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Exploring the Psychometric Properties of Mathematics Homework Scales in the Turkish Educational Context

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ABSTRACT

The purpose of this study was to adapt the Expectancy Value Scale, Students' Motivation for Homework Scale, Homework Interest Scale, Homework Affective Attitude Scale, Math Homework Purposes Scale into Turkish and to develop the Homework Self Efficacy Scale. 1555 middle school students of 5th and 8th grades participated in the study. The students were enrolled in 66 classes in eight schools located in a large metropolitan city in northwestern Turkey. 48.35% of the students were female and the mean age was 11.94 years. For the convergent validity of the scales, the variables of homework completion, homework time, and academic achievement were preferred. Exploratory and confirmatory factor analyses confirmed the construct validity of all scales. Only the students' motivation for homework scale was found to form a third dimension different from the original. The validity and reliability analyses demonstrated that the five scales are suitable for use in homework research at the middle school level. Moreover, according to the results of psychometric evaluation, the developed Homework Self-Efficacy Scale proved to be a valid and reliable instrument for measuring middle school students' self-efficacy perceptions toward mathematics homework.

Keywords:
Homework motivation, self efficacy, interest, affective attitude, homework behavior

1. Introduction

Homework, as an integral part of educational processes, has a significant impact on students' academic performance (Bas et al., 2017; Trautwein & Köller, 2003). In this context, examining the effects of homework practices on student behavior and academic performance is an important ongoing research topic in the field of educational sciences. Theoretical models developed by different researchers have provided an important framework for understanding the complex effects of homework practices on student achievement (Cooper et al., 2001; Dettmers et al., 2010; Xu & Corno, 2022a). These studies have demonstrated that homework quality, student and teacher characteristics, and parental roles affect students' homework-related attitudes and behaviors, and that the effects of homework are multidimensional and dynamic. The fact that homework interacts with more variables than any other teaching activity causes it to have a very complex structure (Cooper, 2015). Intercultural differences in homework practices are also important in differentiating the results. Empirical studies have reported that cultural context plays an important role in the relationship between the quantity and quality of homework and students' approaches to homework (Trautwein & Lüdtke, 2009; Xu & Corno, 1998). It would be useful to conduct research on homework in different cultures in order to reach generalizable results. In recent years, there has been a significant rise in the geographical scope of homework research, which initially began in North America and Europe. Studies from the Far East (e.g., Cooper et al., 2006; Xu & Corno, 2022), South America (Fernández-Alonso et al., 2019), and different regions of Europe (Cunha et al., 2018; Fernández-Alonso et al., 2015) are now becoming more prominent in this field.

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There is also an extensive research literature on homework in Turkish and English language scientific journals on the Turkish sample. However, these studies often fall short when it comes to examining homework activities in the Turkish education system from a broad perspective. There is a pressing need for measurement tools tailored to the Turkish context to test the models proposed in the existing homework literature and to broaden the scope of research related to homework in Turkey. Therefore, the present research aims to adapt the expectancy value scale, students' motivation for homework scale, homework interest scale, homework affective attitude scale, math homework purposes scale into turkish and to develop the homework self efficacy scale.

1.1. Literature Review

1.1.1. Homework Motivation

The three main theoretical frameworks used to examine the effects of motivation in homework are Expectancy-Value Theory (EVT), Self-Determination Theory (SDT) and self-efficacy. SDT is an important concept developed by Deci and Ryan (2000) and used to understand student motivation in education. SDT distinguishes two main types of motivation: intrinsic and extrinsic motivation. Deci and Ryan (1985, 2000) state that intrinsic motivation is a type of motivation that an individual performs for his/her own intrinsic pleasure or satisfaction, while extrinsic motivation is a type of motivation that is driven by external factors. Research has shown that giving students choice and autonomy in homework increases intrinsic motivation and academic achievement (Niemiec & Ryan, 2009; Reeve et al., 2004). In addition, psychological support of parents and autonomy of students in the learning process are effective in increasing intrinsic motivation (Katz et al., 2011a), students with high intrinsic motivation put more effort into academic tasks and achieve better results (Coutts, 2004; Wigfield et al, 2015), are an indicator of positive emotions in the educational environment (Aelterman et al., 2014; Isen & Reeve, 2005), show more interest in academic activities and enjoy these activities more (Mouratidis et al., 2011).

EVT was developed by Atkinson (1964) and extended by Eccles (1983) Eccles (1983). This theory deals with the motivation of individuals through expectancy and value beliefs. Expectancy, a component of EVT, refers to students' belief in their ability to successfully complete a task or goal. Value is related to how important it is for an individual to do a certain task (Wigfield & Eccles, 2000). Bandura (1982, 2001) emphasizes that these beliefs are based on the perception of individual competence. Especially in the context of education, Wigfield and Eccles (2000) stated that students' motivation to do homework is related to achievement beliefs and the value attributed to homework. Eccles and Wigfield (2002) suggested that task-related cost beliefs may have an effect on motivation. Trautwein (2007), Trautwein, Lüdtke, Kastens, et al. (2006), and Trautwein and Lüdtke (2009) proposed an EVT-based model to understand homework behaviors and examined factors such as the perception of homework competence and the benefits and costs of homework.

Interest, one of the concepts explaining academic motivation (Hidi & Renninger, 2006), refers to students' personal predisposition and curiosity towards a particular assignment topic or activity (Harackiewicz et al., 2016). As students' interest in a topic increases, they tend to dedicate more time to that topic and engage more actively in the learning process (Hidi & Harackiewicz, 2000). Interest, which is an important predictor of homework completion (Xu, 2008), is influenced by many family, teacher, and student-based variables (Xu et al., 2016; Xu, 2020, 2023b).

Self-efficacy refers to individuals' beliefs that they can successfully perform certain tasks or challenges (Bandura, 2012). Individuals' perceptions of self-efficacy can affect their motivation, goal-setting processes and expectations for success (Cleary & Zimmerman, 2012). Klassen and Usher (2010) stated that self-efficacy beliefs have a significant effect on students' academic achievement, especially in the field of education. Students with high self-efficacy perception generally have better homework completion skills. Because they are more confident in themselves and feel more competent in using the necessary strategies and resources to overcome the difficulties they face (Pajares & Usher, 2008). Fong and Krause (2014) stated that students with high self-efficacy perceptions show less hesitation and make more effort in the face of challenging assignments. Furthermore, Zee and Koomen (2016) showed that students' self-efficacy perceptions are directly related to their academic achievement and that these perceptions affect students' attitudes towards assignments and their completion of these tasks.

1.1.2. Student Characteristics

In the literature, the descriptive characteristics of students that affect homework completion are gender (McRae et al., 2008; Xu, 2010a), grade level (Cooper & Valentine, 2001; Xu, 2010b), previous academic achievement (Katz et al, 2010; Núñez et al., 2015; Trautwein et al., 2002, 2009), cognitive (Trautwein & Lüdtke, 2009), reason for doing homework (Xu, 2010b, 2010a) and emotional attitude (Xu, 2023a). Reasons for doing homework and emotional attitude are determined through measurement tools. Therefore, these two variables were analyzed in detail. While the reasons for doing homework are generally shared by teachers and parents, students' reasons for doing homework have little similarity with adults (Xu & Corno, 1998; Xu & Yuan, 2003). The main reason for students is to get approval from adults and peers. Apart from this, homework is also done for reasons such as awareness of responsibility, discipline, and gaining study habits (Xu, 2005). Xu (2010a, 2010b) and Xu (2010b, 2010a) categorized students' reasons for doing homework under three headings: adult-oriented (getting consent from adults), peer-oriented (getting consent from peers and working together with them) and learning-oriented (reinforcing what they have learned in class and gaining good study habits). Peer- and adult-oriented are related to extrinsic motivation, while learning-oriented is related to intrinsic motivation. Later researchers (Sun et al., 2020; Xu, 2021), in their studies on the same items, organized the scale into three sub-scales: academic-oriented (gaining academic benefits), approval-oriented (gaining approval from parents, teachers, and peers), and self-regulation-oriented (developing self-regulation strategies). According to SDT, human motivation is driven by intrinsic and extrinsic reasons. Intrinsic motivation is a stronger source of motivation than extrinsic motivation both in the immediate and long term (Ryan & Deci, 2017). According to the theory, the reasons for doing homework are motivational elements that mobilize students. In particular, learning-oriented motives, i.e., when students are aware of the positive benefits of homework, are positively associated with homework completion and time (Coutts, 2004; Valdés-Cuervo et al., 2022; Warton, 2001; Xu, 2005). Learning-oriented reasons are also positively related to homework management behaviors (Xu et al., 2017; Xu & Wu, 2013). Autonomy-oriented behaviors of parents and teachers are important for learning-oriented reasons (Valdés-Cuervo et al., 2022). Homework affective attitude refers to students' preference for homework compared to other after-school activities (Xu, 2023a). The concept is frequently used in homework research by Xu (2009) and Xu et al. (2016).

1.2. The Present Study

Research results revealed that many variables such as the meaning attributed to homework, family involvement in homework, and teachers' homework practices may differ according to culture (Dettmers et al., 2009; Kim & Fong, 2014; Ozyildirim, 2022; Xu, 2010b; Xu et al., 2017). In a meta-analysis study by Fan et al. (2017) examining the interaction between homework and academic performance, it was concluded that the effect of homework on academic performance was stronger in the USA students compared to the Chinese and European students. Apart from analyses on TIMMS and PISA results, studies on cultural differences in homework studies are mostly based on the comparison of Chinese and US societies. Cheung and Pomerantz (2011), in their study comparing Chinese and US students, found that American and Chinese parents had cultural differences in the amount and quality of their involvement in their children's learning. American parents were less involved in their children's learning than Chinese parents, but American parents' involvement was associated with greater autonomy support, whereas Chinese parents' involvement was associated with greater psychological control. In both countries, increased parental involvement similarly increased children's school engagement and academic achievement. Chinese culture values effort more than ability as a means to academic achievement (Martin et al., 2014). Compared to US students, Chinese students do not allow their previous achievements to influence their current homework behavior (Xu, 2014; Yang et al., 2016). These studies, which reveal differences in homework behaviors, show that the findings obtained in one society are valid for that society and might be inadequateto explain homework behaviors in other societies. Therefore, in examining the factors affecting homework behaviors of students in Turkey, there is a need to draw inferences based on the data collected from this population. In addition, in order to obtain comparable data to understand the differences in Turkey, it is necessary to use measurement tools that are frequently preferred in the international literature to explain homework behavior in multiple dimensions.

Since all scales in this research are domain-specific, a course should be preferred for implementation. To examine the relationships between variables affecting homework behavior such as motivation, parental behavior, and homework quality, students should be doing homework frequently in the relevant course, need

parental help, and the effect of the teacher's behavior on achievement should be significant. Research results show that mathematics is frequently preferred in understanding homework behaviors. In this research, this preference was also used due to its compatibility with the literature and the characteristics of the mathematics course. First of all, according to the international literature, more homework is assigned in mathematics compared to other subjects due to cultural reasons (Mu, 2014), national exams (Kitsantas et al., 2011) or the characteristics of mathematics (Bempechat, 2019; Singh et al., 2013; Wu et al., 2022; Xu, 2015, 2023b; Xu et al., 2015). Compared to other subjects, students need more involved parental support with math homework.. (Kitsantas et al., 2011). At the same time, the difficulty of mathematics makes it difficult for parents to help (Dauber & Epstein, 1993), making it necessary to show different types of parental support (Silinskas & Kikas, 2019). In this regard, it may be more effective to compare different parental support behaviors, especially at the secondary school level. In addition, there is a higher interaction between homework variables in mathematics compared to other subjects, and the effect of parent and teacher involvement on performance in mathematics homework is greater than in other subjects (Cooper, 2015; Wei et al., 2019; Xu & Corno, 2022b).

For the predictive validity of the scales (Expectancy Value Scale, Students' Motivation for Homework Scale, Homework Self Efficacy Scale, Homework Interest Scale, Homework Affective Attitude Scale, Math Homework Purposes Scale) that were developed and adapted into Turkish, homework behaviors (homework completion, homework time) and academic perfromance variables were preferred. In the literature, homework behaviors and academic achievement are the two main dependent variables on which all homework-related variables have been investigated. Students' beliefs about how well they will perform in a learning task (expectations) and how valuable they find this task (value) have a strong influence on academic achievement and homework behaviors that lead to academic achievement (Eccles & Wigfield, 2002b; Guo et al., 2015; Wigfield et al., 2015). For homework to be successful, student motivation should be high (Xu, 2017, 2023b). In particular, intrinsic motivation has been consistently associated with positive educational outcomes, including higher academic achievement, greater task persistence, and improved learning outcomes (Vansteenkiste et al., 2004). Interest in homework is an important predictor of homework completion (Xu, 2008). Meta-analyses on homework show that homework time positively affects academic achievement, albeit at a low level (Cooper et al., 2006; Fan et al., 2017). However, Fan et al. (2017) showed that the effect of homework completion on academic achievement was greater than the effect of variables such as homework time. For these reasons, in the current study, it was tested that expectancy, value, intrinsic motivation, self-efficacy, interest and emotional attitude are positively correlated to homework behaviors and academic performance. In addition, extrinsic motivation was hypothesized to be negatively related to homework behaviors and academic achievement. Finally, it was proposed that the connection between the variables and homework completion would be more robust than their connection with academic performance.

2. Methodology

2.1. Research Participants and Process

This research involved 1555 middle school students in grades 5-8. Their responses were divided into four groups: 375 in Group 1, 379 in Group 2, 400 in Group 3, and 401 in Group 4. Group 1 was analysed using Exploratory Factor Analysis (EFA). Group 3 and Confirmatory Factor Analysis (CFA) was performed on the data from Group 2 and Group 4. Data for the Expectancy Value Scale, Students' Motivation for Homework Scale, Homework Self-Efficacy Scale, and Homework Interest Scale were collected from Groups 1-2, while data for the homework affective attitude scale and math homework purposes scale were collected from Groups 3-4. The scales were given to different groups to avoid fatigue or boredom affecting the results. The students are from 27 classes in 6 secondary schools in Istanbul. 48.35% of the students were girls and 51.65% were boys (Table 1).

In the research process, initial permissions were secured from the Ministry of Education. Subsequently, the requisite permissions were obtained from the school administrators and the instructors of the courses in which the implementation was to occur. After the completion of these stages, written approvals were collected from the parents of the students and the application was carried out by distributing the scale forms to the students who volunteered to join in the study.

Table 1. *Demographic Overview of the Participating Students*

	Gender				Grade								Age	
	Girl		Boy		5		6		7		8			
	n	%	n	%	n	%	n	%	n	%	n	%	Ave	Sd
Group 1	189	46.9	191	53.1	92	24.7	111	29.8	96	25.8	73	19.8	11.94	1.21
Group 2	178	47.5	197	52.5	92	24.3	123	32.5	97	25.6	67	17.7	12.09	1.14
Group 3	163	44,5	203	55,5	115	28,8	75	18,8	72	18,0	138	34,5	12.07	1,31
Group 4	218	54,5	182	45,5	94	23,4	149	37,2	79	19,7	79	19,7	11,64	1,03

*Ns=15 Group1, 4 Group2, 34 Group 3, 1Group4

2.2. Instruments

Homework Expectancy Value Scale: The homework expectancy belief scale measures students' confidence in their ability to successfully complete their maths homework. The scale was first developed by Trautwein et al. (2006) as a five-item scale (Cronbach's α=.85), and then revised by Xu (2017) Yang and Xu (2018) as a four-item scale (Cronbach's alpha: .82). The scale is a 4-point Likert scale ("1= strongly disagree, 2=disagree, 3=agree, 4=strongly agree"). The homework value belief scale determines how important maths homework is for students. The scale was first developed by Trautwein et al. (2006) as a four-item scale (Cronbach's α=82), and then revised by Xu (2017) and Yung and Xu (2018) as a four-item scale (Cronbach's α=.85). The scale is a 4-point Likert scale ("1= strongly disagree, 2=disagree, 3=agree, 4=strongly agree"). Xu (2017) and Yung and Xu (2018) combined the expectancy and value scales into a single scale and named it as Homework Expectancy-Value Scale.

Students' Motivation for Homework Scale: Homework motivation is a wide-ranging topic, and in this research, the intrinsic (autonomous) and extrinsic (controlled) motivation scales within the scope of self-determination theory were adapted into Turkish. Intrinsic motivation is when a student does homework for his/her own pleasure, whereas extrinsic motivation is when a student does homework under the compulsion of external factors such as reward and punishment (Deci & Ryan, 2000). (The Students' Motivation for Homework scale developed by Katz et al. (2011) has 19 items to measure intrinsic/autonomous (11 items) and extrinsic/controlled (8 items) motivation. The Cronbach's Alpha coefficients of the original scale for intrinsic/autonomous reasons (α=.93) and extrinsic/controlled reasons (α=.88) are quite high. While the original scale uses the term homework in general, the concept of maths homework was used in this research.

Homework Affective Attitude Scale: Homework affective attitude refers to students' preference for homework compared to other after-school activities (Xu, 2023a). The scale developed by Xu (2008) consists of four items with a Likert-type response scale. The response scale for each item of the scale is separated from each other. The response scales for the first and second items were "1 (much lower than), 2 (lower than), 3 (about the same as), 4 (higher than), and 5 (much higher than)", while the response scales for the third item were "1 (much worse than), 2 (worse than), 3 (about the same as), 4 (better than), and 5 (much better than)". The response scale for the fourth item was Responses were "1 (least favorite activity), 2 (less favorite activity), 3 (about the same as other activities), 4 (more favorite activity), and 5 (most favorite activity)". The Cronbach's Alpha consistency of the scale was .86.

Homework Self Efficacy Scale: The Mathematics Homework Self-Efficacy Perception Scale was developed by the researchers to determine students' self-efficacy perceptions towards doing mathematics homework. In the preparation of the scale items, self-efficacy scales prepared in the academic field in the self-efficacy literature were utilized (Bandura, 2006; Luszczynska et al., 2005; Schwarzer & Jerusalem, 1995). The scale consists of 10 items and has a unidimensional structure. The scale utilizes a 4-point Likert format ("1= strongly disagree, 2=disagree, 3=agree, 4=strongly agree"). The Cronbach alpha value obtained in this research is .90.

Homework Interest Scale: Homework interest refers to the extent to which students find maths homework enjoyable (Xu, 2008). The scale was developed by Xu and colleagues (Du et al., 2016; Xu, 2023a; Xu et al., 2016). The scale includes five items to determine the extent to which students enjoy and are interested in maths homework. The Cronbach's alpha coefficient of the scale was .93 (Du et al., 2016). Three different response scales are used for the items of the Likert scale. The response scale for the first three items is: "strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), strongly agree (5)". The response scale for the fourth item is: "very boring (1), boring (2), neither boring nor interesting (3), interesting (4), very interesting (5)". The

response scale for the fifth item is as follows: “don't like it at all (1), don't like it much (2), neither like nor dislike it (3), like it a little (4), like it a lot (5)”.

Math Homework Purposes Scale: The scale developed by Sun et al. (2020) and Xu (2021) (Sun et al., 2020; Xu, 2021) is based on both their own research (Xu, 2005, 2010b; Xu & Yuan, 2003) and the homework literature (Cooper et al., 1998; Trautwein, Lüdtke, Schnyder, et al., 2006). The scale has three subscales related to students' reasons for doing maths homework. These are academic-oriented, appreciation-oriented and self-regulation-oriented reasons. The academic-orientated reasons (4 items) measure doing homework to reinforce students' mathematics skills and to develop good study habits. Appreciation-oriented reasons (3 items) measure behaviors aimed at gaining approval from parents, teachers and peers. Self-regulation-oriented reasons (3 items) focus on reasons to improve self-regulation skills. Cronbach's alpha coefficients of the academic-oriented, approval-oriented and self-regulation-oriented reasons subscales were found to be .73, .87 and .93, in that order. The Likert-type scale is answered on a four-point scale as strongly disagree “1, disagree 2, agree 3, strongly agree 4”. The scale was applied in its final form in the research conducted by Xu et al (2023) (Xu & Núñez Pérez, 2023).

Homework Behavior: In the context of homework behavior, homework time and homework completion are identified.

Homework Time: In order to ascertain the amount of time spent on homework at the student level, students are requested to indicate the amount of time they typically devote to homework on weekdays and weekends: "On a typical weekday/weekend, how long does it usually take you to do your maths homework?" The answers to this question are “1 (none), 2 (1-20 minutes), 3 (21-40 minutes), 4 (41-60 minutes), 5 (61-80 minutes), 6 (81-100 minutes), 7 (101-120 minutes) and 8 (more than 120 minutes)” (Valle et al., 2019). The homework time is also measured by a one question "On a typical day, how long does it usually take you to finish your mathematics homework?" (Xu, 2022b). At the classroom level, it is asked how often the teacher assigns homework (“How often is maths homework usually assigned?”). The response options for the item include: “1 (never), 2 (rarely), 3 (sometimes), 4 (often), and 5 (routinely)” (Trautwein, 2007).

Homework Completion: In existing literature, a 2-item scale is commonly employed to gauge the extent of homework completion (Xu & Wu, 2013). These items are; "How much of your assigned homework do you usually complete?" and "How often do you come to class without your homework?". The response options for the first item included “1 (none), 2 (some), 3 (about half), 4 (most), and 5 (all)” and for the second item was “1 (never), 2 (rarely), 3 (sometimes), 4 (often), and 5 (routinely)”. The Cronbach's alpha coefficient of the scale is 0.71 (Xu, 2011). Another frequently used way to measure homework completion is the use of a single item. This item is "Some students often complete math assignments on time; others rarely do. How much of your assigned math homework do you usually complete?" Ratings included: “1 (none), 2 (some), 3 (about half), 4 (most), and 5 (all)” (Xu & Corno, 2022a).

Academic Achievement: For the academic achievement of the students, the report card grades of the first semester mathematics course were taken. In Turkey, the termly report card grade is a a blend of exam scores and the assessment of students' academic work. The effect of the exam grade and the teacher's opinion grade on the report card grade is equal. Given that the survey was conducted early in the second semester, before the start of any exams, it was decided to use the report card grades. The grades analyzed in the study were based on students' self-reports.

2.3. Language Equivalence Studies

For the language equivalence studies of the scales, we proceeded in a certain systematic way. Firstly, the measurement tools were translated into Turkish by five academicians. Then, the five forms were converted into a form by the researchers. The form was back-translated into English by another team of experts. A native English-speaking expert reviewed both the original scales and their retranslated versions. After the approval of the expert, the questionnaire applications were carried out.

2.4. Analysing the Data

Exploratory Factor Analysis (EFA): The 1698 students included in this research were randomly divided into four subgroups. EFA analysis of the scales was conducted on two of these groups (Group 1-2). SPSS statistical software package was used for data analysis. Bartlett's Test of Sphericity and Kaiser-Meyer-Olkin (KMO) tests were preferred to determine the suitability of the data for Exploratory Factor Analysis. A significant Bartlett's Test result suggests that the correlation matrix is not a unit matrix and that there are meaningful relationships between the variables. This suggests that the variables in the dataset are appropriate for factor analysis. The KMO test result measures how suitable the variables in the data set are for factor analysis. The closer the KMO value is to 1, the lower the partial correlations between the variables and the more suitable the data set is for factor analysis (Sönmez & Alacapınar, 2016). Principal components analysis with Varimax rotation was applied to the responses from Groups 1 and 3. In determining the factor structure, the fixed number method was utilized due to the prior knowledge of the theoretical structure of the scale. For items that deviated from the original structure, decisions were made based on the conceptual relevance of the items.

Confirmatory Factor Analysis (CFA): Based on the EFA results on the data obtained from Group 1 and Group 3, CFA was applied using AMOS to further examine the accuracy of the factor structures of the scales. The normality of the data set was assessed by examining the skewness and kurtosis values; these values being below 2 were accepted as an indicator that the data were suitable for normal distribution (Çokluk et al., 2012). To assess the model fit, a variety of goodness-of-fit (GIF) indicators were employed, including the Chi-square/df (X^2/df), Comparative Fit Index (CFI), Goodness of Fit Index (GFI), Tucker-Lewis Index (TLI), and Root Mean Square Error of Approximation (RMSEA). To achieve an excellent model fit, the guidelines are "$X^2/df < 3$, CFI ≥ .95, GFI ≥ .95, TLI ≥ .95, and RMSEA within the range of .05 to .06. For a model that meets acceptable fit standards, the criteria include $X^2/df < 5$, CFI ≥ .90, GFI ≥ .90, TLI ≥ .90, and RMSEA < .08. These criteria and evaluation methods are widely recognized as the standard approach for determining the adequacy of model fit to the data (Kline, 2023; Steiger, 2007).

Reliability Analyses: Cronbach's alpha coefficient was used to assess the reliability of the scales used in the study. Item-total correlations were also computed. To accept that the reliability of scales are at an adequate level, the α coefficient should be above .70, this value is generally accepted in the literature (Özdamar, 2016), while item-total correlations are recommended to be above .30 (Ural & Kiliç, 2005). In the case of multidimensional scales, the correlations between the subscales were also examined in detail.

Concurrent Validity Evidence: In the study, four variables were used to determine the concurrent validity values of the scales adapted into Turkish: Homework complete, homework time, going school without homework and academic performance. The relationships among the variables were assessed using the Pearson correlation test.

2.5. Ethical

The procedures conducted in the study adhered to the ethical standards of the Helsinki Declaration and were approved by the Ethics Committee of the Educational Sciences Institute at Istanbul Sabahattin Zaim University.

3. Findings

The validity and reliability analysis results for the scales developed and adapted into Turkish for this research were provided under individual headings for each scale.

Table2. *Bartlett's Test and KMO results for the scales*

	KMO	Bartlett's Test
Expectancy Value Scale	.885	p<.001
Homework Motivation	.878	p<.001
Homework Self Efficacy Scale	.908	p<.001
Homework Interest Scale	.841	p<.001
Homework Affective Attitude Scale	.795	p<.001
Math Homework Purposes Scale	.912	p<.001

Homework Expectancy Value Scale (HEV)

The KMO value (.885) and Bartlett's test results computed on the Group 1 (n=375) data for HEV show that the sample is a suitable sample for EFA. Yang and Xu (2018) and Xu (2017) compared the unidimensional and bi-dimensional structures of the scale in their studies. A similar process was followed in this research. In the first analysis, a one-factor structure with an Eigen value above one emerged. The variance explained by this single dimension was 58.654 and the factor loadings of the items ranged between .871 and .654. The total variance explained by the two interpretable factors (expectancy and value) that emerged as a result of the two-factor constant value selection for the two-dimensional structure is 69.866. This finding aligns with the results obtained from secondary school (Yang & Xu, 2018) and high school (Xu, 2017) samples. The factor loadings of expectancy and value dimensions are 35.002 and 34.864, in that order. The factor loadings of the items belonging to the expectancy factor (4 items) are between .805 and .702, and the factor loadings of the items belonging to the value factor (4 items) are between .823 and .683.

Alpha reliability estimates for expectancy and value scales are .844, and .818 in sequence (N=757) (Table 3). Alpha reliability estimate for the unidimensional structure is 892. All reliability estimates indicate that the internal reliabilities of the sub-scales are good (>.70) (DeVellis & Thorpe, 2021). Item-total correlations between .575 and .764 (>.30; Ferketich, 1991) reveal that the 8 items are homogeneously distributed in their sub-scales (Table 6). There is a highly significant positive correlation between the two sub-scales and between the sub-scales and the single solution (Table 3).

Table 3. *Descriptive Statistics and Intercorrelations of HEV Subscales* (N = 757).

		α	Mean	Sd	1	2
1	Expectancy	.844	4,02	,83		
2	Value	.818	3,69	,99	.706**	
3	Expectancy value	.892	3,45	1,13	.925**	.922**

**p < .01

The Expectancy Value Scale was tested using CFA to evaluate both unidimensional and bi-dimensional structures. For the unidimensional structure, CFA was conducted with data from the Group 2 sample (n=379). GIF indices for the unidimensional model were : $x^2/df=2.187 < 3$, CFI=.977 > .950, GFI=.972 > .950, TLI=.965 > .950, and RMSEA=.057 < .08 (Maruyama, 1997; Schumacker & Lomax, 2004).

The GIF values for the two-dimensional hypothesized model were high: $x^2/df=1.193 < 3$, CFI=.997 > .950, GFI=.986 > .950, TLI=.994 > .950, and RMSEA=.023 < .05. These improvements support the validity of the scale. The final comparison between the one-dimensional and two-dimensional models showed that the two-dimensional model had superior fit values. This outcome is consistent with the findings of Yang & Xu (2018) and Xu (2017).

Homework Motivation (HM)

The sample is suitable for EFA according to the KMO value (.878) and Bartlett's test results calculated from the Group 1 data (n=375) for HM. The three interpretable factors explain the total variance (Autonomous Motivation, Autonomous Motivation: Emotion, Controlled motivation) is 54.067. The factor loadings of Autonomous Motivation, Autonomous Motivation; Emotion and Controlled motivation dimensions are 21.058, 19.930, and 13.079, in that order. The loading values of the items belonging to Autonomous Motivation (7 items) are between .784 and .655, the loading values of the items belonging to Autonomous Motivation; Emotion factor (4 items) are between .752 and .681, and the loading values of the items belonging to Controlled motivation factor (7 items) are between .771 and .623. In the original structure of the scale, there are two dimensions, Autonomous Motivation and Controlled motivation. In this research, 4 items in the Autonomous Motivation dimension formed a new dimension. These items (6th, 9th, 10th and 11th) were named Autonomous Motivation: Emotion because they were related to emotional expressions. Although the Autonomous Motivation dimension was divided into two dimensions in this research, the total score of the two dimensions can be used to measure Autonomous Motivation in research. The high positive correlation between the two dimensions supports this suggestion (Table 4). Item 17 (I do my homework because I want to get a better grade) in controlled motivation was not included in the final version of the scale because it was under the autonomous motivation dimension and was not related to the relevant dimension in terms of scope.

Alpha reliability estimates for compliance, persistence, and seasonal efforts dimensions (N=757) were .886, .784, .870, in that order (Table 4). All reliability estimates indicate that the internal reliabilities of the subscales are good (>.70) (Henson, 2001). Item-total correlations between .584 and .733 indicate that the 18 items are homogeneously distributed in their sub-scales (Table 6). There is a strong correlation between the sub-scales of the scale (Table 4)

Table 4. *Descriptive Statistics and Correlations Among HM Subscales* (N = 757).

		α	Mean	Sd	1	2
1	Autonomous Motivation	.886	3,82	,96		
2	Autonomous Motivation:Emotion	.784	2,80	1,12	,569**	
3	Controlled motivation	.870	2.47	1,13	,006	,164**

**p < .01

The validity of the HM scale, identified through EFA, was tested using CFA with data from the Group 2 sample (n=379). The CFA results for the hypothesized model showed acceptable fit indices: $x^2/df=2.876 < 3$, CFI=.933 > .900, GFI=.901 > .900, TLI=.921 > .900, and RMSEA=.070 < .08. These findings are consistent with CFA results from other studies of homework motivation (Katz et al., 2011, 2014).

Homework Self Efficacy Scale (HS)

The KMO value (.908) and Bartlett's test results calculated from the Group 1 data (n=375) for HS indicate that the sample is suitable for EFA. The unidimensional structure that emerged from the EFA explains 42.073% of the total variance. This value is above the minimum explanatory value (>.40) required for unidimensional scales (Sencan, 2005). The loading values of the 10 items in the scale are between .690 and .549. The scale shows a unidimensional structure as expected from the results of the analyses.

Alpha reliability estimates of the unidimensional HS scale (N=757) were .900, indicating good internal reliability (>.70) (Bland & Altman, 1997). Item-total correlations between .589 and .725 (>.30; Ferketich, 1991) (Ferketich, 1991) indicate that the 10 items were homogeneously distributed (Table 8).

The validity of HS scale, as identified through EFA, was evaluated using CFA with data from the Group 2 sample (n=379). The GIF indices for the hypothesized model were at an acceptable level: $x^2/df=2.327 < 3$, CFI=.977 > .950, GFI=.959 > .950, TLI=.970 > .950, and RMSEA=.060 < .08. These scores support the validity of the homework self-efficacy scale, as they are above acceptable thresholds.

Homework Interest Scale (HI)

The KMO (.908) and Bartlett's test results calculated on Group 1 (n=375) data for HI suggest that the sample is appropriate for conducting EFA. The total variance explained by the unidimensional structure that emerged as a result of EFA is 70.940. This value is above the minimum explanatory value (>.40) required for unidimensional scales (Sencan, 2005). The loading values of the 5 items in the scale are between .897 and .755. The scale shows a unidimensional structure in accordance with the literature.

Alpha reliability estimates (N=757) of the unidimensional HS scale were .916, indicating good internal reliability (>.70) (DeVellis & Thorpe, 2021). Item-total correlations between .723 and .847 (>.30; Ferketich, 1991) (Ferketich, 1991) indicate that the 5 items are homogeneously distributed (Table 6).

The unidimensional structure of the HI scale, identified through EFA, was validated using CFA with data from the Group 2 sample (n=379). The GIF indices for the hypothesized model were at an acceptable level: $x^2/df=1.405 < 3$, CFI=.999 > .950, GFI=.995 > .950, TLI=.997 > .950, and RMSEA=.035 < .05.

Homework Affective Attitude (HAA)

The KMO value (.795) and Bartlett's test results based on the Group 3 data (n=447) for HAA confirm that the sample is appropriate for EFA. The total variance explained by the unidimensional structure that emerged as a result of EFA is 64.116. This value is above the minimum explanatory value (>.40) required for unidimensional scales (Sencan, 2005). The loading values of the 4 items in the scale are between .845 and .763. The scale shows a unidimensional structure in accordance with the literature.

Alpha reliability estimates (N=848) of the unidimensional HAA scale were .774, indicating good internal reliability (>.70) (DeVellis & Thorpe, 2021). Item-total correlations between .343 and .718 (>.30; Ferketich, 1991) (Ferketich, 1991) indicate that the 4 items were homogeneously distributed (Table 8).

The validity of the DT scale, identified through EFA, was assessed using CFA with data from the Group 4 sample (n=401). The GIF indices for the hypothesized model were at an acceptable level: $x^2/df=.137 < 3$, CFI=1.000 > .950, GFI=1.000 > .950, TLI=1.000 > .950, and RMSEA=.000 < .05.

Math Homework Purposes Scale (SHP)

The KMO value (.912) and Bartlett's test results calculated for Group 3 (n=447) data for the SHP scale indicate that the sample is appropriate for conducting EFA. The EFA results revealed that the three interpretable factors—academic, self-regulatory, and approval-seeking purposes—together explained 70.658% of the total variance. The factors contributed as follows: academic purposes accounted for 36.574%, self-regulatory purposes for 19.127%, and approval-seeking purposes for 14.957%. The factor loadings for the academic purposes items (4 items) ranged from .795 to .530, for the self-regulatory purposes items (3 items) from .794 to .743, and for the approval-seeking purposes items (3 items) from .786 to .743.

Alpha reliability estimates for academic purposes, self-regulatory purposes, and approval-seeking purposes dimensions (N=848) were .738, .827, .778, in that order (Table 5). All reliability estimates indicate that the internal reliabilities of the subscales are good (>.70) (DeVellis, 1991; Henson, 2001; Bland, J. M., & Altman, D. G. (1997). Item-total correlations between .513 and .707 indicate that the 10 items are homogeneously distributed in their sub-scales (Table 6). There is a high level of significant relationship between the sub scales (Table 5).

Table 5. *Descriptive Statistics and Intercorrelations Among the SHP Subscales* (N = 757).

		α	Mean	Sd	1	2
1	Academic purposes	.738	2,8453	,69135		
2	Self-regulatory purposes	.827	3,1855	,73737	.611**	
3	Approval-seeking purposes	.778	3,0650	,76341	.558**	.783**

**p < .01

The validity of the SHP scale, established through EFA, was evaluated using CFA with data from the Group 4 sample (n=401). The GIF indices from the CFA testing indicated a good fit: $x^2/df=2.738 < 3$, CFI=.966 > .950, GFI=.950 > .950, TLI=.952 > .950, and RMSEA=.070 < .08. Additionally, the results align with CFA values reported in other studies using the same scale (Sun et al., 2020; Xu, 2021).

Concurrent Validity of Scales

For the concurrent validity of the measurement tools examined in this study, the correlation between them and four variables was examined: Homework Complete, Homework Time, Going to School Without Homework (GSWH), Academic Achievement.

The variables are generally positively correlated with homework complete, homework time and academic achievement, but negatively correlated with GSWH. Expectancy Value is correlated with homework behavior and academic achievement. Only Expectancy Value was found to have a low correlation of .075 (p <.05) with homework time. Similarly, a low level relationship of .097 (p<.05) was found between Homework Self Efficacy and only homework time. Autonomous Motivation is correlated at .471 (p< .01) with homework completion, -.374 (p<.01) with GSWH, .117 (p< .01) with homework time, and .357 (p<.01) with academic achievement. Autonomous Motivation: Emotion has correlations of .316 (p<.01) with homework completion, -.190 (p<.01) with GSWH, .038 with homework time, and .252 (p<.01) with academic achievement. Controlled motivation shows correlations of -.141 (p<.01) with homework completion, .105 with GSWH, .020 with homework time, and -.177 (p<.01) with academic achievement. Homework Interest shows correlations of .477 (p<.01) with homework completion, -.357 (p< .01) with GSWH, .164 (p < .01) with homework time, and .365 (p<.01) with academic achievement. Emotional Attitude is correlated at .388 (p<.01) with homework completion, -.153 with GSWH, .140 with homework time, and .217 (p < .01) with academic achievement results. Academic purposes showing correlations of .240 (p<.01) with homework completion, -.155 (p < .01) with GSWH, .127 (p<.05) with homework time, and .205 (p < .01) with academic achievement. Self-regulatory purposes is correlated at .380 (p < .05) with homework completion, -.238 (p < .01) with GSWH, .131 (p < .05) with homework time, and .281

(p < .01) with academic achievement. Approval-seeking purposes has correlations of .335 (p < .01) with homework completion, -.295 (p < .01) with GSWH, .172 (p < .01) with homework time, and .280 (p < .01) with academic achievement. A positive correlation of .479 was identified between Expectancy and self-efficacy, and a positive correlation of .509 between Value and self-efficacy. These results serve as evidence for the concurrent validity of the newly developed self-efficacy scale (Table 6).

Table 6: *Correlations Among Research Variables, Homework Behaviors, and Academic Achievement*

Scales	Dimensions	Homework Complete	GSWH	Homework Time	Academic Achievement
Homework Expectancy Value Scale	Expectancy	.000	.007	.075*	-.023
	Value	-.026	.060	.059	.041
Expectancy Value		.012	.037	.073	.011
Students' Motivation for Homework	Autonomous Motivation	.471**	-.374**	.117**	.357**
	Autonomous Motivation: Emotion	.316**	-.190**	.038	.252**
	Controlled motivation	-.141**	.105**	.020	-.177**
Homework Self Efficacy Scale		.039	.024	.097*	-.040
Homework Interest Scale		.477**	-.357**	.164**	.365**
Homework Affective Attitude Scale		.388**	-.153**	.140**	.217**
Math Homework Purposes Scale	Academic purposes	.240**	-.155**	.127*	.205**
	Self-regulatory purposes	.380**	-.238**	.131*	.281**
	Approval-seeking purposes	.335**	-.295**	.172**	.280**

*p<.05, **p<.01

Table 7. *Item Loadings, Item-Total, and Standardized Coefficients*

Scales	Sub Scales	Item No	Item Loads	Item total	β	Scales	Sub Scales	Item No	Item Loads	Item total	β
Expectancy Value Scale	Expectancy	1	,805	,615	,584	Homework Self Esfficacy Scale		1	,690	,689	,735
		2	,770	,688	,759			2	,660	,593	,662
		3	,749	,766	,669			3	,657	,648	,710
		4	,702	,700	,623			4	,619	,658	,785
	Value	5	,823	,622	,421			5	,684	,725	,781
		6	,777	,630	,436			6	,679	,650	,745
		7	,758	,782	,836			7	,633	,663	,763
		8	,683	,682	,670			8	,549	,589	,604
Homework Motivation Scale	Autonomous Motivation	1	,760	,681	,776			9	,684	,653	,729
		2	,784	,733	,813			10	,619	,640	,721
		3	,655	,692	,805	Homework Interest Scale		1	,848	,782	,861
		4	,656	,584	,649			2	,897	,847	,914
		5	,667	,683	,797			3	,876	,843	,961
		7	,764	,729	,775			4	,828	,730	,677
		8	,679	,650	,728			5	,755	,723	,658
	Autonomous Motivation: Emotion	6	,714	,587	,669	Homework Affective Attitude Scale		1	,845	,718	,816
		9	,687	,597	,794			2	,763	,633	,852
		10	,752	,659	,870			3	,787	,652	,883
		11	,681	,520	,469			4	,806	,343	,685
	Controlled motivation	12	,634	,584	,675	Math Homework Purposes Scale	Academic purposes	1	,745	,513	,501
		13	,641	,586	,667			2	,796	,540	,533
		14	,756	,673	,749			3	,621	,593	,763
		15	,771	,695	,770			4	,587	,596	,864
		16	,770	,716	,823		Self-regulatory purposes	5	,743	,646	,747
		18	,625	,595	,663			6	,786	,698	,791
		19	,709	,668	,759			7	,794	,707	,815
							Approval-seeking purposes	8	,745	,599	,725
								9	,758	,600	,724
								10	,786	,646	,757

4. Discussion

4.1. Exploratory and Confirmatory Factor Analysis

This research focuses on adapting six scales into Turkish: Expectancy value scale, students' motivation for homework scale, homework self efficacy scale, homework interest scale, homework affective attitude scale, and math homework purposes scale. The expectancy value scale was originally a combination of two different scales. However, in subsequent studies (Xu, 2017; Yang & Xu, 2018), although they measure theoretically different constructs, validity and reliability analyses were conducted for the possibility that the scale may have a unidimensional structure, and goodness of fit values for unidimensional and bi-dimensional constructs were compared. In this research, a similar path was followed and the values related to the unidimensional and bi-dimensional structures of the scale were calculated. In the first analysis, a unidimensional structure emerged in the EFA analysis performed according to the sub-scales with eigenvalues above 1. When EFA analysis was performed for two fixed factors, the items were divided into expectancy and value dimensions in accordance with the original structure. The high correlation between expectancy and value also supports the finding that the scale may be unidimensional. According to the results of the CFA analyses, the goodness of fit values of the two-dimensional structure were found to be much better than the one-dimensional structure. Therefore, it is recommended to prefer the two-dimensional structure in studies. These results are also in line with findings reported in the literature (Xu, 2017; Yang & Xu, 2018). Therefore, it can be said that the Expectancy Value scale can be used to measure middle school students' expectations and value perceptions of mathematics homework.

Homework Motivation scale consists of autonomous (intrinsic) motivation, controlled (extrinsic) motivation dimensions (Katz et al., 2011). Based on the EFA analysis performed on the scale, a three-dimensional structure emerged. Autonomous motivation items were divided into two dimensions that can be categorized as academic and emotion-related. Therefore, items involving emotions (e.g. I do my homework because it is fun) were labelled as Autonomous Motivation: Emotion. The reason for this difference may be that the items in the original scale were related to homework motivation in general, whereas in this research they were based on maths homework. Although autonomous motivation is divided into two sub-scales, it is more appropriate to use both dimensions together in academic studies. The high positive correlation between the two dimensions supports this interpretation. Based on the EFA analysis, the item "I do my homework because I want to get a better grade" in the controlled motivation dimension was not included in the final version of the scale because it was not suitable in terms of scope due to its decomposition under the autonomous motivation dimension. The CFA analysis supported the two-dimensional structure that emerged in the EFA analysis. As a result, it can be said that the findings obtained partially differ from the original findings (Katz et al., 2011). Despite these differences, the Homework Motivation scale can be used to measure mathematics homework motivation in secondary school students.

Within the scope of this research, homework self efficacy scale was developed. In Bandura's theory, self-efficacy refers to individuals' beliefs that they can successfully perform certain tasks or challenges (Bandura, 2012). The expectancy-value theory (EVT) expectancy dimension, which is frequently preferred in homework literature (Trautwein et al., 2006; Xu, 2017, 2023), refers to an individual's belief in his/her own ability to successfully complete a task or reach a goal (Wigfield & Eccles, 2000). Although the expectancy dimension of the expectancy-value scale measures self-efficacy, it was hypothesized that a scale with high content validity would yield more effective results in studies where only the self-efficacy variable would be used. From this point of view, the Homework Self Efficacy Scale emerged. The EFA analysis results of the scale revealed a unidimensional structure. CFA analysis results also confirmed this unidimensional structure. According to these results, it is said that the scale can be used to measure mathematics homework self-efficacy in secondary school students.

Homework interest scale is a unidimensional scale consisting of five items. As in the original scale, the EFA analysis revealed a unidimensional structure as in the original scale and all items were included in this structure with high loading values. The high internal reliability coefficient also supports this interpretation. The findings obtained in the CFA analysis also support the unidimensional structure of the scale.

Homework affective attitude scale is a unidimensional scale consisting of four items. As in the original scale, the EFA analysis revealed a unidimensional structure as in the original scale and all items were included in

this structure with high loading values. The findings obtained in the CFA analysis also supported the unidimensional structure of the scale.

The math homework purposes scale consists of academic purposes, self-regulatory purposes, and approval-seeking purposes sub-dimensions. The scale aims to determine students' reasons for doing homework. The findings of the EFA analysis revealed a three-dimensional structure in accordance with the original structure of the scale and the items were placed under the sub-dimensions in accordance with the original structure of the scale. The results of the CFA analysis also supported the three-dimensional structure that emerged in the EFA analysis. Based on these results, the Math Homework Purposes Scale can be used to explain the reasons for doing maths homework at the secondary school level.

4.2. Concurrent Validity

As part of this research, the concurrent validity of the Expectancy Value scale showed mixed results. No significant relationship was observed between the Expectancy dimension of the scale and the completion of homework, homework time, or academic achievement. A low-level relationship was identified only with the frequency of GSWH. Similarly, there was no relationship between the Value dimension and the four outcome variables. Expectancy is defined by Wigfield, & Eccles (2000, p.71) as "children's beliefs about how well they will do on upcoming tasks, either in the immediate or longer-term future". Value refers to how important it is for the student to fulfil the academic task (Eccles, 2009). Contrary to our findings, research indicates that both expectancy and value are highly positively related to homework completion (Xu, 2017; Xu, 2023c; Yang & Xu, 2018).and academic achievement (Xu, 2023c; Yang & Xu, 2018).

In addition, Xu and Corno (2022b) concluded that maths achievement is related to homework expectancy but not to homework value. These results show that the concurrent validity of the Expectancy Value scale was partially achieved. Similar results were found for the Homework Self Efficacy Scale developed within the scope of this research. It was found that there was no relationship between self-efficacy and homework complete, homework time and academic achievement, but there was a low level relationship between GSWH. Since Self efficacy (Bandura, 2012) and Expectancy (Wigfield & Eccles, 2000) are two variables that are named differently within the scope of different theories but measure the same feature, it is expected that the results obtained will be similar. In this research, the high positive correlation between Expectancy Value and Self efficacy can be presented as evidence for the concurrent value of the scales for each other.

A strong positive correlation was found between the Autonomous (intrinsic) Motivation dimension of the Homework Motivation scale and three variables: homework completion, homework time, and academic achievement. Conversely, a negative correlation was found with the frequency of GSWH. Similar results were obtained for Autonomous Motivation: Emotion, but no relationship was found with homework time. A low negative correlation was found between Controlled motivation and homework complete and academic achievement, and a low positive correlation was found between academic achievement. Autonomous or intrinsic motivation refers to an individual's self-motivated and intrinsically organized participation in an activity of his/her own volition. Controlled or extrinsic motivation is when external pressures or conditions direct the behavior of the individual (Deci & Ryan, 1985, 2000). Autonomous motivation is an important contributor to academic success (Feng et al., 2019; Mih, 2013; Mouratidis et al., 2018; Suárez et al., 2019). In addition, extrinsic motivation is a negative predictor of academic achievement (Areepattamannil et al., 2011; Becker et al., 2010; Lepper et al., 2005). The fact that the values obtained in this research are in the same direction with the literature shows that the concurrent validity of the Homework Motivation scale is high. At the same time, the fact that the correlation between Homework Motivation and homework completion is higher than academic achievement confirms the hypothesis of the study in this direction.

A strong positive correlation was found between homework interest and homework completion, homework time and academic achievement. On the other hand, a significant negative relationship was found between homework interest and GSWH. Homework interest had the highest relationship with homework behavior and academic achievement compared to other variables. Homework interest refers to students' personal predisposition and curiosity towards a particular homework topic or activity (Harackiewicz et al., 2016). As students' interest in a subject increases, they are more likely to spend more time on that subject and participate more actively in the learning process (Hidi & Harackiewicz, 2000). Interest is positively related to academic achievement (Xu, 2008, 2018, 2023c; Xu & Núñez Pérez, 2023; Xu & Wu, 2013; Zhang et al., 2019) and

homework completion (Xu, 2011, 2023c). The concordance between the results of this research and the literature can be considered as evidence of the concurrent validity of the Homework Interest scale.

A strong positive relationship was found between homework affective attitude and homework complete, homework time and academic achievement result. In addition, a significant negative relationship was found between Homework Interest and GSWH. The highest relationship was with homework complete, which was significantly higher than academic achievement. Homework affective attitude indicates to what extent homework is preferred among many extracurricular activities (Xu, 2023a). The results show that students who value homework more than extracurricular activities have better homework behavior and higher academic achievement. Homework affective attitude is a motivational variable positively related to academic achievement (Xu et al., 2016). According to these results, it can be said that the homework affective attitude scale has concurrent validity.

A strong positive relationship was found between the Academic purposes, self-regulatory purposes, and approval-seeking purposes sub-dimensions of the Math Homework Purposes scale and homework complete, homework time, and academic achievement result. In addition, a significant negative relationship was found between the sub-scaless and GSWH. Among the three variables, the highest correlation with the sub-dimensions was with homework complete. In studies using the math homework purpose scale, it was found that students' reasons for doing homework were positively correlated with many homework variables. Xu (2022a) found that academic Self-regulatory and Approval-seeking reasons were positively related to the homework time and the frequency of homework at student and grade levels in a study of 3,018 8th graders in China. In the study conducted by Sun et al. (2020), a positive relationship was found between Academic purposes, self-regulatory purposes and homework completion and academic achievement. Since the findings obtained in this research are compatible with the literature, it can be said that the Homework Purposes scale has concurrent validity.

5. Limitations and Implications for Research

This research was conducted with the participation of students studying in public secondary schools in Istanbul and the results obtained reflect the influence of Turkish culture on education. The cultural and geographical context of the research is central to the interpretation of the results. Students' attitudes towards homework are significantly influenced by variables such as local cultural norms, and the expectations of families. Therefore, conducting similar studies in diverse cultural settings provides a comprehensive understanding of the impact of cultural factors on student behavior. This research was conducted in an urban area such as Istanbul and the results obtained reflect the specific dynamics of such an urban environment. Istanbul, with its dense urban structure, is a city where the data obtained may differ when compared to rural areas or less dense cities. Therefore, it should be considered that the results from this research may not be directly generalizable to other areas with rural or different urban structures. It is recommended that the results of this research be repeated in rural areas in order to provide generalizable results for Turkish culture. The fact that this research was conducted in Turkish culture also constitutes its strength. Due to the fact that most of the studies belong to the western literature (Cooper, 1989; Patall et al., 2008), the data obtained from a society with a collectivist culture like Turkey will add richness to the homework literature.

In this research, data was gathered from middle school students attending 5th - 8th grades. Since the homework literature shows that homework behaviors may differ at different educational levels (Epstein & Van Voorhis, 2012; Hong et al., 2004; Hong & Milgram, 2000; Wigfield et al., 1997), it is recommended to conduct validity studies by applying the scales adapted into Turkish within the scope of this research at high school level. In the scales adapted and developed into Turkish, a course should be preferred. Within the scope of this research, mathematics course was preferred due to family, field and grade level. The subject area or course targeted by the study may influence students' attitudes toward homework. In this research, the findings obtained from the data collected through the mathematics course may not provide solutions for science, language and social courses, as there may be differences. While mathematics demands abstract reasoning and problem-solving skills, literature courses may focus on creative thinking abilities. For this reason, it is recommended that the related scales should be applied to different courses and validity and reliability analyses should be performed.

6. References

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Table 8: *Scale Items*

Scales	Sub Scales	No	Items
Expectancy Value Scale	Expectancy	1	If I don't understand something in mathematics, I often think I'll never understand it.*
		2	If I don't understand something in mathematics, I'm at a complete loss and don't know how to catch up.*
		3	Whether or not I do my mathematics Homework, I don't understand a thing in the lesson anyway.*
		4	I sometimes really dread mathematics Homework.*
	Value	5	Our mathematics Homework takes a lot of time and is of little use to me.*
		6	I don't learn much from our mathematics Homework.*
		7	There is no point in my doing mathematics Homework.*
		8	It makes barely any difference to me whether I do my mathematics Homework or not.*
Homework Motivation Scale	Autonomous Motivation	1	I do homework in order to learn and make progress.
		2	I do homework because it can help me in the future.
		3	I do my homework because I understand that it helps me succeed in school.
		4	I do homework because of the value and contribution of the homework to my learning.
		5	I do homework because I think it is important to do homework.
		7	I do homework in order to improve my understanding in this subject.
		8	I do homework because I love to learn.
	Autonomous Motivation: Emotion	6	I do homework because it is interesting to me.
		9	I do my homework because it is fun.
		10	I do homework because I feel good when I do it
		11	I do homework because it is challenging to me.
	Controlled motivation	12	I do my homework because if I didn't I would feel bad when I meet the teacher.
		13	I do homework so that my parents don't punish me.
		14	I do homework because the teacher writes down who did and didn't do it.
		15	I do my homework because if I didn't I would feel bad when I meet my parents.
		16	I do homework so that the teacher doesn't yell at me.
		17	I do my homework because I want to get a better grade.
		18	I do my homework because if I didn't would feel bad when I meet my friends.
		19	I do my homework because I would feel ashamed if the teacher will find out I didn't do it.
Homework Self Efficacy Scale		1	I can usually find the right solutions when doing maths homework.
		2	I feel comfortable when solving maths problems.
		3	When I encounter a difficult maths problem, I do not give up until I find the solution.
		4	When I fail in my maths homework, I can easily understand and correct my mistakes.
		5	I believe that I can complete my maths homework on time and effectively.
		6	I know the necessary strategies to overcome the difficulties I encounter in maths homework.
		7	I can think of alternative methods to solve the maths problems I encounter.
		8	When I am successful in my maths homework, I feel that this success is due to my own efforts.
		9	I can come up with creative solutions to solve the problems I encounter while doing maths homework.
		10	When I finish a maths homework, I am usually confident that my answers are correct.
Homework Interest Scale		1	I look forward to mathematics Homework
		2	Mathematics Homework is fun.
		3	I enjoy mathematics Homework.
		4	How do you like about mathematics Homework in general?
		5	Overall, do you think mathematics Homework you get is ____?
Homework Affective Attitude Scale		1	My motivation to do mathematics Homework is ____ other after-school activities.
		2	My attention while doing mathematics Homework is ___ other after-school activities.
		3	My mood while doing mathematics Homework is _____other after-school activities.
		4	Compared with other activities I do after school, mathematics Homework is my.
Math Homework Purposes Scale	Academic purposes	1	Doing mathematics Homework helps me get a good grade.
		2	Doing mathematics Homework helps me prepare for the next lesson.
		3	Doing mathematics Homework gives me opportunities to learn from classmates.
		4	Doing mathematics Homework helps me understand what's going on in class.
	Self-regulatory purposes	5	Doing mathematics Homework helps develop good discipline.
		6	Doing mathematics Homework helps develop a sense of responsibility.
		7	Doing mathematics Homework helps me learn to work independently.
	Approval-seeking purposes	8	Doing mathematics Homework brings me teacher approval.
		9	Doing mathematics Homework brings me family approval.
		10	Doing mathematics Homework brings me approval from classmates.

*Reverse coded.