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Empathy and theory of mind abilities of children with specific learning disorder (SLD)

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ABSTRACT

OBJECTIVES: Specific learning disorder (SLD) is a very common disorder in childhood, and it is discussed under neurodevelopmental disorders in the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5). SLD affects children's academic achievement, as well as bringing challenges in their social relationships. The purpose of our study is to compare the empathy and theory of mind (ToM) abilities of children with SLD with those of healthy peers.

METHODS: A total of 83 children were included in our study, comprising 40 cases diagnosed with SLD and without comorbidity and 43 healthy controls. The case group's mean age was 9.3 ± 1.5 years and the control group's mean age was 9.3 ± 1.3 years. All children were evaluated using the Kiddie Schedule for Affective Disorders and Schizophrenia for School-age Children – Present and Lifetime Version (K-SADS-PL), ToM tasks, and emotion recognition scales.

RESULTS: Children diagnosed with SLD demonstrated statistically significantly worse performance on the Comprehension Test (CT), Unexpected Outcomes Test (UOT), and False-belief Tasks, which evaluated the ToM and empathy abilities. No difference was obtained in intelligence level between the two groups.

CONCLUSIONS: It was determined that children with SLD had challenges in the ToM and empathy abilities compared to children with healthy development. In conclusion, developing special education programmes by considering such possible shortcomings in the field of social cognition will positively contribute to the elimination of challenges faced by children in their academic and social lives.

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Introduction

Specific learning disorder (SLD) is a neurodevelopmental disorder characterized by lower than expected levels of one or a few of reading, writing, or mathematics abilities, considering the age and intelligence of the child (American Psychological Association [APA], 2001); it is common in childhood and leads to impairment in many functionalities [1]. The prevalence of SLD is reported to be 5–10% [2]. Academic achievement in children with SLD is lower than expected considering their intelligence level and age. SLD is categorized under neurodevelopment disorders as a reading disorder, written expression disorder, and computational (mathematics) disorder in the Fifth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) [3]. It is diagnosed through a process that includes a detailed psychiatric examination, collection of data about the fields in which the child is experiencing challenges from various sources, and evaluation of neuropsychological functions.

Although SLD is defined as a neurodevelopmental problem that starts at the birth of the child, children with SLD can rather be clinically diagnosed in school years, and the most important reason for families to apply to a clinician is the emergence of academic problems. The presence of indications in the preschool years is underlined in the detailed medical history obtained from families. Early indications include linguistic issues, such as delay in language development, mixing words, and challenges in learning the letter–sound relationship; motor-skill indications, such as challenges with doing up buttons, using scissors, tying shoelaces; and challenges in the development of the concept of similarity/dissimilarity. In the school period, writing illegibly, skipping letters, writing words in reverse, slow reading, mixing letters or numbers, and challenges in mathematical operations and memorizing the multiplication table are among the most frequent indications [2].

Academic underachievement in childhood and adolescence commonly affects the mental health of the individual and impairs relationships with the family,

teachers, and peers [4]. While multiple studies have focused on academic problems in children with SLD, limited research has been conducted on psychosocial problems accompanying SLD. Some studies have reported children with SLD have the following characteristics: more frequent absences from school and problems with social relations, greater depression and pessimism, and lower self-respect [5–8]. In studies on adults with SLD, participants especially reported fear of inability, lack of self-confidence, and challenges in affiliation [9].

Kasirer and Mashal (2016) emphasized that children with SLD have challenges in understanding metaphors [10]; semantic challenges in individuals with SLD are considered to affect this ability [11]. Moreover, some studies have reported deficiencies in executive functions (inhibition, set shifting, working memory, etc.) among children and adults with SLD [12].

The findings described above suggest that more research should be carried out from different perspectives to elucidate problems in the social relationships of individuals with SLD. Social cognition is an important parameter in mutual human relationships. The recognition of emotions and ToM abilities are important areas of social cognition [13]. ToM can be defined as the ability to attribute mental states, such as beliefs, desires, and intents, to other people [14]. Generally, ToM ability is explored with false-belief tasks. Typically developing children are able to successfully perform first-order false-belief tasks at 4 years of age [15], while second-order false-belief tasks can be performed well at around 6 or 7 years of age [16]. Moreover, studies have reported an important relationship between ToM abilities and the development of language [17].

It has been reported that children with attention deficit hyperactivity disorder and autism spectrum disorder have limitations in their social skills, ToM and emotion recognition abilities [18,19]. In the DSM-5, SLD is explained under the same heading, “Neurodevelopment Disorders,” as attention deficit hyperactivity disorder and autism spectrum disorder. It is considered that individuals with SLD also have social limitations, although this has not yet been clearly demonstrated. Studies on the parameters associated with social skills to elucidate the challenges of individuals with SLD in this field are ongoing.

Therefore, studying ToM and emotion recognition skills in children with SLD can help us to understand these individuals’ problems concerning social relations.

The purpose of our study is to study emotion recognition, empathy, and ToM abilities of children with SLD. Because, it’s known that in the developmental period children with SLD has language delay, commonly experience pragmatic and semantic language problems, difficulties in understanding metaphors and have problems in their social relations. All these parameters are thought to be related to ToM and empathy skills. Our main hypothesis is that these

children have limited ToM and empathy abilities. It has been found that in the literature there are fairly limited numbers of studies investigating children’s theory of mind (ToM) ability. For this reason, this is one of the first studies to be done in this area.

Methods

Design, setting, and recruitment

Participants included children who applied to the Child and Adolescent Psychiatry Outpatient Unit between May 2015 and August 2016. Criteria for inclusion of the case group in the study were as follows: (1) diagnosis of SLD according to the DSM-IV criteria, (2) total intelligence score of 80 or above according to the Wechsler Intelligence Scale for Children-Revised Form (WISC-R) results, and (3) age of 7–12 years. Forty children who met these criteria were included in the study. Those with comorbid psychiatric diseases (attention deficit hyperactivity disorder, psychosis, etc.), chronic medical diseases, or an intelligence quotient (IQ) under 80 were excluded. In addition, 43 children aged 7–12 were matched with the case group to form the control group; these individuals did not meet any psychiatric diagnostic criteria as determined by the assessment, were generally healthy, and did not have any chronic medical disease.

Procedures

Individual sessions were arranged with each participant. A clinician applied the Kiddie Schedule for Affective Disorders and Schizophrenia for School-age Children – Present and Lifetime Version (K-SADS-PL) to exclude any possible psychiatric diagnoses in both of the groups. The Emotion Recognition Tests, the False-belief Tasks, Comprehension Test (CT), and Unexpected Outcomes Test (UOT) were applied to evaluate the ToM and empathy abilities of the case and control groups. One of the clinicians assessed and scored blindly the groups of participants.

Measures

Sociodemographic data form

The sociodemographic data form was created by the authors based on the literature to collect data about the sociodemographic characteristics of children and adolescents. The form includes questions about age, gender, academic achievement, and family.

Schedule for affectivity disorder and schizophrenia for school-age children – present and lifetime version (K-SADS-PL)

K-SADS-PL is a semi structured-interview form developed to identify the past and present episodes of the

psychopathology of children and adolescents according to the DSM-III-R and DSM-IV diagnostic criteria [20]. The K-SADS-PL allows to assess a wide array of primary diagnoses, including mood disorders, psychotic disorders, anxiety disorders, elimination disorders, disruptive behaviours disorders, alcohol and substance use disorders, eating disorders, and tic disorders. Turkish translation and validity and reliability studies have been carried out for K-SADS-PL [21].

ToM tasks

The false-belief tasks were initially developed by Wimmer and Perner (1983) [22] to evaluate ToM. Baron-Cohen et al. (1985) developed another version of this test called “Sally and Ann” [23]. False-belief tasks were used in our study to evaluate first- and second-order ToM abilities. In the first order, the character in the story has a false belief about a situation; in the second order, the character has a false belief about another person’s belief. In both orders, for every story, the false-belief tasks included a factual question, a memory question, and a ToM question about the belief of the character concerning another character [24]. Dolls and specify other visual materials were used to present the action sequences in the stories.

Emotion recognition scales

The comprehension test

The CT is an 11-item test developed to measure individuals’ ability to understand a person’s emotional response to a give emotion-eliciting context [25]. Items were created with samples from emotions and affective reasons. Emotions in the items include anger, fear, disgust, surprise, sadness, happiness, contempt, social varieties of basic emotions (pride, shame, pity, and embarrassment), and variations in the intensity of basic emotions (e.g. the difference between horror and fear). It was determined that the CT had acceptable internal consistency ($\alpha = 0.85$) through pilot studies on young children, adolescents, and adults [26]. Answers are scored between 0 and 2 and total scores (0–24) are calculated. The responses of the case and control groups on the CT and UOT were evaluated as “suitable,” “response available but insufficient,” and “not suitable” for each question by two clinicians who were blind to participants’ diagnostic status. Two points were given for “suitable” responses, 1 point for “response available but insufficient,” and 0 points for “not suitable.”

The unexpected outcomes test

The UOT is a 12-item measure of reasoning about the emotional states of others that is essentially related to empathic ability [26]. Its items define a condition that leads to the emotional response of a story character, but the emotional response is unexpected and is

inconsistent with the content that leads to the emotion. The test taker is asked to provide additional situational information to analyse the significant discrepancy. It was determined that the UOT has acceptable internal consistency (Cronbach’s $\alpha = 0.82$) according to pilot studies on adolescents and adults [26]. Answers are scored between 0 and 2 and total scores (0–24) are calculated. The responses of the case and control groups on the CT and UOT were evaluated as “suitable,” “response available but insufficient,” and “not suitable” for each question by two clinicians who were blind to participants’ diagnostic status. Two points were given for “suitable” responses, 1 point for “response available but insufficient,” and 0 points for “not suitable.”

The Wechsler Intelligence Scale for Children-Revised Form (WISC-R)

The WISC-R was developed by Wechsler in 1949 [27]. This scale is individually applied to children aged between 6 years, 0 months and 16 years, 11 months. It has two subscales for verbal and performance. The reliability and validity studies in Turkey were conducted by Savaşır and Şahin [28].

Statistical analyses

The data were evaluated using IBM SPSS statistics software version 22. The study variables were expressed as mean \pm standard deviation, and the categorical variables were defined as percentage and number. The distribution of numeric variables was evaluated using the Kolmogorov–Smirnov test and by evaluating histograms. The comparison of the normal distribution of numeric variables was evaluated using Student’s *t*-test, and non-normally distributed numeric variables were evaluated using the Mann–Whitney U test. The categorical variables were evaluated using Pearson’s Chi-square test and Fisher’s exact test. The value of statistical significance was determined as $p < .05$.

Ethical considerations

Parents provided written informed consent for their children to participate in the study. Permission for this study was granted by the local Ethical Committee.

Results

A total of 83 children were included in our study, comprising 40 cases diagnosed with SLD without comorbidity and 43 healthy controls. The case group’s mean age was 9.3 ± 1.5 (7–12) years, and the control group’s mean age was 9.3 ± 1.3 (7–12) years. The case group included 15 girls and 25 boys, while the control group included 17 girls and 26 boys. No statistically

significant difference was obtained in terms of age, gender, education level, parent's age, and parent's relationship status between the case and control groups (Table 1).

The case group's WISC-R results were as follows: verbal score, 87.9 ± 14.1 ; performance score, 97.2 ± 18.5 ; and total score, 91.9 ± 11.5 ; the control group's WISC-R results were as follows: verbal score, 89.1 ± 12.1 ; performance score, 97.4 ± 16.7 ; and total score, 92.6 ± 12.3 . The total intelligence scores of the groups showed no significant difference (Table 1). The case group's school success was significantly lower than that of the control group (Table 1).

The CT and the UOT total scores were significantly lower in the group with SLD than in the control group (Table 2).

The first- and second-order false-belief tasks comprised three questions, namely a factual question, memory question, and belief question about the story told by the operator. The answers given by the case and control groups were evaluated as "true" or "false." True answers were given 1 point, and false answers were given 0 points; in this way, the first-order, second-order, and total false-belief task scores were obtained. All scores were significantly lower in the case group than in healthy controls ($p < .001$; Table 3).

Discussion

In this study, which compared children diagnosed with SLD to children with healthy development using several instruments, it was found that SLD children exhibited weakness in empathy and ToM abilities compared to healthy children. The case group was mostly male, and the girl-boy ratio in this group was 3/5. In the literature, while some studies have reported that SLD is more common in males, some have underlined no difference between genders [29–31].

One of the most important components of social behaviour is the ability to empathize with another person. Empathy has two subtypes, namely the cognitive and emotional subtypes. Cognitive empathy is the

ability to understand the perspective of another person in relation to an incident and to predict the other person's behaviour in the current condition, which covers ToM abilities. In contrast, emotional empathy is the ability to recognize a person's emotion about a situation, predict possible emotional associations, and share the pain of another person [32]. False-belief and ToM tasks were used to evaluate empathy and ToM abilities in our study. It was found that the first-order, second-order, and total ToM scores of children and adolescents with SLD were significantly lower than those of healthy children and adolescents, and those with SLD demonstrated worse performance in ToM abilities. ToM abilities develop around 5 years of age [15], and the age range of both the case and control groups was 7–12 years in our study. Given this information, the children with SLD were expected to be old enough to have developed ToM abilities, but according to our findings, the children with SLD had insufficient ToM abilities. In accordance with our findings, Cardillo and et al. in their study published in 2017, reported that children with dyslexia had weak ToM skills and had difficulties in understanding others feelings, thoughts, and intentions [33].

There are many studies on the relationship between certain diseases (mental retardation, autism spectrum disorder, Down syndrome, etc.) and ToM abilities, but no previous study on empathy and ToM abilities of children with SLD was found. It was determined that there is an important relationship between ToM abilities and language development [17], and there are problems in ToM abilities among children with autism, hearing impairment, and specific language impairment characterized by the insufficiency in language development [34–36]. Moreover, it is known that frequent latencies occur in language development in the detailed assessment of children with SLD [37]; thus, it can be estimated that individuals with SLD can have insufficiency in their ToM abilities. A study involving adults with dyslexia examined the relationship between reading skills and empathy skills and determined that weaker empathy skills are evident in dyslexic individuals [32]. Studies on the executive

Table 1. Sociodemographic attributes.

		Study group (n = 40)	Control group (n = 43)	p
Age	(mean \pm SD)	9.3 \pm 1.5	9.3 \pm 1.3	.870*
Sex	Male	25 (% 62.5)	26 (% 60.5)	.849**
	Female	15 (% 37.5)	17 (% 37.5)	
Academic success	Good	5 (% 12.5)	35 (81.4%)	<.001**
	Average	14 (% 35.0)	8 (18.6%)	
	Bad	21 (% 52.5)	0 (0%)	
WISC-R scores	Verbal	87.9 \pm 14.1	89.1 \pm 12.1	.680*
	Performance	97.2 \pm 18.5	97.4 \pm 16.7	
	Total	91.9 \pm 11.5	92.6 \pm 12.3	
Age of mother	(mean \pm SD)	36.7 \pm 5.5	37.8 \pm 5.2	.171*
Age of father	(mean \pm SD)	40.3 \pm 7.8	42.5 \pm 6.1	.157*
Togetherness	Together	40 (100 %)	40 (95.2%)	.494**
	Divorced, living separate	0 (0%)	2 (4.8 %)*	

Note: Wechsler Intelligence Scale for Children-Revised Form, SD; Standard deviation.

*Mann-Whitney U test, **Chi-square test, WISC-R.

Table 2. Comparison of comprehension test and unexpected outcomes test total scores.

	Study group (n = 40)		Control group (n = 43)		p
	Mean	SD	Mean	SD	
Comprehension test	9.15	1.78	12.07	2.72	<.001*
Unexpected outcomes test	10.7	3.62	14.65	2.76	<.001**

*Mann–Whitney U test, **Student t-test, SD; Standard deviation.

Table 3. Comparison of theory of mind scores.

	Case group (n = 40)		Control group (n = 43)		p
	Mean	SD	Mean	SD	
First-order ToM	2.25	0.84	2.84	0.43	<.001*
Second-order ToM	2.28	0.68	2.81	0.39	<.001*
Total ToM	4.53	1.22	5.65	0.69	<.001*

*Mann–Whitney U test, ToM; Theory of mind, SD; Standard deviation.

functions and social cognition abilities of individuals with SLD demonstrated that these individuals have limited executive functions (inhibitions, set shifting and working memory, organizing, planning, and task follow-up) [38–40]. Moreover, it was determined that individuals with SLD had challenges in understanding metaphors, myths, tales, and proverbs, and that they missed details of jokes [11,41,42]. It is considered that executive functions can play an important role in understanding metaphors [43]. In one report, no significant difference was observed in terms of executive function and ability to understand metaphors between a group with autism spectrum disorder and a group with SLD, and together, the groups had more challenges compared to healthy children [43]. It is known that ToM is necessary to understand and create metaphors, but this is not the only necessary element.

The total scores on the CT and UOT, which were used to evaluate emotional recognition and empathy skills, were statistically significantly lower in the case group. Some studies in the literature have focused on examining the ability of individuals with SLD to interpret the facial expression of another person and reported limitations in this ability in that population [44]. In parallel with this finding, our study showed weakness in empathy skills among children with SLD.

While it is expected that children with SLD will exhibit insufficiencies in ToM and empathy skills, it is surprising that extremely few studies have carried out in this field. Therefore, the present study focused on the ToM, emotional recognition, and empathy abilities of children and adolescents with SLD and compared them to healthy peers to better understand and interpret their current social challenges. This study makes an important contribution to the first research to examine ToM abilities in children with SLD.

This study's limitations should be considered when evaluating the results described above. The first limitation is the small size of the sample. The second is

that the case group was not divided into subgroups in terms of SLD diagnosis. In addition, the study focuses only on ToM and empathy skills, it has not been assessed how these weaknesses in these skills have an impact on social lives of these children and their families. The last limitation is Emotion Recognition Scales have not been validated in Turkish.

In conclusion, it is known that children with SLD have many problems in their social lives, as well as academic challenges. The results of this study suggest that the psychosocial challenges faced by children with SLD are closely related to challenges concerning ToM and emotional recognition. Investigating whether these challenges continue into adolescence and adulthood will help to elucidate these children's current condition. In addition to educational support for academic problems faced by children diagnosed with SLD, developing special education programmes to improve their social skills that consider challenges with ToM and empathy abilities will lay the foundation for developing an integrated approach for the treatment of these cases.

Disclosure statement

No potential conflict of interest was reported by the authors.

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