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Self-regulated Processes as Predictors of Students' Achievement in Music Theory in Slovenian Elementary Music Schools

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Abstract: The aim of the present research was to examine the relation between processes of self-regulated learning and achievement in Music Theory (MT), a basic and obligatory subject in Slovenian music schools. A total of 457 fifth- and sixth- grade students (153 boys and 303 girls) from 10 different elementary music schools in Slovenia participated in the study. Students completed a questionnaire about affective-motivational processes and a questionnaire about (meta)cognitive processes of self-regulated learning in MT, as well as achievement test. The final grades were collected at the end of the school year. The results showed that significant correlation exists between almost all affective-motivational and (meta)cognitive processes of self-regulated learning and achievement. Affective-motivational factors emerged as better predictors of students' achievement than (meta)cognitive factors. The most important individual predictors were anxiety and competence. It was also found that self-regulated processes explain a greater amount of variance for final grades than for the achievement test.

Key words: elementary music education, music theory, self-regulated learning, academic achievement

Samoregulativni procesi kot prediktorji uspešnosti učencev glasbene šole pri nauku o glasbi

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Povzetek: V raziskavi nas je zanimal odnos med nekaterimi vidiki samoregulativnega učenja in uspehom pri nauku o glasbi, ki je obvezen, temeljni predmet v slovenskih nižjih glasbenih šolah. Sodelovalo je 457 učencev petih in šestih razredov (153 fantov in 303 deklet) iz 10 glasbenih šol v Sloveniji. Učenci so izpolnjevali vprašalnik o čustveno-motivacijskih in (meta)kognitivnih procesih samoregulativnega učenja pri nauku o glasbi ter rešili preizkus znanja. Ob koncu leta smo pridobili tudi njihove zaključne ocene pri predmetu. Rezultati so pokazali, da obstajajo pomembne korelacije med skoraj vsemi vidiki samoregulativnega učenja in učenčevimi dosežki pri predmetu. Pokazalo se je, da so čustveno-motivacijski faktorji boljši prediktorji učnega uspeha kot (meta)kognitivni faktorji, ter da sta anksioznost in kompetentnost najpomembnejša individualna prediktoja. Ugotovili

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smo tudi, da samoregulativni procesi pojasnijo večji delež variance pri zaključnih ocenah kot pri rezultatih preizkusa znanja.

Ključne besede: osnovno glasbeno izobraževanje, nauk o glasbi, samoregulativno učenje, učni uspeh

CC = 3550

Self-regulated learning emerged as an important construct in education in a past few decades (Zimmerman, 1998) and refers on the way students initiate, monitor and control their own learning. Self-regulated learning can be seen from different theoretical perspectives. The present study is based on the social-cognitive theory of learning, which emphasizes the integration of metacognitive, cognitive and affective-motivational processes in learning. Within this theoretical perspective, researchers try to explain self-regulative learning with different models, e. g. a four-component model by Garcia & Pintrich (1994), a six-component model by Boekaerts (1996), a three-phase self-regulated model by Zimmerman (1998). Regardless of the differences between these models, they all considered affective, motivational, cognitive and metacognitive processes as important for students' regulation of their own learning in different domains.

In terms of cognitive and metacognitive processes, self-regulated students have more knowledge and more positive beliefs about tasks and strategies (declarative knowledge). These students also know better how (procedural knowledge), and when, where and why (conditional knowledge) they should use this knowledge and strategies.

Cognitive strategies enable students to learn, remember and understand the material (Zimmerman & Martinez-Pons, 1988). In literature (Garcia & Pintrich, 1994; Hofer, Yu & Pintrich, 1998; Pintrich & Shunk, 2002), the most frequently mentioned cognitive strategies are rehearsal (e. g., reading the text), elaboration (e. g., explaining the material to a friend) and organisation (e. g., extraction of the main idea), whereas planning (e. g., setting goals), monitoring (e. g., self-testing of understanding) and regulation (e. g., reading the text once again if not everything is understood) are the most commonly mentioned metacognitive strategies.

However, knowledge about strategies is not enough for effective learning. Students have to be motivated to start learning and sustain the effort until the task is completed (Boekaerts & Cascallar, 2006). The affective-motivational component of self-regulated learning refers to the knowledge that students have about themselves, tasks and learning situations (Boekaerts & Cascallar, 2006). It includes knowledge and beliefs about strengths and weaknesses as a learner, self-efficacy for various academic tasks, goal orientation for learning, personal interest and value of academic tasks (Garcia & Pintrich, 1994; Hofer, Yu & Pintrich, 1998). Students also posses

a repertoire of motivational strategies among which Garcia and Pintrich (1994) mentioned self-affirmation, self-handicapping, defensive pessimism and attribution style.

Self-regulated behaviour is context-dependent, which means that people are not generally self-regulated or non-self-regulated (Boekaerts & Cascallar, 2006; Shunk, 2001), but they regulate their behaviour according to the context. Researchers studied self-regulated learning most often in mathematics and native language (Pečjak & Košir, 2003; Peklaj, 2001; Pintrich & De Groot, 1990; Poklay & Blumenfeld, 1990; Zimmerman & Martinez-Pons, 1990). In our research we focused on the domain of music education, more precisely on MT, which is a basic and compulsory subject in elementary music schools in Slovenia. Acquiring music language and developing students' competencies for analytical music reading and writing are the most emphasised goals in this subject.

The content of the subject is divided into five fields (Kuret, Bajde, Lorber & Ignjatovič, 2003): solfeggio (students auditorily recognize intervals and chords, they have to write melodic and rhythmic dictations, sing a vista, etc.), theoretical knowledge (students acquire knowledge about scales, intervals, chords, musical forms, etc.), performance and interpretation of selected musical pieces (students consolidate their singing technique, recognize musical literature, etc.) listening (students listen to and estimate the aesthetic value of different musical pieces) and the creation of new pieces of music (students use their knowledge of solfeggio and theoretical knowledge in order to create new musical pieces). Achievement in MT is thus very important also for success in instrument learning and self-regulation has not been studied in this subject yet, thus, we have decided to investigate this specific learning context.

Self-regulated learning and achievement

Self-regulated learning and achievement is one of the most studied topics of self-regulation, but findings are not entirely consistent. Some researchers (Miechenbaum & Beimiller, 1992; Puklek-Levpušček, 2001) have found positive connection between using cognitive and metacognitive strategies and achievement, but others found no or even negative correlation (Pečjak & Košir, 2003; Peklaj & Pečjak, 2002; Peklaj & Vodopivec, 1998).

Findings regarding the affective-motivational component of self-regulated learning and achievement are more consistent. Self-efficacy and intrinsic motivation were found to be positively related to achievement (Bouffard, Marcoux, Vezeau & Bordeleau, 2003; Borkowski & Thorpe, 1994; Metallidou & Vlachou, 2007; Peklaj & Pečjak, 2002; Pintrich & DeGroot, 1990; Puklek-Levpušček, 2001), self-efficacy in particular appeared as one of the most powerful predictors of students' achievement at different levels of education and in different domains (Bandalos, Geske & Finney, 2005; McCormick & McPherson; 2003; Pintrich, & De Groot, 1990; Zohar, 1998).

Anxiety, on the other hand, is usually related negatively to achievement, although very anxious students can be relatively successful at the clearly defined tasks, the routine tasks and tasks without a time limit (Marentič-Požarnik, 2000).

Self-regulation and gender

Research shows that gender is related to the frequency and the type of strategies used. Zimmerman and Martinez-Pons (1990) found that girls use more organization and transformation strategies, they keep records and they use monitoring more frequently than boys. Girls also use more strategies at highly demanding tasks (Ablard & Lipschulz, 1998), they use more metacognitive strategies and more of them believe in the importance of cognitive strategies (Peklaj & Pečjak, 2002).

Gender differences also exist in the affective-emotional components of self-regulated learning, but research results are less consistent. In some research boys report higher results in self-efficacy at verbal tasks (Zimmerman & Martinez-Pons, 1990), at geometric tasks (Poklay & Blumenfelda, 1990) and generally at learning (Pintrich & DeGroot, 1990; Puklek-Levpušček, 2001), while Peklaj & Pečjak (2002), Metallidou & Vlachou (2007) did not find any differences in self-efficacy between boys and girls. On the other hand, girls usually express more positive feelings toward learning and they are more intrinsically motivated (Peklaj & Pečjak, 2002). The majority of researchers in the area of anxiety found that girls express higher levels of anxiety than boys (Chapell, Blanding, Silverstein, Takahashi, Newman, Gubi & McCann, 2005; Pintrich & DeGroot, 1990).

As has been mentioned before, self-regulated behaviour is context-dependent (Boekaerts & Cascallar, 2006; Shunk, 2001), mostly studied in mathematics and native language (Pečjak & Košir, 2003; Peklaj, 2001; Pintrich & De Groot, 1990; Poklay & Blumenfeld, 1990; Zimmerman & Martinez-Pons, 1990), and as there has been no study of self-regulated learning in Music Theory we examined the relations between the processes of self-regulation (affective-motivational and cognitive) and students' achievement in this subject. We were also interested in finding out which of the affective-motivational and cognitive processes of self-regulation are the best predictors of student achievement and if differences in predictors between boys and girls exist.

Method

Participants

The sample consisted of 457 fifth- and sixth- grade students (153 boys and 303 girls) from 10 different elementary music schools in Slovenia. Their average age was 13 years and 8 months.

Instruments

The Music Theory Affective-Motivational Processes Questionnaire – MTAMPQ (Smolej Fritz & Peklaj, 2006) was developed for the purposes of the study to measure affective-motivational processes in learning MT. The MTAMPQ comprises 47 items. Students answered how often the statement is valid for them at MT on a 5-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). The factor analysis (oblimin rotation, scree test) revealed four different factors that accounted for 44.2% of the explained variance. The first factor, *perception of applicability and the importance of MT*, incorporates items about perceiving the importance and applicability of knowledge acquired in MT. *Anxiety* is the second factor and includes items about fear in learning and fear of examinations in MT. The third factor, *self-efficacy and interest*, refers to the feeling that one is able to understand MT and show interest in the subject. The last factor, *incompetence at auditory tasks*, refers to perception of difficulty at auditory tasks. The Cronbach α reliability coefficients for individual factors were: .91, .88, .73, and .75.

The Music Theory Cognitive Processes Questionnaire – MTCPQ (Smolej Fritz & Peklaj, 2006) was developed to measure cognitive and metacognitive processes of self-regulated learning in MT. MTCPQ include 34 items. Students answered how often the statement is valid for them at MT on a 5-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). The factor analysis (oblimin rotation, scree test) revealed three different factors that accounted for 39.4% of the explained variance. The first factor, *strategies for solving convergent tasks*, includes items about different strategies (e. g., remembering, underlining, checking for understanding, planning steps for solving the task) in solving tasks where just one solution is possible. The second factor, *self-handicapping strategies in solving difficult tasks*, includes items about ways to solve the task, when they perceive it as difficult (e. g., giving up, solving just the easier parts of the task). The third factor, *strategies for solving divergent tasks,* includes items about strategies (cognitive and metacognitive) when more than one solution is possible (e. g., creating a melody based on a given rhythm or text). The Cronbach α reliability coefficients for factors were: .91, .68, and .72.

Two *Music Theory Achievement Tests (MTAT)* were also developed for the purposes of the study. The tests for the fifth- and the sixth-grade students were different, but both contained tasks covering solfeggio (listening to intervals, listening to chords, rhythmic and melodic dictation), music theory knowledge (analyses of intervals, analyses of chords, scales and musical concepts), and recognition of some musical pieces. Each correct answer was scored with 1 point. For further analyses, results were converted into *z*-values ($Me = 0$, $SD = 1$). The Cronbach α reliability coefficient for the fifth grade test was .93 and .95 for the sixth grade test.

Procedure

Data were collected during regular classes in the second part of the school year. Students were asked to complete the questionnaires and achievement test in their classroom, in the presence of the researcher. The completion of the questionnaires took approximately 45 minutes, as did the completion of the achievement test. The final grades in MT were also collected at the end of the school year.

Results

In Table 1 the relations between processes of self-regulation and achievement in MT are presented.

Table 1. *Correlations between (meta)cognitive, affective-motivational variables, and achievement in Music Theory*

	Achievement	
	Final grades	MT achievement test
Affective-motivational variables		
Applicability and importance of MT	.19***	.11
Anxiety	–.35***	–.26***
Self-efficacy and interest	.44***	.14*
Incompetence at auditory tasks	–.21***	–.20***
(Meta)cognitive variables		
Strategies for solving convergent tasks	.10	.09
Self-handicapping strategies in solving difficult tasks	–.26***	–.22***
Strategies for solving divergent tasks	.16**	.21***

*$p < .05$, **$p < .01$, ***$p < .001$

Significant correlations were found between all affective-motivational measures and grades in MT, and between all affective-motivational measure and results on MT achievement test (except between applicability and importance of MT and results on MT achievement test). Students who evaluate the applicability and importance of MT higher achieve higher grades. Furthermore, students with higher evaluations of self-efficacy and interest received higher grades and results on achievement test. Students with higher levels of anxiety and incompetence at auditory tasks had lower grades and achievement on MT test. In cognitive measures of self-regulated learning students reporting higher levels of self-handicapping strategies in solving auditory tasks had lower achievement. Students who revealed more strategies for solving divergent tasks achieved better results in MT.

In the second part of data analyses a hierarchical multiple regression analysis was performed to predict the two achievement variables (final grades in MT and results on the achievement test). In predicting final grades, as well as results on achievement test, affective-motivational variables were entered in the analysis first and cognitive variables second. This sequence of steps was used because the students' use of cognitive and metacognitive strategies depends on their learning motivation. Students perceptions of applicability of MT, their self-efficacy, perceptions of competency in auditory tasks affects choices and use of (meta)cognitive strategies in learning situations (Metallidou & Vlachou , 2007; Pintrich & DeGroot, 1990; Pintrich & Schunk, 2002).

A hierarchical multiple regression analysis was computed separately for boys and girls, because some gender differences were found at self-regulation processes as well as in achievement. In two cognitive measures of self regulation, statistically significant differences were found: in strategies for solving convergent tasks, $t(328) = -2.29$, $p < .05$, and in strategies for solving divergent tasks, $t(315) = -3.43$, $p < .001$. Significant difference was also found in the perception of applicability and importance of MT, $t(417) = -3.22$, $p < .001$. Girls scored higher than boys in all three areas of self-regulated learning. A significant difference between boys and girls also exists in final grades, $t(329) = -3.47$, $p < .001$, and in the results of the music theory achievement test, $t(308) = -2.78$, $p < .01$. Girls scored higher than boys.

Table 2. *Correlations between (meta)cognitive and affective-motivational factors*

	CSTR2	CSTR3	MSTR1	MSTR2	MSTR3	MSTR4
CSTR1	–.21***	.59***	.61***	.08	.53***	–.22***
CSTR2		–.29***	–.24***	.24***	–.32***	.35***
CSTR3			.52***	–.02	.50***	–.30***
MSTR1				–.04	.70***	–.35***
MSTR2					–.12*	.32***
MSTR3						–.35***

Note: CSTR1 – strategies for solving convergent tasks, CSTR2 – self-handicapping strategies in solving difficult tasks; CSTR3 – strategies for solving divergent tasks; MSTR1 – perception of applicability and the importance of MTL, MSTR2 – anxiety, MSTR3 – competence and interest, MSTR4 – incompetence at auditory tasks.
$^{*}p < .05$. $^{**}p < .01$. $^{***}p < .001$.

Almost all correlations between cognitive and affective-motivational factors are statistically significant (Table 2). Students who use more strategies for solving convergent tasks also use more strategies for solving divergent tasks, and less strategies when they perceive a task as difficult. In the affective-motivational domain, students who perceive MT as an applicable and important subject consider themselves more competent and they are more interested in the material. On the other hand, students who experience more fear in MT perceive auditory tasks as more difficult and feel less competent and interested in the subject.

Students who perceive learning as applicable and important use more cognitive strategies for solving convergent and divergent tasks. They also use these strategies more frequently when they feel competent and interested in the material and, at the same time, they use less self-handicapping strategies in solving difficult tasks. On the other hand students who use more self-handicapping strategies experience more fear in MT and perceive themselves as more incompetent at auditory tasks.

Table 3. *Affective-motivational and (meta)cognitive aspect of self-regulated learning as predictors of final grades in MT: Results of hierarchical multiple regression.*

	Boys			Girls		
Predictors	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1: Affective-motivational variables						
Applicability and importance of MT	–.13			–.25*		
Anxiety	–.21*			–.32***		
Self-efficacy and interest	.60***			.52***		
Incompetence at auditory tasks	–.10	.41	.41***	–.00	.28	.28***
Step 2: (Meta)cognitive variables						
Strategies for solving convergent tasks	–.06			.01		
Self-handicapping strategies in solving difficult tasks	–.14			.01		
Strategies for solving divergent tasks	–.21	.47	.05*	.01	.28	.00

Note: Standardized β weights are shown. ΔR^2 represents the increment to R^2 associated with each block of variables when entered into the equation.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

As shown in Table 3, both sets of predictors predicted a significant amount of variance in boys' final grades. The affective-motivational component was found to predict final grades better than the cognitive factors. Anxiety, and self-efficacy and interest were the only significant predictors of the final grades for boys.

For girls, the affective-motivational set of predictors predicted a significant amount of variance in final grades, while the cognitive set of predictors did not appear as significant predictors after accounting for the motivational factors. Perception of applicability and the importance of MT, anxiety, and self-efficacy and interest were significant predictors of final grades for girls.

Table 4. *Affective-motivational and (meta)cognitive aspects of self-regulated learning as predictors of results on the MT achievement test: Results of hierarchical multiple regression*

	Boys			Girls		
Predictors	β	R^2	ΔR^2	β	R^2	ΔR^2
Step 1: Affective-motivational variables						
Applicability and importance of MT	–.03			.04		
Anxiety	–.05			–.32***		
Self-efficacy and interest	.21			–.18		
Incompetence at auditory tasks	–.20	.22	.22***	.01	.13	.13***
Step 2: (Meta)cognitive variables						
Strategies for solving convergent tasks	.12			–.12		
Self-handicapping strategies in solving difficult tasks	–.17			–.13		
Strategies for solving divergent tasks	.01	.26	.04	.18	.16	.03

Note: Standardized β weights are shown. ΔR^2 represents the increment to R^2 associated with each block of variables when entered into the equation.
$^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$

As shown in Table 4, only the motivational set of predictors significantly predicted results on the achievement test, for both boys and girls. Anxiety appeared as the only significant (negative) predictor of results on the achievement test, but only for girls.

Discussion

The first aim of our study was to investigate the connections between various components of self-regulated learning and achievement in MT. The study confirms the importance of self regulation found in other domains of learning, e. g. mathematics, native language learning (e. g. Metallidou & Vlachou, 2007; Miechenbaum & Beimiller, 1992; Peklaj & Pečjak, 2002; Pintrich & DeGroot, 1990; Puklek-Levpušček, 2001). The results revealed the existence of stronger connection between affective-motivational processes and achievement than between (meta)cognitive processes and achievement. Students' who perceive knowledge, e.g. auditory recognition of intervals, chords, melodic and rhythmic dictation as more applicable and important for musical instrument learning achieve better final grades in MT. Perceiving applicability and importance of the subject helps students sustain motivation and volition during the year, which is important for achieving a better

final grade. The significant negative connection between anxiety and achievement confirms the results of some other research (e.g. Peklaj, 2001; Pintrich & DeGroot, 1990). Anxious students are usually less successful when they have to solve tasks under time pressure, when they are singled out in class and when they have to solve relatively new and complex tasks. Positive correlation between self-efficacy and interest, and achievement is also consistent with previous research on other domains (Borkowski & Thorpe, 1994; Bouffard, Marcoux, Vezeau & Bordeleau, 2003; Peklaj & Pečjak, 2002; Pintrich & DeGroot, 1990; Puklek-Levpušček, 2001). Students who judge themselves as self-efficient in MT learning, who like doing the tasks and who find the tasks in MT interesting, were prepared to invest more effort in learning MT, which led to high achievement. The fourth affective-motivational factor, incompetence at auditory tasks, refers also to students' self-efficacy in MT in the field of auditory tasks. Students who perceive aural tasks as less difficult achieve better final grades in MT and higher results on the MT achievement test. Aural tasks are quite demanding for students, because visual information is not present and students have no opportunity to look through the information once again. They only receive aural information, which has to be retained and handled in short-term memory and then properly written down. In this case students have to practice much more than in the case of, for instance, analysing chords theoretically.

In meta(cognitive) processes, significant negative correlation between self-handicapping strategies in solving difficult tasks and achievement was found. Students who use these strategies more frequently often solve just part of the task or even terminate the work, and consequently achieve lower results in MT. Significant positive correlation was found between using strategies for solving divergent tasks, where students have to create (e. g., a melody based on the given rhythm or text), and achievement. Such tasks are more demanding for students. Students have to apply their knowledge of solfeggio and some theoretical knowledge in order to create new musical or rhythmical pieces. They have to show some degree of independence and have to be able to use appropriate strategies if they want to complete such kind of tasks.

The results of regression analysis show that differences in predictors for the final grades and for the achievement test exist, as do differences in predictors between boys and girls. Affective-motivational variables are stronger predictors for final grades than (meta)cognitive variables, for both boys and girls. Among affective-motivational variables, self-efficacy and interest have the greatest predictive value. This is consistent with the results of other research (Metallidou & Vlachou, 2007; Pintrich & DeGroot, 1990; Puklek-Levpušček, 2001) where self-efficacy is considered as the key motivational component because of its value in predicting students' task choices, the quantity and quality of students' effort, deeper processing and regulatory strategies, as well as achievement in different domains. Anxiety emerged as a second most important but negative predictor. The results confirm previous research evidence of Metallidou and Vlachou (2007), and Pintrich and DeGroot (1990). Anxiety can

hinder students' performance in solving different tasks, e. g. recognizing intervals and chords, writing melodic and rhythmic dictations, thus have negative effect on their achievement. Somewhat unexpected is the appearance of applicability and importance of the subject as a significant negative predictor for girls in final grades, which is not consistent with other research on motivation (e. g., Poklay & Blumenfeld, 1990). Perhaps girls with better grades in MT do not ask themselves much about applicability and importance of the subject. They simply learn what was expected of them. Another possible explanation is that for some girls getting a good grade is so important that they are ready to put more effort into learning, even when they do not see its usefulness and connection with instrument learning.

The comparison between boys and girls shows that the self-regulated variables explained more variance for boys than for girls. For girls, some other significant predictors could exist that can explain more variance in music achievement, e. g. intelligence, teacher support, cooperative work.

Our results have some practical implications for music education and especially for teaching music theory. Teachers should create learning environments in which students can learn without anxiety and experience success in different learning situations. Such a learning atmosphere promotes perception of self-efficacy, which is an important component of self-regulated learning. Teachers can stimulate self-efficacy by emphasising students' individual improvement. MT is a subject, like mathematics for example, with a very coherent structure (e. g., if students do not consolidate their knowledge about scales, they can not understand intervals), so it is important that teachers start with students' actual knowledge and explain the subject matter step by step. Only in that case will the students be able to solve new problems and develop their sense of self-efficacy in this area. Teachers should also apply different kinds of assessment to increase the possibility of each student's success. Realistic feedback is also an important component for stimulating self-efficacy. It might be useful to devote attention not only to the product (grades), but also to the quality of learning processes. All these may be useful also in reducing student's anxiety.

Although cognitive factors are not as strong predictors of success as motivational factors, more attention in MT should also be directed toward them. Teachers should introduce to students different useful learning strategies they could use especially in solving difficult auditory and divergent tasks and demonstrate how, when and why use these strategies. This is the only way students would use these strategies.

In conclusion, we have to mention some limitations of our study. First, cognitive and metacognitive components of self-regulated learning were measured with self-reporting instruments. The results could gain in their validity if they were supplemented with other measures like structural interviews, behavioural measures or think-aloud protocols. Even though the developed instruments showed satisfactory reliability, further research should be directed toward improving these instruments in order to increase validity, especially for measuring cognitive processes. This could

be achieved by developing instruments for measuring a wider spectrum of cognitive and metacognitive strategies. Further research should also devote some attention to self-regulated learning in specific domains of MT, particularly solfeggio, at which students perceive themselves as the most ineffective. The reasons for the differences in self-regulated learning between boys and girls are also an important matter for further research, as well as the existing differences in the patterns of achievement predictors.

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