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| Research Article / Araştırma Makalesi |

Mathematics Anxiety Among Primary School Teachers: Scale Adaptation and Anxiety Level Determination Study

Sınıf Öğretmenlerinin Matematik Kaygısı: Ölçek Uyarlama ve Kaygı Düzeyi Belirleme Çalışması

Eyüp BOZKURT[1], **Deniz KILIÇ**[2]

Keywords

1. Mathematics anxiety
2. Scale adaptation
3. Primary school teachers
4. Anxiety level

Anahtar Kelimeler

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Abstract

Purpose: This study aims to adapt a scale to measure the mathematics anxiety of primary school teachers and to determine their anxiety levels. Mathematics anxiety can significantly impact teachers' professional competencies and their effects on students. Therefore, accurately determining teachers' anxiety levels and developing strategies to reduce this anxiety is of great importance.

Design/Methodology/Approach: The research used a cross-sectional survey design and was carried out with 300 primary school teachers from various regions across Turkey during the spring term of 2023. Data were collected through an online survey, and validity and reliability analyses were conducted on the adapted scale. Expert opinions were sought for the linguistic and cultural adaptation of the scale, a pilot study was conducted, and then the main study was carried out.

Findings: The findings obtained during the scale adaptation process indicate that the scale is valid and reliable. The mathematics anxiety levels of teachers show significant differences according to variables such as gender, age, and professional experience. Notably, it was found that female teachers have higher levels of mathematics anxiety compared to male teachers. Additionally, teachers with less professional experience were found to have higher anxiety levels.

Highlights: Mathematics anxiety among primary school teachers is a crucial factor that should be considered when developing educational policies and teacher training programs. Strategies and support programs to reduce mathematics anxiety are recommended. Teacher training programs should include methods and techniques to reduce mathematics anxiety.

Öz

Çalışmanın amacı: Bu çalışmanın amacı, sınıf öğretmenlerinin matematik kaygısını ölçmek için bir ölçek uyarlamak ve öğretmenlerin kaygı düzeylerini belirlemektir. Matematik kaygısı, öğretmenlerin mesleki yeterliliklerini ve öğrencilere olan etkilerini önemli ölçüde etkileyebilir. Bu nedenle, öğretmenlerin kaygı düzeylerinin doğru bir şekilde belirlenmesi ve bu kaygıyı azaltmaya yönelik stratejilerin geliştirilmesi büyük önem taşımaktadır.

Materyal ve Yöntem: Araştırmada kesitsel tarama modeli kullanılmıştır. Çalışma, 2023 bahar döneminde Türkiye'nin farklı bölgelerinden 300 sınıf öğretmeni üzerinde gerçekleştirilmiştir. Veriler, çevrimiçi anket yoluyla toplanmış ve uyarlanan ölçeğin geçerlik ve güvenirlik analizleri yapılmıştır. Ölçeğin dilsel ve kültürel uyarlaması için uzman görüşlerine başvurulmuş, pilot çalışma gerçekleştirilmiş ve sonrasında ana çalışma uygulanmıştır.

Bulgular: Ölçek uyarlama sürecinde elde edilen bulgular, ölçeğin geçerli ve güvenilir olduğunu göstermektedir. Öğretmenlerin matematik kaygı düzeyleri cinsiyet, yaş ve mesleki deneyim değişkenlerine göre anlamlı farklılıklar göstermektedir. Özellikle, kadın öğretmenlerin matematik kaygı düzeylerinin erkek öğretmenlere göre daha yüksek olduğu belirlenmiştir. Ayrıca, mesleki deneyimi az olan öğretmenlerin kaygı düzeylerinin daha yüksek olduğu tespit edilmiştir.

Önemli Vurgular: Sınıf öğretmenlerinin matematik kaygısı, eğitim politikaları ve öğretmen eğitim programları geliştirilirken dikkate alınması gereken önemli bir faktördür. Matematik kaygısını azaltmaya yönelik stratejiler ve destek programları önerilmektedir. Öğretmen eğitim programlarında, matematik kaygısını azaltacak yöntem ve tekniklerin yer alması gerekmektedir.

[1] Firat University Faculty of Education, Firat University, Elazığ, TURKEY; https://orcid.org/0000-0001-8009-3478

[2] **Corresponded Author,** Kastamonu University, Primary School Education Departman, Kastamonu, TURKEY; https://orcid.org/0009-0008-0026-0861

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INTRODUCTION

Anxiety makes a person feel that something bad might happen (Işık, 1996). According to Cüceloğlu (1991), anxiety arises from withdrawal of support, expectation of negative outcomes, internal conflict, and uncertainty. Anxiety can be normal or pathological; situational anxiety is short and intense, while trait anxiety lasts longer but is less intense. Factors affecting anxiety are environmental, individual, and situational. The most used anxiety scales are the 'Manifest Anxiety Scale (MAS)' and the 'State Trait Anxiety Inventory' (Karagüven, 1999).

Mathematics is an essential discipline used to solve everyday problems (Aksu, 2008). A student's mathematics achievement is influenced by intelligence, developmental level, attitude, self-efficacy, and family support (Çağırgan Gülten and Derelioğlu, 2006). Attitudes towards mathematics by both students and teachers are influenced by factors such as gender, learning environment, family, and teacher support (Chappell, 2003). Teachers' attitudes directly affect students' attitudes towards mathematics (Aiken, 1970). Positive teacher attitudes help students develop positive attitudes towards mathematics (Kulm, 1980).

Mathematics anxiety can create negative emotions in students and affect their performance (Lim and Chapman, 2015). The causes of anxiety are personal, personality-based, and situational factors. Factors stemming from the student and their environment, including their own and their family's attitudes towards mathematics, are significant (Keçeci, 2011). To treat mathematics anxiety, psychological counseling and mathematics skill development techniques are used (Elman, 1991). Teachers' attitudes directly affect students' mathematics anxiety; supportive and encouraging teachers can reduce anxiety (Sloan, Daane, and Giesen, 2002).

In the literature, the number of current scales measuring anxiety is limited (Üldaş, 2005; Akçakın, Cebesoy, and İnel, 2015). Thus, the study aims to adapt the "Math Anxiety Scale for Teachers (MAST)," created by Colleen M. Ganley and her team in 2019, into Turkish. It will also explore the connection between primary school teachers' anxiety about teaching math and their general math anxiety in Elazığ. Additionally, the study will assess whether factors such as age, gender, years of experience, grade level, and class size lead to significant differences in both teaching math anxiety and general math anxiety.

Purpose and Originality of the Research

Anxiety is often described as a feeling of unease that arises due to an unknown reason or conflict (Aydın, Delice, Dilmaç, and Ertekin, 2009). This unease can manifest as mathematics anxiety when it relates to mathematics. Mathematics anxiety can lead students to develop negative attitudes toward situations requiring mathematical operations (Ma and Xu, 2004). This type of anxiety typically emerges in students during their primary school years because of negative experiences (Harper et al., 1998). For primary school teachers to positively influence students' levels of mathematics anxiety, they must first maintain a positive attitude towards mathematics themselves. Teachers can foster positive attitudes in students, which can enhance their mathematical performance (Yücel and Koç, 2011). Therefore, it is crucial to assess and address teachers' levels of mathematics anxiety (Üldaş, 2005). The foundation of this research problem lies in the absence of a scale capable of measuring both general math anxiety and anxiety specifically related to teaching math. Consequently, the following hypotheses will be investigated:

H1: There is a statistically significant relationship between primary school teachers' mathematics teaching anxiety and their general mathematics anxiety.

H2: There is a statistically significant difference between primary school teachers' mathematics anxiety and gender.

H3: There is a statistically significant difference between primary school teachers' mathematics anxiety and age.

H4: There is a statistically significant difference between primary school teachers' mathematics anxiety and years of service.

H5: There is a statistically significant difference between primary school teachers' mathematics anxiety and grade level taught.

H6: There is a statistically significant difference between primary school teachers' mathematics anxiety and the number of students in the class.

Teacher anxiety can impact their students, especially in primary school, where the foundations of anxiety are established. High teacher anxiety can negatively affect students, leading to mathematics anxiety. Identifying the level of this anxiety with an up-to date scale is crucial. This study uses a new scale from 2019, addressing the gap in current literature where most scales are outdated. Moreover, the study fills a significant gap by using a two-factor scale those measures both general and mathematics teaching anxiety. The scale's practical usability due to its optimal number of items also adds to the study's uniqueness and importance.

METHOD/MATERIALS

In this study, the “Math Anxiety Scale for Teachers (MAST)” developed by Ganley et al. (2019) was adapted into Turkish to determine the mathematics anxiety levels of primary school teachers. The scale was translated into Turkish using the back-translation technique (Hançer, 2003). Additionally, the general survey model, one of the quantitative research methods, was used to determine the mathematics anxiety levels of primary school teachers (Karasar, 2008).

Sample of the Research

The study's population includes primary school teachers employed in Elâzığ. The sample comprises 381 teachers chosen through convenience sampling. (Yıldırım and Şimşek, 2018). From the sample, data from 154 teachers were used in DFA analyses, and data from 227 teachers were used in other analyses (Kline, 1994; Pituch and Stevens, 2016). The back-translation technique was used for translating the scale into Turkish (Looman and Farrag, 2009). The scale was first translated into Turkish by three experts proficient in both mathematics and English. It was then translated back into English by another set of experts, and the original and back-translated versions were compared. The comprehensibility of the adapted scale was tested on 30 primary school teachers.

Data Collection Tool

Data were collected using a survey technique. The survey consists of two parts: a personal information form to gather demographic details of the participants and the scale to determine the general mathematics anxiety and mathematics teaching anxiety of the teachers. The "Math Anxiety Scale for Teachers (MAST)" developed by Ganley et al. (2019) was used. The scale comprises two factors: mathematics teaching anxiety and general mathematics anxiety, with a total of 15 items, structured on a 5-point Likert scale (Ganley et al., 2019)..

Data Analysis

Data were organized in Microsoft Excel and transferred to SPSS 29.0 for analysis. Skewness and Kurtosis tests were used to check the normal distribution of the data. Confirmatory Factor Analysis (CFA) was conducted using AMOS 22 to check the fit indices. Categorical data were analyzed using frequency and percentage values, while numerical data were analyzed using mean and standard deviation values. The "Independent Sample T-Test" was employed to compare two distinct groups, while One-Way ANOVA or Kruskal-Wallis tests were utilized for comparing more than two groups. The "Pearson Correlation Test" was used to assess the relationship between two numerical variables. The significance level for all analyses was established at $p<0.05$.

FINDINGS

Colleen M. Ganley et al. (2019) developed the original scale named "Math Anxiety Scale for Teachers (MAST)". This section details the process of adapting the scale into Turkish and presents the findings of the study.

Findings Related to Confirmatory Factor Analyses

Using modification indices to improve the goodness of fit values in confirmatory factor analysis is recommended (Jöreskog and Sörbom, 1993: 127; Whittaker, 2016: 658). This involves establishing covariance links between error terms, reducing the chi-square value, and improving model fit indices. Following the suggested indices, covariance relationships were established between error terms of theoretically related items. After applying three recommended modifications—e1-e2 (0.26), e2-e4 (0.24), and e2-e3 (0.28) —improvements in model fit were observed. The confirmatory factor analysis, with two latent and 15 observed variables, was validated. Detailed values are discussed under goodness of fit findings. Table 1 presents findings on standardized/unstandardized factor loadings, standard error, t values, and significance levels.

Table 1. CFA Results for the Measurement Model

		β0[1]	β1[2]	S.E.[3]	t	p
Item 8	GMA[4]	0.687	0.915	0.079	11.602	***
Item 7	GMA	0.643	0.976	0.104	9.375	***
Item 6	GMA	0.739	0.989	0.092	10.790	***
Item 5	GMA	0.653	0.841	0.088	9.524	***
Item 4	GMA	0.789	0.975	0.085	11.519	***
Item 3	GMA	0.742	0.938	0.087	10.826	***
Item 2	GMA	0.851	0.991	0.080	12.425	***
Item 15	MTA[5]	0.788	1.000			
Item 14	MTA	0.824	1.042	0.076	13.657	***
Item 13	MTA	0.712	0.817	0.072	11.373	***
Item 12	MTA	0.707	1.015	0.090	11.272	***
Item 11	MTA	0.736	0.969	0.082	11.843	***
Item 10	MTA	0.806	1.010	0.076	13.258	***
Item 1	GMA	0.704	0.847	0.082	10.272	***
Item 9	GMA	0.716	1.000			

[1] Standardized factor loading [2] Unstandardized factor loading [3] Standard Error [4] General Mathematics Anxiety [5] Mathematics Teaching Anxiety

Upon examining Table 1, it was found that the correlations between variables are significant. Additionally, the standardized factor loadings of the items are observed to be above 0.30.

Findings on the Goodness of Fit Values of the Structural Model

When examining the goodness of fit values of the structural model, the significance level of the model and whether the structure needs improvement were evaluated.

Table 2. Structural Model Values and Acceptable Fit

	Structural Model Values	Acceptable Fit
χ2/df*	2,707	2d≤ χ2/sd ≤ 3
RMSEA**	0,087	0,05 <RMSEA ≤ 0,10
CFI***	0,932	0,90 ≤ CFI ≤ 0,95
IFI***	0,908	0,90 ≤ IFI ≤ 0,95
IFI***	0,908	0,90 ≤ IFI ≤ 0,95
TLI***	0,917	0,90 ≤ TLI ≤ 0,95
NFI***	0,912	0,90 ≤ NFI ≤ 0,95
GFI***	0,883	0,90 ≤ GFI ≤ 0,95
SRMR**	0,043	0,5 ≤ SRMR ≤ 0,10
χ2: 232,831; df:86; p<0,001		

* Kline, 2011 16

** Browne & Cudeck, 1993 17

*** Baumgartner & Homburg, 1996; Bentler, 1980; Bentler & Bonett, 1980; Marsh, Hau, Artelt, Baumert & Peschar, 2006

The results indicate that the structural equation model is significant at the p <0.001 level based on CFA analysis. The goodness of fit values confirm the structure's validity (χ^2 = 232.831 (df) = 86; p <0.001; χ^2/df = 2.707; CFI = 0.932; GFI = 0.883; NFI = 0.912; IFI = 0.908; TLI = 0.917; RMSEA = 0.087; SRMR = 0.0437), with all values except GFI within the acceptable range. The 15 items of the scale relate to a two-dimensional structure. Fornell and Larcker's (1981) AVE and CR values were calculated, both of which are above the acceptable thresholds for convergent validity (for GMA: AVE = 0.5287, CR = 0.9093; for MTA: AVE = 0.5847, CR = 0.8938).

Findings on the Assumption of Normality and Reliability

Table 5 presents the analysis results regarding whether the data is normally distributed and how reliable it is. According to Tabachnick and Fidell (2013), data is considered to come from a normal distribution if the skewness and kurtosis values are between -1.5 and +1.5.

Table 3. Normality Assumption Analysis and Reliability Analysis

Scale	n	Mean	SD	Skewness	Kurtosis	Cronbach's Alpha
General Mathematics Anxiety	227	17.41	7.050	0.822	-0.242	0.911
Mathematics Teaching Anxiety	227	8.42	3.512	0.751	0.143	0.891
Mathematics Anxiety Scale	227	25.83	9.952	0.724	-0.242	0.942

Upon examining the Skewness and Kurtosis values, it is determined that the subscales of General Mathematics Anxiety and Mathematics Teaching Anxiety, as well as the Mathematics Anxiety Scale, follow a normal distribution. The scale's reliability is evaluated using the Cronbach's Alpha coefficient. A Cronbach's Alpha value greater than 0.70 suggests that the scale is considered reliable. The results demonstrate that the General Mathematics Anxiety, Mathematics Teaching Anxiety subscales, and the Mathematics Anxiety Scale are reliable.

Findings Related to Sociodemographic Information

A dataset of 154 individuals from the study's sample of 381 was used for CFA analyses. The remaining dataset of 227 individuals was used for other analyses. The findings related to the sociodemographic information of the current sample of 227 individuals are presented in Table 4 below.

Table 4. Sociodemographic Information Table

Variables	Group	n	Percent (%)
Years	22-32 Years	134	59
	33-41 Years	47	20,7
	42-51 Years	21	9,3
	52 Years and Above	25	11
Grade	1	71	31,3
	2	36	15,9
	3	51	22,5
	4	69	30,4
Average Number of Students in the Class	20 People and Below	66	29,1
	21-29 People	87	38,3
	30 People and Above	74	32,6

72.2% of the participants are women, and 59% are between the ages of 22 and 32. 37.4% of the participants have a tenure of 1-5 years. 31.3% of the participants are in the first grade. Additionally, 38.3% of the participants report that the average number of students in their class is between 21 and 29.

T-Test Findings for the Gender Variable

The T-test findings for the gender variable are presented in Table 5. An independent samples t-test was conducted to determine if there are any differences between female and male participants in terms of their general mathematics anxiety, mathematics teaching anxiety subscales, and total scores on the mathematics anxiety scale.

Table 5. Gender Variable T-Test Table

Scale	Group	n	Mean	SD	t	p
General Mathematics Anxiety	Female	164	17.32	6.93	-0.895	0.372
	Male	63	18.22	6.53		
Mathematics Teaching Anxiety	Female	164	12.23	5.16	0.627	0.531
	Male	63	11.75	5.16		
Mathematics Anxiety Scale	Female	164	29.54	11.54	-0.251	0.802
	Male	63	29.97	11.13		

*p<0,05

An independent samples t-test was used to determine if there were any differences between male and female participants in their mathematics teaching anxiety subscales, general mathematics anxiety, and total scores on the mathematics anxiety scale. The results indicated no statistically significant differences between genders in these measures (p>0.05). The scores for general mathematics anxiety, mathematics teaching anxiety subscales, and the mathematics anxiety scale did not vary by gender.

One-Way ANOVA Analysis Based on Class, Age, and Average Number of Students in the Class

The findings regarding the answer to the question “What are the main factors affecting organizational commitment in theses?” addressed in the sixth sub-problem are given in Table 4. As seen in Table 3, only 375 theses of relational screening type were considered.

Table 6. Gender Variable T-Test Table

Variables	Scale	Group	n	Mean	s	F	p	Difference
Age	General Mathematics Anxiety	22-32 Years	134	17.60	7.04	1.475	0.231	
		33-41 Years	47	16.32	6.00			
		42 Years and Above	46	18.74	6.87			
	Mathematics Teaching Anxiety	22-32 Years	134	12.42	5.52	1.454	0.236	
		33-41 Years	47	10.96	4.27			
		42 Years and Above	46	12.30	4.77			
	Mathematics Anxiety Scale	22-32 Years	134	30.02	11.94	1.438	0.240	
		33-41 Years	47	27.28	9.59			
		42 Years and Above	46	31.04	11.39			
Class	General Mathematics Anxiety	1	71	17.51	6.90	1.537	0.206	
		2	36	15.47	5.54			
		3	51	18.35	6.63			
		4	69	18.14	7.36			
	Mathematics Teaching Anxiety	1	71	12.13	5.18	1.883	0.133	
		2	36	10.44	4.54			
		3	51	13.08	5.34			
		4	69	12.19	5.17			
	Mathematics Anxiety Scale	1	71	29.63	11.58	1.802	0.148	
		2	36	25.92	9.05			
		3	51	31.43	11.17			
		4	69	30.33	12.25			
Average Number of Students in the Class	General Mathematics Anxiety	20 and Below	66	16.68	6.18	0.904	0.406	
		21-29 People	87	18.17	7.45			
		30 and Below	74	17.65	6.58			
	Mathematics Teaching Anxiety	20 and Below	66	11.80	4.70	0.171	0.843	
		21-29 People	87	12.13	5.14			
		30 and Below	74	12.31	5.58			
	Mathematics Teaching Anxiety	20 and Below	66	28.48	10.43	0.510	0.601	
		21-29 People	87	30.30	12.09			
		30 and Below	74	29.96	11.48			

There were no statistically significant differences found between class levels and the total scores for general mathematics anxiety, mathematics teaching anxiety, and the mathematics anxiety scale ($p>0.05$). This indicates that the scores for general mathematics anxiety, the subscales of mathematics teaching anxiety, and the total scores on the mathematics anxiety scale do not vary by class level.

Similarly, the analysis showed no statistically significant differences between the average number of students in the class and the total scores for general mathematics anxiety, mathematics teaching anxiety, and the mathematics anxiety scale ($p>0.05$). This suggests that the scores for these measures do not differ based on the average number of students in the class.

Furthermore, there were no statistically significant differences between age groups and the total scores for general mathematics anxiety, mathematics teaching anxiety, and the mathematics anxiety scale ($p>0.05$). The scores for general mathematics anxiety, the subscales of mathematics teaching anxiety, and the total mathematics anxiety scale do not vary by age group.

Kruskal-Wallis H Test Findings Related to the Tenure Variable

The findings of the Kruskal-Wallis H test related to the tenure variable are presented in Table 7.

Table 7. Kruskal-Wallis H Analysis for the Tenure Variable

Scale	Group	n	Mean	SD	H	p	η²
General Mathematics Anxiety	1-5 Years	85	19.78	7.55	24.869	<0.001*	0.120
	6-10 Years	63	14.52	4.64			
	11-15 Years	26	15.62	6.24			
	16-20 Years	20	20.45	6.39			
	20 and Above	33	17.48	6.55			
Mathematics Teaching Anxiety	1-5 Years	85	13.88	5.76	18.350	<0.001*	0.089
	6-10 Years	63	10.29	4.30			
	11-15 Years	26	11.00	4.18			
	16-20 Years	20	12.75	4.27			
	20 and Above	33	11.39	4.81			
Mathematics Anxiety Scale	1-5 Years	85	33.66	12.79	23.336	<0.001*	0.114
	6-10 Years	63	24.81	8.05			
	11-15 Years	26	26.62	9.98			
	16-20 Years	20	33.20	9.71			
	20 and Above	33	28.88	11.19			

*p<0.05

The general mathematics anxiety scores significantly differ according to the tenure variable groups (p<0.001). Posthoc analysis indicates that individuals with 1-5 years and 16-20 years of tenure have significantly higher average general mathematics anxiety scores compared to those with 6-10 years of tenure. The effect size, eta squared (η^2), is 0.12, indicating a small effect.

Similarly, mathematics teaching anxiety scores also significantly differ according to the tenure variable groups (p<0.001). Posthoc analysis shows that individuals with 1-5 years and 16-20 years of tenure have significantly higher average mathematics teaching anxiety scores compared to those with 6-10 years of tenure. The effect size, eta squared (η^2), is 0.08, indicating a small effect.

For the mathematics anxiety scale scores, there is a significant difference among the tenure variable groups for overall class teachers (p<0.001). Posthoc analysis reveals that individuals with 1-5 years of tenure have significantly higher average scores compared to those with 6-10 and 11-15 years of tenure. Additionally, individuals with 16-20 years of tenure have significantly higher average scores compared to those with 6-10 years of tenure. The effect size, eta squared (η^2), is 0.11, indicating a small effect.

Table 8. Correlation Analysis

	General Mathematics Anxiety	Mathematics Teaching Anxiety	Mathematics Anxiety Scale
General Mathematics Anxiety	1		
Mathematics Teaching Anxiety	0.747** <0,001	1	
Mathematics Anxiety Scale	0.972** <0,001	0.882** <0,001	1

**p<0,001 *p<0,05

The results of the correlation analysis between general math anxiety, math teaching anxiety, and the overall variables are presented. There is a positive and strong significant relationship between general mathematics anxiety and mathematics teaching anxiety (r=0.747; p=0.000). In other words, as overall mathematics anxiety rises, so does the anxiety relate to teaching mathematics. There is a positive and very strong significant relationship between general mathematics anxiety and the mathematics anxiety scale for classroom teachers (r=0.972; p<0.001). As general mathematics anxiety increases, the total score on the mathematics anxiety scale for classroom teachers also increases.

Additionally, there is a positive and very strong significant relationship between mathematics teaching anxiety and the mathematics anxiety scale for classroom teachers (r=0.882; p<0.001). As mathematics teaching anxiety increases, the total score on the mathematics anxiety scale for classroom teachers also increases.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

The Math Anxiety Scale for Teachers (MAST), developed by Colleen M. Ganley et al. in 2019, was adapted into Turkish to measure the mathematics anxiety of primary school teachers. The study examined the anxiety levels of these teachers based on

various variables. The results and discussions of the research problems are presented, and the findings are compared with similar studies in the literature. Recommendations for researchers are also provided.

The MAST was adapted into Turkish with necessary permissions obtained from Rob Schoen. The scale was translated using back-translation by experts fluent in both English and Turkish. The Turkish version was administered to 30 primary school teachers to assess its clarity, and its validity and reliability were established through statistical analyses. The scale was administered to 154 eachers for confirmatory factor analysis and 227 teachers for additional variable analyses.

Cronbach's alpha reliability analysis was used to assess the reliability of each dimension and sub-dimension of the scale, demonstrating that the Turkish version of the scale is a valid and dependable instrument for measuring mathematics anxiety levels among primary school teachers. Statistical analysis revealed significant differences in mathematics anxiety scores based on gender. Previous studies had mixed findings on this variable, with some reporting no significant differences (Başpınar, 2015; Demir et al., 2016; Üner, 2018; Tabuk, 2018; Deringöl, 2018; Üldaş, 2005; Cooper & Robinson, 1991; Sırmacı, 2007; Olson, 1985; Brush, 1978; Peker & Halat, 2010; Ameen et al., 2002; Marso & Pigge, 1998; Tatar, Zengin, & Kağızmanlı, 2016; Altundal, 2013; Dreger & Aiken, 1957; Ling, 1982; Fee-Fulkerson, 1983) and others identifying higher anxiety levels among female teachers (Zettle & Raines, 2000; Tapia & Marsh, 2000; Alexander & Martray, 1989; Meece, 1981; Karaman & Çil, 2021; Eldemir, 2006; Turan & Asal, 2020; Doruk & Kaplan, 2013; Benson, 1989). This study's results align with some of the literature while differing from others.

It was found that math anxiety scores did not vary significantly by grade level. This finding aligns with the results of several studies. that found no differences based on class level (Başpınar, 2015), but contrasts with others that reported higher anxiety among teachers of higher grade levels due to increased complexity of mathematics topics (Gürbüz & Yıldırım, 2017; Jackson & Leffingwell, 1999).

Likewise, no significant differences were observed in math anxiety scores related to the average number of students in the class. However, some studies have reported increased anxiety in larger classes due to challenges in managing and teaching effectively (Lerkkanen et al., 2014; Miron, 2013; Yıldırım & Gürbüz, 2017; Duban & Küçükyılmaz, 2008; Yılmaz & Altınkurt, 2011). Age was also not a significant factor in mathematics anxiety scores. This result aligns with some studies that found no significant relationship between age and anxiety (Al-Louzi & Salah, 1997; Wiggins, 1984), while others reported that anxiety decreases with age (Erden & Akgul, 2010; Girgin, 1995; Yıldırım, 2013; Richardson & Suinn, 1972; Betz, 1978; Dew et al., 1983; Piyal et al., 2002; Garrosa, 2006; Martinussen et al., 2007).

Tenure showed significant differences in mathematics anxiety scores, with teachers having 1-5 years and 16-20 years of experience showing higher anxiety compared to those with 6-10 years of experience. This is consistent with some studies that found anxiety decreases with increased tenure, suggesting that more experienced teachers develop better coping mechanisms (Yıldırım, 2013; Girgin, 1995).

The research was limited to primary school teachers in Elazığ province and was confined to the scope of the measurement tool and its sub-dimensions.

RECOMMENDATIONS

Researchers are advised to increase the sample size in future studies using the adapted scale, examine the variable of years of service, and explore relationships with different mathematics-related scales. It is also advisable to use both scales together to examine the connection between teacher and student mathematics anxiety and to explore how mathematics anxiety relates to various other factors. It is also suggested to use scales that measure parental mathematics anxiety.

Practitioners are encouraged to use existing scales to determine teachers' levels of mathematics anxiety and to inform them about the negative effects of this anxiety through in-service training. Furthermore, the development of tools to measure mathematics anxiety and studies aimed at understanding the causes of this anxiety are recommended.

Teachers are advised to improve their mathematics knowledge and skills to reduce their mathematics anxiety. Accepting the anxiety and seeking support are considered important steps towards resolving the issue.

Declaration of Conflicting Interests

On behalf of all authors, the corresponding author declares that there is no conflict of interest in this research.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

This research was conducted following the approval of the Administrative Board of the Institute of Educational Sciences at T.R. Fırat University, dated 03/05/2024 and numbered 869428. The consent to use the scale, which was required for the start of the data collection process, was obtained from the relevant individuals.

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