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The role of absenteeism in the prediction of math achievement on the basis of self-concept and motivation: TIMMS 2015 in Serbia*

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This study examines how students' absenteeism moderates the relationship of math self-concept and motivation to learn math on one side and the achievement in the TIMSS 2015 math test on the other. The stratified random sample consists of 4036 fourth grade pupils from 160 primary schools in Serbia. Separate regression models were made for four levels of frequency of students' absenteeism. The results show that self-concept makes a positive contribution to the prediction of achievement, and motivation a negative one. Additionally, with the increase of absenteeism the importance of self-concept drops and that of motivation grows. The analysis of variance confirmed that along with the increase of absenteeism, students express lower levels of self-concept, while the level of motivation does not change. The most important conclusion is that regular class attendance contributes to the students' math self-concept and consequential achievement by developing their experiences of success in math. The usefulness of the motivation scale for predicting math test performance is discussed.

Keywords: TIMSS 2015, predictors of mathematical achievement, math self-concept, motivation to learn math, absenteeism.

Highlights:

- Students' absenteeism decreases positive contribution of math self-concept to the prediction of achievement.
- Regular class attendance is related to a higher math self-concept.
- Self-concept is a more important motivational variable than intrinsic motivation.
- Negative effects of absenteeism are present even at a young school age.

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This paper is focused on how the achievement in the mathematics test is linked to students' characteristics in the TIMSS 2015 international research in Serbia. More precisely, we analyse whether absenteeism moderates the prediction of achievement in the math test on the basis of math self-concept and motivation to learn math. A large number of previous studies have shown the connection between self-concept, motivation and pupils' achievement (e.g., Marsh & Craven, 2006; Ryan & Deci, 2009). The role of absenteeism in relation to the aforementioned variables has still not been sufficiently explored.

Self-concept refers to one's perception of his/her own worth, connected with perceived competence in a certain field (Pajares & Miller, 1994). According to the model by Marsh and Shavelson (1985), self-concept is organised hierarchically. Global self-concept is located at the top of the hierarchy, and academic and non-academic (social, emotional and physical) self-concept on the next level (Byrne & Worth Gavin, 1996; Marsh, 1990). Then, academic self-concept encompasses math academic self-concept and verbal academic self-concept, while self-concepts in specific academic subjects are posited at the lowest level of the hierarchy.

Academic self-concept influences students' school achievement and test performance by contributing to the acquisition of high-quality knowledge (Marsh & Craven, 2006; Mullis et al., 2008; Mullis, Martin, Foy, & Arora, 2012). Research identified the highest correlations between math self-concept and achievement in this subject compared to the correlations of academic self-concepts and achievements in other school subjects (Marsh & Yeung, 1997). Math self-concept is closely linked to school achievement in mathematics, math test performance, as well as students' choice of math courses (Marsh & Martin, 2011). It was also shown that positive self-concept and self-efficacy beliefs in mathematics and science have positive impact on motivation, positive emotions, and effort (Abu-Hilal, 2000; Akey, 2006).

Students' motivation to learn math is considered to be significant for their achievement in this subject. The TIMSS research project operationalized motivation as intrinsic sense of enjoyment (Mullis et al., 2016), very much in accordance with the self-determination theory (Deci & Ryan, 1985b). It is argued that intrinsic motivation is of particular importance, as it refers to the individuals' inherent need to develop their own capabilities in relation to their surrounding (White, 1959) and to be autonomous (Deci & Ryan, 1985a; 1987; 2000; Deciet al., 1991). Research shows that intrinsic motivation is more strongly connected with achievement than extrinsic motivation (Beckeret al., 2010; Deci & Moller, 2005; Ryan & Deci, 2009; Vansteenkisteet al., 2008). Students who are intrinsically motivated to learn math perceive this subject as interesting and enjoyable, which leads to higher creativity, flexibility and satisfaction in dealing with problem situations in this subject area (Deci & Ryan, 1985a, 1987). Deci and Ryan interpret their findings in a way that the competence self-beliefs are not sufficient for high achievement in math as the experience of personal meaning in dealing with such contents is also required.

Student absenteeism is defined as any excusable or inexcusable absence from school. In the literature dealing with absenteeism and its implications on students' personal, academic and social functioning, various research approaches may be recognised. In one group of studies, absenteeism is perceived as a form of dysfunctional behaviour, together with aggression, substance abuse and similar (Kearney, 2008). In such an approach, absenteeism is treated as one of the symptoms of a deeper disorder of a personal, family and social nature (Zrilić, 2007, 2008; Kearney 2008; McShane et al., 2001). On the other side, absenteeism is considered to be a risk factor for school failure and early dropout (Veselinović et al., 2016; Archambault et al., 2009; Reid, 2008b). Absence from school is also linked to lower school achievement (Byer, 2000, Henry, 2007, Veenstra at al., 2010; Vaughn at al., 2013), lower self-concept (Corville-Smith et al., 1998; Reid, 1982; Southworth, 1992, Reid, 2006, 2008b), as well as low motivation for school. Namely, absentees like school less (Vaughn et al., 2013; Sheppard, 2009; Byer, 2000) and are less engaged in their school work (Balkuset al., 2016; Vaughn et al., 2013).

The aforementioned studies about absenteeism are mainly focused on older students as the frequency of absence increases with age (Havelka, 1994; Zrilić, 2007). This raises the question as to whether absenteeism among younger students is also related to lower levels of self-concept, motivation and achievement. Also, these studies did not consider students' domain specific, but only general self-concept, motivation and achievement. Furthermore, since the previous studies fail to discuss the effect of absenteeism on the relations between those variables, we wanted to examine whether the frequency of absenteeism moderates the relations among math self-concept, motivation to learn math and math test performance. Although there is a phenomenon known as *specific lesson absenteeism* (Reid, 1999), there is no research, known to authors, that selected math absentees as participants. Our research cannot take into account specific absenteeism from math lessons since international TIMSS 2015 study provides us only with a self-report measure of frequency of general school absenteeism.

Method

This paper is based on a secondary analysis of the data obtained by the student questionnaire and math knowledge test used in the TIMSS 2015 international research (Mulliset al., 2016). The analysed variables were: students' scores on math knowledge test, students' motivation to learn math, math self-concept and frequency of absenteeism (in the further text – absenteeism).

Sample

The sample includes 3976 students (192 fourth grade classes) from 160 primary schools in Serbia. This is a stratified random sample of students with both genders equally represented (49% girls) with an average age of 10.75 years.

Measures

Considering the domain specificity of self-concept, the scale used in the TIMSS 2015 refers to the unidimensional math self-concept and encompasses nine items for the self-

assessment of successfulness in math and for difficulties in learning math (α = .88)[1]. The motivation scale for learning math is also a unidimensional variable that consists of nine items for the self-assessment of enjoyment in learning math, interest in the content and affective attitude towards math contents (α = .93)[2]. The students reported their level of agreement with those items on a four-point Likert-type scale. Frequency of absenteeism (self-reported frequency of students' excusable or inexcusable absences from school in general) was operationalised as a categorical variable with four levels: *Never or almost never*, *Once a month*, *Once every two weeks*, and *Once a week or more*. Finally, the students' achievement in math was represented as the score achieved in the knowledge test (*M* = 500; *SD* = 100) that was constructed within the framework of the TIMSS 2015 study (Mullis et al., 2016). A total of 169 tasks measured various mathematics contents (numbers, geometric shapes and measures, and data display) and a range of cognitive processes within the knowing, applying, and reasoning domains.

Analysis

Linear regression analysis was used in the data processing. The students' achievement in the math knowledge test was the criterion variable, and the predictors were the math self-concept and motivation to learn math. Absenteeism was treated as a moderating variable, and regression analysis was carried out separately for each of the four levels of absenteeism. In addition, one-way analysis of variance was conducted in order to test the differences in the students' math self-concept, motivation, and achievement related to the frequency of absenteeism.

Results

We will start with the descriptive statistics together with the analysis of how math self-concept, motivation and students' achievement vary between different levels of absenteeism (Table 1). Intercorrelations between the variables are presented afterwards (Table 2). Finally, we will present the results of the linear regression analyses conducted separately for each level of absenteeism.

In order to explore the effect of absenteeism on the students' math self-concept and motivation we performed two one-way analyses of variance (Table 1), with absenteeism as the independent variable and math self-concept and motivation to learn math as dependent variables.

Table 1
Descriptive statistics for achievement in math, students' math self-concept and motivation to learn math for four levels of absenteeism

Students' absenteeism	*N*	%	Achievement		Self-concept		Motivation	
			M	*SD*	*M*	*SD*	*M*	*SD*
Never or almost never	2767	69.3	534.19	76.74	10.67	2.21	10.02	1.96
Once a month	744	18.6	526.02	74.55	10.26	2.22	9.77	1.97
Once every two weeks	211	5.3	495.82	85.30	9.89	2.16	9.78	1.82
Once a week or more	269	6.7	455.22	86.10	9.53	2.04	9.88	1.99
Total	3991	100.0	525.31	80.19	10.48	2.23	9.95	1.96

1 Examples of the items from the self-concept scale: „I usually do mathematics well"; „Mathematics is harder than any other subject". A presentation of all the items is provided in Table 5.

2 Examples of items from the motivation scale: "I enjoy learning mathematics"; "I learn many interesting things from mathematics". A presentation of all the items is provided in Table 5.

Students who are more frequently absent have lower math self-concept than those who are never or almost never absent ($F(3, 3935) = 31.19$, $p < .001$, $\eta^2 = .023$), and the observed effect is weak. Despite being statistically significant ($F(3, 3947) = 3.71$, $p = .011$, $\eta^2 = .003$), the effect of absenteeism on motivation is not practically significant. In other words, students' absenteeism is not relevant for their motivation to learn math.

One-way ANOVA for independent samples (Table 1) shows that the students' achievement in math drops as the frequency of absenteeism rises, $F(3, 3972) = 97.33$, $p < .001$, $\eta^2 = .068$. Post-hoc comparisons (with Bonferroni correction) show statistically significant differences between all the groups, with the exception of two groups of students with the least frequent absenteeism ($p = .067$).

The intercorrelation matrix (Table 2) shows high positive correlations between motivation and math self-concept for all levels of absenteeism. Moderate positive correlations were observed between math self-concept and achievement and low correlations between motivation and achievement. The lowest correlation between math self-concept and achievement is in the group of students with the highest frequency of absenteeism, whereas there is no correlation between motivation and achievement on this level.

Table 2
Intercorrelations between achievement in math, students' motivation to learn math and math self-concept for four levels of absenteeism

	Level of absenteeism			
	Never or almost never		Once a month	
	Motivation	Self-concept	Motivation	Self-concept
Achievement	.20**	.50**	.15**	.48**
Motivation		.65**		.62**
	Once every two weeks		Once a week or more	
Achievement	.19*	.48**	.00	.36**
Motivation		.59**		.54**

*$p < .01$; **$p < .001$.

How Absenteeism Moderates the Relation among Math Self-concept, Motivation, and Achievement

The results shown in Table 3 suggest that motivation and math self-concept predict students' achievement to a significant extent and explain approximately one fourth of variance in achievement for each of the four levels of absenteeism. The highest percentage of explained variance was gained in the group of students with the least frequent absences and it drops along with an increase in absenteeism.

Table 3
Percentage of explained variance for four levels of absenteeism in the prediction of achievement in mathematics on the basis of math self-concept and motivation

Absenteeism	*R*	R^2	Adjusted R^2	Standard error of estimate
Never or almost never	.53**	.28	.28	63.47
Once a month	.52**	.27	.27	62.64
Once every two weeks	.49**	.24	.23	74.82
Once a week or more	.42**	.18	.17	76.26

Although both motivation and self-concept positively correlate with achievement (Table 4), when those two variables are included in the regression equation, only self-concept positively contributes to achievement and such a contribution drops with the increase in absenteeism. On the other hand, motivation contributes negatively to achievement prediction. Considering its positive correlation with achievement, it is clear that motivation has a suppression effect on achievement.

Table 4
Absenteeism as the moderator of the relation among math self-concept, motivation, and achievement

Levels of absenteeism		Standardised coefficients	*t*	Correlations		
		Beta		Zero	Partial	Semi-partial
Never or almost never	(constant)		56.96**			
	Self-concept	.645	30.33**	.504	.502	.493
	Motivation	-.219	-10.29**	.197	-.193	-.167
Once a month	(Constant)		32.27**			
	Self-concept	.641	15.86**	.477	.506	.501
	Motivation	-.263	-6.51**	.137	-.234	-.206
Once every two weeks	(Constant)		11.49**			
	Self-concept	.558	7.29**	.474	.458	.450
	Motivation	-.142	-1.86[a]	.187	-.130	-.115
Once a week or more	(Constant)		14.21**			
	Self-concept	.498	7.50**	.356	.421	.421
	Motivation	-.267	-4.01**	.000	-.241	-.225

**$p < .001$; [a]$p = .064$.

The question arises as to why the contribution of motivation is negative in spite of its positive correlations with achievement. One of the possible causes could be the high positive correlation between the two predictors in the regression equation.

The Second Regression Analysis

On the basis of the results of the first regression analysis and the presented hypothesis about the suppression effect of motivation as a consequence of the correlation between the predictors, we wanted to examine the relation between motivation and achievement when the shared variance with the second predictor – math self-concept[3] is excluded from the motivation (Table 5).

Table 5
Absenteeism as the moderator of the relation among math self-concept, intrinsic motivation, and achievement

Level of absenteeism		Standardised coefficients	*t*	Correlations		
		Beta		Zero	Partial	Semi-partial
Never or almost never	(Constant)		58.75**			
	Self-concept	.508	31.27**	.504	.514	.508
	Motivation (residual)	-.167	-10.29**	-.154	-.193	-.167
Once a month	(Constant)		33.33**			
	Self- concept	.477	15.10**	.477	.488	.477
	Motivation (residual)	-.206	-6.51**	-.205	-.234	-.206
Once every two weeks	(Constant)		12.93**			
	Self- concept	.464	7.48**	.474	.468	.462
	Motivation (residual)	-.115	-1.86[a]	-.156	-.130	-.115
Once a week and more	(Constant)		14.49**			
	Self- concept	.348	6.19**	.356	.358	.347
	Motivation (residual)	-.226	-4.01**	-.238	-.241	-.225

**$p < .001$; [a]$p = .064$.

The obtained residual of motivation negatively correlates with achievement and contributes negatively to the prediction of achievement. This indicates that the suppression effect of motivation on achievement has disappeared. In order to understand the psychological meaning of this residual, we carried out content analysis of the items in order to identify any substantial similarities and differences between the math self-concept scale and the motivation to learn math scale.

Prior to the item analysis, additional analyses were carried out in order to identify any significant differences between the beta ponders for the given predictor for the levels of absenteeism.[4] It was confirmed that the differences

3 The percentages of the explained variance (R^2) gained in the second regression analysis remain identical to those gained in the first for all four level of absenteeism.

4 This was done by comparing two levels of absenteeism, coded with 0 (the group which in the compared pair has a lower level of absenteeism) and 1 (the group which in the compared pair

in the beta ponders are significant between those students who are most rarely absent from school and those who are absent the most often. A tendency was noted whereby along with the growth in absenteeism, math self-concept becomes a less significant predictor of achievement, while motivation gains in importance. As for motivation, there are significant differences in the beta ponders only between students who are rarely absent (never or once a month) and those who are absent most often (once a week or more) but it is probably due to higher variability of achievement in the most absent group of students. The perceived outcome could also be understood in the context of the decrease of importance of self-concept in this model with two predictors.

On the basis of our content analysis of the items which are encompassed in the motivation and math self-concept scales (Table 6), we concluded that what those two variables have in common is experience of efficacy, which is supported by the theoretical hypotheses and findings of previous research into the relations between experience of success/efficacy and motivation (Akey, 2006; Deci & Ryan, 1985a; Elliot & Dweck, 2005; Zimmerman, 2000).

Table 6
Items in the motivation to learn math and math self-concept scales in the TIMSS 2015 research

Scale	Items
Motivation to learn math	I enjoy learning mathematics
	I wish I did not have to study mathematics
	Mathematics is boring
	I learn many interesting things in mathematics
	I like mathematics
	I like any schoolwork that involves numbers
	I like to solve mathematics problems
	I look forward to mathematics lessons
	Mathematics is one of my favourite subjects
Math self-concept	I usually do well in mathematics
	Mathematics is harder for me than for many of my classmates
	I am just not good at mathematics
	I learn things quickly in mathematics
	Mathematics makes me nervous
	I am good at working out difficult mathematics problems
	My teacher tells me I am good at mathematics
	Mathematics is harder for me than any other subject
	Mathematics makes me confused

has a higher level of absenteeism). Then regression analysis was carried out on the sample of those two groups, which in addition to the predictors, also included the variable which represents the interaction of *belonging to the group*predictor.* The statistical significance of the regression coefficient for this variable shows if the difference between the two regression coefficients for the two compared levels of absenteeism for the given predictor is significant.

On the other hand, it could be assumed that motivation, operationalised in this way (for instance: "I like mathematics, I look forward to mathematics lessons, I like to solve mathematics problems"), comprises a positive affective attitude to math, which the items in the self-concept scale do not include. Previous research findings point out that an affective attitude represents one of the core aspects of intrinsic motivation (Köller et al., 2001; Ryan & Deci, 2002). In addition, some of the items in the motivation scale are almost identical to those that refer to intrinsic motivation measured by other relevant scales such as the Academic Self-Regulation Questionnaire ─ SRQ-A (Ryan & Connell, 1989). Therefore, we believe that it is justified to consider this residual of motivation as intrinsic motivation.

Discussion

This study provides two main findings: 1) considering the general picture, independently of students' absenteeism, with the growth of math achievement, math self-concept also grows, while intrinsic motivation to learn math drops; 2) it was confirmed that absenteeism does moderate the relations between self-concept, intrinsic motivation and achievement in the way that the importance of math self-concept for the prediction of achievement drops with the frequency of absenteeism, while the importance of intrinsic motivation grows. However, we hold that the observed increase of predictive ability of intrinsic motivation is statistical artefact with no practical meaning that is supposed to be explained psychologically.

Fourth grade students in Serbia are, overall, good attenders considering that almost 70% of students is never or almost never absent from school, and that less than 7% of students regularly miss school classes. This result is in line with the previous findings on absenteeism being lower among younger students (Havelka, 1994; Zrilić, 2007), and is encouraging if we have in mind that the age of the onset of school non-attendance is becoming increasingly younger (Malcolm et al., 2003).

Math self-concept is confirmed as a solid predictor of achievement in the math test in the TIMSS 2015 research, which is in accordance with previous findings obtained on the TIMSS data on the Serbian sample (Mirkov et al., 2011; Milošević et al., 2005). Considering numerous other studies (Akey, 2006; Abu-Hilal, 2000; Džinović & Vujačić, 2017; Mullis et al., 2008; Mullis et al., 2012), self-concept is consistently proved to be important in understanding various educational outcomes.

According to our findings, self-concept is lower among those students who are more frequently absent from school. Considering similar findings obtained for older students (Reid, 2006, 1999; Corville-Smith et al., 1998), we may conclude that absenteeism already has impacts on students' self-concept at their younger age just as it has in adolescence. In addition, with an increase in the frequency of absenteeism the contribution of self-concept to the

prediction of achievement decreases, indicating that exposure to daily school life has a positive effect on the development of math self-concept. On this basis we could assume that in some way school 'strengthens' the relationship between self-concept and achievement in math while, on the other side, being absent from school 'opens up the space' for some other factors which could moderate achievement. It is highly likely that school provides opportunities for students, through various activities, to develop self-perception of being successful in math, but also ensures systematic feedback from teachers about their achievement in math. However, the reciprocal relation between the absenteeism and the self-concept is suggested by Reid (1999, 2002).In the first study Reid (1999) found that perpetual experience of failure in school reduced students' academic self-concept and this resulted in their strategy of withdrawal from school as a way to preserve the fragile self-beliefs. However, the withdrawal from school has further negative effect on students' self-concept (Reid, 2002), which might perpetuate the described negative loop.

As for the intrinsic motivation, it was shown to contribute negatively to the achievement in the math test when considered together with self-concept. Such a finding could lead to a controversial conclusion, which is inconsistent with previous research (Wigfield & Eccles, 2000; Marshet al., 2005; Mulliset al., 2008; Mulliset al., 2012), that intrinsic motivation impedes achievement in the math knowledge test. In order to interpret such a result, we will discuss the meanings that students assigned to the items from the motivation to learn math scale and also take into consideration the students' tendency to provide socially desirable responses.

First of all, it is arguable that 4th grade students were likely thinking about the classic school math curriculum when responding to items from the motivation scale. Therefore, the intrinsic motivation we are considering here is supposed to be understood as the intrinsic motivation to learn school math. That could shed some light on the reason for obtaining the negative correlation between the intrinsic motivation and the TIMSS test score in this research. Unlike classical school math tasks, which are oriented to factual reproduction, the tasks from international assessments (TIMSS, PISA) are supposed to engage students in applying and reasoning, and are more creative and ecologically reliable (Silver & Snider, 2014). Following that, it may be assumed that students with high expressed motivation to learn school math failed in new context presented by the tasks on the TIMSS test. These students are presumed to face higher level of anxiety and negative emotions in the TIMSS test situation compared to students with lower motivation to learn math. The later ones are presumed to experience boredom and dislike facing math tasks in school, but are not necessarily low achievers and they scored higher in the TIMSS test. In contrast to the intrinsic motivation, when responding to items from the math self-concept scale, the students also thought about school math, but that did not result in a negative correlation with achievement. This supports the assumption that math self-concept is more transferable to various math performance contexts than intrinsic motivation is.

A complex and controversial relation between intrinsic motivation, self-concept and math achievement is also suggested by numerous other studies. For example, in their research on how gender stereotypes influence school achievement in math and language arts Plante et al. (Planteet al., 2013) pointed to the negative relationship between intrinsic motivation (operationalized here as task value) and school grades while competence beliefs (the measure which is operationalized in a way that is very similar to self-concept) positively contributed to school grades. The authors explained the obtained result as a reciprocal suppressor effect between predictors, which is similar to the obtained suppression effect between intrinsic motivation and self-concept in our study. These two findings lead to a coherent conclusion that the unique variance of intrinsic motivation contributes negatively to math achievement while the variance that motivation shares with self-concept has a positive relationship with achievement. In other words, intrinsic motivation for math may enhance math achievement only if it is coupled with high perceived competence (Prastet al., 2018), or in our case with high self-concept. Some studies, however, point out that intrinsic motivation is of greater importance for the acquisition of high-quality knowledge and the accomplishment of long-term academic goals than for school success and tests performance. This construct may be of importance for predicting educational outcomes that depend more on individual preferences than on the external structure, such as making academic choices (Kölleret al., 2001; Wigfield & Eccles, 2000), mastering various cognitive/metacognitive strategies (Pintrich, 1999), choice of efficient learning strategies, deeper understanding of the content studied (Liem et al., 2008), long-term interest in the studied subject (Vansteenkinste et al., 2006), and psychological wellbeing (Koestner & Zuckerman, 1994).

While numerous studies claim that intrinsic motivation influences school performance, some authors argue that the relation is in the opposite direction, e.g., that motivation is affected by previous achievements (Skaalvik & Vals, 1999), and that this association is mediated by some other constructs - students'self-efficacy and teacher emotional support (Skaalvik et al., 2015). These findings are in line with the self-determination theory where intrinsic motivation is central to self-determined activity (Ryan & Deci, 2000) and it could be expected to be reciprocally related to achievement (Marsh & Martin, 2011). Contrary to this expectation, there is some evidence arguing systematic directional prediction from achievement in mathematics to intrinsic motivation (Prast et al., 2018; Garon-Carrier et al., 2016). This means that previous achievement has positive effect on intrinsic motivation, while intrinsic motivation does not lead to better achievement in the future. All mentioned findings and discussions strongly support the conclusion that the variables related to the perceived competence are stronger predictors of math achievement than intrinsic motivation is (Bong et al., 2012; Kriegbaum Jansen & Spinath, 2015; Prast et al., 2018; Spinath et al., 2006). It is important to highlight that our study is in line with the study of Prast et al. (2018) showing that self-concept is a more important predictor of achievement than motivation even in early primary school.

Finally, it is possible that students gave socially desirable responses on items from the motivation scale and the real picture of the relationship between intrinsic motivation and achievement was thus blurred. Namely, it is known that students with weaker academic test performance have a higher inclination to give socially desirable responses (Crandall, 1966), which could result in a stronger confounding effect of socially desirable responding. It is also known that students' answers are culturally and socially biased (Min et al., 2016), and that might suggest that in responding to items they rely on messages from adults relating to the desirable attitude towards math.

Conclusion

The first significant conclusion of this study is that students' absenteeism is related to lower levels of self-concept, motivation and math achievement even among lower elementary school children. Furthermore, students' absenteeism moderates the relations between self-concept and motivation, on one side, and math achievement, on the other. So, it is necessary to ensure students' regular attendance in school if we want to support their high achievement. Students who are absent more often from school need additional support in order to compensate for the lack of incentives provided by school as resources for attaining higher self-concept and consequently higher achievement. In order to ensure students' regular presence in school it is necessary to discover the reasons for absenteeism in order to design interventions directed at tackling the problem of irregular school attendance (Vesić, 2016; Reid, 2008a, 2008b).

The second significant conclusion is that math self-concept is a more reliable construct for prediction of math achievement than intrinsic motivation for learning math. Following that line, we can conclude that it is far more useful to support students in their endeavours to build up sense of selves as ones who are successful in math, than to rely on their intrinsic motivation and enjoyment in math. Further implication of our finding is questioning of the usefulness of the distinction between motivation and self-beliefs as two basic categories for predicting test performance as well as school achievement. It seems that the category of motivation is already encompassed by academic self-beliefs as they set in motion and direct individuals' behaviour towards high school achievement. This conclusion makes an argument in favour of the exclusion of the motivation scale from the TIMSS inventory.

Based on the limitations of this paper, some recommendations could be made for further research. First, it is unclear whether the cognitive processes and types of knowledge engaged in school math tests are different from those in the TIMSS. Namely, in this paper motivation to learn classical school math was researched, since the participants were likely thinking about the math they are familiar with while responding to the items in the TIMSS motivation scale. In order to better understand the negative effect of motivation on the knowledge test performance, the similarities and differences in the students' cognitive

engagement in those two contexts should be explored. In addition, another limitation of this research lies in the fact that both self-concept and motivation were assessed exclusively on the basis of the self-assessment of children aged ten to eleven. Consequently, further research is required to include: a) different conceptualisations and operationalisations of self-concept and motivation; b) different measures of achievement, such as school grades in math, school math test performance or general school success, and c) different study designs (i.e., longitudinal studies).

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Uloga izostajanja sa nastave u predviđanju matematičkog postignuća na osnovu self-koncepta i motivacije: TIMMS 2015 u Srbiji

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U ovom istraživanju je ispitivano kako izostajanje učenika sa nastave moderira povezanost matematičkog self-koncepta i motivacije za učenje matematike sa jedne strane i postignuća na TIMSS 2015 testu iz matematike sa druge. Stratifikovani slučajni uzorak se sastojao od 4036 učenika četvrtog razreda iz 160 osnovnih škola u Srbiji. Posebni regresioni modeli su sastavljeni za svaki od četiri nivoa učestalosti izostajanja učenika sa nastave. Rezultati su pokazali da self-koncept ima pozitivan doprinos predikciji postignuća, dok je doprinos motivacije negativan. Pored toga, sa porastom izostajanja važnost self-koncepta opada, a motivacije raste. Analiza varijanse je potvrdila da sa porastom izostajanja učenici pokazuju niži nivo self-koncepta, dok se nivo motivacije ne menja. Najvažniji zaključak je da redovno pohađanje nastave doprinosi matematičkom self-konceptu učenika i posledičnom postignuću tako što podstiče njihovo iskustvo uspeha u matematici. Diskutovana je korisnost skale motivacije za predviđanje postignuća na testu iz matematike.

Ključne reči: TIMSS 2015, prediktori matematičkog postignuća, matematički self-koncept, motivacija za učenje matematike, izostajanje učenika sa nastave

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