

## Psychometric Properties of Turkish Version of the Strength and Difficulties Questionnaire for Age 2-4

### Güçler ve Güçlükler Anketinin 2-4 Yaş için Türkçe Versiyonunun Psikometrik Özellikleri

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#### ABSTRACT

**Introduction:** Strengths and Difficulties Questionnaire for 2-4 year olds (SDQ 2-4) is one of the best of these scales developed to screen children in early childhood for psychosocial problems. The aim of this study is to investigate the psychometric properties of SDQ 2-4 in Turkish for the age group of 2-4 years.

**Methods:** The study was conducted with 159 participants. SDQ 2-4 Parent and BITSEA scales were applied to parents. Patients whose scores were detected to be at risk were referred to the hospital and a clinical interview was performed.

**Results:** Chronbach alpha value for total difficulties scale was 0.80. Total difficulties score of the SDQ was positively correlated with the BITSEA/P

score, and negatively correlated with the BITSEA/C score. Prosocial Behaviors score of SDQ was positively correlated with BITSEA/C while it was negatively correlated with BITSEA/P. In all scales of SDQ that identified the problem, the scores of the participants with clinical diagnosis were significantly higher than the scores of the participants not diagnosed. The cut-off value for total difficulties scale was calculated as 10 with 80% sensitivity and 88% specificity.

**Conclusion:** The SDQ 2-4 scale is valid and reliable in the Turkish language.

**Keywords:** SDQ; validity; reliability; Turkish; BITSEA

#### ÖZ

**Amaç:** Güçler ve Güçlükler Anketi 2-4 yaş arası çocuklar için (SDQ 2-4), erken çocukluk dönemindeki psikososyal problemleri taramak için geliştirilen en iyi ölçeklerden birisidir. Bu çalışmanın amacı, 2-4 yaş grubunda Türkçe SDQ 2-4'ün psikometrik özelliklerini araştırmaktır.

**Yöntem:** Çalışma 159 katılımcı ile gerçekleştirildi. SDQ 2-4 Ebeveyn anketi ve BITSEA ölçekleri ebeveynlere uygulandı. Skorları riskli bulunan hastalar hastaneye sevk edildi ve klinik görüşme yapıldı.

**Bulgular:** Toplam güçlükler alt ölçeği için Chronbach alfa değeri 0,80'di. SDQ'nun toplam güçlükler skoru BITSEA/P skoru ile pozitif, BITSEA/C

skoru ile negatif korelasyon gösterdi. SDQ Prosocial Davranışlar skoru BITSEA/C ile pozitif korelasyon gösterirken, BITSEA/P ile negatif korelasyon gösteriyordu. Sorun tanımlayan tüm SDQ alt ölçeklerinde, klinik tanılu katılımcıların puanları, tanı konmamış katılımcıların puanlarından anlamlı derecede yüksekti. Toplam güçlükler alt ölçeği için kesme değeri %80 duyarlılık ve %88 özgüllük ile 10 olarak hesaplandı.

**Sonuç:** SDQ 2-4 ölçeği Türkçe dilinde geçerli ve güveniliridir.

**Anahtar Kelimeler:** SDQ; geçerlilik; güvenilirlik; Türkçe; BITSEA

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#### INTRODUCTION

In epidemiological studies of early childhood, emotional and behavioral symptoms are seen in 7.3-16% of preschool children (1, 2), and 7.1-16.2% of preschool children have psychiatric disorder (3, 4). Despite fairly high rates of psychiatric diagnoses, many of the patients do not seek treatment. Problems that can be overcome with early diagnosis and treatment become more serious over time (5). For this reason, it is extremely important to screen preschool-age children for biopsychosocial problems (6).

Screening with a clinical interview is quite costly and difficult. Depending on this situation screening scales have been developed (7). However, there

are few scales used to assess the psychosocial aspects and to identify the difficulties in preschoolers. Strengths and Difficulties Questionnaire for 2-4 year olds (SDQ 2-4) is one of the best of these scales developed to screen children in early childhood for psychosocial problems (8).

The Strengths and Difficulties Questionnaire was developed in 1997 by Robert Goodman et al. to screen childhood psychopathologies. There are a parent and a teacher form for 2-4, 4-10 and 11-16 years of age, and a form filled by adolescents for 11-16 years of age (9).

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Because of the easy applicability and low cost of SDQ, the scale is often preferred. SDQ is a very common scale in the world, has been translated for more than 40 languages. The scale, can be easily downloaded from [www.sdqinfo.com](http://www.sdqinfo.com) web address. This scale consists of 25 items and consists of emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, and prosocial behaviors subscales. The total difficulties score is reached by summing the scores of first 4 subscales (10).

In the validity-reliability study of Goodman and colleagues, the internal consistency of SDQ was determined to be reliable by a Cronbach's alpha value of 0.73. The SDQ score above the 90th percentile was predictive of a higher probability of psychiatric diagnosis, indicating that the scale was valid (10).

The study comparing the original SDQ with Child Behavior Checklist (CBCL) showed that SDQ and CBCL were highly correlated, similar scores were obtained on both scales, only hyperactivity/inattentive subscale of SDQ was superior to CBCL (11).

In a study comparing SDQ, Ages and Stages Questionnaires: Social-Emotional (ASQ: SE) and KIPPPPI (the acronym standing for 'short instrument for the psychological and pedagogical inventory', a Dutch questionnaire) in the age group of 3–4, SDQ was found to be more successful in screening psychopathologies in this age group than the other two scales (12).

The relationship between SDQ and CBCL scale scores was investigated in Turkish validity-reliability study conducted by Güvenir et al. It has been shown that SDQ is highly correlated with CBCL and can distinguish between high and low risk groups. The Cronbach alpha values showing the internal consistency of subscales other than peer relationship problems subscale are shown to be greater than 0.65. It has been stated that SDQ 4–16 is valid and reliable for the Turkish language (13).

SDQ 2–4 scale seems to be very convenient for quick psychiatric screening in children with aged 2 to 4 years. The aim of this study is to investigate the psychometric properties and the validity and reliability of SDQ 2–4 in Turkish for the age group of 2–4 years.

## METHODS

### Participants

This study was carried out through the participants applying to Psychosocial Development Screening and Monitoring in Early Childhood Centre, which was established in the eastern province of Turkey, Erzurum in 2015. In this center, children between 18–48 months were screened for psychosocial development, psychopathology and parental risk factors for psychiatric disorders and sleep disorders in Erzurum and the screen positive cases were referred to Atatürk University Medical Faculty Hospital, a tertiary-care treatment hospital. In this hospital, the patients were diagnosed and their treatments were started.

According to Emmanuel et al., the number of required participants per item should be 2–20 and the number of participants should be minimum 100 for the sample size of a reliability and validity study of a scale (14). In this regard 171 participants between 18–48 months were included in the study. Of these participants, 12 were excluded due to shortcomings in their forms and the study was conducted with 159 participants. The number of participants per item was calculated as 6.36. The parents of participants were informed about the study. Written informed consent was taken from parents. Ethical approval was obtained from the Ethical Committee of Atatürk University Medical School.

### Strengths and Difficulties Questionnaire for 2–4 year olds (SDQ 2–4)

The 25 items in SDQ 2–4 are divided into 5 subscales, each consisting of 5 items. These are hyperactivity/inattention, emotional symptoms, conduct problems, peer relationship problems and prosocial behaviors subscales. Each item is marked as 'not true', 'somewhat true' and 'certainly true'. The sum of scores for hyperactivity/inattention, emotional symptoms, conduct problems, peer relationship problems subscales constitutes the total difficulty score which is between 0–40. There is also a part of SDQ that is questioning the impact. The total impact score is between 0–10 (10).

In this study, the original SDQ parent form for age 2–4 scale was translated from English to Turkish. Then the Turkish scale was back translated to English by a professional English translator who is blind to the original version of SDQ. The original and back translated versions were compared as word, meaning and content and SDQ 2–4 Turkish version was created. After a pilot study for assessing the applicability final version was prepared.

Brief Infant-Toddler Social and Emotional Assessment (BITSEA) This scale was developed for screening psychosocial developmental problems of children aged 1–4 years. The scale consists of 42 items evaluating social and emotional problems. Thirty-one items are scored for psychiatric problems and these items constitute BITSEA Problem scale (BITSEA/P), while 11 items are for psychosocial development and these items constitute the BITSEA Competence scale (BITSEA/C). Each item is rated 3-point Likert type. A high BITSEA/P score indicates behavioral and emotional problems while a low BITSEA/C score indicates social development problems (1).

The Turkish validity-reliability study of BITSEA was carried out by Karabekiroğlu et al. The Chronbach alpha value for BITSEA/P was 0.81–0.83, while the value for BITSEA/C was 0.72. The BITSEA scores were highly correlated with CBCL internalizing, externalizing and total scores. The Turkish version of BITSEA has been shown to be valid and reliable in screening social, emotional and behavioral problems in children aged 1–4 years (15).

### Procedure

This study was performed retrospectively. The sociodemographic characteristics of the participants were recorded. A general practitioner medical doctor and a nurse applied SDQ 2–4 Parent and BITSEA scales to parents for the purpose of screening the children's psychosocial problems. The scale scores of participants were calculated. Patients whose scores were detected to be at risk were referred to the hospital and a DSM-based clinical interview was performed by an experienced child and adolescent psychiatrist to determine psychiatric disorders who was blind to SDQ and BITSEA scores. Psychometric properties of SDQ 2–4 were detected.

### Statistical Analysis

The majority of analyzes were performed using the IBM Statistical Package for Social Sciences (SPSS) 23.0 for Windows (SPSS Inc., Chicago, Illinois, USA) program. Shapiro-Wilk analysis showed that numerical data were not normally distributed. Correlation of SDQ 2–4 scale scores with age was performed by Spearman Correlation analysis. SDQ scores were compared between genders using the Mann-Whitney U test. When determining reliability, Chronbach alpha analysis was performed to test the internal consistency of the scale. For validity, correlation of SDQ scores with BITSEA scores was analyzed by Spearman Correlation analysis. SDQ and BITSEA scores were compared between the groups according to the results of the screening and diagnosis by the Mann-Whitney U test. Relationships between clinical diagnosis and banding of

**Table 1.** SDQ 2-4 scale scores for gender

Scales	Boys		Girls		U Value	p
	Median	Min-Max	Median	Min-Max		
SDQ/Total Difficulties	4	0-24	3	0-30	2612.5	0.052
SDQ/Emotional Symptoms	0	0-4	0	0-4	2944	0.321
SDQ/Conduct Problems	0	0-7	0	0-8	2863.5	0.224
SDQ/Hyperactivity/Inattention	2	0-10	0	0-10	2657	0.068
SDQ/Peer Relationship Problems	2	0-9	2	0-10	2703	0.086
SDQ/Prosocial Behaviours	10	1-10	10	1-10	2848.5	0.203

\*Mann-Whitney U Test

SDQ were analyzed by Fisher-Freeman-Halton Test. ROC Curve analyzes were performed for SDQ and BITSEA to assess the clinical diagnostic ability. Cut-off scores of SDQ scales for clinical diagnosis were calculated. Comparisons of ROC Curves were performed via the MedCalc Version 18 Program.

**RESULTS**

The mean age of the participants was 26±6 months. Of the 159 children participating in the study, 49.1% (n=78) were boy and 50.9% (n=81) were girl. 9.4% (n=15) of the participants had a clinical diagnosis. Clinical diagnosis was present in 14.1% (n=11) of boys and 4.9% (n=4) of girls, and there was a significant difference between genders ( $\chi^2=3.906$ ,  $p=0.048$ ).

SDQ 2-4 scale scores were assessed by gender and age. No significant difference was found between boys and girls in terms of SDQ scores ( $p>0.05$ ). Table 1 shows SDQ scale scores according to gender. As age increased, a significant increase was found in the total difficulties ( $r=0.527$ ,  $p<0.001$ ), emotional symptoms ( $r=0.411$ ,  $p<0.001$ ), conduct problems ( $r=0.475$ ,  $p<0.001$ ), hyperactivity/inattention ( $r=0.548$ ,  $p<0.001$ ), peer relationships scale scores ( $r=0.162$ ,  $p=0.042$ ) and a decrease was found in the prosocial behaviors score ( $r=-0.397$ ,  $p<0.001$ ).

**Internal Consistency of SDQ 2-4**

Chronbach alpha values for SDQ 2-4 internal consistency analysis were calculated (Table 2). As seen on table, Chronbach alpha value for total difficulties scale was 0.80. High Chronbach alpha values were found on all scales except peer relationship problems scale with the result of 0.381.

**Correlations Between SDQ and BITSEA Scale Scores**

In order to determine the validity of the scale, the correlations between SDQ 2-4 and BITSEA scale scores were assessed. Total difficulties score of the SDQ and the scores of all subscales that forming this scale were positively correlated with the BITSEA/P score, and negatively correlated with the BITSEA/C score. Prosocial Behaviors score of SDQ was positively

**Table 2.** Internal consistency of SDQ 2-4 parent scale

Scales	Chronbach's Alpha Value
Total Difficulties	0.800
Emotional Symptoms	0.712
Conduct Problems	0.797
Hyperactivity/Inattention	0.806
Peer Relationship Problems	0.381
Prosocial Behaviours	0.702

\*Reliability Analysis

correlated with BITSEA/C while it was negatively correlated with BITSEA/P. These correlations can be observed in Table 3.

**Differences in Mean SDQ and BITSEA Scores for Clinical Diagnosis**

The mean SDQ and BITSEA scores of the participants who were referred to the hospital and diagnosed were compared with scores of those without any problems in the scan. In all scales of SDQ that identified the problem, the scores of the participants with clinical diagnosis were significantly higher than the scores of the participants not diagnosed with a DSM 5 criteria based disorder ( $p<0.001$ ). In addition, SDQ Prosocial Behaviors and BITSEA/C scores of negative screening group were significantly higher than the detected diagnosis group ( $p<0.001$ ). Table 4 shows the differences in mean scale scores according to diagnosis and screening results.

**Relationships Between Clinical Diagnosis and Banding of SDQ Scale**

The comparison of banding results obtained from SDQ scale scores according to clinical diagnosis is given in Table 5. According to SDQ total difficulties scale, 33.3% were in very high band, 20% of clinically diagnosed patients were in high and, while 40% were in normal band. 95.1% of participants not diagnosed with a DSM 5 criteria based disorder were in normal band, while 0.7% were in high, 0.7% were in very high band. This difference was statistically significant ( $p<0.001$ ).

**Table 3.** Correlations between SDQ 2-4 and BITSEA scale scores (r values of correlation analysis)

Scales	1	2	3	4	5	6	7	8
1. SDQ/Total Difficulties	1.000					-		
2. SDQ/Emotional Symptoms	0.631	1.000						
3. SDQ/Conduct Problems	0.789	0.485	1.000					
4. SDQ/Hyperactivity/Inattention	0.887	0.500	0.701	1.000				
5. SDQ/Peer Relationship Problems	0.561	0.268	0.391	0.307	1.000			
6. SDQ/Prosocial Behaviours	-0.646	-0.425	-0.604	-0.567	-0.393	1.000		
7. BITSEA/Problem	0.675	0.395	0.596	0.685	0.250	-0.508	1.000	
8. BITSEA/Competence	-0.568	-0.337	-0.455	-0.611	-0.164	0.363	-0.676	1.000

\*Spearman Correlation Analysis \*All correlations were significant at  $p<0.001$  level.

**Table 4.** Differences in mean SDQ and BITSEA scores for clinical diagnosis

Scales	Clinical Diagnosis				U Value	p
	Detected Diagnosis		Negative Screening			
	Mean	Standard Deviation	Mean	Standard Deviation		
SDQ/Total Difficulties	16.33	6.56	4.47	3.80	100	<0.001
SDQ/Emotional Symptoms	1.47	1.25	0.38	0.88	495.5	<0.001
SDQ/Conduct Problems	3.33	2.38	0.58	1.27	294.5	<0.001
SDQ/Hyperactivity/Inattention	6.73	2.76	1.38	1.74	112	<0.001
SDQ/Peer Relationship Problems	4.80	2.46	2.14	1.31	358.5	<0.001
SDQ/Prosocial Behaviours	6.13	3.09	9.55	0.83	311	<0.001
BITSEA/Problem	9.93	8.60	2.39	4.49	468.5	<0.001
BITSEA/Competence	14.47	5.97	20.92	2.75	289.5	<0.001

\*Mann-Whitney U Test

**Table 5.** Relationships between clinical diagnosis and banding of SDQ

Subscales		Clinical Diagnosis				p
		Detected Diagnosis		Negative Screening		
		n	%	n	%	
SDQ/Total Difficulties	Normal	6	40.0	137	95.1	<0.001
	Slightly Raised	1	6.7	5	3.5	
	High	3	20.0	1	0.7	
	Very High	5	33.3	1	0.7	
SDQ/Emotional Symptoms	Normal	12	80.0	139	96.5	0.029
	Slightly Raised	2	13.3	2	1.4	
	High	1	6.7	3	2.1	
	Very High	0	0.0	0	0.0	
SDQ/Conduct Problems	Normal	9	60.0	139	96.5	<0.001
	Slightly Raised	2	13.3	1	0.7	
	High	1	6.7	2	1.4	
	Very High	3	20.0	2	1.4	
SDQ/Hyperactivity/Inattention	Normal	5	33.3	140	97.2	<0.001
	Slightly Raised	4	26.7	2	1.4	
	High	0	0.0	2	1.4	
	Very High	6	40.0	0	0.0	
SDQ/Peer Relationship Problems	Normal	3	20.0	114	79.2	<0.001
	Slightly Raised	1	6.7	10	6.9	
	High	3	20.0	12	8.3	
	Very High	8	53.3	8	5.6	
SDQ/Prosocial Behaviours	Normal	7	46.7	142	98.6	<0.001
	Slightly Lowered	4	26.7	2	1.4	
	Low	1	6.7	0	0.0	
	Very Low	3	20.0	0	0.0	

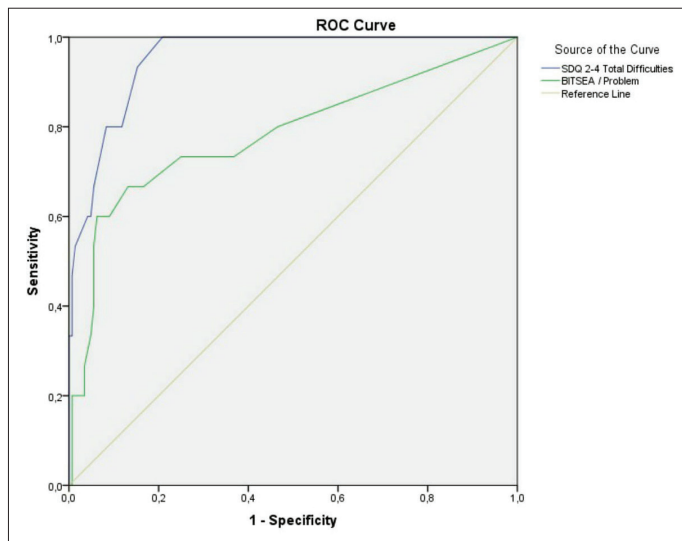
\*Fisher-Freeman-Halton Test

**Table 6.** Cut-off values of SDQ 2-4 scale scores for screening

Subscales	Cut-Off Value	Sensitivity (%)	Specificity (%)	AUC	% 95 CI of AUC
SDQ/Total Difficulties	≥10	80	88	0.954	0.918–0.990
SDQ/Emotional Symptoms	≥1	73	81	0.771	0.635–0.906
SDQ/Conduct Problems	≥2	80	86	0.864	0.750–0.977
SDQ/Hyperactivity/Inattention	≥5	80	94	0.948	0.900–0.996
SDQ/Peer Relationship Problems	≥3	80	79	0.834	0.705–0.963
SDQ/Prosocial Behaviours	≤8	80	89	0.856	0.719–0.993

\*Based on ROC Curve Analysis





**Figure 1.** ROC Curves of SDQ Total Difficulties Scale and BITSEA/P for Clinical Diagnosis

### ROC Analyses of SDQ and BITSEA

ROC curve analyses were performed to assess the clinical diagnostic ability of the SDQ Total Difficulties scale and the BITSEA/P scale. As both scales detect childhood psychiatric disorders, it is expected that the areas under the curve (AUC) will be similar. AUC calculated for total difficulties scale of SDQ was 0.954, while AUC calculated for the BITSEA/problem was 0.783. When two ROC curves were compared, a significant difference was found that AUC of SDQ total difficulties was greater than that of BITSEA/P. ( $Z=2.190$ ,  $p=0.029$ ). The cut-off value for total difficulties scale of SDQ was calculated as 10 with 80% sensitivity and 88% specificity. Cut-off values for the scales are given in Table 6. The ROC curves for both scales are shown in Figure 1.

## DISCUSSION

This study shows that the Turkish SDQ 2-4 form is valid and reliable. Chronbach alpha analyzes were performed to evaluate the internal consistency of the scale and high Chronbach alpha values were found on all scales except peer relationship problems scale. In the original SDQ study performed by Goodman et al., the alpha value was calculated as 0.82, while in the Turkish SDQ for 5-16 ages, it was calculated as 0.800 (10, 13). The value obtained was quite close to that of the original SDQ study, and was exactly the same as the Turkish SDQ for 5-16 ages. This result shows the internal consistency of the scale, indicating that SDQ 2-4 is reliable.

The Chronbach alpha value of peer relationship problems scale in the study was found to be relatively low. Similar to the results obtained, peer relationship alpha value was 0.57 in Goodman's study, 0.51 in Swedish SDQ study, 0.46 in Turkish SDQ for 5-16 ages study, and the lowest alpha values found in the scales were peer relationship scale (10, 13, 16). It was stated that this condition may be caused by the low number of items in this subscale (13).

The correlation between SDQ and BITSEA scores was investigated in the study. The problem areas of the scales were positively correlated with each other, social competence areas were positively correlated with each other, and social competence and problem areas were found to be correlated negatively. Previous studies have investigated the correlations of the SDQ and CBCL scales and have shown that these two scales were correlated with each other (11, 17). Besides, a positive correlation between BITSEA and CBCL was shown in the Turkish BITSEA validity reliability study (15). Because both SDQ and BITSEA scales were used to screen for early

developmental problems, it was observed that the two scales were well correlated as expected. The SDQ and BITSEA scores of the participants with detected diagnosis and negative screening were compared and the scores of the patients with detected diagnosis on all scales that detected the problem were found to be significantly higher than the scores of the screening negative participants. On the scales that measure social competence, the score of the screening negative participants is higher. It has been shown that SDQ can be used for screening psychiatric diagnoses in studies conducted in many different countries such as United States of America, England, Italy, China (10, 18-20). This study has shown that Turkish SDQ 2-4 can be used for psychiatric screening.

Participants with detected diagnosis were in more serious bands than the screening negative participants, while the screening negative participants usually were in normal band on SDQ. This result shows that besides the scores obtained from the scale, the categorization obtained from the scores is also very useful. To our best knowledge, no study investigated the relationship between the four-band scale categorization for SDQ and clinical diagnosis.

In the ROC analysis of SDQ total difficulties and BITSEA/P scales, the AUC of the SDQ total difficulties scale was significantly higher than the AUC of the BITSEA/P scale. This result suggests that SDQ 2-4 was better than BITSEA in predicting clinical diagnosis. In a study conducted by Goodman et al., it has been shown that SDQ was as good as CBCL in detecting internalizing and externalizing problems and better than CBCL in detecting hyperactivity/inattention (11). In the validity-reliability study of the German SDQ performed by Klasen et al., it was shown that CBCL and SDQ could distinguish the clinical sample from the community sample, and SDQ was better than CBCL in distinguishing only hyperactivity-inattention (17).

The cut-off values for SDQ 2-4 scales can be determined with 80% sensitivity on the ROC curve according to the clinical diagnosis or percentile values such as 70%, 80% or 90% of the scores. In the SDQ validation studies, the cut-off value for total difficulties was 9.5 for Finland, 10 for Spain, Netherlands, Australia, 11 for Sweden and Iran, and 14 for UK study. Spain and Netherlands studies were conducted in the 3-4 age range group, while all other studies were conducted in children 5 years and older (9, 10, 12, 21-25). The cut-off value obtained in our study is quite similar to the cut-off values obtained from other countries.

Another finding is that as age increases, SDQ scores increase in problem areas and decrease in prosocial behaviors score. In fact, this finding is consistent with the literature. In preschool children, epidemiological studies have shown both the prevalence of psychopathology and comorbidity increase in children aged 3 years compared to aged 2 years (4).

Furthermore, there was no significant difference in sex for the scores of SDQ total difficulties and other scales. Similarly, no significant difference was found in the study conducted in Spain for this age group (25). This may be due to the lack of psychopathology frequency difference between sexes in preschool children (26, 27).

### Limitations

CBCL is used in many validation studies of screening questionnaires but we used BITSEA instead. CBCL was translated into Turkish and the validity-reliability study was not published for the 2-4 years old children and its data could not be obtained

Among the limitations of the study, test-retest and interrater reliability were not applied in the study. Since the data obtained from a screening center has been retrospectively analyzed, these analyzes have not been performed.

## CONCLUSION

Consequently, the SDQ 2–4 scale is valid and reliable in the Turkish language. The SDQ 2–4 is appropriate to be used for screening purposes to assess the psychosocial aspects and to identify the difficulties in preschool-age children. It is expected to be widely used because the SDQ is short, easy to apply and free. Children who have a score above the cut-off value should be referred to a child psychiatrist.

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