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Evaluation of the Life Skills of Students in Adolescence: Scale Development and Analysis

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ABSTRACT Adolescents have been the leading group for life skills (LS) education in the last decade. The primary purpose of this study was to develop a valid and reliable instrument for assessing the general LS of students in adolescence. In addition, the relation of adolescents' LS to gender, grade level, science/physics course scores, GPA, and socio-economic status variables was examined. This descriptive survey study included two data sets, one for the development of the scale part, including 692 students, and the other for confirmatory analysis and inferential statistics, including 887 students. LS were assessed using the Life Skills Scale (LSS), which consisted of 83 items in 10 sub-dimensions, and evaluated critical thinking, creative thinking, decision making and problem-solving, coping with stress and emotion, social responsibility, teamwork, self-esteem, self-awareness, empathy, and interpersonal relationship and communication skills of the students. The results of the exploratory and confirmatory factor analysis and the reliability coefficient of the scale provided solid statistical evidence, which was coherent with the 10-subdimension model of the scale. The findings revealed that the LSS is a valid and reliable tool for adolescents to evaluate their LS. Students scored highest on empathy, self-awareness, and self-esteem, whereas they scored lowest on teamwork, coping with stress & emotion, and critical thinking. There was a significant relationship between various sub-dimensions of LS and some variables such as GPA, grade level, gender, and science/physics course score. The results also indicated that the academically successful students were highly skilled in most LS sub-dimensions.

Keywords Life Skills, Science, Scale Development, Adolescent, Factor Analysis

1. INTRODUCTION

The life skills (LS) concept was first introduced in a psychological consultation program in the mid-'60s. This program was about the application of the life skills consultation model on disadvantageous groups and described LS as "…the psychological and social skills for mastering the interrelated problems in living encountered in training, on the job, in the home, and the community." (Adkins, 1970). Since then, the concept has gained its place in the general culture, and there has been an increasing interest in LS programs (Adkins, 1984; Bailey & Deen, 2002; Chauhan, 2016; Choudhary & Rani, 2020). The scope of these programs varied and covered topics such as adolescents' problems, youth problems, disadvantageous groups, protection from epidemics, occupational problems, career development in business and industry, anti-poverty programs, marriage/separation/divorce problems, health, death, teacher education, nutrition, and sports (Adkins, 1984; Bailey & Deen, 2002; Botvin & Griffin, 2004; Choudhary & Rani, 2020; Ghasemian & Kumar, 2017; Gould & Carson, 2008; UNICEF, 2012; WHO, 1994).

In recent years, adolescents have been the leading group for LS education (Balsano, Phelps, Theokas, Lerner, & Lerner, 2009; Durlak, Weissberg, & Pachan, 2010; Population Council, 2013; UNICEF, 2012; WHO, 1994). Adolescents experience a period of changes, which include biological, cognitive, and socio-emotional changes, during their transition from childhood to adulthood (Santrock, 2012). Joseph (2018) states that the probability of facing different issues and problems increases during this period. Building LS in this term helps them understand themselves and makes them feel more comfortable dealing with the problems.

Assessing adolescents' LS is essential to understand better their usage level of these skills in their own lives and the ones they need to improve. Many recent studies

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regarding LS emphasized the absence of valid and reliable instruments to measure them (Chauhan, 2016; Erawen, 2010; Green, 2008; Kennedy, Pearson, Brett-Taylor, & Talreja, 2014). Particularly, it is evident that there is a need for measurement tools that cover all of the general LS (Erawen, 2010; Vranda, 2009). This study aimed to develop and validate a survey instrument that could adequately evaluate the LS of adolescents.

1.1 Scope of Life Skills

WHO (1997) defines LS as positive attitudes and skills which help a person effectively cope with the problems of daily life. Core LS, which encourages adolescents to be healthy and positive, can be listed as decision making, problem-solving, creative thinking, critical thinking, effective communication, interpersonal relation skills, self-awareness, empathy, coping with emotions, and coping with stress (WHO, 1997). Other emphases about the definition of LS are as follows: 'The necessary skills to satisfy daily life requirements' (Kennedy et al., 2014; Khalil, 2018); 'basic development units of human existence' (Ginter, 1999).

There are no defined categories concerning LS, but they include various skills necessary for a successful life (Danish, Forneris, Hodge, & Heke, 2004). According to Hendricks (1998), it is crucial to find out and define the target LS for young people. Therefore, the LS categories may change depending on the target audience and their needs (Bailey & Deen, 2002). For instance, LS programs' target skills and objectives are different for adolescents (Magnani et al., 2005; Vranda, 2009) and adults (Diehl, 2004; Helfrich, Aviles, Badiani, Walens, & Sabol, 2006). Hendricks (1998) organized the 4-H LS model and categorized the LS into four primary groups: Head, Heart, Hand, and Health. The studies referenced above and the other studies in the literature (Erawen, 2010; Partnership for 21st Century Skills, 2015; Tan, 2018) examined the LS by using different categorizations, but the sub-components of these categories are mostly the same with the core LS listed by WHO (1997) (Erduran Avcı & Kamer, 2018).

LS is defined as the individual's ability to manage daily life's demands and difficulties, psycho-social competence, or interpersonal competencies (Sagone & Indiana, 2017; UNICEF, 2012; WHO, 1997). The psycho-social factors that affect a person psychologically or socially have a multidimensional structure like mood status, cognitive-behavioral responses, and social factors (Suzuki & Takei, 2013). Some of the past research examined the relation of life skills to psychological and demographic factors. Some examples of such factors are as follows: gender (Ansari, Khorram, Soleimaninejad, & Ansari-Moghaddam, 2016; Ghasemian & Kumar, 2017; Kennedy et al., 2014; Kobayashi et al., 2013; Vranda, 2009), grade level (Duerden, Witt., Fernandez, Bryant, & Theriault, 2012), grade point average (GPA) or academic performance (Chien, Harbin, Goldhagen, Lippman, & Walker, 2012; Cronin et al., 2021; Currie et al., 2012), socio-economic status (SES) (Dadgarmoghaddam et al., 2019; Dhingra & Chauhan, 2017; Singla et al., 2020), well-being (Choudhary & Rani, 2020). Most of these studies proved that life skills are related to the mentioned psychological and demographic factors. Therefore, LS are bounded elastically by refined skills that are shaped depending on various factors and can be learned and improved (Cronin & Allen, 2017).

1.2 Need to develop a new instrument

Most of the scales in the literature have the LS highlighted by WHO (1997) as sub-factors (Ansari et al., 2016; Bolat & Balaman, 2017; Chauhan, 2016; Erawen, 2010; Prasad, 2018; Vranda, 2009). However, recent studies on the LS scales varied in terms of their objectives, targeted age groups, sub-factors, and validity & reliability analysis. Some of them were created to measure the outputs of special LS programs, such as school garden programs (Robinson & Zajicek, 2005), out-of-school education (Neill, 2008; Seevers, Dormody, & Clason, 1995), 4-H Youth Development Programs (Bailey & Deen, 2002), teacher education (Chauhan, 2016). Some others were developed to measure the individuals' LS generally (Bolat & Balaman, 2017; Erawen, 2010; Prasad, 2018). Some of them were structured for special conditions and groups such as juvenile delinquents (Kadish, Glaser, Calhoun, & Ginter, 2001), disadvantaged children and young people (Kennedy et al., 2014), and youth sports (Cronin & Allen, 2017). There are also LS scales developed for different age groups such as adolescents (Erawen, 2010; Vranda, 2009), secondary/high school students (Özmete, 2008; Prasad, 2018), primary school students (Kobayashi et al., 2013; Robinson & Zajicek, 2005), higher education students (Cronin et al., 2021).

A literature review on LS instruments, developed for assessing LS of different age groups and characteristics, revealed specific instruments. Some of these instruments were used to evaluate LS programs with designated/special purposes (Bailey & Deen, 2002; Cronin & Allen, 2017; Dunn & Arbuckle, 2003; Kadish et al., 2001; Kennedy et al., 2014). The studies used other instruments shared the same focus as the present study and targeted to evaluate the general LS of adolescents (Erawen, 2010; Green, 2008; Özmete, 2008; Prasad, 2018; Vranda, 2009). Vranda (2009) and Prasad's (2018) LS scale factors consisted of the ten core LS stated by WHO (1997). Vranda (2009) proposed a 115-item scale to evaluate the LS of adolescents aged 13 to 16, and Prasad (2018) created a 50-item scale to evaluate the life skills of 11th and 12th-grade senior secondary school students. Özmete (2008) developed a scale in their research, which was performed on high school 1st-grade students, and aimed to determine the LS using personal development, health, family life, consumer education-financial planning, and career planning factors. Although these scale development studies (Özmete, 2008; Prasad,

2018; Vranda, 2009) included some statistical efforts, they lack the statistical analyses to provide decent evidence (a good statistical source data) for a valid and reliable scale. Green (2008) developed a 'Youth Life Skills Scale' to evaluate the life skills of young people between 11 and 16 with 112 items and five factors (communication, time management, coping skills, goal setting, and leadership). Even though Green (2008) provided detailed and solid statistical evidence about the scale factors, it did not cover all of the core LS defined by WHO (1997). It thus had limited content regarding the LS factors.

Erawen's (2010) scale covered the adolescent group, included all core life skills categories (WHO, 1997), and provided solid statistical evidence regarding the scale's validity and reliability. This scale consisted of 120 items and had nine factors, including 'self-respect' and 'self-responsibility' in addition to the core skills (critical thinking, creative thinking, self-awareness, empathy, interpersonal relations, and communication, decision making-problem solving, coping with stress, and emotions) defined by WHO (1997). The structure of Erawen's scale leveraged mixed methods research, which comprised qualitative (affinity diagram technique) and quantitative (model of confirmatory factor analysis) methods. The research provided reliable statistical data about the structure of the scale by analyzing the data collected from 1,305 high school students (aged between 12 and 17) in Thailand. Therefore, it can be claimed that out of all life skills scales in the literature, the scale developed by Erawen (2010) is a proper, valid, and reliable instrument to evaluate the core life skills of adolescents.

The scope of life skills may differ according to some cultures or countries (Koen & Ebrahim, 2013; WHO, 1997), such as Thailand (Erawen, 2010), Japan (Kobayashi et al., 2013) or India (Bhardwaj, 2013; Chauhan, 2016). Nasheeda, Abdullah, Krauss, and Ahmed (2019) stated, "Examining adolescent experiences within the embedded culture of the individual is important to understand how individuals from different backgrounds construct life skill knowledge into reality" (p. 376). In this context, the present study aims to examine the LS development of adolescents in Turkey. One of the primary objectives of the Turkish education system is "growing individuals who are integrated to our values & competencies and possess required information, skills, and behavior" (TMNE, 2018a). One of the purposes of education is to make the students embrace and apply the fundamental values, such as effective communication, collaboration, respect, and responsibility. At the same time, they research and question a piece of information. Also, the national science course curriculum (TMNE, 2018a) and the physics course curriculum (TMNE, 2018b) in Turkey emphasize the importance of developing some life skills in students' responsibility regarding daily life problems. For instance, these six LS are emphasized in the science course curriculum: analytical thinking, decision making, creativity, entrepreneurship, communication, and teamwork (TMNE, 2018a). No valid and reliable LS scale can evaluate the development of the core LS proposed by WHO (1997), and the development of the LS emphasized by the Turkish national education system and the curricula (TMNE, 2018a, 2018b).

The results of Alaca, Yaman, and Nas (2020) 's study showed that the pre-service science teachers in Turkey did not have the cognitive structures to produce enough answer words about life skills. Furthermore, Nasheeda et al. (2019) stated that most developing countries' LS programs lack evaluation and monitoring. Such research results strengthen the necessity of evaluating the LS of students.

1.3 The present study

To understand young people's skill development, it is crucial to establish valid and reliable instruments for LS (Cronin & Allen, 2017). The need for the tools to assess these skills is obvious, and this study has the potential to contribute to the literature by validating a new instrument, the Life Skill Scale (LSS), for adolescents. In some studies, the LS was examined regarding variables such as gender, grade level, and SES. Some studies investigated the relationship of the LS to gender, and a portion of them indicated that females scored higher than males (Kennedy et al., 2014; Kobayashi et al., 2013; Vranda, 2009). Another group stated that males scored higher than females (Ansari et al., 2016), and the remaining ones emphasized that there was no superiority in scores according to gender (Duerden et al., 2012; Ghasemian & Kumar, 2017).

Furthermore, Duerden et al. (2012) stated that the school level produced the most significant score differences across LS measures. They found that the LS scores of the primary school students were higher than secondary school and high school students except for communication and self-respect. The communication scores of the high school students were higher than the other students, and the self-respect scores of the secondary school students were higher than the other students. For the students' GPA, Cronin et al. (2021) and Currie et al. (2012) revealed that LS was associated with academic achievement scores in certain sub-dimensions such as goal setting, problem-solving, and leadership. Yayla Eskici and Özsevgeç (2019), in their study, examine the studies on the LS and underline that it is a research area that needs to be questioned according to socio-economic level. Therefore, the purpose of the study was to develop an instrument evaluating the general LS of adolescent students and to analyze them concerning certain variables.

The study's research questions were listed as follows: (1) Is the LSS developed in the present study valid and reliable according to the results of the exploratory and confirmatory factor analyses? (2) Are there any significant differences between the total and dimensions scores of the

students' LS and the variables of GPA, gender, grade level, science/physics course score, and SES?

2. METHOD

This study was a descriptive survey study that aimed to develop an LSS for adolescent students– between the ages of 10 and 17 and to confirm and cross-validate the ten-factor structure of the developed LSS (Fraenkel, Wallen, & Hyun, 2012). Therefore, all of the procedures to support the construct validity of the LSS were justifications to validate the scale's ten-factor structure. Furthermore, LS sub-dimensions of secondary and high school students were examined in terms of different variables – namely GPA, gender, age, grade level, school type, science/physics course score, and SES.

2.1 Participants

The accessible population of the study was around 9,700 middle and high school students in Burdur, Turkey. Among this student population, we collected the research data from the two most crowded secondary schools (Secondary School A and B) and three high schools (High School A, B, and C). LSS was applied to 1,967 students, out of which 1,068 were secondary school students and 899 were high school students (approximately 20.3% of the population). At first, the 211 middle school and 177 high school students' data, including incomplete markings, were removed. Then, we used two data sets for the study: data set-1 (for EFA) and data set-2 (for CFA and the inferential statistics). We set the number of individual data for these two sets as close as possible. Data set-1 was created by combining the data from Secondary School A and High School B (692 students in total), and data set-2 was created by combining the data from Secondary School B and High School A and C (887 students in total). We combined data from the secondary school students with high school students because LSS covered the age group (ages 10 to 17) from both school types. The EFA, 13 students' data including outliers were removed from data set-1, was performed on the data obtained from 679 students [369 female, 54.3% and 310 male, 45.7% (secondary school students: 216 female and 196 male; high school students: 153 female and 114 male)]. The CFA, 302 students' data including outliers were removed from data set-2, was carried out with the data of 585 students [360 female, 61.5% and 225 male 38.5% (secondary school students: 130 female and 120 male; high school students: 230 female and 105 male)]. A sample size greater than 200 was considered adequate for CFA (Brown, 2012; Field, 2009).

The inferential statistics, 122 students' data including multivariate outliers were removed from data set-2, was carried out with 765 students [449 female, 58.7% and 316 male 41.3% (secondary school students: 198 female and 190 male; high school students: 251 female and 126 male)]. In the sample of the inferential statistics part, the students' distribution of independent variables (Gender, GPA, science/physics course score, grade level, and SES) are presented in Table 1.

Table 1 Number of students and their percentages in terms of independent variables

Independent Variables	Intervals	Number of Students - (Percentages)
Gender	Male	449 (58.7)
	Female	316 (41.3)
GPA	60-69.99	55 (7.2)
	70-84.99	138 (18.0)
	>=85	572 (74.8)
Science/physics Couse Score	50-59.99	40 (5.2)
	60-69.99	95 (12.4)
	70-84.99	200 (26.2)
	>=85	430 (56.2)
Grade Level	5	99 (12.9)
	6	118 (15.4)
	7	123 (16.1)
	8	46 (6.0)
	9	141 (18.4)
	10	111 (14.5)
	11	109 (14.2)
	12	18 (2.4)
SES	low	312 (40.8)
	medium	351 (45.9)
	high	102 (13.3)

2.2 Variables

The mean scores obtained for the ten sub-dimensions of the LSS were the dependent, and students' gender, GPA, science/physics course score, grade level, and SES were the independent variables for the inferential statistics of this study. The properties of variables, and item numbers from which the variables were derived or taken, are presented in Table 2. In the regulation on secondary educational institutions (TMNE, 2020), the categorical transformations of the students' scores as below 49.99 'does not pass', 50-59.99 'passes'; 60-69.99 'average', 70-84.99 'good', above 85 'very good. The students' science/physics course score (SPCS), representing the overall score for the previous term, and their general GPA are transformed into categorical variables concerning this transformation. The SES variable also indicates a composite measure of the SES index. The SES score in this study was a combination of students' scores for answers to the family's seven demographic questions related to education, occupation, and income variables as described in the Turkish socio-economic status index document from the Social Structure Studies Program (SSSP, n.d.). The item for mothers' and fathers' education status was scored between 1 and 5, occupation status was scored between 0 and 1, total income was scored between 1 and 5, the number of people in the family was scored between 1 and 5, and ownership of their houses was scored between 1 and 3. The total SES score varies between a minimum of 7 and a maximum of 23

Table 2 Description of the variables

Variable Name	Variable (wrt types)	Variable (wrt values)	Derived/Taken Items from the Scale	Variable Label / Source	Intervals Min.-Max.
School Type	Independent	Categorical	Pre-defined	Secondary / High School	-
Gender	Independent	Dichotomous	Demographic#1	female/male	-
Grade Level	Independent	Categorical	Demographic#2	1, 2, 3, 4	5-6, 7-8, 9-10, 11-12
Age	Independent	Categorical	Demographic#3	1, 2, 3, 4	10-11, 12-13 14-15, 16-17
Science/physics course score	Independent	Categorical	Demographic#4	2, 3, 4, 5	50-59.99; 60-69.99; 70-84.99; 85 & above
GPA	Independent	Categorical	Demographic#5	2, 3, 4, 5	50-59.99; 60-69.99; 70-84.99; 85 & above
SES	Independent	Categorical	Demographic#6-12	Low Medium High	7-14 15-18 19-23
Critical T.	Dependent	Continuous	1-6	Data	1.49-3.26
Creative T.	Dependent	Continuous	7-16	Imputation	2.11-4.67
Decision M.	Dependent	Continuous	17-28	from AMOS	2.24-4.56
Coping w. Stress	Dependent	Continuous	29-39		1.60-4.08
I. R. and Communication	Dependent	Continuous	40-46		2.48-4.53
Empathy	Dependent	Continuous	47-53		2.58-4.81
Self-awareness	Dependent	Continuous	54-65		2.00-4.11
Self-respect	Dependent	Continuous	66-73		2.34-5.42
Teamwork	Dependent	Continuous	74-78		.71-3.26
Social Responsibility	Dependent	Continuous	79-83		2.30-4.51

points. Its mean is 15.1, and the standard deviation is 3.1. The distribution of calculated SES scores was then divided into tertiles according to the percentage distribution of Turkish SES groups in the SSSP (n.d.). Therefore the scores between 7-14 are defined as low, between 15 and 18 are defined as medium, and between 19 and 23 are defined as high SES (see Table 1).

2.3 Data analysis

The LSS was applied by including 14 demographic questions on the scale. The demographic questions were used to attain the independent variables of the analysis described in Table 2. In the LSS, higher scores for students' answers to five-point Likert-type items were interpreted as a higher perception of LS.

Before EFA, CFA, and inferential statistics calculations, the data were analyzed for accuracy, missing data, outliers, normality, multiple accuracy, and singularity. Since missing values lower than 5% could be replaced by any method that handles the missing values, according to Tabachnick and Fidell (2007), they were replaced with the means of series. All outliers detected for single and multiple variables were removed from the data set. The multicollinearity within the items inspected with tolerance and VIF was not observed. The shape of the scatter-plot diagrams was also checked for homoscedasticity, and this assumption was also validated. For the normality, as Byrne (2010) suggested, at first univariate normality (skewness and kurtosis values were within the range of -2 and +2) was validated. The CFA was conducted by running the baseline model; only the factor loadings are constrained to be equal across the data for the original 10-factor structure. The common fit indices are given in Table 3, together with their critical value ranges.

In addition to the values in Table 3, Hu and Bentler (1999) indicated a combination of rules for a reasonably good fit between the model and the source data to increase the acceptability of Type I and Type II error rates. a) SRMR value close to or below .08; b) RMSEA value close to or less than .06, and c) CFI and TLI values close to or greater than 0.95. There is no apparent difference between the combined values given in Table 3 and the critical limits of this study. Therefore, the statistically significant $\chi 2$ is not sufficient to imply that the data is incompatible with the model. In such a case, model fit can be evaluated by comparing the value of $\chi 2$ to twice the degree of freedom

Table 3 Fit indices with suitable thresholds used in this study

Fit Index	Critical Values	Resource(s)
χ2 (CMIN)	Low χ2 value and p > .05 (good fit) If p < .05 (acceptable fit)	Brown (2012) Tabachnick and Fidell (2007) Bryne (1989), Hu and Bentler (1999)
χ2/df	Good Fit χ2/df < 1 Acceptable Fit χ2/df < 2	Byrne (1989)
RMSEA	RMSEA < .05 (good fit) RMSEA < .08 (fair fit)	Brown (2012) Hu and Bentler (1999) Jöreskog and Sörbom (1993) Tabachnick and Fidell (2007)
RMR	RMR≤.05 (good fit)	Jöreskog and Sörbom (1993)
SRMR	SRMR≤.08 (reasonably good fit)	Hu and Bentler (1999)
GFI	.95 ≤ GFI ≤ 1 (good fit)	Tabachnick and Fidell (2007)
CFI	.90 ≤ CFI ≤ .95 (adequate fit)	Brown (2012)
IFI	.90 ≤ CFI ≤ .95 (adequate fit)	Brown (2012)

Note: χ2 = chi-square, RMSEA = root mean square error of approximation, RMR = the root mean square residual, SRMR = the standardized root mean square residual, GFI = goodness of fit, CFI = comparative fit index, and IFI =

(Byrne, 1989), analyzing critical limits for the value of χ2 / df, and analyzing the other fit indices.

The dependent variables were the scores assigned through data imputation from AMOS for the ten sub-dimensions of the LSS, as explained in Table 5. The assumptions of the MANOVA were checked that the observations were independent and the sample size was sufficiently large for the groups of MANOVA. The assumptions of the absence of multiple variable outliers, the normal distribution of the dependent variables for each independent variable, linearity, multicollinearity, homogeneity of variances, and homogeneity of variable matrices were also met. The age and type of the schools were not included in the further analysis since they do not meet the assumptions of homogeneity of normality and variance.

3. RESULTS

3.1 Framework for development of the LSS and results for the EFA and CFA

The five-stage model for scale development proposed by Hinkin (1998) was accepted as the framework. These stages were item generation, scale management, initial item reduction, confirmatory factor analysis, scale evaluation, and convergent/discriminant validity. The five-stage process stated by Hinkin was analyzed within the five sub-titles of this section.

Item generation

At this stage, initially, the related scale studies in the literature were examined (Bolat & Balaman, 2017; Dhingra & Chauhan, 2017; Dunn & Arbuckle, 2003; Erawen, 2010; Green, 2008; Kar, 2011; Kennedy et al., 2014; Kobayashi et al., 2013; Özmete, 2008; Petterson, Gravesteijn, & Roest, 2016; Sharma, 2003; Subasree & Nair, 2014; Tuncer, 2008). Then, Erawen's (2010) LS scale was found to be the closest one to the objectives of the present study because (i) its target audience was adolescents, (ii) it included all core life skills factors defined by WHO (1997), and (iii) it provided valid and reliable statistical evidence. Therefore, the definitions, variables, and indicators of nine sub-dimensions in Erawen's (2010) LS scale were selected as the model of the present study.

Besides the ones mentioned in Erawen (2010), some of the studies in the literature which focus on the classification of the LS considered 'teamwork' as a life skill sub-dimension (Cronin, & Allen, 2017; Hendricks, 1998). This sub-dimension is also emphasized in the Turkish curriculum (TMNE, 2018a). Therefore, the LSS in the present study was structured under ten sub-dimensions by adding 'teamwork' to Erawen's (2010) framework. The final structure of the LSS contained ten sub-dimensions: (1) Critical thinking, (2) Creative thinking, (3) Decision making and problem-solving, (4) Coping with emotion and stress, (5) Empathy, (6) Self-awareness, (7) Self-esteem, (8) Interpersonal relationship and communication, (9) Social responsibility, and (10) Teamwork.

In this context, researchers formed a table including definitions, variables, and indicators of sub-dimensions by mostly revising Erawen's (2010) study (see Supplementary Material Table A). The researchers formed an initial item pool (including 189 items) by accepting and/or revising the items of the other scales in the literature and creating new ones (see Supplementary Material Table B). Six faculty members who were experts in educational fields discussed these items in three sessions.

Table 4 Factor loadings of items within the EFA and CFA of the study

Component	Item No.	Factor Loadings EFA	CFA
Critical Thinking	Item 3	.591	.716
	Item 6	.563	.737
	Item 2	.562	.698
	Item 4	.452	.657
	Item 5	.446	.431
	Item 1	.419	.386
Creative Thinking	Item 12	.627	.627
	Item 11	.623	.740
	Item 14	.588	.697
	Item 13	.580	.704
	Item 16	.549	.400
	Item 8	.545	.633
	Item 10	.543	.725
	Item 15	.534	.593
	Item 9	.394	.611
	Item 7	.371	.597
Decision Making and Problem Solving	Item 25	.628	.690
	Item 27	.615	.727
	Item 24	.599	.679
	Item 23	.589	.713
	Item 19	.578	.712
	Item 22	.571	.747
	Item 28	.558	.742
	Item 26	.537	.626
	Item 17	.518	.692
	Item 20	.455	.685
	Item 21	.447	.583
	Item 18	.442	.729
Coping with Stress and Emotion	Item 37	.639	.608
	Item 35	.635	.582
	Item 31	.608	.719
	Item 32	.565	.631
	Item 30	.518	.543
	Item 33	.512	.354
	Item 36	.504	.467
	Item 39	.483	.464
	Item 34	.392	.682
	Item 38	.353	.668
	Item 29	.317	.605
Interpersonal Relation & Communication	Item 45	.584	.701
	Item 44	.562	.637
	Item 46	.503	.634
	Item 43	.485	.525
	Item 42	.366	.629
	Item 41	.333	.710
	Item 40	.326	.771
Empathy	Item 51	.668	.790
	Item 53	.645	.732
	Item 52	.611	.666
	Item 50	.493	.762
	Item 49	.485	.788
	Item 47	.448	.707
	Item 48	.387	.769
Self-Awareness	Item 61	.687	.739
	Item 60	.680	.802
	Item 63	.676	.799
	Item 56	.655	.839
	Item 59	.647	.758
	Item 58	.636	.731
	Item 55	.623	.771
	Item 57	.620	.798
	Item 62	.560	.702
	Item 65	.531	.761
	Item 64	.528	.645
	Item 54	.482	.735
Self-Esteem	Item 68	.609	.732
	Item 66	.561	.740
	Item 67	.560	.766
	Item 69	.543	.650
	Item 73	.510	.792
	Item 72	.442	.691
	Item 70	.440	.731
	Item 71	.427	.688
Team Work	Item 76	.805	.766
	Item 75	.729	.677
	Item 74	.685	.476
	Item 77	.669	.602
	Item 78	.656	.535
Social Responsibility	Item 82	.740	.462
	Item 83	.695	.712
	Item 81	.660	.699
	Item 80	.461	.689
	Item 79	.440	.576

Scale management

Items were selected according to the comments of the experts. The researchers and experts agreed on the draft LSS containing 140 items in 10 dimensions. A pilot study was conducted on 40 students aged between 12 and 15. The pilot study aimed to collect the students' opinions about the scale items' clarity and the application duration. In addition, the scale was presented to 13 science teachers for evaluation. One of the special purposes and learning fields of the Turkish Science Course curriculum (TMNE, 2018a) is LS. The science teachers in Turkey are experienced and knowledgeable in making the students gain these skills. Therefore, the researchers consulted experienced science teachers to obtain their assessment of the draft LSS. The teachers' opinions were evaluated together with the

application results in the pilot study, and four items were removed from the draft LSS.

Initial item reduction: Providing construct validity

After the first application of the LSS, construct validity of the LSS was carried out with explanatory factor analysis (EFA) by principal component analysis with the extraction method and varimax with Kaiser normalization as the rotation method. The KMO value was found to be .957, accepted as 'very good' for extracting factors from the collected data (Field, 2009). Bartlett's sphericity test result was $\chi^2 = 27350.787$, $p < .001$. Therefore, this sample size was adequate for factor analysis (Field, 2009; Henson & Roberts, 2006). There were 136 items on the scale for the first application of the study. The researchers considered three criteria in item reduction: (1) The factor loadings of the items should be above the critical limit of .320 (Tabachnick & Fidell, 2007), and (2) The Cronbach's alpha reliability of the scale should remain as "very good" (> .90) after the removal of the item, and (3) there should be another item that measures the same skill with the removed item, so the removal should not result in any measuring deficiency regarding the skill. For this process, the researchers carried out a factor analysis and analyzed these three criteria five separate times, repeatedly (16 in the 1st cycle, 13 in the 2nd cycle, 9 in the 3rd cycle, 9 in the 4th cycle, and 6 in the 5th cycle, in total 53 items were removed). Then, principal components analysis was performed with 83 items during the EFA process. Since the scree plot advised that the factors after 11th and 12th had very close values, the scale was considered a 10-factor scale.

In the 'Total Variance Explained' table of the SPSS, ten factors accounted for 51.07% of the variance, which is acceptable (Henson & Roberts, 2006), with eigenvalues of 1.0 or higher. Furthermore, the items in these ten factors had loadings between .326 and .805. Therefore, the final factor groups and factor loadings for the EFA are given in Table 4.

The factors were named as given in Table 5 using the category names from the literature (Erawen, 2010). The internal consistency of the ten factors was analyzed by Cronbach's α values as given in Table 5 (ranging between .717 and .916). Therefore, the internal consistency of the whole test ($\alpha = .964$) was considered acceptable, and the results of the LSS are reliable (Pallant, 2007).

In the LSS, the score for students' answers in five-point Likert type items was assigned the following codes: 1 'Totally disagree', 2 'Disagree', 3 'Neutral', 4 'Agree', 5 'Totally agree'. Higher scores are interpreted higher perception of LS. Table 2 represents the mean scores of the participants' perceived LS concerning sub-dimensions obtained from the LSS. The first three sub-dimensions with the highest mean scores in descending order are empathy, self-awareness, and self-esteem, and the sub-dimension with the lowest mean score is teamwork.

Confirmatory factor analysis (CFA)

CFA with AMOS was performed in order to determine the model-fit whether the LSS derived from EFA. Before conducting CFA, data from 826 students were analyzed for outliers using Mahalanobis distance at $p < .001$ (Tabachnick & Fidell, 2007, p. 99). The outliers were removed, and the CFA was conducted with 585 students' data. The related fit indexes (CFI, GFI, and IFI) were within the accepted thresholds in Table 3. All fit indices were observed to be within the acceptable value range ($\chi2(3268, N = 585) = 5953.186$; $\chi2/df = 1.822$; RMSEA = .0038, SRMR = .049; CFI = 0.900; IFI = 0.901), which

Table 5 The number of items, mean scores, standard deviations, and alpha coefficients of the study

	Life Skills	Number of Items		EFA Part			CFA Part			Inferential Statistics Part		
		Prior to	After	M	SD	alpha	M	SD	alpha	M	SD	alpha
	Whole Scale	136	83	-	-	.964	3.91	.90	.973	3.86	.97	.949
Dimensions	Critical Thinking	13	6	3.75	1.05	.717	3.91	.88	.761	3.84	.96	.639
	Creative Thinking	11	10	3.86	1.03	.853	3.99	.86	.866	3.96	.92	.781
	Decision M. & Problem S.	19	12	3.81	1.06	.893	3.96	.83	.918	3.91	.90	.846
	Coping with Stress & Emotion	14	11	3.42	1.20	.823	3.50	1.04	.843	3.43	1.13	.797
	Interpersonal Relation & Communication	20	7	3.90	1.05	.803	3.95	.88	.842	3.91	.94	.752
	Empathy	8	7	4.14	1.02	.875	4.20	.79	.899	4.15	.86	.789
	Self-Awareness	17	12	4.08	1.02	.916	4.11	.83	.940	4.08	.89	.875
	Self-Esteem	12	8	3.93	1.11	.880	4.02	.90	.900	3.98	.97	.844
	Team Work	10	5	3.15	1.32	.772	3.40	1.18	.750	3.29	1.25	.732
	Social Responsib.	12	5	3.88	1.12	.781	3.96	.94	.756	3.92	1.01	.660
N (Number of participants)		N = 679					N = 585			N = 765		

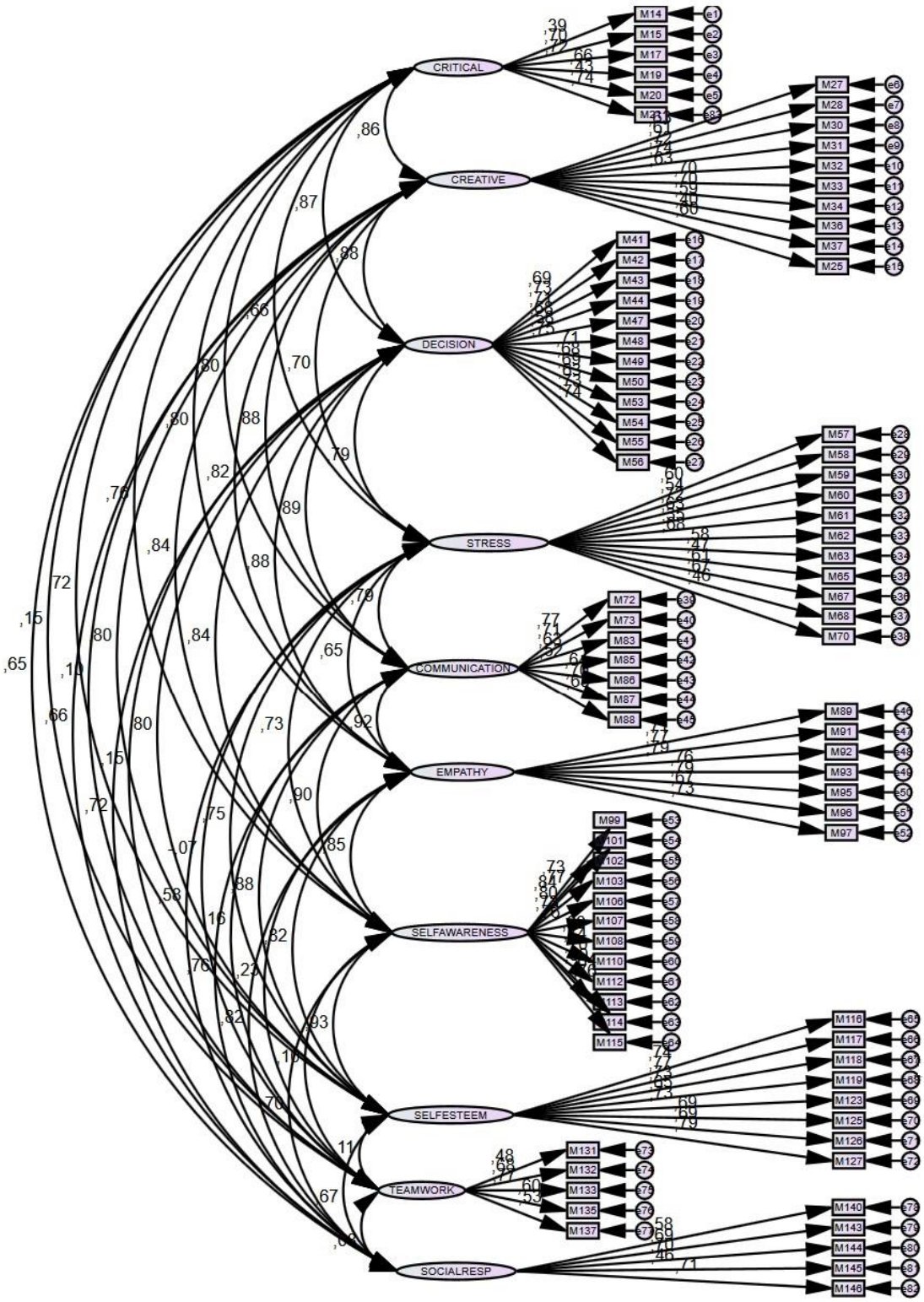

Figure 1 The path diagram of the ten-factor structure of the LSS

corresponded to a fair fit. Therefore, the LSS corresponds to the same 10-factor structure model over the new student group in the Burdur sample as it adequately fits the model reached in the EFA. The path diagram of the 10-factor structure is presented in Figure 1, and the factor loading values are presented in Table 4.

Convergent/discriminant validity

At this phase, as stated by Hinkin (1998), reporting the discriminant, convergent, and concurrent validity clearly can prove the validity of theoretically justified relation between the variables. The construct validity was also controlled by convergent and discriminant validity. The

factor loadings were above the critical value of .50 for CFA (see Table 1), ranging from .354 to .839 within the ten-factor structure. Regarding the ten factors, the computed average variance extracted (AVE) values ranged between .385 and .694 and was calculated as .457 for the whole scale. Moreover, the composite reliability (CR) was calculated for the ten factors ranging between .752 and .942, and the CR was .986 for the whole scale. The AVE is higher than .400, which is acceptable when the CR is higher than .600 (Fornell & Larcker, 1981). This is an indicator of acceptable convergent validity (Ullman, 2007). Furthermore, the factors measured different concepts, and the inter-correlation coefficients among them varied between .584 and .758. These values, which were lower than the critical threshold of .800, supported the discriminant validity (Brown, 2012).

The reliability coefficient (Cronbach's alpha) of the scale concerning the whole was calculated as α = .964. Table 5 shows the reliability coefficients for the ten factors calculated from the data collected for the study's EFA, CFA, and inferential statistics. The values indicated high reliability of the test results (Fraenkel et al., 2012).

3.2 Analysis of students' LS in terms of certain variables

There were significant differences between the mean scores obtained for the sub-dimensions of the LSS and the gender of students [Pillai's Trace = .134, F(10, 754) = 11.646, p < .001, partial η^2 = .134]. Follow up analysis indicated that this significant difference was found to be in favor of females for the empathy [F(1, 763) = 15.265, p<.001, partial η^2 = .020, (X_{female} = 3.96; X_{male} = 3.83)] and in favor of males for the coping with stress and emotions [F(1, 763) = 11.776, p = .001, partial η^2 = .010 (X_{female} = 2.85; X_{male} = 2.97)].

When MANOVA results are examined in Table 6; it was found that there were statistically significant differences between the mean scores obtained for the sub-dimensions of the LSS in terms of grade levels of students [Pillai's Trace = .208, F(50, 3770) = 3.265, p < .001, partial η^2 = 0.042]. In follow up analysis; there were statistically significant differences with small effect sizes for the self-esteem (F(5, 759) = 12.544, p < .001, partial η^2 = 0.042), self-awareness (F(5, 759) = 5.117, p < .001, partial η^2 = 0.035), coping with stress and emotions (F(5, 759) = 6.053, p < .001, partial η^2 = 0.035) and creative thinking (F (5, 759) = 3.335, p = .007, partial η^2 = 0.021). Homogeneity of variances assumptions is valid only for these four sub-dimensions concerning Levene's test values.

There are no significant differences for the sub-dimensions in terms of between 9th and 10th, 11th and 12th graders; and between 10th and 11th and 12th graders. In Table 7, it was found that there were statistically significant differences between the mean scores obtained for the sub-dimensions of the LSS in terms of the science/physics course score [Pillai's Trace = .109, F(30, 2262) = 2.835, p < .001, partial η^2 = 0036]. In terms of the follow up analysis there were statistically significant differences; with small effect size for the social responsibility (F(3, 761) = 4.881, p = .001, partial η^2 = 0.022), team work (F(3, 761) = 9.902, p < .001, partial η^2 = 0.033), self-esteem (F(3, 761) = 7.312, p < .001, partial η^2 = 0.042), self-awareness (F(3, 761) = 5.005, p < .001, partial η^2 = 0.034), empathy (F(3, 761) = 7.817, p < .001, partial η^2 = 0.048), interpersonal

Table 6 MANOVA post hoc findings for grade level concerning the sub-dimensions

Dependent Variable (Score for sub-dimensions)	Grade Level (I)	Grade Level (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Self-esteem	5th	6th	.2916*	.08341	.007	.0533	.5299
		7th and 8th	.3540*	.07746	.000	.1327	.5753
		9th	.4258*	.08025	.000	.1965	.6551
		10th	.3920*	.08460	.000	.1503	.6337
		11th and 12th	.2947*	.08205	.005	.0603	.5292
Self awareness	5th	6th	.1874*	.05916	.020	.0184	.3564
		7th and 8th	.2222*	.05493	.001	.0653	.3792
		9th	.2694*	.05691	.000	.1068	.4320
		10th	.2568*	.06000	.000	.0853	.4282
		11th and 12th	.1837*	.05819	.020	.0175	.3500
Coping with stress and emotions	5th	6th	.2373*	.06382	.003	.0550	.4196
		7th and 8th	.2309*	.05927	.001	.0616	.4002
		9th	.2796*	.06140	.000	.1042	.4551
		10th	.2975*	.06473	.000	.1125	.4824
		11th and 12th	.1994*	.06278	.019	.0200	.3788
Creative thinking	5th	6th	.2126*	.06188	.008	.0358	.3894

Table 7 MANOVA post hoc findings for science/physics course score for the sub-dimensions

Dependent Variable (Score for sub-dimensions)	SPCS (I)	SPCS (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social responsibility	≥86	51-65	.2613*	.07734	.004	.0622	.4604
		66-75	.2137*	.05304	.000	.0771	.3503
		76-85	.1683*	.04004	.000	.0652	.2714
Team work	≥86	66-75	.2168*	.06043	.002	.0612	.3724
Self esteem	≥86	66-75	.2314*	.06961	.005	.0521	.4106
	≥86	76-85	.2243*	.05256	.000	.0890	.3596
Self awareness	≥86	51-65	.2090*	.07168	.019	.0245	.3936
		66-75	.1705*	.04916	.003	.0439	.2971
		76-85	.1463*	.03711	.001	.0508	.2419
Empathy	≥86	51-65	.2779*	.07478	.001	.0853	.4704
		66-75	.2325*	.05129	.000	.1004	.3645
		76-85	.1611*	.03872	.000	.0614	.2607
Interpersonal relationship and communication	≥86	51-65	.2255*	.07170	.009	.0409	.4101
		66-75	.1849*	.04917	.001	.0583	.3115
		76-85	.1675*	.03712	.000	.0720	.2631
Coping with stress and emotions	≥86	66-75	.1938*	.05292	.002	.0575	.3300
	≥86	76-85	.1881*	.03995	.000	.0852	.2909
Decision making and problem solving	≥86	51-65	.3102*	.07028	.000	.1293	.4912
		66-75	.2399*	.04820	.000	.1158	.3640
		76-85	.1908*	.03639	.000	.0971	.2845
Creative thinking	≥86	51-65	.3027*	.07393	.000	.1123	.4930
		66-75	.2192*	.05070	.000	.0886	.3497
		76-85	.1521*	.03828	.000	.0536	.2507
Critical thinking	≥86	51-65	.2265*	.04845	.000	.1018	.3513
		66-75	.1941*	.03323	.000	.1085	.2796
		76-85	.1208*	.02509	.000	.0562	.1854

relationship and communication ($F(3, 761) = 6.175$, $p < .001$, partial $\eta^2 = 0.041$), coping with stress and emotions ($F(3, 761) = 6.663$, $p < .001$, partial $\eta^2 = 0.039$), creative thinking ($F(3, 761) = 7.610$, $p < .001$, partial $\eta^2 = 0.048$), with medium effect size for the decision making and problem solving ($F(3, 761) = 9.563$, $p < .001$, partial $\eta^2 = 0.065$, critical thinking ($F(3, 761) = 5.601$, $p < .001$, partial $\eta^2 = 0.072$), in favor of students having the science/physics course score of 86 or more with respect to students having the science/physics course score of lower than 86.

In Table 8; MANOVA results indicates that, it was found that there were statistically significant differences between the mean scores obtained for the sub-dimensions of the LSS in terms of the students' previous year-end GPA [$F(20, 1506) = 4.926$, $p = .008$; Wilk's $\Lambda = 0.881$, partial $\eta^2 = 0.061$].]. In follow up analysis; there were statistically significant differences, with small effect size for the sub-dimensions of social responsibility ($F(2, 762) = 6.971$, $p < .001$, partial $\eta^2 = 0.040$), team work ($F(2, 762) = 5.886$, $p < .001$, partial $\eta^2 = 0.027$), self-awareness ($F(2, 762) = 1.960$, $p = .006$, partial $\eta^2 = 0.013$), empathy ($F(2, 762) = 7.618$, $p < .001$, partial $\eta^2 = 0.047$), interpersonal relationship and communication ($F(2,762) = 3.730$, $p < .001$, partial $\eta^2 = 0.025$), coping with stress and emotions ($F(2, 762) = 7.456$, $p < .001$, partial $\eta^2 = 0.051$), creative thinking ($F(2, 762) = 6.286$, $p < .001$, partial $\eta^2 = 0.039$), with medium effect size for the sub-dimensions of critical thinking ($F(2, 762) = 4.746$, $p < .001$, partial $\eta^2 = 0.067$), in favor of students having GPA 86 or more with respect to students having GPA lower than 86.

When MANOVA results are examined in terms of SES of the students, the differences between the mean scores obtained for the sub-dimensions of the LSS were not statistically significa nt [$F(20, 1508) = 1.212$, $p = .234$; Wilk's $\Lambda = 0.969$, partial $\eta^2 = 0.016$].

4. DISCUSSION

One of the main objectives of this study was to develop an LSS for adolescents. Therefore, different stages of this study provided evidence for the structural validity of the LSS and the reliability of the results obtained from adolescents aged between 10 and 17. These stages were conducted as follows: (i) 140 items in the draft scale were selected by a team of experts from an item pool that was

Table 8 MANOVA post hoc findings for GPA concerning the sub-dimensions

Dependent Variable (Score for sub-dimensions)	GPA (I)	GPA (J)	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Social responsibility	≥86	66-75	.1752*	.06607	.022	.0200	.3303
		76-85	.2345*	.04439	.000	.1303	.3387
Team work	≥86	66-75	.2840*	.07503	.000	.1078	.4602
		76-85	.1524*	.05040	.007	.0341	.2708
Self awareness	≥86	76-85	.1062*	.04153	.029	.0086	.2037
Empathy	≥86	66-75	.2868*	.06386	.000	.1369	.4368
		76-85	.2008*	.04290	.000	.1001	.3016
Interpersonal relationship and communication	≥86	66-75	.1896*	.06171	.006	.0447	.3345
		76-85	.1471*	.04146	.001	.0498	.2445
Decision making and problem solving	≥86	66-75	.2645*	.06044	.000	.1226	.4065
		76-85	.2100*	.04060	.000	.1146	.3053
Creative thinking	≥86	66-75	.2850*	.06337	.000	.1362	.4338
		76-85	.1648*	.04257	.000	.0648	.2648
Critical thinking	≥86	66-75	.2346*	.04145	.000	.1372	.3319
		76-85	.1531*	.02785	.000	.0877	.2185

built after a comprehensive literature survey, and (ii) The structural, semantic, and conceptual equivalence of the scale items were developed by consulting to 6 literature and educations experts. 13 science teachers inspected the validity of the first version of the scale. The clarity and the application time duration of the items were controlled during the pre-application on 40 students, (iii) While increasing the coefficients of factor loadings on the sub-dimensions, EFA was carried out repeatedly to keep the internal consistency of the items at a good level, and the items were removed under the supervision of the experts. After repeated EFAs, an 83-item scale with 10 dimensions was obtained, (iv) The CFA, which was performed on a different group, confirmed the proposed structure and provided evidence for convergent and discriminative validity, (v) The internal consistency of the scale items were confirmed by Cronbach's Alpha coefficient for both EFA and CFA data. These analyses revealed that the reliability coefficients were high for the scale and the sub-dimensions, indicating a high degree of internal consistency. It can be stated that the well-planned and systematic aspects of the five-stage scale development process proposed by Hinkin (1998) proved effective in obtaining valid and reliable results. The study put forth evidence for the factorial validity, convergent validity, construct validity, discriminant validity, predictive validity, test-retest reliability, and internal consistency reliability of the LSS (Brown, 2012; Field, 2009; Tabachnick & Fidell, 2007; Ullman, 2007). The factor loadings in the previous studies (e.g., Cronin & Allen, 2017; Erawen, 2010) were calculated between .39 and .90 for both EFA and CFA, similar to the present study. The internal consistency reliability coefficients of the present study were higher than .70 and at a good level (Pallant, 2007), similar to studies by Cronin and Allen (2017) and Erawen (2010). In this context, this study proved that the LSS was a valid and reliable scale for adolescents, which evaluated critical thinking, creative thinking, decision making and problem-solving, coping with stress and emotion, social responsibility, teamwork, self-esteem, self-awareness, and empathy, interpersonal relationship, and communication. So, LSS could be used in studies aiming to determine adolescents' life skills. In addition, the inferential statistics part of the study revealed the relationship of adolescents' LS with some variables. They provided support for the discussion on the development of their LS.

The LS scores of the adolescent were relatively high in all three parts of the study (EFA part, CFA part, and inferential statistics part), and the score rankings of the sub-dimensions were similar. These parts indicated that they scored highest on empathy, self-awareness, and self-esteem, whereas they scored lowest on teamwork, coping with stress & emotion, and critical thinking. There are both similar and different results in the literature regarding these parts. For instance, Vranda (2009) found that the LS scores of the adolescents were average, the highest scores were on interpersonal relationships, and the lowest was on coping with stress. In Erawen's (2010) study with high school students in Taiwan, the highest scores for the high school students were on decision making and problem-solving, interpersonal relation and communication, and social responsibility; where the lowest scores were on creative thinking, critical thinking, coping with stress, and emotion. In studies conducted with university students, different results were obtained regarding the highest and lowest LS (Cronin et al., 2021; Ansari et al., 2016). The different

results of the above studies might be caused by the different development periods/ages of the sample groups (Çardak, 2013; Santrock, 2012; Slavin, 2013; Statistics Canada, 2005), school curricula (Yuen et al., 2010), geographic region/country (Statistics Canada, 2005), or cultural differences (Santrock, 2012; WHO, 1997). Based on our cross-sectional findings, future research may examine how and why the students' LS development changes regarding other variables such as age, culture, development levels of the countries, curriculum, teacher education policies, parent relations, and so on.

According to the results from the inferential statistics, there were statistically significant differences between the mean scores obtained for some sub-dimensions of the LSS in terms of gender, grade level, GPA, and science/physics course score. However, no statistically significant differences existed between the LSS scores and SES. Looking at the results in terms of gender, the significant difference was found to favor females for empathy and the males for coping with stress and emotions. Santrock (2012) indicated that stress was prevalent in adolescence, females and males experienced stress in various types, and there were no differences regarding gender. However, females experienced more stress in peer relations. Although some findings in the literature generalized some of the skills according to gender, it was considered essential to handle the gender roles according to the culture and the context of the behavior (Santrock, 2012). Therefore, the studies in the literature indicate that there is a need for more studies that are supported by dimensional qualitative & quantitative findings and examine the differentiation and development of LS of adolescents according to gender roles.

Our results indicated statistically significant differences in self-esteem, self-awareness, coping with stress and emotions in favor of 5th graders for other grade levels, and creative thinking in favor of 5th graders concerning 6th graders. Adolescence is a period of socio-emotional changes and is the transition from childhood to adulthood (Çardak, 2013; Santrock, 2012). The changes are quite fast in the first period of this term (ages 10-13) and slow down in the middle and last periods (ages 14-20) (Çardak, 2013, pp. 62-64). It is claimed that self-concept, defined as the view, attitude, and emotional perceptions of a person about themselves, differs more in adolescence (Terzi, 2013). Slavin (2013) stated that self-concept and self-respect changed during the transition into adolescence and during adolescence, where self-respect was at the lowest degree at the beginning of puberty, namely when children started secondary school or high school. In this study, the statistically significant difference for 5th graders (ages 10-11) in self-respect and self-awareness indicated that these students were not adolescents yet, or could be at the beginning of pre-adolescence.

In Turkey, 5th grade is the start of secondary school, and 9th grade is the start of high school. The 5th graders had the highest scores in coping with stress and emotions, and there was a general decline in the scores of this sub-dimension as the grade levels increased. One of the reasons for this could be related to the processes in adolescence. According to Slavin (2013), individuals are more optimistic and happier before adolescence. However, academic achievement becomes a more serious issue, the academic struggle increases, and young adolescents may experience more emotional reflections compared to childhood. Another reason might be the negative emotional conditions caused by central examinations, which are conducted at the end of secondary school and high school in Turkey (Atlı Özbaş, Sayın, & Coşar, 2012; Bacanlı & Sürücü, 2006; Ünalan, Çifçili, Dinç, Akman, & Topçuoğlu, 2017). In order to develop adolescents' ability to cope with stress and emotions, it can focus on studies in cooperation with guidance and psychological counseling centers, teachers, school administrators, and parents, and the long-term effects of these studies can be examined.

The results of our study revealed significant differences between most of the LS sub-dimensions in favor of the students with both high GPA and high science/physics course scores. These results indicated that the academically successful students were also highly skilled in most LS sub-dimensions. Cronin et al. (2021) stated that goal setting, time management, leadership, and total LS were positively associated with higher-education students' predicted academic grades. Similarly, Currie et al. (2012) stated that four life-skills categories (interpersonal communication, problem-solving, physical fitness, identity development) predicted an additional 9.4% variance in cumulative GPA beyond high school GPA and SAT scores. In addition, Currie et al. (2012) suggested that the ability to handle the associated stress would be a good predictor of initial academic success for students starting university. Chien et al. (2012) emphasized considerable evidence that the skills that predict success in elementary school also predicted social and academic success in adolescence and adulthood. Future research may focus on learning strategies that affect students' academic performance in classroom settings.

The present study showed no statistically significant differences between the LSS and SES. An international research report on adult skills indicated that for most countries, skills significantly decreased one's chances of earning less than half the median earnings (OECD, Statistics Canada, 2011). In addition, according to the results of Cronin et al. (2021), the LS of the students positively related to their social, physical, emotional, and school/work functions.

Like any study, there were several limitations to the present study. First, any action or instrument to assess the LS has its boundaries or constraints (Jacobs Foundation, 2011). In this study, these effects tried to reduce by (i)

conducting pilot studies, (ii) providing enough time to the participants, (ii) telling them to make their markings after reading all of the items, and (iii) providing researcher support during the application, and (iv) conducting outlier analyses on the obtained data. Second, although the intersectional quality of our research provided statistically significant evidence regarding the differences between the LSS sub-dimensions and the variables, they were not enough for a relation of causality. 'Life skills' should not be treated as isolated but as a composition of manual skills and psycho-social abilities (UNESCO, 2004). Third, future research can evaluate the LSS in adolescents from other countries/cultures or perform inter-cultural comparisons. Fourth, this study investigated the relation of a limited set of variables with the LSS. More research can be conducted on different variables associated with adolescents' LS.

CONCLUSION

This scale development study put forth two main conclusions. The first is that the LSS is a valid and reliable scale to determine adolescents' general life skills. The scale's CFA and EFA results, together with the convergent/discriminant validity and reliability coefficients (Cronbach's alpha), provided strong statistical evidence coherent with the 10-subdimension model. In this context, the LSS, with its 10 sub-dimensions covering 83 items, can be used as a valid and reliable scale to diagnose complex psychological concepts such as the students' perception of LS and identify their skills.

The second result is that this study provided evidence about how the life skills of the adolescents were related to several variables, such as grade level, science/physics course scores, GPA, and SES. According to the results of the present study, there were statistically significant differences between the average scores for some of the life skill sub-dimensions of the LSS and gender, grade level, science/physics course grades, and GPA variables. However, no statistically significant difference was found for the SES variable.

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