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Mastery Motivation in School Subjects in Hungary and Taiwan

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Abstract

This study focuses on the school related dimensions of mastery motivation. The Subject Specific Mastery Motivation Questionnaire (SSMMQ), recently developed in Hungary, measures persistence in trying to master six school domains (reading, math, science, English language, music, and art) and overall mastery pleasure in school. Each scale includes 6 Likert items. The total score of the six school subject scales is called school mastery motivation. The SSMMQ was translated into Chinese. The goal of this study was to compare Hungarian and Taiwanese students' subject specific mastery motivation. Participants in the cross-sectional study were 1359 Hungarian and 623 Taiwanese school children from grades 4, 6, 8, and 10. Exploratory factor analysis confirmed the theoretical structure of the questionnaire in both countries. Each of the seven scales and the total scale had high reliabilities in Hungary and in Taiwan. The relations among the domains were stronger in younger ages. There were significant age differences in each of the domain specific mastery motivation scales. In both countries, academic mastery motivation significantly decreased between grades 4 and 8. The Hungarian students rated themselves significantly higher than did the Taiwanese. The results were generally consistent with the literature. Implications for further research and school practice are discussed.

Keywords: motivation, schools, questionnaires, mastery motivation, cross cultural studies, cross sectional study, school subjects

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Introduction

Mastery Motivation

Mastery motivation encourages one to work hard to master a certain skill or ability. Mastery motivation operates as long as the challenge persists and as long as acquisition is not complete; i.e., until mastery has been reached. Mastery motivation is understood as a "psychological force that stimulates an individual to attempt independently, in a focused and persistent manner, to solve a problem or master a skill or a task which is at least moderately challenging for him or her" (Morgan, Harmon, & Maslin-Cole, 1990, p. 319.).

Mastery motivation functions as the basis of learning in infants, but such motivation can also be active and can be activated in preschool and school-aged children, as well as in adults (Morgan, Józsa, & Liao, 2017). This fact is well exemplified by children who persist at and find great pleasure in learning to count and read, or adults who pursue their profession with expertise. However, the school and the family both have an important role in the development and functioning of mastery motivation (Józsa, 2007; Morgan, Liao et al., 2017).

Mastery motivation has a fundamental impact on cognitive, social, and psychomotor development (Wang & Barrett, 2013; Morgan, Józsa et al., 2017). Some studies indicate that mastery motivation may be a better predictor of cognitive development than intelligence, hence playing a crucial role in school achievement (Józsa & Molnár, 2013; Yarrow, Klein, Lomonaco, & Morgan, 1975). Shonkoff and Philips (2000) state that mastery motivation is a key factor in personality development. They highlight the importance of research in this field, stating that assessment of mastery motivation should be an important part of the evaluation of a child's development.

There is research evidence that mastery motivation has a relation with school achievement. Gilmore, Cuskelly, and Purdie's (2003) study found that mastery motivation predicted school-related skills. Mokrova, O'Brien, Calkins, Leerkes, and Marcovitch (2013) studied the prediction of kindergarten academic skills (language and math). More recently, Mercader, Presentación, Siegenthaler, Moliner, and Miranda (2017) found that mastery motivation (persistence) in preschool significantly predicted mathematics achievement in second grade. Józsa and Morgan (2014) found a significant relation between mastery motivation in grade 4 and grade point average (GPA) in grade 8. Józsa and Molnár (2013), in a cross-sectional study of third and sixth graders, also found an association between instrumental mastery motivation and both GPA and achievement in specific school subjects.

Domain Specific Approaches to Academic Motivation

Wigfield, Guthrie, Tonks, and Perencevich (2004) gave arguments that underlie the domain specificity of academic motivation. (1) Students perceive different self-efficacy in different areas; they can have different interests; and their intrinsic motivation also can be different. (2) Students can be more motivated in one particular area than in another (for example, a student can be strongly motivated in mathematics, but can have much less motivation in reading). (3) Students need different skills to perform well in different areas. (4) The separation of school subjects can lead children to have subject-specific motivation. Bong (2001) also emphasized the role of situation in motivation.

A certain student could be motivated in the field of mathematics, yet the same might not be true in language learning. Research on self-concept has revealed that students' self-concepts are differentiated according to subject domains; e.g., self-concept in mathematics is different from self-concept in reading (Marsh, 1990; Zanobini & Usai, 2002). There is empirical evidence that academic motivation can be differentiated across different areas (Martin, 2008; Wigfield et al., 2004). The theoretical background of domain specificity is mainly based on self-concept theory (Bong, 2001; Martin, 2008) and the factor-analytic investigations of self-efficacy and competence-beliefs (Wigfield, 1997).

Theoretical models and empirical studies showed that self-concept is a hierarchical construct. Although there is a general academic self-concept, according to the hierarchical structure, under general self-concept, there are different subject-specific self-concepts. Moreover, these subject-specific self-concepts often do not connect to each other (Brunner, et al., 2010; Brunner, Keller, Hornung, Reichert, & Martin, 2009; Gogol, Brunner, Martin, Preckel, & Goetz, 2017; Green, Martin, & Marsh, 2007). Students can also have domain specificity in school subject attitudes. They have different attitudes towards different school subjects, e.g., there are math, science, and art attitudes (Csapó, 2000). There are similar results in the field of academic intrinsic motivation (Gottfried, 1985; Gottfried, Fleming, & Gottfried, 2001; Steinmayr & Spinath, 2009) and academic interest (Wigfield, 1997).

School subject-specific motivation research has sometimes focused on just one given school subject; for example, Józsa and Józsa (2014), Szenczi (2010, 2013), and Wigfield (1997) analyzed the aspects of reading motivation; also Hannula (2012) and Hannula, et al. (2016) focused on motivation in math. Some studies analyzed the domain specificity of motivation in several subjects at the same time (e.g., Bong 2001; Green et al. 2007; Leaper, Farkas, & Brown, 2012). Green et al. (2007) argued that academic motivation has dimensions, which are subject-specific. They verified in mathematics, English, and science, that motivation among Australian high school students is a multidimensional construct, and motivation has domain-specific characteristics. According to their results, students' perceptions about their motivation in a given subject is not strongly related with how they perceive themselves in other subjects. Furthermore, subject-specific motivation in a certain subject shows stronger correlations with behavioral dimensions (e.g., self-

handicapping) in the same school subject, compared to correlation between the same construct on two different subjects. Bong (2001) also found that motivation is multidimensional. She pointed out that motivation constructs, like self-efficacy, task-value, and achievement goal orientations, among Korean middle and high school students, are subject-specific mathematics, English, science, and Korean. Based on her results, domain specificity becomes greater by age; older students more clearly differentiate verbal and quantitative subjects than younger students. This finding is consistent with the research results that mathematics and verbal self-concepts are significantly differentiated (Brunner et al., 2010).

Martin (2008) found domain-specificity of motivation across academic, sport, and music domains. Wigfield (1997) noted that one of the most important questions in connection with domain specificity is to discover which motivation constructs are domain-specific and which are domain-general. Based on a literature review, he grouped competence beliefs and self-efficacy beliefs as domain-specific motivational constructs; on the other hand, achievement goal orientation was rather general. In connection with intrinsic and extrinsic motivation, there was evidence for domain specificity and for domain generality as well. Peklaj, Podlesek, and Pecjak (2015) found that self-efficacy, interest, and motivation strategies (immediate action, procrastination/distractibility) are subject-specific constructs.

Domain Specific Approach to Mastery Motivation

Mastery motivation was conceptualized by Barrett and Morgan (1995) to be a complex psychic concept consisting of two main aspects: 1) instrumental and 2) expressive or affective. The instrumental component is shown by behavioral manifestations of persistence, which was the principle measure of mastery motivation in most studies. These manifestations include a) cognitive persistence, b) social persistence, and c) gross motor persistence (Morgan et al., 1995). Experiencing mastery pleasure provides the necessary feedback and reinforcement in relation to mastery motives (Barrett & Morgan, 1995).

Early mastery motivation studies mainly focused on young children. The source of Barrett and Morgan's definition of mastery motivation was based on this early childhood research. However, recently there is a growing body of research on school age children (e.g., Green, & Morgan, 2017; Józsa & Morgan, 2014; Józsa & Molnár, 2013; Józsa, Wang, Barrett, & Morgan, 2014) and young adults (Doherty-Bigara & Gilmore, 2015; Gilmore, Islam, Younesian, Bús, & Józsa, 2017).

Based on Barrett and Morgan's (1995) definition, Józsa (2014) described further dimensions of mastery motivation, assuming that mastery motivation had school specific dimensions, and could vary in different school domains; i.e. different subjects. He developed new scales to measure domain-specific dimensions of mastery motivation. Likert-items were developed for the following domains: reading, mathematics, science,

English and German as foreign languages, music, and art. Items were developed based on several related definitions of mastery motivation (Barrett & Morgan, 1995; Busch-Rossnagel & Morgan, 2013; Morgan et al., 1990), the DMQ (Dimensions of Mastery Questionnaire) scales by Morgan et al. (1993), as well as their Hungarian adaptation (Józsa, 2007). A pilot study of 775 children supported the validity and reliability of the scales for Hungarian students' studying the English and German languages in school. The correlations of these foreign language mastery motivation scales and language achievement varied from medium to strong (Józsa, 2014).

Schools in Hungary and Taiwan

This study compares Hungarian and Taiwanese students' motivation. Having insight into the educational systems of the two counties aids in a better understanding of the results. Therefore in the following we briefly introduce the educational systems of the two countries. It will make clear that the major characteristics of schools in the two countries are similar.

Hungarian Schools

The education in Hungary is regulated by a central curriculum that is mandatory for every school. The Hungarian National Core Curriculum defines the content, which must be acquired during the different grade levels. This national curriculum is supplemented with local curriculums and programs (Hungarian Government, 2012).

Children can enter school in September after their sixth birthday, but beginning school is flexible; developmentally immature children can start first grade one or two years later. Primary education (ISCED 1–2) is eight years long and has two sections. Elementary school (lower primary school) is from the first to the fourth grade. Middle school (upper primary school) is from the fifth to the eighth grade. The lower and the upper primary school classes are usually in the same building (Balázs, Kocsis, & Vágó, 2011; Hungarian Government, 2011).

Secondary education (ISCED 3) is between grades 9–12, and there are three types of secondary schools. The primary goal of academic high school is to prepare for higher education. Vocational high school prepares children for specialized higher education and employment, using both academic and practical education. Industrial high school prepares students to get a skilled job directly after secondary education with academic and practical education in three years, rather than four years (Balázs et al., 2011; Hungarian Government, 2011).

Education in academic high schools and in vocational schools ends with a matriculation exam. All students in these two types of high schools have to take an exam in five subjects: Hungarian grammar and literature, history, mathematics, foreign language, and a required optional subject, which is a vocational subject in the vocational school (Hungarian Government, 2011).

The mean class size is 23 in the elementary schools, 24–28 in the middle and secondary schools (Hungarian Government, 2011). The education of boys and girls is integrated; they have completely the same requirements. In lower primary school, the same teacher teaches all of the subjects. Sometimes sports and art can be taught by a different teacher. In middle school and secondary school, different teachers teach different subjects. Education in reading, writing, mathematics, science, music, art, and sports starts in the first grade. There are integrated science courses for grades 1–6. After grade 6, the students learn separate science subjects: biology, chemistry, physics and geography/earth science. Learning a foreign language is mandatory from the 4th grade, and learning a second foreign language is possible from the 7th grade (Hungarian Government, 2016). In the academic high schools, the students have to learn two foreign languages; in the vocational and industrial schools, only one is required. About three-fourths of the students learn English and nearly the one-fourth of them learn German as the first foreign language. Other languages (typically French, Italian, Russian, and Spanish) are rare as the first foreign language, but could be learned as the second foreign language (Balázs et al., 2011).

School classes are 45 minutes long in all educational levels, with 10–15 minutes breaks between the classes. Education usually starts at 8 am in the morning and ends early in the afternoon. There are about 25 classes in a week in the lower primary school, 28–30 in the upper primary school and 35 in the secondary schools. Education is five days a week, from Monday to Friday, from 1 September to the middle of June. There are three (about one week long) breaks during an academic year, in Autumn, in Winter, and in Spring (Hungarian Government, 2011).

Taiwanese Schools

The education in Taiwan for every school is regulated by the Ministry of Education and the local government. Children enter elementary schools in the September after their sixth birthday; however, some children with special needs, such as developmental delay, can apply to start first grade one year later (Ministry of Education Republic China (Taiwan), 2011). The Committee of Curriculum Development defines the general content to be acquired during the different grade levels. All schools have the national curriculum and also have local or school-based curriculums (Ministry of Education Republic China (Taiwan), 2015).

In Taiwan, a 9-year compulsory education system consists of two sections: elementary school, from 1st to 6th grade, and junior high school, from 7th to 9th grade. Elementary schools and junior high school are usually separated and located in different locations.

Secondary education is from 10th to 12th grade and can be classified into two categories, general and vocational senior high schools. Generally speaking, the general senior high school is for children to prepare to enter colleges or universities. The vocational school allows children to gain practical knowledge and training for specific industries, so that

students can begin work in that industry immediately or enter a college or university of technology after their graduation. Most schools accept both genders of children; however, a few schools accept only boys or girls.

Compulsory education was extended from 9 years to 12 years to cover senior secondary school in 2014 (Ministry of Education Republic China, Taiwan (2016). The academic year usually begins on September 1st and ends at the end of June. Each academic year has two semesters, and each semester is about four to five months. Students are required to go to school five days a week, from Monday to Friday. The size of class varies from primary to secondary education. Typically, each class have 21–28, 23–35, and 40–50 students in elementary schools, junior high schools, and senior high schools, respectively.

In lower primary schools, a teacher teaches most subjects, but some subjects such as English, sports, and the arts can be exceptions. Most schools teach Chinese, math, science, art, sport, and music from first grade; however, science, music, and art are integrated into the life curriculum. After grade 7, students start to learn biology; after grade 8, students start to learn chemistry and physics; after grade 9, students start to learn geography. The first foreign language, English, is started between the first grade and third grade in different counties (i.e., some cities begin English in first grade, some in second grade, some in third grade), and a second foreign language (e.g. French, Germany, Japanese) is beginning from the 10th grade (Ministry of Education Republic China (Taiwan), 2012, 2013).

In elementary schools, each class usually lasts 40 minutes and with 10–20 minute breaks between classes. However, in junior and senior high schools, each class lasts 45–50 minutes with a 10–15 minute break. The school schedule starts at 8 am and ends about around 4:00 or 4:30 pm. There are about 22–30, 28–30, and 35 classes a week in elementary schools, junior high schools, and senior high schools, respectively. During the academic year, students usually have a break of about 21 days in the winter, plus about 60 days in the summer.

The weekly courses designed for elementary schools include: six classes of Chinese (including one class of reading), four classes of math, three classes each in English, sports, and science, as well as one class each for music and art. In regard to junior and senior high schools, the weekly courses include six classes of Chinese (including one reading class), six classes of math, five classes of both English and science, two class in sport, as well as one class each in music and art (Ministry of Education Republic China (Taiwan), 2012).

Objectives

The goals of this study were: (1) to analyze the reliability and construct-validity of the recently developed Subject Specific Mastery Motivation Questionnaire (SSMMQ) in Hungary and Taiwan, (2) to compare mastery motivation in specific school subjects across two different cultural contexts, and (3) to explore school grade level differences in subject specific mastery motivation in both countries.

Method

Participants

The total sample included Hungarian (*n* = 1359) and Taiwanese (*n* = 623) children from grades 4, 6, 8, and 10. Table 1 shows the distribution of the sample by grade levels and country. The Hungarian sample consisted of 56 school classes from 29 schools in the south region of Hungary. Primary schools and all three types of high schools were included. The SES background of the students was similar in different grade levels. The schools were located in 15 different towns, from small to medium size cities. The Taiwan sample included 15 schools and a total 34 classes. One of the schools was located in the middle of Taiwan, others were from northern Taiwan. Two schools were located in small towns, and others were located in big towns.

The proportions of boys was 51% in both countries. The education level of parents was significantly higher in Taiwan, where mothers had an average of 13.37 (*SD* = 2.70) years of school and fathers had 13.65 (*SD* = 2.86). In Hungary, mothers had an average of 10.67 years of school (*SD* = 1.79) and fathers had 10.56 (*SD* = 2.06).

Table 1. Distribution of the Sample by Grade Level

Sample	4	6	8	10	Total
Hungary	416	426	304	213	1359
Taiwan	137	215	128	143	623
Total	553	641	432	356	1982

Instrument

The Subject Specific Mastery Motivation Questionnaire (SSMMQ, Józsa, 2014; Józsa & Kis, 2017) was used in this study. It covers six school subjects/domains (reading, mathematics, science, English as a foreign language, art, and music) and also school mastery pleasure. The questionnaire consists of 5-point Likert items: 6 items in each scale, with 42 items altogether in the seven scales. The total score of the six subject specific scales was considered to be a measure of *school mastery motivation*. *The school mastery pleasure* scale includes 6 items, each of them related with one of the school domains. A*cademic mastery pleasure* and *academic mastery motivation* were computed scales based only on the reading, math, and science items. Based on suggestions by Józsa and Morgan (2017), the SSMMQ scales included only positive items.

Procedure

The Hungarian version of the SSMMQ was translated into English, than the English version into Taiwanese. Back translations were made, and some minor corrections were done before this study.

The data collection procedure was the same in both countries. Children filled out the questionnaires in class, which required about 20–30 minutes. Teachers in Hungary and researchers in Taiwan helped with the data collection.

Scale means were calculated for each student, then linear transformations were conducted on the means, using the formula (x-1)*25. This way, the scale would range between 0 and 100, called a percentage points (%p) scale. Correspondences between the 1-5 values of the scale and the percentage points are as follows: 1 = 0%p, 2 = 25%p, 3 = 50%p, 4 = 75%p, and 5 = 100%p.

Results

Reliability

Table 2 shows the excellent internal consistency reliabilities of the scales for the Hungarian and Taiwanese samples, and also for the total sample. Alphas were higher (above 0.8) for all six school subjects. Somewhat lower, but still acceptable alphas were found for the school mastery pleasure scale. Reliability indices of the two countries were similar. The aggregated index of the six subject-specific mastery motivation was called *school mastery motivation*; with 36 items the alphas for this scale were understandably high for both counties. With only 3 items (reading, math, science), *academic mastery pleasure* alphas were, as expected, lower but still at least marginally acceptable because they were above .6. The internal consistencies of the overall *academic mastery motivation* scales were excellent. Thus, for both countries, there was strong evidence to support the internal consistency of the measures.

Table 2. Reliabilities of the Subject Specific Mastery Motivation Scales (Cronbach-α)

Country	Reading	Math	Science	English	Art	Music	SMP	SMM	AMP	AMM
N of items	6	6	6	6	6	6	6	36	3	18
Hungary	.815	.818	.828	.883	.892	.923	.785	.936	.621	.888
Taiwan	.854	.887	.844	.915	.847	.905	.786	.943	.704	.903
Total	.816	.848	.831	.916	.883	.920	.785	.939	.673	.896

Note. SMP = school mastery pleasure, SMM = school mastery motivation, AMP = academic mastery pleasure, AMM = Academic mastery motivation. The "academic" scales were computed from the reading, math, and science items.

Validity

Evidence for construct validity of the instrument was provided by exploratory factor analysis. The Kaiser-Meyer-Olkin indices were high: .946 for Hungary, .907 for Taiwan, and .953 for the total sample. The analysis revealed seven factors, which were clearly matched with the theoretical model. The seven factors together explained 63% of the total variance. The factor weights given in Table 3 were for the total sample.

Table 3. Factor Loadings of the Subject Specific Mastery Motivation Questionnaire for the Total Sample

Scales and items	1	2	3	4	5	6	7
1 Reading Mastery Motivation							
I practice reading to do it well.	.71						
I want to master reading even if it takes a long time.	.70						
I do my best to become a good reader.	.65						
I read things again and again to gain deeper understanding.	.50						
I keep on reading until I completely understand.	.47						
If I do not understand a sentence, I read it again.	.46						
2 Math Mastery Motivation							
If I do not understand a math task, I try it again.		.74					
I keep on working on a math task until I completely understand.		.72					
If I make a mistake in my calculation, I start it again.		.70					
I do my best to solve a math problem.	.46	.68					
I practice calculation to do it well.		.49					
I want to learn to calculate even if I need to practise a lot.		.48					
3 Science Mastery Motivation							
I persist in observing things and phenomena in nature.			.76				
I want to understand nature even if it takes a long time.			.75				
I do experiments to get answers to my nature-related questions.			.73				
If I am interested in a natural phenomenon, I keep questioning and inquiring until I know everything about it.			.65				
I observe how weather changes.			.61				
I wonder why the day turns into night and vice versa.			.54				
4 English Language Mastery Motivation							
I do my best to be good at English.				.81			
I practice English words until I know them well.				.81			
I practice English to get better in it.				.79			
I do my best to be a better and better speaker of English.				.79			
If I cannot spell something in English, I practice until I learn it well.				.72			
If I do not understand an English sentence, I read it again.				.68			
5 Art Mastery Motivation							
I would like to get better and better at painting and drawing.					.79		
I want to master drawing even if it takes a long time.					.79		
I practice drawing to do it well.					.75		
I keep on drawing until it looks beautiful.					.68		
I do my best to be able to paint beautifully.					.68		
If I do not like my drawing, I start it again.					.61		
6 Music Mastery Motivation							
I want to master singing even if it takes a long time.						.82	
I do my best to be a good singer.						.81	
I keep on learning a song until it goes perfectly.						.81	
I practise singing to do it well.						.79	
If I do not sing clearly and precisely, I practise until I get better.						.77	
If I sing poorly, I try it again.						.74	
7 School Specific Mastery Pleasure							
I am pleased when I solve a math problem.							.63
I am pleased when I can say something in English.				.47			.63
I am pleased when I understand the text.							.62
I am pleased when I can sing a song nicely.						.53	.59
I am pleased when my drawing looks beautiful.					.49		.57
I am pleased when I understand a natural phenomenon.			.61				.46

There was only one item out of the 42 that loaded to a different scale from that intended, and that was a science pleasure item which loaded more highly of the science scale than the mastery pleasure scale. Four of the items from school mastery pleasure (science, music, art, and English) loaded above .40 on the corresponding subject-specific mastery scale in addition to the mastery pleasure scale. Factor analyses carried out separately for the two countries revealed similar patterns. With few exceptions, these analyses confirmed that items loaded most highly to the intended scales.

Correlations

Relationships among the subject-specific mastery motives were investigated by correlation analyses. The analyses were carried out by grade level because subject specific mastery motives generally declined with age. These declines are discussed in the next section. Correlations for grade 4 students are shown in Table 4, and those of grade 10 students are shown in Table 5. In both tables, the lower triangle includes the Taiwanese data, and the upper triangle includes the Hungarian data.

In Table 4, all correlations were moderate to strong and all values were significant ($p <$ .01). Corresponding correlations were similar for the two countries. The six subject-specific mastery motives were related to school mastery pleasure with medium to strong correlations (r = .41–.49, median .47 for Hungarian, and r = .47–.63, median .48 for Taiwanese students). Correlations among the seven subject specific scales, which included school mastery pleasure, varied widely in both groups: .31–.72, median .41 for Hungarians, and .28–.64, median .47 for Taiwanese. Tables for grade 6 and 8 correlations were similar to those for grade 4 students.

Table 4. Correlations between the Variables in Grade 4

Scales	Reading	Math	Science	English	Art	Music	Pleasure	School
Reading		.72**	.39**	.68**	.41**	.47**	.49**	.79**
Math	.64**		.36**	.64**	.37**	.41**	.41**	.73**
Science	.50**	.36**		.31**	.38**	.33**	.47**	.65**
English	.46**	.50**	.37**		.31**	.44**	.43**	.76**
Art	.39**	.28**	.43**	.32**		.52**	.48**	.71**
Music	.34**	.35**	.55**	.49**	.40**		.49**	.77**
Pleasure	.57**	.47**	.55**	.48**	.47**	.63**		.71**
School	.77**	.71**	.73**	.72**	.64**	.74**	.81**	

*Note. The upper triangle contains Hungarian data, the lower triangle contains Taiwanese data, school = school mastery motivation scale; ** p < .01.*

For grade 10 students, the correlations were substantially lower than for grade 4 students. In Table 5 there are correlations that were not significant. For the Hungarians, music mastery motivation was not significantly related to reading, mathematics, or English as a foreign language (EFL) mastery motivation. Because art and music were not assessed in these Taiwanese 10th graders, there were no correlations of them with other subjects. In Taiwan, the correlations among the subject-specific mastery motives in the academic subjects of reading, math, and science were much lower than in grade 4, indicating an increased differentiation in mastery motives at that age. In both countries, the correlation between English and Science was the lowest of the correlations among the

academic subjects. In Hungary, the motivation to mastery English was not significantly related to either art or music, but mastering English was significantly related to the motive to master reading and math in both countries. In general, the relations between subject-specific mastery motives in grade 10 were lower than in grade 4, 6, and 8.

Table 5. Correlations between the Variables in Grade 10

Scales	Reading	Math	Science	English	Art	Music	Pleasure	School
Reading		.47**	.42**	.49**	.21**	.10	.41**	.65**
Math	.21*		.36**	.42**	.14*	-.07	.25**	.53**
Science	.27**	.46**		.21**	.30**	.20**	.50**	.68**
English	.45**	.24**	.07		.10	.09	.25**	.54**
Art	-	-	-	-		.23**	.45**	.62**
Music	-	-	-	-	-		.39**	.53**
Pleasure	.51**	.34**	.36**	.45**		-		.76**
School	.68**	.65**	.60**	.64**		-	.74**	

*Note. The upper triangle contains Hungarian data, the lower triangle contains Taiwanese data; *p < .05; ** p < .01.*

Age Differences

There were significant age differences in subject specific mastery motives in both countries (see Figures 1 to 6). We performed one-way ANOVAs to test the differences between grade levels. The significant grade level decreases in Hungary were: reading (F = 55.95, p < .001, grade levels 4 >6 >8, 10), math (F = 70.90, p < .001, grade levels 4 >6 >8, 10), science (F = 47.75, p < .001, grade levels 4 >6 >8, 10), English (F = 4.46, p < .05, grade levels 4 >6, 8, 10), art (F = 128.53, p < .001, grade levels 4 >6 >8 > 10), and music (F = 82.90, p < .001, grade levels 4 >6 >8 > 10). Thus, In Hungary mastery motivation decreased from grade 4 to 8 in all subjects except English as a foreign language, where it stayed the same at grades 6, 8, and 10.

The grade level differences in Taiwan were: reading (F = 7.43, p < 0.001, grade levels 4, 10 > 6, 8), math (F = 14.38, p < 0.001, grade levels 4, 10 > 6, 8), science (F = 7.63, p < .001, grade levels 4, 10 > 6, 8), English (F = 4.17, p < .05, grade levels 4 > 8), art (F = 19.10, p < .001, grade levels 4 >6 >8), and music (F = 1.07, p = .344), so the motive to master music skills did not decline from grade 4 to 8. Taiwanese students do not have art and music in grade 10, so we computed those ANOVAs just for grade 4−8. There were age differences in Taiwan, but they were less consistent. Except for music, there was a decline from grade 4 to 6 in all subjects, but grade 10 motivation was often higher than for grade 6 and 8. Similar to Hungary, the motive to master English as a foreign language stayed essentially constant from grades 6 to 10.

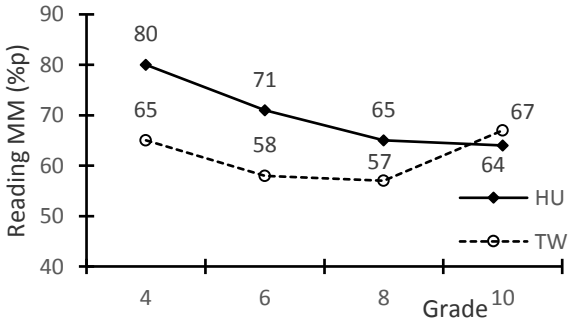

Figure 1. Age changes in Reading MM for Hungarian and Taiwanese Students

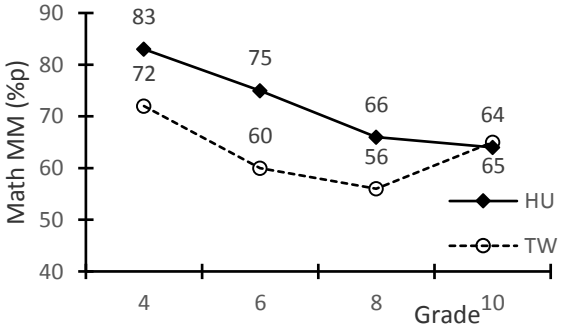

Figure 2. Age changes in Math MM for Hungarian and Taiwanese Students

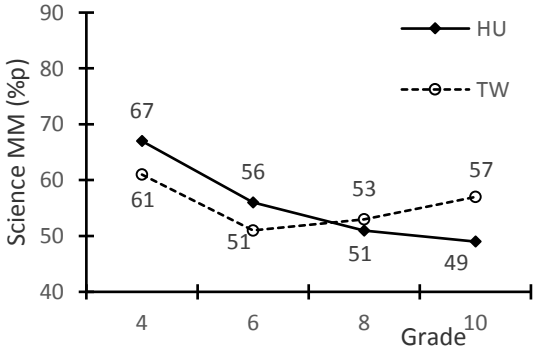

Figure 3. Age changes in Science MM for Hungarian and Taiwanese Students

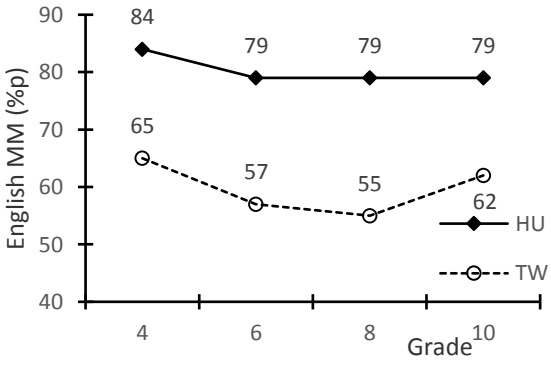

Figure 4. Age changes in English MM for Hungarian and Taiwanese Students

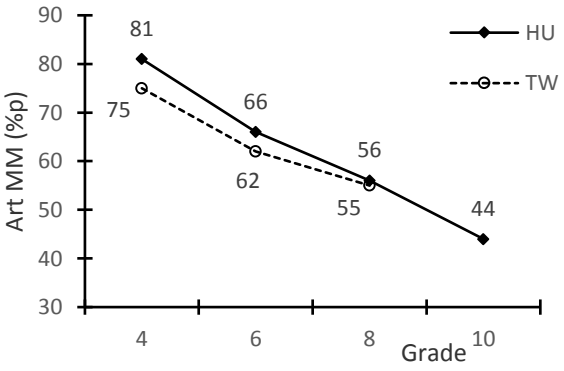

Figure 5. Age changes in Art MM for Hungarian and Taiwanese Students

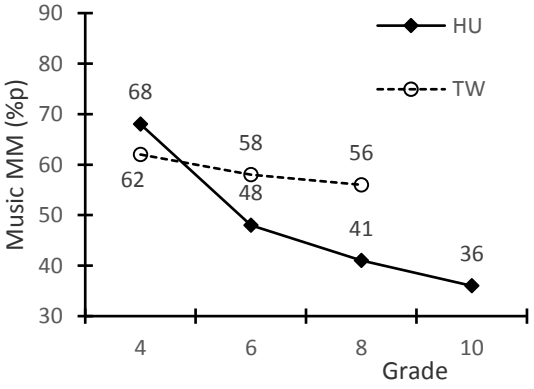

Figure 6. Age changes in Music MM for Hungarian and Taiwanese Students

There were significant grade level changes in school mastery pleasure in both countries (one-way ANOVA, Hungary $F = 64.24$, $p < .001$, grade levels 4 >6 > 8, 10; in Taiwan, $F = 5.25$, $p < .05$, grade levels 4 > 8). The Taiwanese student do not have art and music in grade 10, thus, we computed the ANOVA just for grade 4–8.

A country x grade level MANOVA was run for grades 4–8 and also separately for grades 4–10 for reading, science, and English (Table 6). There were several significant country and grade differences and some significant interactions. For both the analysis of grades 4–10 and 4–8, there were significant grade level differences on all variables, but the effect sizes for English were small, reflecting the decrease from grade 4–6, but not thereafter. On the subjects of English, reading, math, and art the Hungarian children rated themselves more motivated to master the subject, but on science there was no country difference. The Taiwanese students rated themselves higher on music. There were notable grade by country interactions in science and music where the students from Taiwan rated themselves higher than the Hungarian at the older grades but lower at grade 4.

Table 6. Multivariate Analyses of Variance for SSMM Scales as a Function of Grade Level and Country

DMQ scale		Grade 4–8			Grade 4–10		
		F	*p*	η^2	*F*	*p*	η^2
MANOVA	Grade Level	12.72	<.001	.07	12.27	<.001	.03
	Country	43.98	<.001	.20	83.34	<.001	.16
	G x C	2.84	<.001	.02	5.92	<.001	.01
Reading	Grade Level	20.46	<.001	.03	19.88	<.001	.03
	Country	74.89	<.001	.06	68.90	<.001	.04
	G x C	4.11	.017	.01	14.57	<.001	.03
Math	Grade Level	37.60	<.001	.05	39.17	<.001	.06
	Country	61.07	<.001	.05	66.04	<.001	.04
	G x C	2.62	.073	.00	9.76	<.001	.02
Science	Grade Level	20.47	<.001	.03	22.98	<.001	.04
	Country	2.18	.14	.00	0.01	.912	.00
	G x C	5.51	.004	.01	7.56	<.001	.01
English	Grade Level	3.94	.02	.01	7.98	<.001	.01
	Country	191.88	<.001	.13	307.71	<.001	.15
	G x C	.31	.734	.00	1.56	.199	.00
Music	Grade Level	21.63	<.001	.03	-	-	-
	Country	5.43	.020	.00	-	-	-
	G x C	9.02	<.001	.01	-	-	-
Art	Grade Level	63.64	<.001	.09	-	-	-
	Country	4.83	.028	.00	-	-	-
	G x C	1.22	.294	.00	-	-	-
Pleasure	Grade Level	13.83	<.001	.02	-	-	-
	Country	94.63	<.001	.07	-	-	-
	G x C	1.05	.351	.00	-	-	-

The academic mastery motivation score was the mean of the math, reading and science mastery motivation scores. (Similarly, academic mastery pleasure was based on math, reading and science mastery pleasure items.) A country x grade level ANOVA was run using the academic mastery motivation score as the dependent variable. All effects were statistically significant at the 0.01 significance level (Figure 8). The main effect for country was: $F = 50.49$, $p < .01$, partial $\eta^2 = .02$, indicating a significant overall difference between Hungarians ($M = 67.15$, $SD = 18.22$) and Taiwanese ($M = 59.65$, $SD = 18.70$). Again the Hungarian rated themselves higher. The main effect for grade level was: $F = 49.83$, $p < .01$,

partial $\eta^2 = .06$, indicating a significant difference between grades: 4 > 6 > 8. There was no significant difference between grade 8 and grade 10. The interaction effect was significant $F = 17.60$, $p < .05$, partial $\eta^2 = .02$ because in grade 10 children from Taiwan seemed to increase their academic motivation.

A country x grade level ANOVA was also run using the academic mastery pleasure score. All effects were statistically significant at the 0.01 significance level (Figure 9). The main effect for country yielded $F = 120.95$, $p < .001$, partial $\eta^2 = .05$, indicating a significant difference between Hungarian ($M = 83.56$, $SD = 19.24$) and Taiwanese ($M = 72.00$, $SD = 23.46$). Again, the Hungarians rated themselves higher, this time on pleasure. The main effect for grade level was $F = 17.74$, $p < .001$, partial $\eta^2 = .02$, indicating that grade 4 > 6. Thus, there was a decline in academic mastery pleasure from grade 4 to 6 but then there was no further decline and what seems to be an increase at grade 10. The interaction effect was also significant $F = 13.70$, $p < .001$, partial $\eta^2 = .02$.

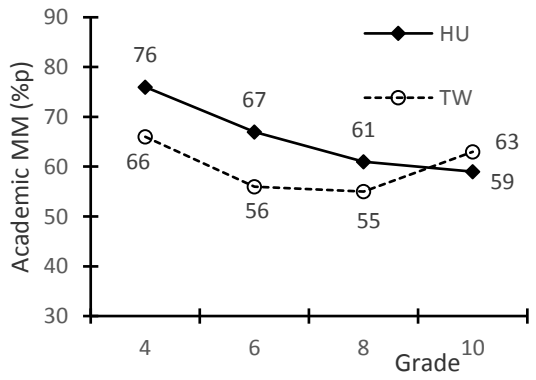

Figure 8. Age changes in Academic MM for Hungarian and Taiwanese Students

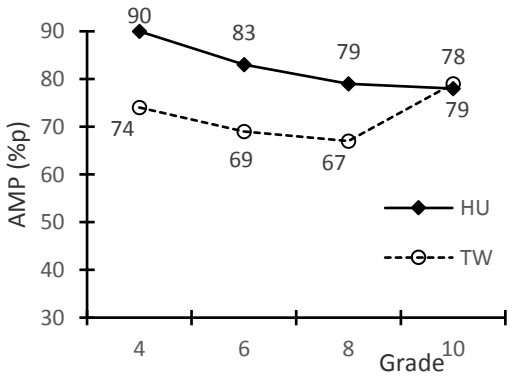

Figure 9. Age changes in Academic Mastery Pleasure for Hungarian and Taiwanese Students

Discussion

This study presented the results of a cross-cultural comparison of school related mastery motivation in the subjects of reading, math, science, English language, music, and art and in overall mastery pleasure in school between grade 4 and 10. The study used the Subject Specific Mastery Motivation Questionnaire (SSMMQ, Józsa, 2014; Józsa & Kis, 2017), whose scales had high reliabilities in both Hungary and Taiwan. The summative scale of school related mastery motivation also had high reliability. Exploratory factor analysis supported the 7-factor structure of the questionnaire for the total sample and for the Hungarian and Taiwanese samples separately. Based on these findings, we assume that the Subject Specific Mastery Motivation Questionnaire can be used in different cultures with a wide age range of students.

We found that motivation decreased between grade 4 and 8 for most of the school-subject mastery motives, school mastery pleasure, and also for overall school mastery motivation in both countries. Józsa and Morgan (2014), Józsa et al. (2014) found similar decreases in mastery motivation. The results were consistent with previous studies, for example Lepper, Corpus, and Iyengar (2005), which found that intrinsic motivation decreased as the age of students increased from grade 3 to grade 8. Gottfried et al. (2001) in a longitudinal study, also found a decrease from middle childhood to adolescence in intrinsic motivation for reading, math, science, and total school motivation. Józsa and Morgan (2014) also found a decrease in the cognitive persistence domain of mastery motivation in school-age children from grade 4 to grade 8.

However, it is important to note that English as a foreign language did not decrease in either Hungary or Taiwan from grade 6 to 10. This is similar to Józsa's (2014) finding about a lack of decline in Hungary of the motive to master English. Furthermore, in Hungary the motivation to master English was considerably higher than any of the other subjects during grades 6–10 but was similar to the high ratings of school mastery pleasure. In Taiwan, mastery motivation in English was not especially high and the trend across grades was somewhat similar to that for other school subjects. It is also interesting to point out the relatively low ratings for motivation in science in both countries.

In the present study, there were different trends between grade 8 and grade 10 in Hungary and Taiwan. There were non-significant decreases in academic subjects in Hungary; however, the Taiwan students indicated that they were more motivated at grade 10 than 8 in reading, math, and science. These differences may be due to the learning environment of these two countries and the sample characteristics at grade 10. For example, senior secondary (high school) education consists of three years of schooling from 10th to 12th grade in Taiwan. Taiwanese students in grade 10 have recently finished the examination for entrance into senior high school and most students have transferred to a new learning environment from junior high school to senior high school at grade 10. However, Hungarian students move to high school at grade 9. More importantly, in Taiwan class placements in grade 1–9 are different from those grade 10–12. During primary and junior high school, the student attends the school in the school district where they live, and they are randomly assigned to classrooms. However, during senior high school most students attend different schools based on their entrance examination scores. In Taiwan, two senior high schools were sampled in the present study. One was a top ranked high school and the other was a community high school ranked average. Thus, there was a less diverse sample of students at grade 10 than grades 4 to 8 in Taiwan. Because half of the students at grade 10 were from a top ranked high school, they had better academic records, which may have led to higher mastery motivation than the students in grades 4–8. In Hungary, all types of high school were represented so there wouldn't have been SES differences between primary and secondary education for students, as there probably was in Taiwan.

Hungarian students rated themselves higher than the Taiwanese students in every school subject (except for music), mastery pleasure in school, and the total school related mastery motivation. Morgan, Liao et al. (2017) also found that Hungarian parents rated their preschool children higher on the DMQ than the Taiwanese parents, and they discuss possible explanations including that Chinese parents probably have higher expectations for academic achievement and, thus, may rate their children lower.

There were similar medium to high correlations in the two countries among the motives in grade 4, 6 and 8. However, we found lower correlations (i.e., more differentiation) among the motives in grade 10 in both countries. Bong (2001) and Brunner et al. (2010) also found more domain specificity as participants become older.

Our study has some limitations. One of them is that we used a cross-sectional design, so the age differences do not directly indicate that there would be similar changes as the same students got older. This cross-sectional design was clearly a problem for interpreting the apparent increase in motivation from grade 8 to 10 in Taiwan. Further research should use longitudinal designs. We should also study age change trends in other countries and cultures. Teachers', parents', and peer ratings also can give us useful information. Because social desirability can influence questionnaire responses, behavioral measures would be more appropriate for studying mastery motivation. However, there are no behavioral measures yet for school age children.

Conclusion

Our study showed that in general, subject specific mastery motivation and mastery pleasure in school tend to decrease between grade 4 and 8 in both countries and continue to decline to grade 10 in music and art in Hungary. These motivation decreases can impact students' school achievement, which can strongly impact life success. Schools, teachers, parents, and peers may have a role in these motivational decreases with age. An important question is how can these decreasing trends in motivation be stopped, or at least slowed down? What are appropriate methods for improving mastery motivation in school settings? Future studies are needed in this field.

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