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ARAŞTIRMA

Açık Erişim

Comparison of Children Who Do and Do Not Stutter Regarding Dimensions of Temperament, Aspects of Attention-Deficit Hyperactivity Disorder and Anxiety Types

Kekemeliği Olan ve Olmayan Çocukların Mizaç Boyutları, Dikkat Eksikliği Hiperaktivite Bozukluğu Nitelikleri ve Kaygı Tiplerinin Karşılaştırılması

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ABSTRACT

The aim of this study was to compare school-age children who do (CWS) and do not stutter (CWNS) in terms of temperament dimensions, attention-deficit hyperactivity disorder (ADHD) aspects and anxiety types. Participants were 32 CWS (Age range = 8–11) and 32 CWNS (Age range=8-11). The Conners' Parent Rating Scale Long Form-Revised, Spence Children's Anxiety Scale-Parent and The School-Age Temperament Inventory were administered to collect data. Also, the stuttering severity of the CWS was measured using the Stuttering Severity Instrument-4. CWS had significantly higher scores for certain temperament dimensions (eg. negative reactivity), ADHD aspects and anxiety types than CWNS. However, no significant relationship was found between the stuttering severity and other variables. The present study showed that some ADHD aspects and anxiety types can accompany stuttering. Also, it can be suggested that the CWS exhibits a different profile in terms of some temperament dimensions than CWNS.

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ÖZET

Bu çalışmanın amacı, kekemeliği olan ve olmayan okul çağı çocukların mizaç boyutları, dikkat eksikliği hiperaktivite bozukluğu (DEHB) nitelikleri ve kaygı tipleri açısından karşılaştırılmasıdır. Çalışmanın katılımcı grubu 32 kekemeliği olan (Yaş aralığı = 8-11) ve 32 kekemeliği olmayan (Yaş aralığı = 8-11) çocuktan oluşmuştur. Çalışmada Conners Ana Baba Dereceleme Ölçeği Yenilenmiş Uzun Formu, Spence Çocuklar için Anksiyete Ölçeği-Ebeveyn Formu ve Okul Çağı Çocuklar için Mizaç Ölçeği veri toplama aracı olarak kullanılmıştır. Ayrıca kekemeliği olan grup için kekemelik şiddeti, Kekemelik Şiddetini Değerlendirme Aracı-4 kullanılarak hesaplanmıştır. Kekemeliği olan çocuklar belirli mizaç boyutları (ör. olumsuz tepkisellik), DEHB nitelikleri ve kaygı tipleri açısından kekemeliği olmayan çocuklara kıyasla anlamlı olarak daha yüksek skorlar elde etmişlerdir. Bununla birlikte kekemelik şiddeti ile diğer değişkenler arasında anlamlı bir ilişki bulunmamıştır. Çalışma, bazı DEHB nitelikleri ve kaygı tiplerinin kekemeliğe eşlik edebileceğini göstermiştir. Ayrıca kekemeliği olan çocukların, mizacın bazı boyutları açısından farklı bir profil sergilediği öne sürülebilir.

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Ethical Statement: The study was carried out within the framework of the Helsinki Declaration and all participants whose informed consents were obtained took part in this study as volunteers. The ethics committee of Üsküdar University was consulted for ethical approval of this study (Approval Number: 61351342/2020-205; Approval Date: 04/05/2020).

INTRODUCTION

Developmental stuttering can be defined as a more frequent interruption of speech fluency than normal with particular types of disfluencies, such as sound/syllable repetitions, prolongation of sounds, and/or blocks (Guitar, 2014). In Turkey, this disorder is one of the main reasons for admissions to child and adolescent psychiatry clinics (Aktepe et al., 2010). Although it is agreed that several factors, including language skills, motor performance, cognition, and temperament, play a role in stuttering, how these factors interact is not clear (Smith & Weber, 2017). Generally, current models explain the mechanism underlying stuttering by considering many components (Conture et al., 2006; Smith & Weber, 2017). In fact, it would be incomplete to examine one variable separately, such as motor performance, independent of emotions, language skills, and cognition (Kleinow, 2018).

One component that is central to many explanations of the mechanism underlying stuttering is temperament (Furnham & Davis, 2004). This can be defined as the behavioral characteristics consistently displayed by an individual. However, leading theoreticians consider temperament to be a concept with many dimensions, including cognitive features, regularity of biological functions, and sensorial features rather than comprising only behavior, emotions, or attitudes (Rothbart & Derryberry, 1981; Thomas & Chess, 1977).

In the literature on stuttering, children who stutter have generally been compared with their peers in relation to the dimensions of temperament proposed by the theoreticians. While several studies have revealed no difference between children who stutter and those who do not (Reilly et al., 2013; Smith et al., 2017), other studies have shown particular dimensions of temperament in children who stutter, such as negative mood (Howell et al., 2004) and difficulty in emotion regulation (Johnson et al., 2010; Ntourou et al., 2013). In addition, many researchers have found that these children have high emotional reactivity (Ambrose et al., 2015; Eggers et al., 2010; Karrass et al., 2006; Ntourou et al., 2013; Uysal & Ozdemir, 2019). Furthermore, in several studies, children with stuttering have lower scores for adaptability (Anderson et al., 2003; Howell et al., 2004) and higher scores for introversion (Fowlie & Cooper, 1978; Giorgetti et al., 2015) and rhythmicity (Anderson et al., 2003).

As a multidimensional term, as explained above, temperament has dimensions that are closely related to aspects of attention-deficit hyperactivity disorder (Chauhan et al., 2019; Foley et al., 2008; Nigg, 2006). Negative reactivity, hyperactivity, and attentional focusing or task persistence can be identified as examples of these dimensions (Foley et al., 2008). Children with stuttering have also been reported as exhibiting temperament dimensions related to attention-deficit hyperactivity disorder, including hyperactivity (Eggers et al., 2010; Giorgetti et al., 2015; Howell et al., 2004) and low attention levels (Eggers et al., 2010; Eggers et al., 2013; Felsenfeld et al., 2010; Karrass et al., 2006; Uysal & Ozdemir, 2019).

Attention-deficit hyperactivity disorder (ADHD) and stuttering share many characteristics in addition to temperament (Donaher & Richels, 2012). A complex interplay of neural differences, with genetic and environmental components, has been reported as a possible cause of both disorders. In addition, both may appear more frequently in boys than in girls (Gallo & Posner, 2016). Furthermore, it is emphasized that childhood stuttering can be accompanied by aspects of ADHD (Druker et al., 2019). Likewise, children exhibiting signs of ADHD more frequently display speech disfluencies than their peers (Lee et al., 2017).

Another variable relating to temperament and ADHD is anxiety. If stuttering is examined in terms of temperament and ADHD, anxiety cannot be disregarded. Concerning the relation between temperament and anxiety, it has been noted in the literature that some dimensions of temperament, such as negative reactivity and effortful control, play a role both at the onset and during the course of an anxiety disorder (Bijttebier & Roeyers, 2009). There are many potential interactions between ADHD and anxiety, which may involve their concomitance or interplay (Jarrett & Ollendick, 2008).

School-age children who stutter may obtain higher scores than their peers for several types of anxiety, especially social anxiety (Iverach et al., 2016; Mulcahy et al., 2008; McAllister et al., 2015). However, there are other studies that show no difference between these groups in terms of anxiety (Craig & Hancock, 1996; Rocha et al., 2019; Smith et al., 2017). In addition, whether temperament is predictive of anxiety symptoms accompanying stuttering or whether anxiety results from negative social experiences in later years is not yet clear (Kefalianos et al., 2012).

In the light of the literature described, it is suggested that children with stuttering and those without stuttering will display different profiles in terms of temperament, certain aspects of ADHD, and some types of anxiety. In addition, it is to be expected that there will be some correlations between these variables in children who stutter. However, it is not possible to draw definite conclusions about this issue that could be generalized to all children who stutter. Furthermore, there are very few studies that deal with combinations of these variables (Rocha et al., 2019).

The aim of this study is to compare children with stuttering and those without stuttering regarding dimensions of temperament, aspects of ADHD, and types of anxiety and to examine the relations between the components of stuttering and these variables in children who stutter. The results of the study will contribute to the literature on the multidimensional nature of this disorder.

METHOD

Study Group

The participants were 32 children who stuttered (CWS) (age range = 8–11) and 32 children who did not stutter (CWNS). The participants were accessed through schools and private institutions offering speech and language therapies in Istanbul, Turkey. The groups were matched in terms of age and gender. The distribution of girls and boys in both groups was adjusted according to the universal gender ratios for stuttering (the ratio female: male was about 1:4–5) (Table 1).

Table 1. Descriptive statistics of demographic features of the participants

Groups	Gender (n)		Age (months)		
	Girls	Boys	Mean±SD	Min	Max
Stuttering	5	27	110.09±12.4	96	141
Non-stuttering	5	27	110.53±12.2	96	139
Total	10	54			

n: Number of participants, SD: Standard deviation

The inclusion criteria for the children with stuttering were determined according to the literature (Yairi et al., 1996; Yairi & Seery, 2015). According to these, confirmation of a history of developmental stuttering by the participants and their families, a diagnosis of stuttering by the researchers according to the Stuttering Severity Instrument–Fourth Edition (SSI-4), and a stuttered syllable rate of at least 3% in a spontaneous speech sample of at least 400 syllables were determined as inclusion criteria for this study.

To form the non-stuttering group, procedures frequently described in the literature were followed (Pellowski & Conture, 2002; Yairi & Ambrose, 1992). A sociodemographic data form was utilized to determine that the participants did not stutter. In addition, the researchers checked the speech samples of at least 400 syllables to confirm that there was no stuttering-like disfluency.

Inclusion criteria for both groups were as follows: a) a lack of any history of a neuropsychiatric disease or additional speech and language disorder, and b) not taking any medication likely to affect cognitive function. These two criteria were fulfilled through the use of a sociodemographic data form given to the families of the participants. Furthermore, the researchers observed the participants during in-person interviews to ensure that the participants did not have additional communication impairments.

Ethical Statement

Ethical approval was obtained from the Ethical Committee for Noninterventional Research at Üsküdar University (Approval Number: 61351342/2020-205; Approval Date:04/05/2020). The study was conducted in accordance with Helsinki Declaration. Informed consent was also obtained from the participants and their families.

Data Collection Tools

The Conners' Parent Rating Scale Long Form-Revised. The Conners' Parent Rating Scale Long Form-Revised (CPRS-R) was developed by Conners (1997), and the validity and reliability of the scale for use in the Turkish population were tested by Kaner et al. (2011). The scale is based on parents' reports and is primarily directed towards measuring aspects of ADHD in individuals aged 3–17 years while also evaluating problematic behaviors under such dimensions as anxiety, oppositional, perfectionism, and social and psychosomatic problems. It is a four-point Likert-type scale and is composed of 80 items. Fit indices from confirmatory factor analysis show that the original structure of the scale is valid for the Turkish culture (RMSEA = 0.04; RMR = 0.04; GFI = 0.90; AGFI = 0.89). Cronbach's alpha coefficients for the scale range from moderate to high (0.85–0.55). The test-retest reliability coefficients for the scale range between 0.74 and 0.42 (Kaner et al., 2011).

Spence Children's Anxiety Scale-Parent. Spence Children's Anxiety Scale-Parent (SCAS-Parent) was created by Spence (1998), and the validity and reliability of the scale for use in the Turkish population were tested by Orbay and Ayvasik (2006). SCAS-Parent is a Likert-type scale composed of 38 items. It evaluates various types of anxiety in children aged 7–12 years, including separation anxiety, panic attacks, social phobia, obsessive-compulsive disorder, and agoraphobia. Cronbach's alpha for the scale is 0.88, and the split-half reliability is 0.79. The reliability coefficients for the subscales are shown to range from 0.54 to 0.71 (Orbay & Ayvasik, 2006).

The School-Age Temperament Inventory. Developed by McCloskey (1995), the School-Age Temperament Inventory (SATI) was adapted into Turkish by Eremsoy (2007). The SATI measures temperament dimensions in children aged 8–11 years based on their parents' reports. It has four subscales: approach/withdrawal, task persistence, activity, and negative reactivity. It is a five-point Likert-type scale composed of 38 items. The internal consistency coefficient for the Turkish version ranges from .79 to .86. The test-retest coefficients for the inventory are between .85 and .93 (Eremsoy, 2007).

Stuttering Severity Instrument-Fourth Edition. The Stuttering Severity Instrument-Fourth Edition (SSI-4) was developed by Riley and Bakker (2009). SSI-4, designed for children aged 6–16 years, was

tested for its validity and reliability in the Turkish environment by Mutlu (2014). It yields four types of score: frequency of disfluency, average duration of disfluencies, physical concomitants, and total stuttering severity score. Cronbach's alpha is .94. The interrater reliability for the total score and subscale scores of the instrument vary from 94.65% to 98.5%. In the test-retest reliability analysis, the total score and the subscale scores, with the exception of the physical concomitants score ($p = .029$), do not differ significantly (Mutlu, 2014).

Sociodemographic Data Form. A sociodemographic data form was created by the researchers and was filled in by the children participating in the study and their parents. The form has two sections; the first section contains questions about the demographic characteristics of the participants, and the second section contains questions about the inclusion criteria, such as a history of stuttering and additional impairments.

Process

After informed consent was obtained from the participants, both the children with stuttering and those without stuttering were asked to complete the sociodemographic data form. The parents of all the children were also asked to fill in a form eliciting information about any history of stuttering. Next, a researcher talked to the children and evaluated the general features of their speech. At this stage, any children found to have an additional impairment were excluded from the study. The parents were then given information about the other data collection tools and were asked to complete them. Finally, each child was involved in an interview, and spontaneous speech and reading samples involving a minimum of 400 syllables were obtained. These samples were video recorded.

Data Analysis

Data were analyzed with SPSS 21.0 (NY IMB Corp., 2012), and $p < .05$ was considered significant for the analyses. Depending on the normality of the data obtained, the independent samples t-test and the Mann-Whitney U test were employed to compare the groups. Pearson correlation analysis was performed to determine the relations between variables in the children with stuttering.

RESULTS

Comparison of children who stutter with those who do not stutter by using data from the Conners' Parent Rating Scale Long Form-Revised and using the Mann Whitney U test

The results from the comparison of the scores for the stuttering and non-stuttering groups on the subscales of the CPRS-R, calculated by using the Mann-Whitney U test, are presented in Table 2.

Table 2. The comparison of the scores for the subscales of CPRS-R between the stuttering group (n=32) and the nonstuttering group (n=32) by using Mann Whitney U test

CPRS-R subscales	Stuttering			Non-stuttering			
	Mean rank	Sum of ranks	Mean rank	Sum of ranks	u	z	p
Cognitive problems/Inattention	34.27	1096.5	30.73	983.5	455.5	-0.760	0.447
Hyperactivity	40.84	1307.0	24.16	773.0	245.0	-3.599	0.001*
Anxiety-Shyness	38.23	1223.5	26.77	856.5	328.5	-2.472	0.013
Perfectionism	33.14	1060.5	31.86	1019.5	491.5	-2.277	0.782
Social problems	32.72	1047.0	32.28	1033.0	505.0	-0.097	0.923
Psychosomatic	33.42	1069.5	31.58	1010.5	482.5	-0.403	0.687

ADHD index	36.47	1167.0	28.63	913.0	385.0	-1.708	0.088
Global index:restlessness-impulsivity	41.13	1316.0	23.88	764.0	236.0	-3.724	0.001*
Global index:emotional lability	37.17	1189.5	27.83	890.5	362.5	-2.030	0.042*
DSM-IV symptoms:inattention	34.97	1119.0	30.03	961.0	433.0	-1.065	0.287
DSM-IV symptoms:Hyperactivity-impulsivity	37.77	1208.5	27.23	871.5	343.5	-2.267	0.023*
DSM-IV symptoms:total	37.50	1200.0	27.50	880.0	352.0	-2.150	0.032*

CPRS-R: Conners' Parent Rating Scale Long Form-Revised, ADHD: Attention Deficit and Hyperactivity Disorder, DSM-IV: Diagnostic and Statistical Manual of Mental Disorder, n: Number of participants, u: Mann-Whitney U test, $p^* < 0.05$

As shown in Table 2, the stuttering group had significantly higher scores for the CPRS-R subscales hyperactivity ($Z = -3.599$; $p = .001$), global index: restlessness-impulsivity ($Z = -3.724$; $p = .001$), global index: emotional lability ($Z = -2.030$; $p = 0.042$), DSM-IV symptoms: hyperactivity-impulsivity ($Z = -2.267$; $p = .023$), and DSM-IV symptoms: total ($Z = -2.150$; $p = 0.032$) than the non-stuttering group.

Comparison of the stuttering and non-stuttering groups by using data from the Conners' Parent Rating Scale Long Form-Revised and the Spence Children's Anxiety Scale-Parent by using the independent samples t-test

The comparison of the scores for the subscales of the CPRS-R and the SCAS-Parent between the stuttering and non-stuttering groups, calculated by using the independent samples t-test, are shown in Table 3.

Table 3. Results of the comparison of the CPRS-R and SCAS-Parent scores between the stuttering group (n=32) and the nonstuttering group (n=32) by using independent samples t-test

	Stuttering		Non-stuttering		t	p
	Mean	SD	Mean	SD		
CPRS-R subscales:						
Oppositional-defiant disorder	11.13	5.4	7.75	6.7	-2.207	0.031*
Global index:total	11.13	6.1	6.31	5.5	-3.307	0.002*
SCAS-Parent:						
Social phobia	9.13	4.7	6.88	4.1	-2.033	0.046*
SCAS-Parent total	26.63	13.5	17.44	10.4	-3.046	0.003*

CPRS-R: Conners' Parent Rating Scale Long Form-Revised, SCAS-Parent: Spence Children's Anxiety Scale - Parent, SD: Standard deviation, t: Student's t-test, $*p < 0.05$

As presented in Table 3, the stuttering group received significantly higher scores for the CPRS-R subscale oppositional-defiant disorder ($t = -2.207$; $p = 0.031$) and the global index: total ($t = -3.307$; $p = 0.002$) than the non-stuttering group. Also, as shown in Table 3, the stuttering group had a significantly higher score for SCAS-Parent subscale social phobia ($t = -2.033$; $p = 0.046$) and a significantly higher total score for SCAS-Parent ($t = -3.046$; $p = 0.003$) than the non-stuttering group.

Comparison of the scores for the Spence Children's Anxiety Scale-Parent and the School-Age Temperament Inventory between the stuttering and non-stuttering groups

The comparison of the scores for the subscales of the SCAS-Parent and the SATI between the stuttering and non-stuttering groups, calculated by using the Mann-Whitney U test, is presented in Table 4.

Table 4. The comparison of the scores for the subscales of the SCAS-Parent and the SATI between the stuttering group (n=32) and the nonstuttering group (n=32) by using Mann Whitney U test

	Stuttering		Non-stuttering		u	z	p
	Mean rank	Sum of ranks	Mean rank	Sum of ranks			
SCAS-Parent subscales:							
Separation anxiety	37.31	1194.0	27.69	886.0	358.0	-2.075	0.038*
Panic attacks	35.94	1150.0	29.06	930.0	402.0	-1.506	0.132
OCD	37.47	1199.0	27.53	881.0	353.0	-2.185	0.029*
Agoraphobia	33.58	1074.5	31.42	1005.0	477.5	-0.475	0.635
Subscales of the SATI:							
Negative reactivity	40.03	1281.0	24.97	799.0	271.0	-3.239	0.001*
Task persistence	29.72	951.0	35.28	1129.0	423.0	-1.196	0.232
Approach-withdrawal	37.67	1205.5	27.33	874.5	346.5	-2.227	0.026*
Activity	39.91	1277.0	25.09	803.0	275.0	-3.191	0.001*

SCAS-Parent: Spence Children's Anxiety Scale – Parent, SATI: The School-Age Temperament Inventory, OCD: Obsessive-compulsive disorder, u: Mann-Whitney U test, $p < 0.05$

According to Table 4, the stuttering group had significantly higher scores for the SCAS-Parent subscales separation anxiety ($Z = -2.075$; $p = 0.038$) and obsessive-compulsive disorder ($Z = -2.185$; $p = 0.029$) than the non-stuttering group. Also, as demonstrated in Table 4, the stuttering group received significantly higher scores for the SATI subscales negative reactivity ($Z = -3.239$; $p = 0.001$), approach-withdrawal ($Z = -2.227$; $p = 0.026$), and activity ($Z = -3.191$; $p = 0.001$) than the non-stuttering group.

Relations between stuttering severity-related variables and the subscales of CPRS-R, SCAS-Parent, and SATI

The relations between the stuttering severity-related variables, examined by using SSI-4, and the subscales of the CPRS-R, SCAS-Parent, and SATI, were analyzed using the Pearson correlation analysis. There was no significant relationship between the stuttering severity-related variables and the subscales of CPRS-S, SCAS-Parent, and SATI, as presented in Tables 5-7 ($p > .05$).

Table 5. Pearson's correlation analysis findings on the investigation of the relationships between the severity of stuttering variables and the CPRS/R subscale scores in children with stuttering

CPRS-R subscales		Stuttering Frequency	Stuttering Duration	Physical Concomitants	SSI-4 Severity Degree
Oppositional-defiant disorder	r	.072	.020	-.205	-.039
	p	.694	.912	.260	.833
	n	32	32	32	32
Cognitive problems / Inattention	r	.082	-.148	-.141	-.078
	p	.656	.419	.440	.672
	n	32	32	32	32
Hyperactivity	r	-.076	-.251	.012	-.141
	p	.678	.166	.949	.440
	n	32	32	32	32
Anxiety-Shyness	r	-.023	-.155	-.155	-.155

	p	.899	.396	.398	.396
	n	32	32	32	32
Perfectionism	r	.146	-.017	.202	-.017
	p	.426	.927	.268	.927
	n	32	32	32	32
Social problems	r	.197	.007	-.130	.007
	p	.279	.968	.478	.968
	n	32	32	32	32
Psychosomatic	r	.145	.072	.075	.072
	p	.429	.694	.684	.694
	n	32	32	32	32
ADHD index	r	-.067	-.179	-.216	-.179
	p	.716	.327	.235	.327
	n	32	32	32	32
Global index: restlessness impulsivity	r	-.046	-.140	-.230	-.140
	p	.803	.445	.205	.445
	n	32	32	32	32
Global index: emotional lability	r	.051	-.073	-.065	-.073
	p	.783	.693	.722	.693
	n	32	32	32	32
Global index: total	r	.010	-.108	-.155	-.108
	p	.957	.555	.396	.555
	n	32	32	32	32
DSM-IV symptoms: inattention	r	.035	-.229	-.120	-.229
	p	.849	.207	.512	.207
	n	32	32	32	32
DSM-IV symptoms: Hyperactivity-impulsivity	r	-.173	-.301	.027	-.301
	p	.344	.095	.883	.095
	n	32	32	32	32
DSM-IV symptoms: total	r	-.094	-.306	-.027	-.306
	p	.610	.089	.882	.089
	n	32	32	32	32

CPRS-R: Conners' Parent Rating Scale Long Form-Revised, ADHD: Attention Deficit and Hyperactivity Disorder, DSM-IV: Diagnostic and Statistical Manual of Mental Disorders, SSI: Stuttering Severity Instrument, n: Number of participants, r: Pearson correlation coefficient, $p^* < 0.05$

Table 6. Pearson's correlation analysis findings on the investigation of the relationships between stuttering severity variables and SCAS-Parent subscale scores and total score in children with stuttering

SCAS-Parent subscales		Stuttering Frequency	Stuttering Duration	Physical Concomitants	SSI-4 Severity Degree
Separation anxiety	r	-.152	-.215	-.082	-.206
	p	.407	.238	.657	.258
	n	32	32	32	32
Panic attacks	r	.044	.117	-.050	.234

	p	.813	.525	.785	.197
	n	32	32	32	32
Social phobia	r	.209	.016	-.334	-.022
	p	.251	.932	.062	.906
	n	32	32	32	32
Obsessive-compulsive disorder	r	.044	.006	-.050	.005
	p	.813	.974	.785	.979
	n	32	32	32	32
Agoraphobia	r	.193	-.146	-.018	.035
	p	.289	.425	.921	.851
	n	32	32	32	32
SCAS-Parent total score	r	.137	-.062	-.266	-.065
	p	.456	.734	.141	.725
	n	32	32	32	32

SCAS-Parent: Spence Children's Anxiety Scale – Parent, SSI: Stuttering Severity Instrument, n: Number of participants, r: Pearson correlation coefficient, $p < 0.05$

Table 7. Pearson's correlation analysis findings on the investigation of the relationships between the severity of stuttering variables and the subscales of the SATI scores in children with stuttering

Subscales of the SATI		Stuttering Frequency	Stuttering Duration	Physical Concomitants	SSI-4 Severity Degree
Negative reactivity	r	-.135	-.059	-.036	-.112
	p	.461	.749	.843	.540
	n	32	32	32	32
Task persistence	r	.158	.100	-.254	.173
	p	.389	.587	.161	.344
	n	32	32	32	32
Approach-avoidance	r	.158	.086	-.254	.014
	p	.389	.639	.161	.938
	n	32	32	32	32
Activity	r	-.074	-.175	-.109	-.159
	p	.688	.337	.551	-.159
	n	32	32	32	32

SATI: The School-Age Temperament Inventory, SSI: Stuttering Severity Instrument, n: Number of participants, r: Pearson correlation coefficient, $p < 0.05$

DISCUSSION

In the present study, children with and without stuttering were compared in terms of dimensions of temperament, aspects of ADHD, and types of anxiety. The children with stuttering were found to have significantly higher scores for most of the comparisons in these three categories. However, no significant relation was found between stuttering severity-related variables and temperament, ADHD, and anxiety. The results obtained are discussed below in light of the literature on psychology and stuttering.

Differences in Temperament and ADHD Between Stuttering and Non-stuttering Children

Children with stuttering were found to obtain significantly higher scores for the SATI subscales negative reactivity and approach/withdrawal. Consistent with this finding, the children with stuttering also had a significantly higher score on the CPRS-R subscale emotional lability. According to the findings, "Expressing more frequent negative emotions and "Avoiding new people, strangers and situations" (Eremsoy, 2007) characterized the stuttering group regarding temperament. Previously, many researchers have reported similar findings in children with stuttering regarding emotional reactivity (e.g. Ambrose et al., 2015; Ntourou et al., 2013; Uysal & Özdemir, 2019), approach-avoidance, and introversion (e.g. Giorgetti et al., 2015; Uysal & Ozdemir, 2019).

In the current study, the comparison of the CPRS-R subscale scores between the stuttering and nonstuttering children showed that the stuttering group is characterized by certain aspects of ADHD. This is compatible with evidence about the relation between stuttering and ADHD reported in many studies (Donaher & Richels, 2012; Druker et al., 2019; Healey & Reid, 2003). In fact, the possible temperament characteristics in children with stuttering are associated with several aspects of ADHD (Alm, 2014). In the present study, the presence of a difference in the activity dimension of temperament between the stuttering and non-stuttering groups seemed to support the evidence from the literature. The children with stuttering also had a significantly higher score for the activity dimension of temperament. This finding, suggesting a high level of motor activity (Eremsoy, 2007), seemed to confirm findings concerning the CPRS-R, utilized to measure aspects of ADHD since these subscales involve items relating to motor activity levels (Kaner et al., 2011). This is not a surprising finding when taking into consideration the likelihood of a high prevalence of hyperactivity in stuttering (Druker et al., 2019) and similar findings in the literature on stuttering (Giorgetti et al., 2015; Howell et al., 2004).

In the present study, the children with stuttering were also shown to have a significantly higher score for the CPRS-R subscale oppositional defiant disorder. This subscale is related to conduct problems (Kaner et al., 2011). In fact, the definition of destructive behaviors involves impulsivity, attention problems, and hyperactivity (McMahon, 1994). However, making generalizations about oppositional characteristics in stuttering children is only speculative since they do not have any basis in the relevant literature.

Taken together, the findings of temperament and ADHD seem to support the hypotheses proposed in the literature that stuttering children have more negative reactivity to emotional stimuli and are more unsuccessful in regulating their emotions and adapting to new situations (Ambrose et al., 2015; Ntourou et al., 2020; Zengin-Bolatkale et al., 2018).

Anxiety in Stuttering

In the current study, the children with stuttering obtained significantly higher scores for SCAS-Parent and for certain types of anxiety compared to their peers with normal fluency. Some of these findings seem to be complementary to the ones about temperament and ADHD. The most salient finding was that stuttering children have a significantly higher score for the subscale social phobia, which is congruent with the literature (Blood et al., 2001; Blood et al., 2007; Cherif et al., 2018; Iverach et al., 2016; Mulcahy et al., 2008). When the connection between temperament and anxiety is taken into account (Liotta, 2013; Ollendick & Hirshfeld-Becker, 2002), the finding of social phobia is consistent with the scores for the subscale approach/withdrawal, suggesting that stuttering children experience more social withdrawal.

It has been reported in the literature that children with high negative reactivity are more easily affected by stress and are more likely to exhibit anxiety symptoms (Bates et al., 1991). When the evidence from

the literature that children with stuttering feel daily stressors more (Blood et al., 1997) and those anxiety symptoms are related to stuttering (Smith et al., 2014) is taken into consideration, the negative reactivity dimension of temperament might have modulated the results of this study. In fact, one of the results of this study, namely that children with stuttering differ significantly from their non-stuttering peers in terms of both negative reactivity and anxiety symptoms, supports this notion.

The stuttering group also had a significantly higher score for the SATI subscale approach/withdrawal. This finding is supported by the significantly higher score of children with stuttering on the SCAS-Parent subscales social phobia and separation anxiety. These subscales relate to the presence of profound fear in social environments or situations requiring effort, with anxiety about being separated from home or from people important to the children (Orbay & Ayvasik, 2006).

Attributing the high anxiety scores of children with stuttering only to the connection between temperament and anxiety can be quite misleading. It could suggest that the possible relation between social anxiety and emotional/negative reactivity in normally fluent children (Goldin et al., 2009) is quite different from that in children who stutter. The commonly held view is that the high levels of social anxiety in children who stutter originate from their stuttering-related experiences and therefore rise increasingly, regardless of temperament (Blood & Blood, 2007; Cook & Howell, 2014; Kefalianos et al., 2012).

The children with stuttering also obtained a significantly higher score on the Separation Anxiety subscale compared to the non-stuttering peers, which is consistent with their total anxiety score. When the potentially negative effect of stuttering on children's communication with people other than members of their family is considered (Kikuchi et al., 2019), it is to be expected that these children will exhibit separation anxiety. Previous studies with stuttering children and adolescents have yielded similar findings (Iverach et al., 2016; McAllister, et al., 2015).

Another anxiety-related finding of the present study is that the stuttering children got a significantly higher score for the SCAS-Parent subscale obsessive-compulsive disorder. However, considering other studies that do not show a difference in obsessive-compulsive disorder in school-aged children with stuttering (Iverach et al., 2016) hinders the drawing of a strong conclusion about this interaction between stuttering and obsessive-compulsive disorder.

It should be kept in mind that the SCAS-Parent is a parent-report scale. It has been reported that parents of children with stuttering can also have high levels of anxiety about the effects of the child's stuttering (Costelloe et al., 2018). In other words, parents of children with stuttering can have increased sensitivity to anxiety in their children, and this might have affected the results of the present study.

Relation Between Stuttering Severity, Temperament, ADHD, and Types of Anxiety

In this study, stuttering severity showed no relation with temperament, ADHD, or types of anxiety. These findings are consistent with those of Eggers et al. (2010) and Uysal and Ozdemir (2019), who reported no relation between stuttering severity and temperament. However, Johnson et al. (2010) and Ntourou et al. (2020) did show a relationship between them. There is also conflicting evidence about the relation between stuttering severity and ADHD. While one study shows a significant correlation between these variables (Druker et al., 2019), Donaher and Richels (2012) do not report a significant correlation between them. In addition, some studies demonstrate a correlation between stuttering severity and types of anxiety (Blood et al., 2007; Craig & Hancock, 1996; Mulcahy et al., 2008) while other studies do not reveal any

relation between them (Blood et al., 2001), which is compatible with the results of the present study. The conflicting evidence about the relationship between stuttering severity and temperament, ADHD, and types of anxiety can be ascribed to potential problems with the validity and reliability of the tools utilized to measure stuttering severity in the presence of many mediating psychological variables and the wide variety of tools utilized to collect the data about these psychological variables (scales and experimental tasks, etc.).

Despite the valuable findings described, this study is not without its limitations. Data were collected only with parent-report scales, while child-report scales and task-based measurements were not used. If further studies are to provide more reliable results, it is recommended that these additional data collection methods be used. Furthermore, whether or not participants were receiving therapy was not considered as an inclusion criterion. Adopting this criterion, especially for the variable anxiety, could provide more accurate results. So that the interactions between stuttering, anxiety, and ADHD can be more clearly interpreted, stuttering individuals exhibiting ADHD and those not exhibiting ADHD could be compared in terms of the features of anxiety. In addition, longitudinal studies are needed to investigate the interactions between temperament and anxiety.

Conclusion and Suggestions

Stuttering is generally more than a phenomenon involving difficulty in the physical production of sounds or words. As shown in the present study, cognitive and emotional factors may also play a role in stuttering. Therefore, professionals working with stuttering individuals should be aware of differences in the dimensions of temperament, aspects of ADHD, and types of anxiety that are associated with stuttering. In fact, as shown in the present study, professionals should be aware that these features may affect stuttering subclinically irrespective of the fact that an individual is diagnosed with ADHD or anxiety disorder, and should plan appropriate assessments and treatment programs.

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Author Contributions

This study was conducted by both of the authors working together and cooperatively. Both of the authors substantially contributed to this work in each step of the study.

Conflict of Interest

It has been reported by the authors that there is no conflict of interest.

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