)	10.02(2.10)	2.792/0.065 b < a*, c*
Educational years	4.00(1.88)	3.71(1.98)	4.14(1.85)	3.18(1.79)	4.06(2.08)	2.691/0.072 b < c*
Total IQ	99.43(13.58)	104.00(10.97)	97.46(14.28)	97.84(13.04)	112.98(11.25)	20.171/<0.001 a***, b*** < c
Conduct factor	31.98(4.41)	32.64(5.77)	31.66(3.65)	19.62(2.64)		15.571/<0.001
Learning factor	11.84(2.40)	11.00(2.83)	12.24(2.10)	11.54(2.34)		0.570/0.570
Physical and mental factor	7.26(2.41)	6.71(2.16)	7.52(2.52)	6.54(1.57)		1.610/0.112
Hyperactivity-impulsivity index	11.91(2.82)	11.14(3.48)	12.28(2.42)	8.95(2.63)		4.903/<0.001
Anxiety factor	7.42(2.06)	7.36(1.95)	7.45(2.15)	6.05(1.82)		3.170/0.002
Hyperactivity index	27.98(5.25)	27.21(7.93)	28.34(3.42)	21.38(4.32)		6.172/<0.001

*** mean $p < 0.05$, ** mean $p < 0.01$, *** mean $p < 0.001$.**
ODD: the children diagnosed as pure ODD and ODD combined with ADHD; Pure ODD: the children diagnosed as only ODD; ODD/ADHD: the children diagnosed as ODD combined with ADHD; Pure ADHD: the children diagnosed as only ADHD.
F-test was used for comparing the groups ODD [a], Pure ADHD [b], & Control [c], and then ANCOVA was used for pair-wise comparisons between ODD [a] & Pure ADHD [b], Pure ADHD [b] & Control [c], ODD [a] & Control [c].
t-test was used for comparing the groups ODD and ADHD.

2.2.3 Wechsler Intelligence Scale for Children (WISC)

The WISC-II-R and WISC-IV adapted for Chinese individuals was used in this study. Total IQ represented the IQ level in this study. The digit span test was conducted in both forward and reverse orders.[16] The original data of the digital span test was analyzed as a part of executive function.

2.2.4 CANTAB

The CANTAB[17] used in this study included the spatial span test (SSP), spatial working memory test (SWM), and stocks of Cambridge test (SOC). In the SSP test, the participants memorized spatial locations in order; the degree of success indicated the individual's visuospatial memory span. The SWM test required participants to keep spatial positions in mind as they appeared on the screen and refresh their memory. This test assessed the individual's ability to memorize the spatial locations and refresh spatial memory. The SOC evaluated an individual's capacity for planning and problem solving. Participants were asked to finish the task as quickly as possible making as few mistakes as possible.

2.2.5 Stroop Color-Word Test

The Stroop Color-Word Test is a classical tool used to measure inhibitory/control capability and includes two tests.[18] In test A, the participants must read cards of different characters as quickly as possible (red, blue, green, and brown). In test B, which is also referred to as the "interference test", the participants must read the cards with the background color with the fastest speed (red, blue, green, and brown). The test time is limited to 2 min. The numbers of correct reads were measured.

2.2.6 WCST

The WCST was conducted on a computer. In this test, the computer presented a total of 128 cards. Participants matched a card, which appeared on the lower left corner of the screen, with four template cards (either a red triangle, two green stars, three yellow diamonds, or four blue circles) on the top of the screen. Matching rules included color, shape, and item number. The computer randomly determined the matching rule. When a participant made 10 persistent correct matches, the computer changed the matching rule automatically. The scores generated by WCST included the categories completed, perseverative errors, perseverative responses, and conceptual level responses.[19]

2.3 Statistical analysis

All data were used to establish a database, and statistical analyses were performed using the Statistical Package for Social Science (SPSS 11.5, SPSS, Inc., Chicago, IL, USA). Analysis of variance (ANOVA) and group t-tests were used for measurement data that were normally distributed. Analysis of covariance (ANCOVA) was also used to compare the EF performance of the different groups corrected for age. Finally, logistic regression was used to identify the risk factors for EF deficits in the ODD, ODD/ADHD, and pure ADHD children when age was controlled as a covariate.

3. Results

3.1 Clinical symptoms and intelligence

According to the ANOVA and least significant difference results (Table 1), the ODD group exhibited significantly lower scores in the total IQ compared with the control group (see table 1).

T-tests indicated that the ODD group exhibited significantly increased scores in conduct problems, anxiety, impulsivity-hyperactivity, and hyperactivity indices compared with the pure ADHD group. There was no significant difference in the clinical performance or GAI between the pure ODD and ODD/ADHD groups.

3.2 Executive function (EF) tests

ANCOVA was used to analyze the EF performance between the different groups and subgroups corrected for age. The ODD group exhibited significantly lower scores in both Stroop Color-Word Tests, the backwards digital span of the WISC, and the categories completed and perseverative responses of the WCST compared with the control group. The ODD group also exhibited significantly increased scores in the SWM between errors, and the strategy in spatial working memory of the CANTAB compared with the control group (see table 2).

In comparisons between the ODD subgroups, the ODD/ADHD group exhibited significantly increased scores regarding perseverative errors (WCST), SWM between errors, strategy in SWM, compared with the control group, as well as significantly lower scores in correct reading of numbers in the Stroop Color-Word Test A & Test B, conceptual level, perseverative responses (WCST), and backwards digital span tests of the WISC, SOC minimum number of moves, and

Table 2. ANCOVA of the executive function performance corrected for age between the case and control groups (mean[sd])

		ODD[a] (n = 43)	Pure ODD (n = 14)	ODD/ADHD (n =29)	Pure ADHD[b] (n = 39)	Control[c] (n =52)	*F/p*	
Stroop Color-Word Test	Reading number in test A	164.47 (52.45)	169.29 (37.60)	162.14 (58.76)	148.49 (45.37)	181.75 (45.67)	5.384/0.006	a*, b** < c
	Reading number in test B	56.98 (16.66)	58.71 (15.58)	56.14 (17.36)	51.33 (20.34)	72.92 (21.71)	14.754/<0.001	a***, b*** < c
WCST	Categories completed	5.50 (0.80)	5.77 (0.44)	5.38 (0.90)	5.39 (1.00)	5.67 (0.62)	1.390/0.253	
	Perseverative responses	45.93 (9.09)	48.62 (5.16)	44.72 (10.24)	44.76 (11.59)	49.94 (8.83)	3.579/0/031	a* < c
	Perseverative errors	39.50 (18.53)	32.46 (19.61)	42.66 (17.46)	39.74 (21.06)	32.42 (18.91)	2.158/0.120	
	Conceptual level	65.88 (18.33)	68.81 (12.51)	64.569 (20.48)	66.704 (17.33)	73.309 (15.32)	2.754/0.067	a* < c
WISC	Digital span	7.51 (1.34)	7.62 (1.66)	7.46 (1.20)	6.58 (1.50)	7.67 (1.26)	7.695/0.001	b < c**, a*,
	Backwards digital span	4.76 (1.73)	5.08 (1.80)	4.61 (1.71)	3.97 (1.28)	5.45 (1.58)	9.913/<0.001	a*, b*** < c
CANTAB	SOC minimum number of moves	5.03 (1.84)	5.64 (2.11)	4.75 (1.68)	5.29 (2.02)	5.70 (2.00)	1.231/0.296	
	Spatial span	4.76 (1.84)	5.36 (2.02)	4.44 (1.70)	4.83 (1.63)	5.27 (1.77)	1.117/0.330	
	SWM between errors	52.29 (25.14)	45.21 (28.41)	55.82 (23.07)	49.84 (17.41)	40.91 (17.17)	3.920/0.022	a* > c
	Strategy in SWM	37.45 (4.54)	37.50 (5.89)	37.43 (3.81)	36.97 (3.73)	35.02 (5.26)	3.497/0.033	a* > c
	SOC total mean moves	21.26 (2.74)	20.18 (2.83)	21.75 (2.62)	21.26 (2.46)	20.27 (2.78)	1.923/0.151	

ODD: the children diagnosed as pure ODD and ODD combined with ADHD; Pure ODD: the children diagnosed as only ODD; ODD/ADHD: the children diagnosed as ODD combined with ADHD; Pure ADHD: the children diagnosed as only ADHD.
F-test was used for comparing the groups ODD [a], Pure ADHD [b], & Control [c], and then ANCOVA was used for pair-wise comparisons between ODD [a] & Pure ADHD [b], Pure ADHD [b] & Control [c], ODD [a] & Control [c].
SOC: Stocks of Cambridge; SSP: Spatial Span; SWM: Spatial Working Memory

spatial span. The pure ODD group exhibited significantly lower scores regarding the correct reading number in the Stroop Color-Word Test B. There was no significant difference in the EF performance between the pure ODD and ODD/ADHD groups.

3.3 Logistic regression of the risk factors in ODD and ADHD

A logistic regression analysis was subsequently conducted in which age was defined as a covariate, which should be included in the regression equation based on the method of Enter, and other EF scores were used as independent variables with the method of Backward to identify the risk factors associated with EF deficits in the development of ODD (pure ODD and ODD/ADHD) and pure ADHD (see table 3). Age (X1) and reading number in test B (X2) fit the regression equation very well, i.e., Y = 2.762 + 0.37X1 – 0.06X2 (χ^2 =23.284, p<0.001), where Y indicates whether individuals are affected by ODD.

Age (X1) , reading number in test B (X2) and backwards digital span (X3) fit the regression equation very well, i.e., Y = 2.518 + 0.27X1 – 0.05X2 – 0.55X3 (χ^2 =23.284, p<0.001), where Y indicates whether individuals are affected by ADHD.

Next, we designated the ODD group as 1 and the ADHD group as 0, and the digital span (X2) fit the regression equation very well, i.e., Y = - 4.46+0.14X1 + 0.46X2 (χ^2 = 10.652, p = 0.005).

4. Discussion

4.1 Main findings

EF is described as the ability of an individual, who aims to achieve a particular goal, to consciously control the psychological processes of thought and action. As described by Chan et. al., EF is an umbrella term for various functions, including response inhibition, working memory, planning, mental flexibility, and action monitoring.[2] EF deficits in ADHD children have been confirmed; however, whether children with ODD suffer from EF deficits remains unclear.[3-6,20] Studies regarding EF in ODD should consider the EF deficit in ADHD comorbidity.[8,9]

In this study, we selected boys with ODD and ADHD, aged 6-12 years old, because behavior problems are more prevalent in boys during childhood. [21,22] Although previous studies have taken IQ performance into account,[3-9] we controlled for age instead of IQ performance, since EF and IQ interfere with each other, they could not be clearly separated. We collected data using a set of classical EF measurements. The performance on test B is substantially influenced by reading speed and inhibition capability. [18] The WCST is also considered to measure cognitive flexibility, problem solving, decision making, and self-monitoring. [19] To form a set of measurement tools regarding working memory, we collected the SSP and SWM of the CANTAB to test the visual working memory [17] and digital span test in the WISC as a supplement to measure auditory working memory. Finally, the capability of planning and forethought was tested by the SOC of the CANTAB. [16]

Our findings suggest that both the boys with ODD and the boys with pure ADHD-INA performed poorly in several EF tasks, whereas the ODD boys with or without ADHD performed even worse.

According to our findings, the inhibition capability and working memory impairment are both important EF deficits shared by ODD and pure ADHD-INA boys. Inhibition has been regarded as an important EF facet, which, in Barkley's theory, [23] is the core EF

Table 3. Risk factors for executive functions in the ODD and ADHD groups

		B	S.E.	Wald	Sig.	Exp (B)	χ^2/p
ODD vs. control groups (n =95)	Age	0.369	0.158	5.421	0.020	1.446	23.284/< 0.001
	Reading number in test B	-0.061	0.018	11.658	0.001	0.941	
	Constant	2.762	1.786	2.391	0.122	15.828	
ADHD vs. control groups (n =91)	Age	0.270	0.164	2.702	0.100	1.310	29.113/< 0.001
	Reading number in test B	-0.045	0.016	7.411	0.006	0.956	
	Backwards digital span	-0.549	0.207	7.026	0.008	0.578	
	Constant	2.518	1.289	3.814	0.051	12.401	
ODD group (1) vs. ADHD group (0) (n = 82)	Age	0.136	0.146	0.868	0.352	0.872	10.652/ 0.005
	Digital span	0.462	0.193	5.702	0.017	0.630	
	Constant	-4.456	1.601	7.744	0.005	86.123	

Note: (α = 0.05).

impairment in ADHD. And working memory has also been regarded as another core deficit in ADHD. Several previous studies have discussed response inhibition and working memory in children with ODD, but the results were inconsistent. Some studies have identified EF difficulties in ODD children,[3-5] and some not. But among most of these findings what is quite consistent is that children with ODD/ADHD suffer from more severe EF deficits.[12,24] Noordermeer found that individuals with ADHD + ODD showed abnormalities in inhibition, working memory, facial emotion recognition, and temporal processing, which suggests that ODD comorbidity carries a substantial part of the EF deficits observed in ADHD.[24] However, in Rhode's study, which focused on children with only ODD, a working memory deficit has been reported, which confirms an EF deficit in children with ODD-only. Although the results of our study supported the idea that children with ODD suffered more EF deficit, the impact from ODD/ADHD boys should still be carefully considered. Furthermore, ADHD-INA children without behavioral problems were selected considering the overlap of clinical manifestations in our study. As we know, ADHD is a kind of disorder with clear neuropsychological heterogeneity. [25] Neuropsychological performance in ADHD-INA has been investigated, and results indicated EF impairments in planning, spatial working memory, flexibility, and inhibition. [26]

Moreover, according to our study, boys with ODD further exhibited difficulties in the WCST and SWM tasks. While SWM has been regarded as a tool assessing working memory,[20] the WCST is a classical tool used to examine prefrontal cortex function with high sensitivity and low specificity, and patients with prefrontal impairments do not perform well on the WCST.[19] But in Nyhus's update, it was suggested that using an integrative model of prefrontal function was better at explaining the poor performance in WCST.[27] Conceptual level and perseverative responses have been regarded as a stable index in WCST with medium effect size.[27] In this study, it was suggested that ODD children have more difficulty in cognitive flexibility, problem solving, decision making, and self-monitoring.

Third, there was no significant deficit in the SOC performance in the boys with ODD or ADHD. The SOC is regarded as a tool to measure planning and forethought.[17] Planning has been identified as a deficit in ADHD and ODD patients.[28,29] In our previous study on adolescents over 10 years old, it was suggested that planning deficits could be found in patients with ODD. [30] However, in this study we did not identify a deficit in planning for either those children with ODD or ADHD. This may be due to the differences in samples between these two studies. Finally, according to the results of logistic regression, the Stroop effect may play an important role not only for children with ODD but also for those with ADHD only. Furthermore, auditory working memory was only identified as a potential risk factor for ADHD-INA. This finding is consistent with some previous studies.[3,4] In Schoemaker's study of preschool aged children, [3,4] it was found that that children with ODD and ADHD only performed worse on a test of inhibition, but children with ADHD also had more problems with working memory. Our results are consistent with Schoemaker's. As we know, executive function is closely related to neurodevelopment. Our findings suggest stable neuropsychological features among children with ADHD and ODD across a range of ages.

4.2 Limitations

We attempted to clarify the differences between pure ODD and ODD with comorbid ADHD. However, this study is still limited by the relatively small sample size of boys who had a diagnosis of ODD only, while children with ODD/ADHD account for about two-thirds of children with ODD, which is consistent with previous research. Often it is difficult to have children with ODD complete a battery of tests in a manner that will yield valid results. Therefore future studies should increase the sample size of boys with ODD only. Second, there was no measurement of the so-called "hot" EF in this study, which may interfere with ones incentive and motivation. [31]

4.3 Implications

Inhibition is associated with the development of school-aged ODD. Responsive inhibition appears to be uniquely associated with ODD, while responsive inhibition and working memory have been shown to be associated with ADHD.

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Conflict of interest statement

The authors declare no conflict of interest related to this manuscript.

Informed consent

All participants' guardians provided written informed consent to participate in the study.

Ethical approval

The ethics committee of the Shanghai Mental Health Center approved the study (approval number: IRB00002733).

Authors' contributions

Wenqing Jiang: paper writing, data collection and sorting

Manfei Xu: data processing, statistical analyses

Yasong Du: project supervisor, guidance for drafting of the paper

Juan Fan: paper drafting

Yan Li: data collection and sorting

未经药物治疗的对立违抗障碍患儿的执行功能特征

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背景：对立违抗障碍（ODD）以显著的对立、违抗和破坏性行为为主要特征，和品行障碍（CD）一样，被认为是破坏性行为障碍（DBD）的一种。然而，相比较与 CD，ODD 并不包括严重的攻击或者反社会行为。

目的: 本研究旨在探索 ODD 患儿的执行功能（EF）特征。

方法：采用病例对照的研究设计。入组研究的 ODD 组有 43 例（pure ODD 患儿 14 例和 ODD/ADHD 患儿 29 例），和 pure ADHD 患儿 39 例。健康对照组参与研究的有 52 例。采用 Stroop 色词测试，韦克斯勒智力量表儿童版（第四版，WISC-IV），威斯康辛卡片分类测试（WCST），和剑桥成套神经心理测试（CANTAB）对 ODD 和单纯注意缺陷多动障碍（ADHD）儿童进行执行功能测试，并且在控制了年龄以后，与健康发育儿童作比较。采用 Logistic 回归分析，探索执行功能缺陷在 ODD（包括单纯 ODD 和 ODD/ADHD）和单纯 ADHD 发生中的风险。

结果：控制年龄因素后，ANCOVA 方差分析结果显示相比较于对照组，ODD 组在 Stroop 色 - 词测试，WISC-IV 的倒背数字广度、WCST 的持续反应数和概念化水平的得分更低，而在 CANTAB 任务视觉空间记忆（SWM）的错误数和策略分的得分更高。Logistic 回归分析发现 Stroop 色词测试乙表读数进入 ODD 的回归方程。

总结：ODD 的患儿在执行功能任务时表现得更差。反应抑制缺陷是 ODD 的风险因素，而反应抑制和工作记忆缺陷是 ADHD 的风险因素。

关键词：对立违抗障碍，执行功能缺陷，风险因素

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