

Association between parenting styles and dyslexia in primary school students: the mediating role of home literacy environment

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Research Article

Keywords: Dyslexia, Parenting style, Home literacy environment, Reading ability, Children

Posted Date: January 23rd, 2024

DOI: <https://doi.org/10.21203/rs.3.rs-3873207/v1>

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Additional Declarations: No competing interests reported.

Abstract

Background: Despite an increasing amount of research on the relationship between parenting styles and neurodevelopmental disorders, there has been minimal focus on how parenting styles impact children's reading abilities. The aim of this study was to investigate the potential mediating role of the home literacy environment in the connection between parenting styles and dyslexia.

Methods: A total of 212 primary school students from grade 2 to 5 were recruited in this study. The Chinese Reading Ability Test was used to screen children with dyslexia. Eгна Minnen Beträffande Uppfostran questionnaire was used to assess the parenting style (emotional warmth, rejection, overprotecting and anxious rearing). The structural equation modelling was carried out to evaluate the direct, indirect, and total effects of parenting styles on dyslexia.

Results: Dyslexic children had lower scores for emotional warmth, overprotecting and anxious rearing compared to normal children, especially among male dyslexic children (all $P < 0.01$). Dyslexic children were lack of regular reading time (OR=2.69, 95%CI:1.04-6.97, $P < 0.05$), and have higher homework pressure compared to normal children (OR=7.41, 95%CI:1.45-37.82, $P < 0.05$). Additionally, emotional warmth, paternal overprotection and anxious rearing were negatively associated with dyslexia in children (all $P < 0.05$). Our findings indicate a strong correlation between dyslexia, home literacy environment, and parenting styles. In a structural equation model, an indirect effect was found showing that the home literacy environment independently mediated the effect of parenting styles on dyslexia. The total indirect effect is 0.55 and 0.68, respectively.

Conclusions: The findings of this study indicate that home literacy environment serves as a mediator between parenting styles and dyslexia in children. This study offers fresh insights into the intricate connections between parenting styles and dyslexia, offering significantly important theoretical and practical implications.

Introduction

Developmental dyslexia (DD) is a neurodevelopmental disorder and is the most common learning disability in school-age children[1]. It is characterized by difficulties in word recognition, spelling and decoding[2]. Despite normal intelligence, complete sensory abilities, and adequate educational opportunities, children with dyslexia have serious and persistent problems in acquiring reading skills[1]. The previous studies have demonstrated that DD affects approximately 10% of children[3] and 3% to 12.6% of school-age children in China [4], which can persist into adulthood. Unfortunately, dyslexia not only prevents children from enjoying reading, but also increases their learning difficulties and often deprives them of opportunities to develop other potential, which in turn has a considerable negative impact on mental health outcomes and behaviors[5, 6]. Therefore, DD is an important public health issue that deserves attention.

Many studies have shown that the occurrence of dyslexia is closely related to family environment[7, 8]. The home literacy environment (HLE) is used to describe the interactions, resources, and attitudes that children experience at home related to literacy, such as parent–child literacy-related activities, family books, usage of electronic devices etc.[9]. Previous studies have studied the HLE from various aspects. Meanwhile, many research have shown the positive relationship between HLE and children’s reading development. The HLE explains 12 to 18.5 percent of the variation in children's language skills[10]. Frank Niklas et al. stated that the relationship between parental attitudes toward shared reading and children's language ability was mediated by the HLE[10]. A Finnish longitudinal study also found that the HLE plays a crucial role in the development of dyslexia in children[11]. Importantly, a good reading atmosphere at home was a conducive condition for promoting the development of children's early reading skills[12]. Rashid conducted a study among dyslexic children and found a significant correlation between HLE and children's passage comprehension as well as spelling scores[13]. Similarly, recent research has confirmed that Chinese children with dyslexia often come from homes with poor literacy environments[4, 9]. Therefore, the HLE is a crucial factor in the development of reading ability in children.

Parenting styles are the methods and forms commonly used by parents in the raising and education of their children, with a relatively stable style of behavior[14]. Parenting styles permeate the parent-child interaction process and have a significant impact on children's personality, mental health, and especially their academic performance[15, 16]. More specifically, negative parenting styles seem to increase risk of emotional and behavioral problems among children[17]. Several studies have identified that the parents of dyslexic children are under great parenting pressure, and it is difficult to provide effective help, which reflects that there is a correlation between parenting styles and dyslexia[18, 19]. On the other side, numerous studies have demonstrated that parenting care is necessary to meet the needs of children's brain development and that positive parenting reduces the incidence of neurodevelopmental disorders in children[20, 21]. Furthermore, a recent survey among Portuguese children has shown that parenting styles play a significant role in explaining higher reading processes, including syntactic and semantic[22]. Therefore, parenting styles are particularly crucial for children with dyslexia, as these variables can either increase risk or serve as protective factors.

Despite the growing body of research on parenting styles and their impact on neurodevelopmental disorders, there has been limited focus on how parenting styles specifically influence dyslexic children. Therefore, further exploration of the mediating factors in the relationship between parenting styles and dyslexia in children is necessary. We propose that the HLE could be a significant predictor of dyslexia, potentially interacting with parent–child interaction at home and influencing children’s literacy development.

To date, no prior studies have specifically examined the relationships among parenting styles, HLE, and dyslexia in Chinese children. Therefore, the aim of this study is to address two key questions: (a) Is there a correlation between dyslexia and both parenting styles and HLE among Chinese children; (b) Could the HLE serve as a mediator in the relationship between parenting styles and dyslexia.

Methods

Study populations

In this study, 53 children with dyslexia diagnosed were selected as the case group in the Mental Health Center, Shantou University Medical College. The control group was normal development children in grades 2–5 from a randomly selected public primary school in Shantou, China. The case and control groups were matched 1:3 according to gender, age and grade. After clarifying the objective of the research, a total of 212 children and their parents (53 in the case group and 159 in the control group) voluntarily agreed to participate in the study following informed consent.

The inclusion criteria of the dyslexia case group were consistent with the previous studies of our group[8]. In brief, we followed the following criteria as: (1) Intelligence Quotient (IQ) above 85 by the Combined Raven's Test; (2) the score on the Dyslexia Checklist for Chinese Children (DCCC) are two standard deviations higher than the average score of children in the same grade (Cronbach's $\alpha = 0.97$)[23]; (3) at least 1 standard deviation below the average level of their actual grade on the Chinese Vocabulary Test and Assessment Scale (Cronbach's $\alpha = 0.75$)[24]; (4) The Chinese language test score was below the 20th percentile among all students in the same grade; (5) The final diagnosis was made by a child psychiatrist based on the results of the Chinese Reading Ability Test (CRAT) (Cronbach's $\alpha = 0.75$)[24] and the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5)[25]. Children with brain disease, traumatic brain injury, epilepsy, visual and auditory dysfunction and other neurodevelopmental disorders were excluded from the study. Approval from the Ethics Committee of Mental Health Center, Shantou University Medical College was received before the initiation of this study and informed consent have been collected by all participants.

Procedure

After the trained investigators clearly explained the purpose of the study and obtained informed consent from all participants, questionnaires were administered to both the children and parents in the case and control groups. The DCCC and CRAT were completed by the child and their parents or other guardians according to written instructions, respectively. In addition, parents or other guardians were asked to complete questionnaires related to home literacy environment and parental rearing styles. The quality control process of students filling in the questionnaire in the control group was consistent with that in the case group.

Measuring tools

Egna Minnen Beträffande Uppfostran for Children (EMBU-C)

The EMBU-C is a powerful and objective tool which is used to evaluate the current relationship between parenting styles and children's mental health. The Chinese version (EMBU-C) for school-age children and adolescents, as translated and revised by Liming Tie et al., was applied in our study[26]. This version of the EMBU-C has shown good reliability (Cronbach's $\alpha = 0.82$). The EMBU-C includes four dimensions,

namely emotional warmth (EW), rejection (R), overprotecting (O) and anxious rearing (AR), made up of 10 items, respectively. The items were rated on a four-point Likert scale from never (1 point) to always (4 point) where the higher the score on a dimension, the greater the tendency to represent parenting styles on that dimension. The participants were asked to respond twice to each question item, evaluating the current parenting styles of their fathers and mothers, respectively.

Home literacy environment (HLE)

Based on the HLE scale designed by He et al. [9], this study made some changes to the items. Ten variables reflected the home literacy environment, such as Literacy-related activities, restrictions on using electronic devices, usage of electronic devices, shared TV, children's learning habits, completion of homework by children, whether the child participated in extracurricular activities, frequency of encouraging children to participate activities and hours of outdoor. Children's literacy-related behaviors were a regular reading time coded according to the assignment table of HLE variables. The higher the frequency of the behavior, the higher the score. The cumulative score of each item ranged from 0 to 24 among all the students. See the details in **Table S1**.

The Chinese Reading Ability Test (CRAT)

The Chinese Reading Ability Test (CRAT) was used to diagnose Chinese dyslexic children[27]. It is composed of five subscales, respectively the phonological awareness (PA), morphological awareness (MA), rapid automatized naming (RAN), orthographic awareness (OA), and reading ability (RA). The PA consists of three tests: Rhyme Recognition, Onset Recognition and Tone Recognition. The MA asks the children to combine each character in the first column with a character in the second column to form a meaningful compound word, and record the completion time and score. In the RAN, children are asked to name of all numbers twice, from left to right, from top to bottom, as quickly and accurately as possible. The OA was used to measure children's knowledge of the structure of Chinese characters and their sensitivity to differentiate between Chinese and non-Chinese characters. The RA includes oral and written questions, as well as reading time. The higher the score and the shorter the time taken, the better the children have mastered the skill. The Cronbach's alpha coefficient for the scale was 0.75[24].

Statistical Analysis

The statistical analyses were performed using IBM SPSS 26.0 Statistics for Windows (IBM Corp., Armonk, NY, USA) and R 4.2.3. (R Core Team, Vienna, Austria). The continuous variables were expressed using mean \pm standard deviation (mean \pm SD), and the categorical variables were expressed using frequencies and percentages. The individual sample t-test and chi-square test were used for group comparisons. Preliminarily, Spearman correlations were performed to examine the relationships among the home literacy variable, parenting styles and dyslexia to assess the multicollinearity of the variables [28]. Given the observed correlations, causality was examined using multiple logistic regression. The examination of the causality of the variables is necessary to carry out the mediation model [29].

Then, based on the hypothesis, we used Structural Equation Modeling (SEM) to examine the mediation effects. We examined this association controlling for various child and family characteristics. After analyzing the missing data for patterns, we estimated missing data using the full information maximum likelihood option (MLR estimator) in M-plus version 8. For the indirect effects, we used a bootstrap resamples of 5,000 in order to obtain nonbiased 95% confidence intervals(CI)[30]. If the 95% CI did not contain zero, it indicated a significant mediating effect. All predictor variables were standardized to minimize multicollinearity. Besides, to examine the model fit, several fit indices were considered: Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR). The values of > 0.90 for CFI and TLI, < 0.08 for RMSEA and < 0.05 for SRMR represent a good fit [31]. The significant level was set to 0.05.

Results

General characteristics of the participants

Table 1 displays the sociodemographic details of 53 dyslexic children and 159 controls. Concerning district, 43 (81.1%) children in the dyslexic group resided in urban areas, compared to 149 (93.1%) in the control group ($P = 0.007$). A significant difference was also observed in monthly family income between the two groups ($P = 0.017$). Compared to controls, the proportion of single-parent families (9.4% vs 1.9%, $P = 0.037$) and family history of dyslexia (7.5% vs 0.6%, $P = 0.009$) were much higher in dyslexic children. In terms of paternity, children with dyslexia were more likely to feel ignored and scolded by their parents (all $P < 0.05$). No significant differences were observed in sex, grade distribution, learning training before age 3 or parental education levels between the two groups ($P > 0.05$).

Table 1
General characteristics of the participants.

Variable	Dyslexic (n = 53)	Control (n = 159)	P
Sex, n (%)			1.000
Boys	38(71.7)	114(71.7)	
Girls	15(28.3)	45(28.3)	
Grade			1.000
2	18(34.0)	54(34.0)	
3	16(30.2)	48(30.2)	
4	12(22.6)	36(22.6)	
5	7(13.2)	21(13.2)	
Single parent family			0.037
Yes	5(9.4)	3(1.9)	
No	48(90.6)	156(98.1)	
Place of residence			0.007
Rural	10(18.9)	10(6.3)	
City	43(81.1)	149(93.7)	
Family history of dyslexia			0.009
Yes	4(7.5)	1(0.6)	
No	49(92.5)	158(99.3)	
Learning training before age 3			0.628
Yes	20(37.7)	66(41.5)	
No	33(62.3)	93(58.5)	
Father's educational level			0.127
Junior high school or below	18(34.0)	33(20.8)	
High school or equivalent	13(24.5)	54(34.0)	
Bachelor's degree or above	22(41.5)	72(45.3)	
Mother's educational level			0.237
Junior high school or below	15(28.3)	53(34.6)	

Variable	Dyslexic (<i>n</i> = 53)	Control (<i>n</i> = 159)	<i>P</i>
High school or equivalent	9(17.0)	38(23.9)	
Bachelor's degree or above	29(54.7)	66(41.5)	
Monthly family income			0.017
< 5000	17(32.1)	30(18.9)	
~ 10,000	22(41.5)	53(33.3)	
> 10,000	14(26.4)	76(47.8)	
Be scolded by parents			0.005
Yes	48(81.6)	108(67.9)	
No	5(9.4)	51(32.1)	
Ignore children's feelings			0.035
Frequently	3(5.7)	4(2.7)	
General	35(66.0)	79(49.7)	
None	15(23.4)	76(47.8)	

Comparison of Parenting Styles and CRAT between dyslexic and non-dyslexic children

The scores for the different types of parenting styles of dyslexic and control children were shown in Fig. 1. The scores for emotional warmth and anxious rearing of parents in the dyslexic group were lower than those in the control group ($P < 0.01$), and the scores for overprotecting of fathers were also significantly lower than those in the control group ($P < 0.001$). Based on gender stratification analysis, the results showed that there were differences in the scores of parenting styles between dyslexic boys and normal boys, mainly in the five dimensions of emotional warmth, anxious rearing and overprotection of the father, and emotional warmth and anxious rearing of the mother. Male dyslexic children scored significantly lower than controls on all of these factors ($P < 0.05$). However, among the maternal rearing style of girls, only anxious rearing had a statistically significant difference between the two groups ($P < 0.05$), with the dyslexic group scoring lower than the controls ($P < 0.05$).

Regarding CRAT, there were significant differences in the five dimensions between the two groups (all $P < 0.05$). The case group scored lower than the children in the control group and took longer time to complete the test on all subscales (Table S2).

Correlation matrixes between the investigated factors

Data were assessed for normality, outliers and multicollinearity prior to path analysis. No evidence of significant deviation from normality and outliers was observed. Besides, the Spearman correlation test results indicated that the correlations coefficients among variables were lower than 0.90, and multicollinearity was not present. The results indicated that reading ability were related to parenting styles and HLE in children (Figure S1).

Association of dyslexia with HLE

In Fig. 2, we showed the association between dyslexia and HLE. No regular reading time (OR = 3.93, 95%CI: 1.92–8.02, $P < 0.05$) and time spending on TV > 2 hours everyday (OR = 7.41, 95%CI: 2.11–25.95, $P < 0.05$) were positively associated with dyslexia. Moreover, the case group had higher homework pressure (OR = 8.55, 95%CI:3.87–18.86, $P < 0.05$) and longer homework time (OR = 1.41,95%CI:1.04–1.90, $P < 0.05$) than the control group. While literacy-related activities (OR = 0.86, 95%CI: 0.77–0.95, $P < 0.05$), learning actively ($P < 0.05$) and absence of homework pressure (OR = 0.25, 95%CI: 0.07–0.88, $P < 0.05$) were protective factors for dyslexia. Likewise, we integrated the meaningful results into a multiple logistic regression model and demonstrated that dyslexia had a positive correlation with no regular reading time (OR = 2.69, 95%CI:1.04–6.97), high homework pressure (OR = 7.41, 95%CI:1.45–37.82), and time spending on TV > 2 hours everyday (OR = 6.16, 95%CI:1.30-29.15, all $P < 0.05$). However, we did not observe any significant association between the risk of dyslexia and literacy-related activities and homework time (Fig. 3).

Association between parenting styles and dyslexia

Similarly, we used the same regression model to identify predictors of parenting styles for dyslexia. We found that emotional warmth (Father: OR = 0.93, 95%CI: 0.88–0.98; Mother: OR = 0.94,95%CI:0.89–0.99), paternal overprotection (OR = 0.91, 95%CI: 0.87–0.96) and anxious rearing (Father: OR = 0.90,95%CI: 0.85–0.97; Mother: OR = 0.89, 95%CI:0.83–0.97) were negatively associated with dyslexia in children (all $P < 0.05$, Fig. 4).

Test of the mediation model

The results generated by M-plus version 8 were presented in Fig. 5. The mediation analysis regarding parenting styles and dyslexia showed that after being adjusted for sex and grade, parenting styles were positive predictors of HLE ($\beta = 0.721$, 95% CI: 0.448–0.852, $P < 0.01$). While the direct effect of parenting styles on dyslexia was not statistically significant ($\beta = -0.130$, 95% CI: -0.652 – 0.162, $P > 0.05$). Additionally, HLE had a positive effect on dyslexia ($\beta = 0.940$, 95% CI: 0.576–1.462, $P < 0.01$), which was divided into four components ($\beta = 0.525$, - 0.120, - 0.485, - 0.835). The mediation analysis results showed that HLE had a total mediation effect on the association between parenting styles and dyslexia. The total indirect effects of mediation were 0.55 and 0.68, respectively. The path model was a good fit (RMSEA = 0.096, CFI = 0.969, TLI = 0.924, SRMR = 0.039).

Discussion

Developmental dyslexia, a common learning disability affecting numerous children, has garnered increasing attention in recent years[32]. Recent studies showed that children with dyslexia are at risk of academic failure and emotional problems[33]. Therefore, investigating the factors that influence dyslexia may lead to mitigating the consequences of this prevalent disease. In the present study, we aim to examine the relationship between parenting styles and dyslexia among Chinese children, with a specific focus on the potential mediating role of HLE. Our findings indicate a strong correlation between dyslexia, HLE, and parenting styles. More importantly, HLE was found to have a complete mediation effect on the association between parenting styles and reading ability. This study builds upon previous research by introducing innovative models that connect parenting styles to dyslexia in children, thus offering valuable insights for future interventions and educational practices.

Our findings indicate that the absence of regular reading time and high homework pressure are risk factors for dyslexia. In line with previous research, our results highlight a significant association between dyslexia and HLE in children[29, 34]. Ensuring children have a designated reading time not only increases their overall reading exposure but also cultivates positive reading habits, thereby enhancing their vocabulary and reading skills. A longitudinal study spanning ages 2 to 15 found that the HLE positively impacts language and literacy development in preschoolers, leading to improved reading comprehension throughout childhood due to preschool-based skills and heightened motivation[11]. Several studies have also suggested that the relationship between HLE and children's reading ability may be reciprocal, with children's early reading ability influencing parental involvement in home literacy activities[34, 35]. However, a study from Japan did not find such results, but rather linked access to literacy resources to early reading development[36]. We posit that this disparity may be attributed to the temporal nature of HLE effects, which diminish as children receive formal literacy instruction. Nevertheless, it is indisputable that a favorable HLE offers numerous opportunities for educational activities that foster children's language and literacy skills.

On the other hand, consistent with our findings, there were pieces of evidence showing that a conscious learning habit had a significant impact on the occurrence of dyslexia[4]. Learning habit is an individual automatic learning behavior, conscious study habits are conducive to stimulate the enthusiasm and initiative of students to learn. Children with positive learning habits generally show positive learning attitudes in campus and home learning, and will actively and enthusiastically discuss with the teacher in the classroom or communicate with their classmates to learn after class, and express their views more actively, which greatly improves their language expression ability and expression opportunities. From this perspective, it can be explained that conscious and active learning habits can improve children's reading experience, which has an important impact on the acquisition of children's reading knowledge and skills, and thus reduces the risk of dyslexia[37]. In contrast, the presence of longer time and stressful difficulties in completing homework assignments in dyslexic children, in addition to a possible lack of conscious study habits, is more likely to be due to their poor reading skills related to difficulties in completing homework tasks[28].

In recent years, there has been a growing focus on parenting styles in the research community, yet little attention has been paid to the relationship between dyslexia and parenting styles[8, 38]. Similar to prior researches[19, 39], our research has found a strong correlation between parenting style and dyslexia. In particular, negative correlations were observed with regard to parental emotional warmth, anxious rearing, and fathers' overprotection. These results may reflect apathetic and neglectful attitudes of parents towards dyslexic children and inadequate care for dyslexic children, which is a negative rearing style. Research has shown that parents who adopt a neglectful parenting style demand less from their children and communicate less with them[40]. We suggest that negative parenting styles may be due to the fact that the academic underachievement of dyslexic children affects parents' parenting satisfaction and sense of efficacy, which leaves most parents disillusioned and appearing less protective and anxious than parents of typically developing children[41]. This may also partly explain our results. Consistent with our findings, a Finnish study found that parents of dyslexic children have high parenting stress and struggle to provide effective help [18]. That is, more adaptive parenting styles promote a better performance when compared with less adaptive parenting styles. Previous studies have indicated that parenting styles play an important role in explaining higher reading processes (syntactic and semantic) in children with dyslexia, as supported by main theories on dyslexia[22]. Therefore, our results add to the growing body of evidence highlighting the impact of parenting styles on children with dyslexia.

In addition, we found that the relationship between boys' parenting style and dyslexia was more pronounced. To our knowledge, there is a general consensus among current researchers that boys are at a higher risk of developing dyslexia than girls[4, 33, 42]. In line with a prior study, the gender of children had an impact on parenting styles[15]. Boys are given more responsibility, and parents are harsher, more rejecting and neglectful of boys, especially fathers, who are more likely to be strict with boys in home education. However, parents are more willing to tolerate girls. Also, there are differences in the personalities of boys and girls; boys are active and disobedient, while girls are more obedient and well-behaved, so parents are harsher and prone to punishment and rejection of boys, and are more tolerant and provide emotional warmth to girl [43]. Thus, we should pay more attention to the way boys are parented, to be emotional warmth, tolerant and protective enough to help prevent dyslexia in boys.

Furthermore, our research has established that the HLE acts as an independent mediator between parenting styles and dyslexia. This means that positive parenting styles create a richer HLE, which in turn reduces the risk of dyslexia. Children's early language skills are developed through their interactions with their parents[44]. More specifically, parental attitudes towards reading seem to influence the development of children's reading skills [10]. As numerous studies have shown, the actions and characteristics of both children and parents can shape family interactions[45]. Parents' behaviors and attitudes, along with family communications and interactions, contribute to increasing children's reading activities and create a positive HLE. The behavior of individual family members impacts all other members, making it essential to consider the family and the overall environment when examining a child's behavior[46]. Given this, interventions that focus on effective parent-child communication can be a crucial part of rehabilitation training for children with dyslexia. Moreover, this study will enhance our understanding of the impact of parenting styles on children's dyslexia. In general, based on the findings of the present

study, improving parenting styles, enhancing family interaction, and creating a positive family reading atmosphere can be considered crucial strategies for reducing the risk of dyslexia. In summary, parenting styles can either positively or negatively influence dyslexia in children through HLE, making this the most innovative contribution of this study.

This study has several limitations that must be considered. Firstly, it is a case-control study, which limits the ability to establish causality. However, it provides valuable insights for future cohort or intervention studies seeking to verify these findings. Secondly, this study demonstrates that parenting styles impact children's reading ability through the home literacy environment. However, defining the specifics of a "good" home literacy environment and establishing the optimal level to prevent reading difficulties and improve reading challenges remains elusive. Thirdly, the evaluation of parenting styles was subjective and may be subject to recall bias. Additionally, there may be other factors not evaluated in this study that also influence the relationship between parenting styles and reading ability. Therefore, further research with a prospective design is needed to explore a broader range of potential mediators. To strengthen the generalizability of these findings, it is recommended to conduct future studies on samples from numerous regions to assess the reproducibility of these results.

Conclusions

In this study, we developed a robust mediation model to explore the potential relationship between parenting styles and dyslexia in children. Our findings suggest that the HLE serves as a mediator between parenting styles and dyslexia. This study highlights the critical role of parenting styles and the HLE in the development of interventions for dyslexic children. Our study offers fresh insights into the intricate connections between parenting styles and dyslexia, and the results carry significant theoretical and practical implications. This novel mediation model, never before utilized, aids in deepening our comprehension of the mechanisms that underlie the link between parenting styles and dyslexia. Additionally, the findings can inform the creation of clinical interventions and management programs aimed at reducing dyslexia occurrences among children. In conclusion, parenting styles appear to serve as a crucial factor in shaping individual differences in HLE and, ultimately, children's reading abilities. Given that these parenting styles vary across different family backgrounds, they represent a promising target for interventions designed to enhance the HLE and support children's reading development.

Abbreviations

HLE: Home Literacy Environment; DD: Developmental dyslexia; IQ: Intelligence Quotient; DCCC: Dyslexia Checklist for Chinese Children; CRAT: Chinese Reading Ability Test; DSM-5: the fifth edition of Diagnostic and Statistical Manual of Mental Disorders; EMBU-C: Egena Minnen Beträffande Uppfostran for Children; SD: standard deviation; SEM: Structural Equation Modeling; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Square Residual.

Declarations

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Acknowledgments

The authors express our sincere gratitude to all subjects who participated in this study.

Funding

The research was funded by Special Fund for Science and Technology of Guangdong Province (grant no.: STKJ202209070), the Shantou Science and Technology Project (No. 230509116495730). The authors wish to thank all the students and teachers who participated in this project.

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Authors' contributions

Wanyi Wen carried out the initial analyses, drafted the initial manuscript, and reviewed and revised the manuscript. Xuanzhi Zhang, Liwen Guan, Anyan Huang, Zhiya Liang, Xinle Yu, and Qianfei Gu conducted a survey design, collected the data, and carried out the initial analyses. Yanhong Huang and Kusheng Wu

conceptualized and designed the study, draft the initial manuscript, revised and finalized the manuscript. All authors significantly contributed to the revisions of the manuscript. The paper and data have not been published before. All authors have read and agreed to the published version of the manuscript.

Ethics approval and consent to participate

Approval from the Ethics Committee of Mental Health Center, Shantou University Medical College was received before the initiation of this study and informed consent have been collected by all participants.

Competing Interests

The authors declare no conflicts of interest.

Consent for publication

Not applicable.

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Figures

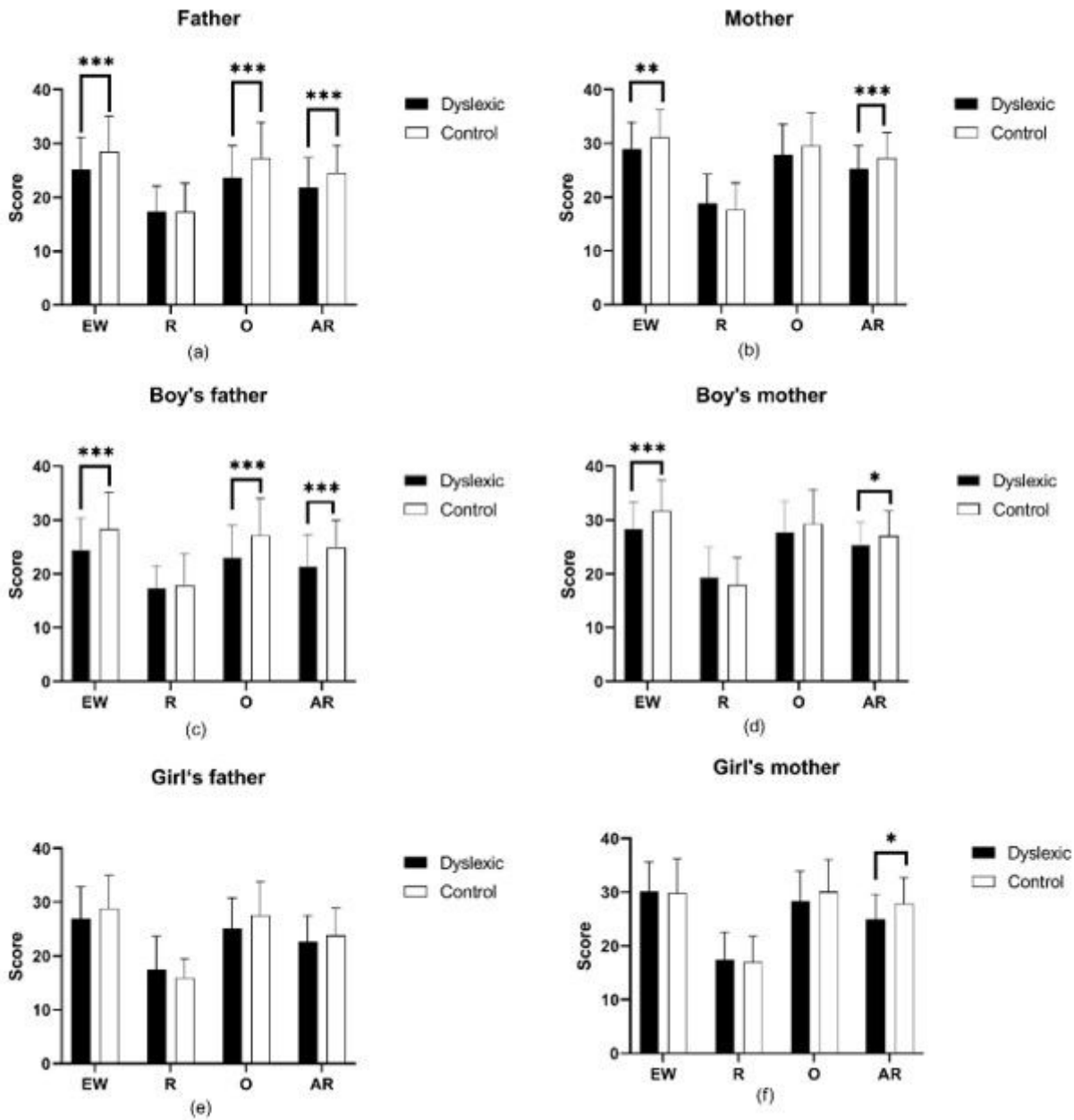


Figure 1

Comparison of scores of parental rearing style between dyslexic group and control group. Abbreviations: EW, emotional warmth; R, rejection; O, overprotecting; AR, anxious rearing. Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; This part of the data analysis excluded children from single-parent families.

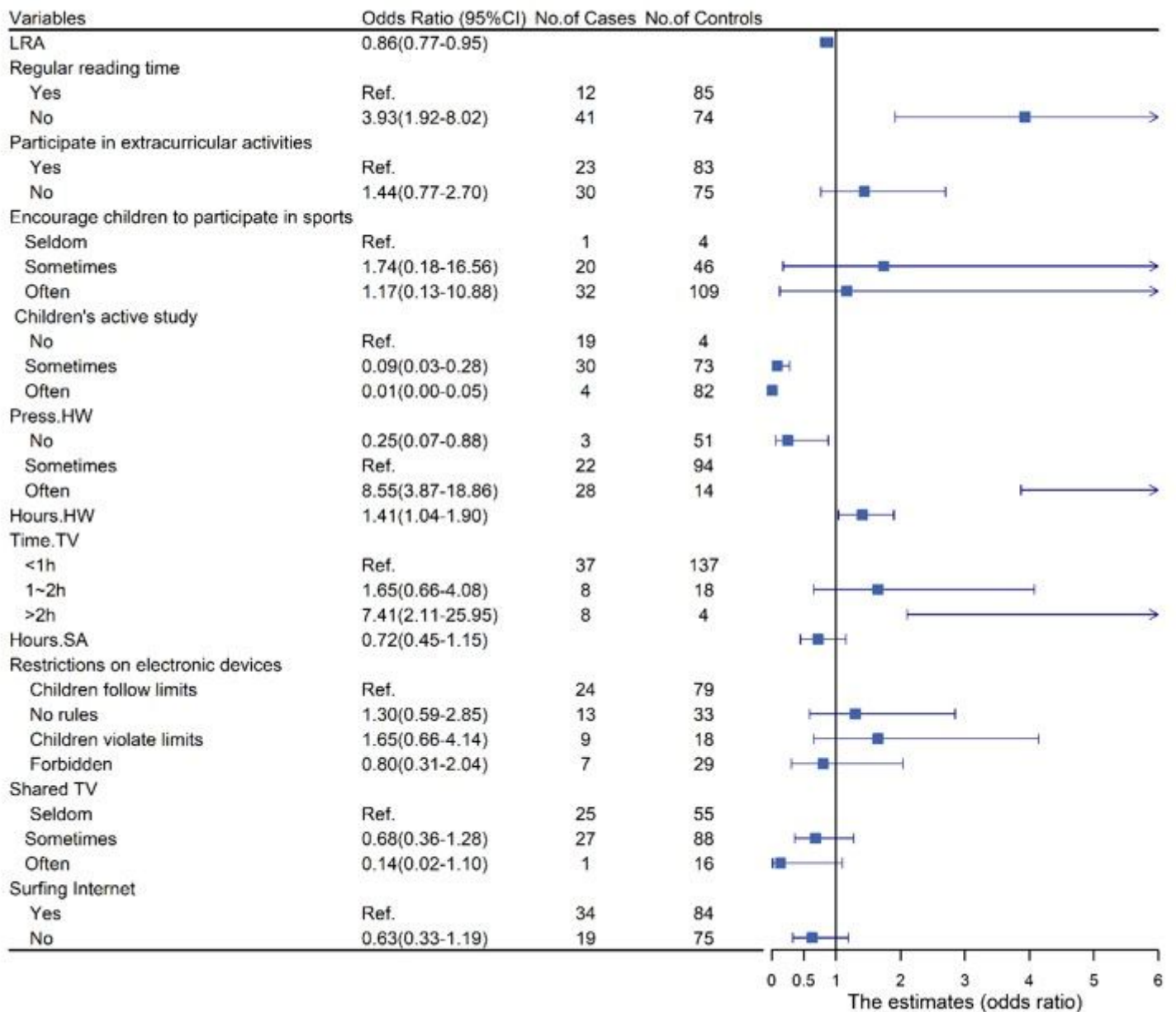


Figure 2

Associations (points) and 95% CI (bars) from Univariate logistic regression analyses of home literacy environment and dyslexia. Solid vertical lines indicate the null values. Note: CI, confidence interval; LRA, literacy-related activities; Press. HW, Homework pressure; Hour. HW, hours of finishing homework; Time.TV, time spending on TV everyday; Hours.SA, hours of sports activities.

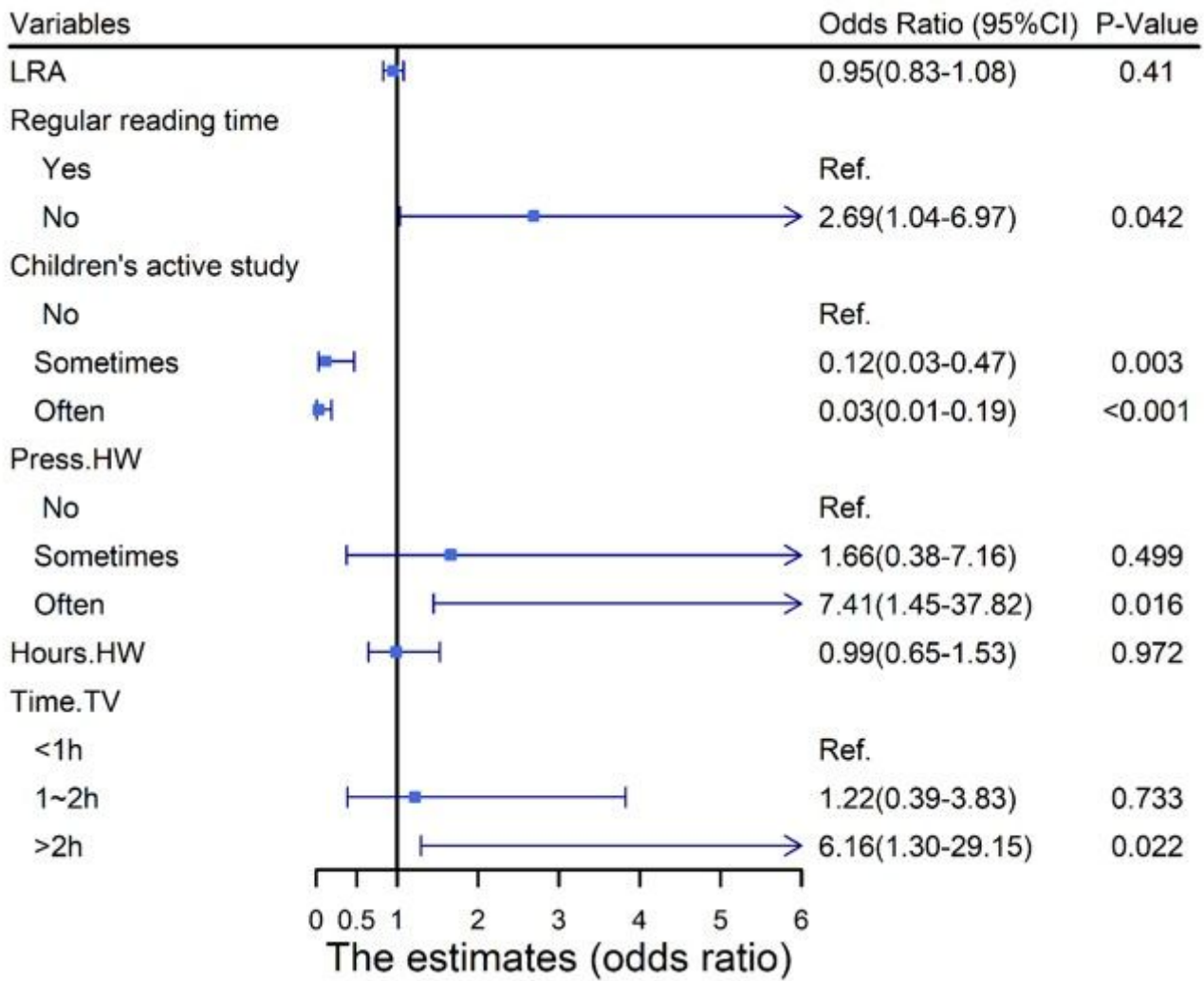


Figure 3

Associations (points) and 95% CI (bars) from multivariate logistic regression analyses of home literacy environment and dyslexia. Solid vertical lines indicate the null values. Adjusted for family income per month, be scolded by parents, ignore children's feelings and family history of dyslexia. Note: CI, confidence interval; LRA, literacy-related activities; Press.HW, Homework pressure; Hour.HW, hours of finishing homework; Time.TV, time spending on TV everyday.

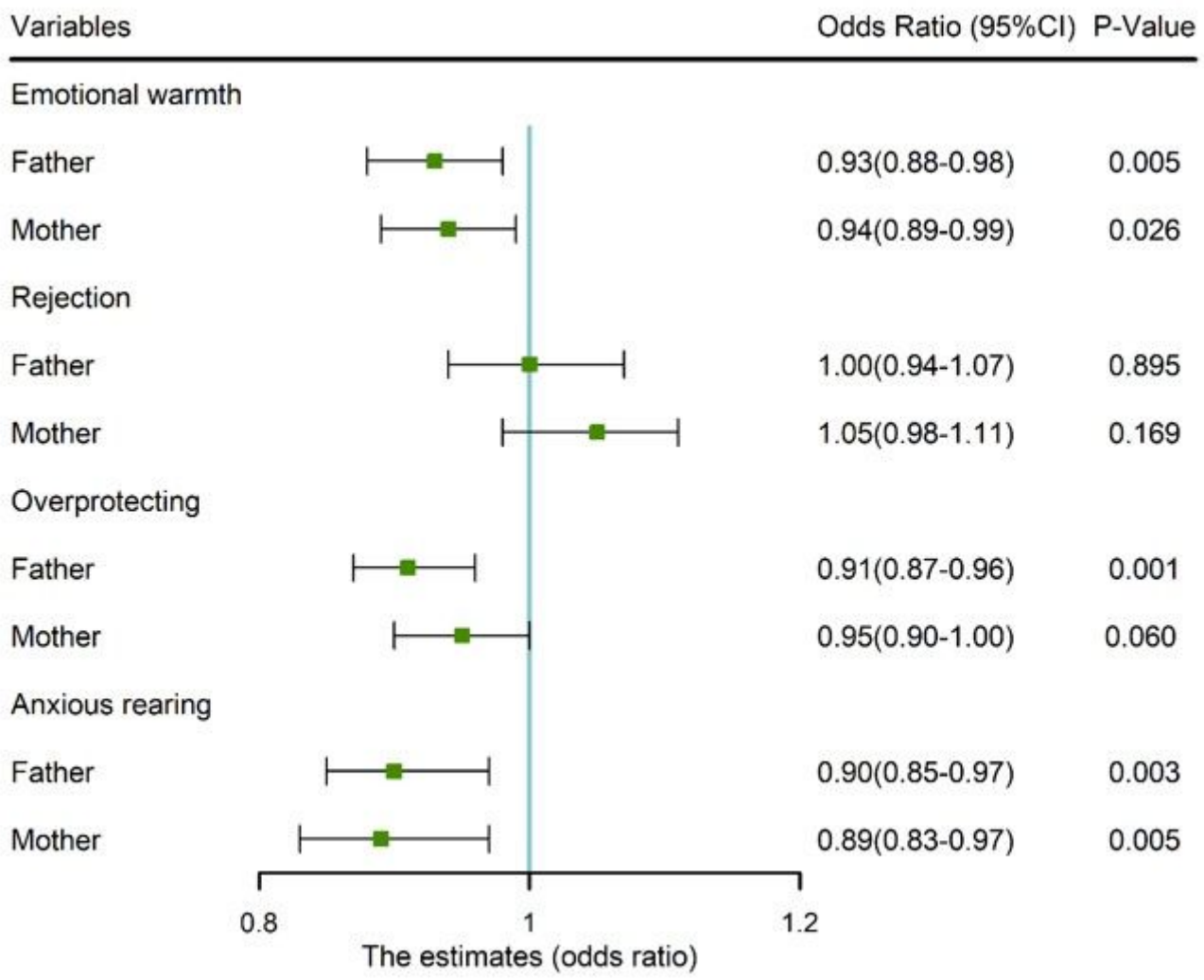


Figure 4

Associations (points) and 95% CI (bars) from multivariate logistic regression analyses of parental rearing style and dyslexia. Solid vertical lines indicate the null values. Adjusted for single parent family and place of residence. Note: CI, confidence interval.

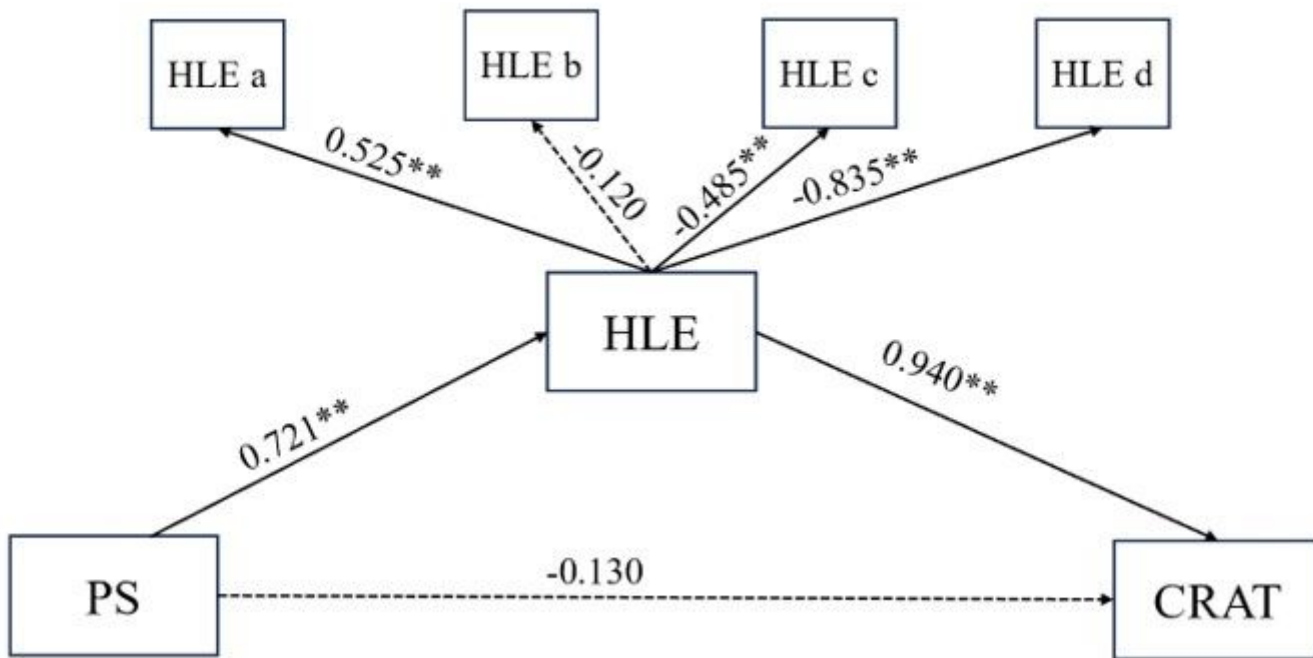


Figure 5

The chart and path coefficients of the mediators in the relationship between parenting style and CRAT. Abbreviations: PS, parenting styles; HLE, home literacy environment; CRAT, the score of reading ability. *, $P < 0.05$; **, $P < 0.01$.

Supplementary Files

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