The role of self-control, self-efficacy, metacognition, and motivation in predicting school achievement

Vladimir Džinović, Rajka Đević, and Ivana Đerić

Institute for Educational Research, Belgrade, Serbia

Self-control and self-regulated learning refer to those processes and strategies whereby individuals exert agency in facing educational demands. This study tested a structural model which predicts that self-control has direct effect on school achievement, as well as mediated by metacognitive self-regulation, academic self-efficacy, and regulatory motivational styles as the variables related to self-regulated learning. The research was carried out on a stratified random sample of 575 eighth grade students. It was shown that the effect of self-control on achievement is mediated by self-efficacy. In other words, students who have heightened self-control and believe in their own ability to meet school demands will be successful in school regardless of the complexity of their learning or whether they are autonomously motivated. The implications of such a finding were considered, as well as the limitations of the research and the indications for future research.

Key words: self-control, self-efficacy, metacognitive self-regulation, regulatory styles of motivation, school achievement

Highlights:

- The relation between self-control and self-regulated learning is still not explored.
- Self-control affects the achievement through academic self-efficacy.
- Metacognition and motivational styles do not mediate relation between self-control and achievement.
- Longitudinal study on the self-control and self-regulated learning is required.

Corresponding author: v.dzinovic@gmail.com

In this paper we consider the relationship between the constructs which have proved to be the most influential to educational outcomes: self-control (SC) and self-regulated learning (SRL). SC is gaining the increasing attention because "current evidence for self-control as a determinant of academic outcomes is stronger than for any other aspect of personality or temperament" (Duckworth, Gendler, & Gross, 2014, p. 199). It refers to the ability to voluntarily control one's own cognition, emotions, and behavior in order to establish optimal compatibility between the self and the environment (Tangney, Baumeister, & Boone, 2004). Another construct, related to SC, which is also in the focus of research, is SRL. It is manifested through cognitive, metacognitive, and motivational processes, which ensure that students actively manage their own learning (Boekaerts, 1997; Pintrich, 1999; Zimmerman, 2000a). Although they come from different theoretical backgrounds, both SC and SRL represent aspects of self-regulation, as a basic human capability responsible for our perception of personal agency. One of the key differences between those constructs lies in the generality of the domains to which they refer. SC is domain-general, while SRL is domain-specific since it refers to the academic context. In this respect, we wish to explore whether this general ability of self-regulation affects self-regulation in the field of school activities and achievement.

Self-control

The concept of SC has emerged from cybernetic and cognitive-behavioral perspectives and refers to self-regulation through the process in which someone sets a reference value, compares between that value and his/her present state, attempts to match the one with the other, and reinforces oneself for goal attainment (Carver & Scheier, 1982; Kanfer, 1977). Crucial to SC is the individuals' ability to think, feel, and act differently to the way they usually do in the aim of resisting immediate desires and satisfactions in anticipation of those in the future (de Ridder, Lensvelt-Mulders, Finkenauer, Stok, & Baumeister, 2012; Hofmann, Baumeister, Förster, & Vohs, 2012; Letzring, Block, & Funder, 2005; Muraven & Baumeister, 2000; Tangney, Baumeister, & Boone, 2004). Duckworth, Gendler, and Gross (2014) talk about five types of strategies which help us to voluntarily modify our processes: situation selection, situation modification, attentional deployment, cognitive change, and response modulation. However, there are empirical grounds for the belief that the effect of SC on different positive outcomes is mediated by strong habits which enable individuals to avoid facing "problematic" aspirations (Baumeister & Alquist, 2009; Galla & Duckworth, 2015; Hofmann et al., 2012).

In their meta-analysis of the links between SC and various forms of behavior, the group of authors came to the conclusion that SC presents "a quintessential feature of self-regulatory behavior" (de Ridder et al., 2012, p. 77). An earlier study showed that the ability to postpone satisfaction in the early period of life is a strong predictor of a series of cognitive and social competences in

adolescence, such as planning, directing, and maintaining attention, the effective pursuit of goals, self-confidence, successfully dealing with frustration, the easy initiation of social contacts, or trust in others (Mischel, Shoda, & Peake, 1988). Numerous later research studies showed that SC impacts on more efficient self-regulation in various fields of functioning, such as the self-regulation of diet (Heatherton, 1993; Wills, Isasi, Mendoza, & Ainette, 2007), the use of alcohol (Cook, Young, Taylor, & Bedford, 1998; Gottfredson & Hirschi, 1990) and psychoactive substances (Storey, 1999; Wills & Stoolmiller, 2002), prosocial behaviour (Burton, Cullen, Evans, Alarid, & Dunaway, 1998; de Ridder et al., 2012), and mental health (Tangney, Baumeister, & Boone, 2004). It was also found that SC influences school achievement (Duckworth, Tsukayama, & May, 2010), general achievement at the end of secondary school and persistence in the first year of studies at university (Galla & Duckworth, 2015), as well as general university achievement (Wolfe & Johnson, 1995). Research data points to the conclusion that students who have high SC complete tasks on time, successfully balance their duties and free time, and prevent emotional states from impeding their work, which all lead to better academic results (Duckworth, Quinn, & Tsukayama, 2012; Tangney, Baumeister, & Boone, 2004). So far we have considerable amount of data which shows that SC is a determinant of self-regulatory behavior including the manifestations of self-regulation in the school context. It leads to the assumption that SC is the predictor of academic self-regulation. However, we know surprisingly little about this assumed relation due to the virtual absence of the authors' interest in investigating the links between these constructs.

Self-regulated Learning

SRL or academic self-regulation is a complex construct which includes metacognition and the motivational processes necessary for the expression of agency in the academic context (Zimmerman, 1995). Metacognition refers to the regulation of one's own cognitive processes and encompasses various constructs such as metacognitive knowledge, metacognitive skills, learning strategies, meta-memory, etc. (Veenman, Van Hout-Wolters, & Afflerbach, 2006). However, SRL also includes motivational self-regulation. There are numerous constructs which refer to the motivational component of SRL and some of the most frequently used in research are self-efficacy (Bandura, 1997), task value beliefs (Eccles et al., 1983), goal orientation (Elliot & Dweck, 1988), interest (Hidi, 2006), affective motivational constructs (Boekaerts & Corno, 2005), etc. In this study we will deal with self-efficacy, one of the most powerful predictors of various educational outcomes, which is a form of motivational self-regulation exerted by competence self-beliefs. Also we will include the motivational construct which originates from the self-determination theory (SDT) – regulatory styles of motivation (Deci & Ryan, 1985). The reason for this is that the concept of self-determination complements the concept of motivational self-regulation by connecting it to the self and the sense of personal choice.

Metacognitive self-regulation. Knowledge of thought processes and metacognitive skills (Veenman, Van Hout-Wolters, & Afflerbach, 2006) or strategies of cognitive self-regulation (Pintrich, 1999) are the two aspects of metacognitive self-regulation. The first aspect represents knowledge of the conditions when certain learning strategies are effective (Boekaerts, 1997). The metacognitive strategies which are most frequently mentioned as the components of metacognition are planning, monitoring, control, and reflection (Pintrich, 2000). In other words, in order for the individual to manifest SRL, he/she needs to have appropriate conceptual, procedural, and episodic knowledge, as well as the skills required to set goals for a certain activity, to plan the necessary cognitive strategies, to compare his/her own achievements with certain criteria of success, and to adapt his/her activities in order to achieve the determined goals. In that way, metacognitive self-regulation provides more complex learning and a deeper understanding of what has been learned.

Self-efficacy (SE). One of the constructs belonging to motivational self-regulation (Boekaerts, 1997; Zimmerman, 2000a) and is of the greatest importance for SRL (Zimmerman & Schunk, 2008). SE represents the foundation of human agency, because people will act if they believe it is within their power to influence various outcomes in their lives (Bandura, 1997). According to the social cognitive theory, SE is the central mechanism of human self-regulation because it impacts on how much effort individuals will invest in a certain activity, how persistent they will be in confronting obstacles, and how resistant they will be to unfavorable influences (Bandura, 1991; Schunk & Pajares, 2005).

Academic self-efficacy (ASE) refers to the individual's belief in his/her ability to successfully resolve certain tasks in the educational context (Bong & Skaalvik, 2003). In previous research studies, ASE was measured by the examinees evaluating their beliefs in their ability to solve a particular task (Jansen, Scherer, & Schroeders, 2015) or to master the contents of a particular subject (Liem, Lau, & Nie, 2008). However, certain findings point out the cross-subject generality of the academic competencies and skills responsible for developing ASE (Bandura, 1997; Bong, 1997, 2001).

Regulatory styles of motivation. For the full manifestation of self-regulation it is not sufficient to believe that the outcomes of our activities are under our control, as Bandura's concept of SE suggests. When we have the sense that our activities represent a personal choice and when they are "endorsed by the self, fully identified with and owned" (Ryan & Deci, 2006, p. 1561) we will do our best, persist and gain a deep understanding of what we do. According to SDT, the key processes for developing full autonomy are internalization and integration, and the extent to which any given activity is internalized and endorsed by the self will impact on individual's motivational or regulatory style of practicing that activity (Ryan & Deci, 2000a). In other words, autonomy is a matter of degree and presupposes continuity from fully external regulation, through introjected, identified, and integrated regulation, as the gradual

internalization and personal integration of the regulation processes, to internal motivation which represents full autonomous regulation (Deci & Ryan, 1985). In external regulation someone's behavior is motivated by external incentives, while in case of introjected regulation the control is internalized but the reasons for action is to avoid negative feelings or to attain positive ones. In identified regulation someone realizes personal importance of particular behavior and recognizes its regulation as his or her own. Finally, individual could be internally motivated which means that he/she engages in particular activity for personal satisfaction and enjoyment.

The relation between SC and regulatory styles of motivation. Initially, SDT connects SC to the introjected regulation, in which an individual internalizes formerly external incentives for certain activities, but he/she perceives the activity as something that is compulsory (Deci & Ryan,1985). Thus, SC is understood as a different type of self-regulation from self-determination because "the issue is not so much whether the source of control is oneself or another, but whether or not one is being controlled" (Deci & Ryan,1985, p. 106). However, recent research suggests that internalized control can be accompanied by an experience that we voluntarily subject ourselves to modification and inhibition of our mental processes in order to achieve goals that we see as personally relevant and fulfilling (Muraven, 2008). This leads to the conclusion that SC could be pursued autonomously, even though it is rather compelled type of self-regulation. In the case of autonomous SC an individual faces less internal conflicts and temptations while struggling to modify her/his own cognition and emotion (Muraven, Rosman, & Gagné, 2007; Nix, Ryan, Manly, & Deci, 1999).

The relations between metacognition, ASE, motivation, and school achievement. Findings support the influence of applying metacognitive strategies on student learning and achievement (Cleary & Zimmerman, 2004; Zimmerman & Schunk, 1989). Also, ASE is found to influence the solving of mathematical problems (Pajares & Kranzler, 1995; Pajares, 1996) and the grades, as well as test achievements for mathematics, languages, and science (Jansen, Scherer, & Schroeders, 2015; Lee, Lee, & Bong, 2014). Finally, motivational styles close to internal regulation are found responsible for the quality of learn, enjoyment in learning and achievement (Ryan & Deci, 2000b).

Research also indicates that ASE predicts metacognitive self-regulation and motivation. Students high in ASE faster eliminated incorrect strategies and were more persistent in their attempts to solve mathematical tasks in comparison with their peers with the same abilities but lower ASE (Collins, 1982, as cited in Bandura, 1997). Numerous studies confirmed this earlier finding about the influence of ASE on the use of complex metacognitive learning strategies (e.g., Lee, Lee, & Bong, 2014; Liem, Lau, & Nie, 2008; Pintrich, 1999; Schunk & Pajares, 2005). Research points out that ASE also impacts on educational aspirations and academic motivation (Zimmerman, Bandura, & Martinez-Pons, 1992). It was shown that individuals with a high level of ASE are inclined towards self-determined school motivation (Vallerand, Fortier, & Guay, 1997)

and mastery goal orientation, which corresponds to autonomous motivation in SDT (Elliot, 1999; Liem, Lau, & Nie, 2008).

Research shows that motivation is important for successful metacognitive self-regulation. For instance, mastery goal orientation is strongly positively correlated with the use of metacognitive strategies, while extrinsic goal orientation has a negative correlation with metacognitive self-regulation (Pintrich, 1999). Similarly, it was demonstrated that the adoption of a mastery goal, as well as the performance–approach goal (corresponds to introjected regulation) in the context of learning English exerts a direct effect on the use of deeper learning strategies (Liem, Lau, & Nie, 2008).

The Goal of the Present Study

Previous research led to the conclusion that SC as an early developed and general self-regulation is of crucial importance for successful manifestation of other forms of self-regulation. However, there is a gap in the research data concerning the link between SC and other processes of self-regulation including those responsible for high school achievement. In other words, we do not know whether SRL plays a mediating role between SC and achievement and what is the nature of that mediation.

The goal of our research is to test the model of the relationship between SC, metacognitive strategies, ASE, regulatory styles of motivation, and achievement, which implies that the effect of SC on achievement is mediated by the SRL components (Figure 1).
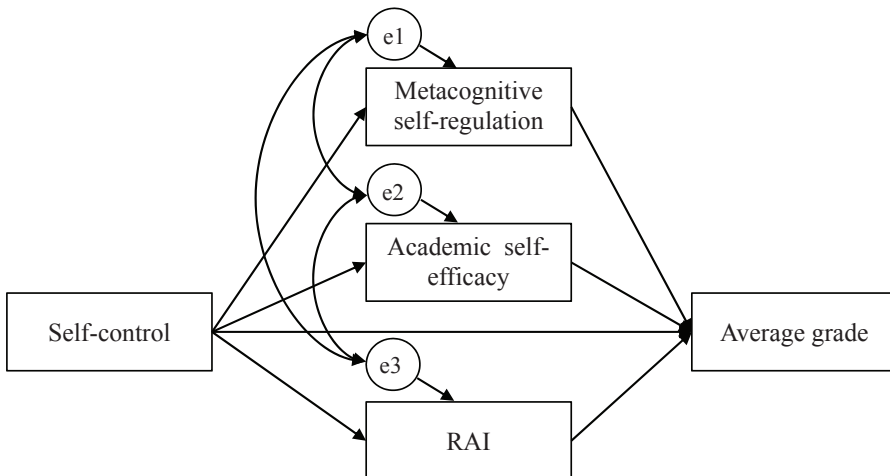

Figure 1. Measurement model for the relations between Self-control, Metacognitive self-regulation, Academic self-efficacy, Relative Autonomy Index (RAI), and Average grade.

We start from the theoretical and empirical conclusion that the essence of SRL is in exerting of *agency* (Zimmerman, 1995). In the case of metacognition, this refers to the *intentional* use of metacognitive strategies when confronted with innovation or mistakes in learning (Veenman, Van Hout-Wolters, & Afflerbach, 2006). In the case of SE, it concerns the experience of the self as the one who *chooses* a course of action in accordance with the personal beliefs that such an activity is manageable by the self and not by circumstances (Bandura, 1982). According to Ryan and Deci (2006), this experience of personal agency is essential in order to identify ourselves with the activities we perform, and so the condition for developing motivational styles which are closer to full autonomy. The assumed effect of SC on SRL could be accounted by the assumption of the *transferability* – if a child successfully masters SC as the early manifestation of agency, he/she will be able to transfer it to the domain of activities related to SRL. In addition, on the basis of previous research, we will assume that SC also has a direct effect on achievement and that the MSR, ASE, and RAI will mutually correlate.

Method

Participants and Data Collection Procedure

A total of 575 eighth grade students, who were mostly fourteen years old at the time of the research, participated in the study (Table 1). This age was chosen because, on the basis of previous findings (Mischel, Shoda, & Peake, 1988), we can expect visible effects of SC on the researched aspects of SRL in early adolescence. The sample was stratified, and within the strata the participants were chosen randomly. The sampling procedure firstly implied the creation of a stratified sample of schools, by establishing quotas for statistical regions of Serbia (Vojvodina, Belgrade, Central and Western Serbia, and Eastern and Southern Serbia; the region of Kosovo and Metohija was not included). The number of schools included in the sample was proportional to the number of children of school age in each statistical region. On the basis of the number of eighth grade classes in a given school, one class was chosen by a random selection procedure. The instruments were completed by all the students in the chosen class who were present in the school at the time the research was carried out. Written consent from the principals was provided because the testing was anonymous.

Table 1
Descriptive statistics of the sample

	Gender		Place of residence								
	Female	Male	1	2	3	4	5	6	7	8	9
%	52	48	17	12	12	9	12	11	16	7	4

Note. 1. Belgrade; 2. Regional centre (Niš, Novi Sad, Kragujevac); 3. Town of 50–200 thousand; 4. Town of 20–50 thousand; 5. Town of 5 to 25 thousand; 6. Place of 3 to 5 thousand citizens; 7. Place of 500 to 3000 citizens; 8. Village of up to 500 citizens; 9. I don't know how many citizens live in my place of birth.

Measures

Self-control. The participants completed the Brief Self-Control Scale (Tangney, Baumeister, & Boone, 2004), consisting of 13 items, adapted to the Serbian language. Examples of items are: "I am good at resisting temptation", "I say inappropriate things.", and "People would say that I have iron self-discipline". The Brief, as well as the Total version of the scale measures five aspects of SC: Self-discipline, Impulse control, Healthy habits, Work ethic, and Reliability. The participants answered by estimating on a five-point scale to what extent each claim applied to them, where 1 denotes *does not apply to me at all* and 5 *fully applies to me*. The score on the scale was calculated as the average value of the answers to all the items, while negative claims were taken as inverse values. Higher scores on the scale indicate more expressed SC. α of the original Brief SCS is .83, and of the scale translated into the Serbian language .80.

Metacognitive self-regulation. We modified the widely used Metacognitive Self-Regulation Scale, which is part of the Motivated Strategies for Learning Questionnaire (Pintrich, Smith, Garcia, & McKeachie, 1993). The items on the scale refer to the implementation of the metacognitive strategies of planning, monitoring, and regulating of cognitive activities. The participants in our study gave self-evaluations of the use of metacognitive strategies in mastering school materials across subjects, instead of that for a specific subject. For instance, the original item which is "If course materials are difficult to understand, I change the way I read the material", we adapted to "If school materials in this class are difficult to understand, I change the way I read the material". Namely, the knowledge and activities of self-regulated learning have a strong shared component in different subjects, which indicates the existence of a general level of metacognition which students transfer from one learning situation to another (Schraw, 1998; Scott & Berman, 2013; Veenman, Elshoutt, & Meijer, 1997). Another examples of modified items are: "I try to change the way I study in order to fit the requirements and instructor's teaching style in this class"; "Before I study new school material thoroughly, I often skim it to see how it is organized". However, the original items were used as well, for example "I ask myself questions to make sure I understand the material I have been studying in this class"; "I try to think through a topic and decide what I am supposed to learn from it rather than just reading it over when studying". The scale consists of 12 items, and 7 of them were modified for the purpose of this research. The items could apply to the participants at different levels – 1 denotes *does not apply to me at all* and 5 *fully applies to me*. For each participant the score was calculated on the basis of the average value of the answer on the scale, whereby a higher score indicates a higher degree of the metacognitive strategies. α of the original scale is .78, and of the modified .77.

Academic self-efficacy. The Self-Efficacy for Learning and Performance Scale (Pintrich et al., 1993) was modified so that the generality of its domain would be compatible with the other scales in the study. More precisely, some of the items were modified in order to refer to the appraisal of SE in mastering school tasks across the subjects. For instance, the original item on the scale "I'm certain I can understand the most difficult material presented in the readings for this course", was adapted to "I'm certain I can understand the most difficult material presented in the readings for the courses in this class". Although they are diverse in terms of content, school subjects engage almost the same competences and skills, primarily verbal and numerical, and that explains the moderate correlation between perceptions of SE across subjects and their transferability (Bong, 1997, 2001). The scale consists of 8 items, and 5 of them were modified in our research. Examples of modified items are: "I'm confident I can understand the most complex material presented by the teachers in this class"; "I'm confident I can do an excellent job on the assignments and tests

in this class". Examples of the original items are: "I expect to do well in this class"; "I'm certain I can master the skills being taught in this class". The participants responded by assessing the extent to which they apply to the items on a five point scale, where 1 denotes *does not apply to me at all* and 5 *fully applies to me*. The score on the scale represents the average value of the answers to the items, where a higher score means a higher ASE. α of the original scale is .84, and of the modified .85.

Regulatory styles of motivation. The participants completed the Academic Self-Regulation Questionnaire (SRQ-A), which was developed from the self-determination theory and is specifically adapted for students who are about to finish primary school or are attending secondary school. The questionnaire comprises four questions about the reasons why students undertake various school activities: A) "Why do I do my homework?"; B) "Why do I work on my classwork?"; C) "Why do I try to answer hard questions in class?", and D) "Why do I try to do well in school?" (Ryan & Connell, 1989). For each question answers were offered in the form of reasons for the corresponding behavior, which refer to different levels of autonomous motivation. Examples of offered answers are: "Because I want the teacher to think I'm a good student"; "Because it's fun"; "Because that's the rule". The students responded by appraising on a four point scale to what extent each of the offered reasons applied to them, where 1 denotes *does not apply to me at all* and 4 *Fully applies to me*. The score on this scale was calculated such that the average values of the sub-scale were calculated first (External regulation, Introjected regulation, Identified regulation, and Intrinsic motivation), and then Relative Autonomy Index (RAI) was established by means of the following formula: RAI = 2 x Intrinsic + Identified – Introjected – 2 x External. Both the original and translated scales have a reliability of .93.

Achievement. At the time the research was carried out, the 2016/2017 school year was approaching the end of the first trimester, and therefore there was no information about GPA. Consequently, the participants asked to provide us with grades from four subjects (the Serbian language, history, mathematics, and physics) which represent social and natural science disciplines as it would have been impractical to provide grades for all the subjects in the eighth grade. On the basis of the average value of the grades from the aforementioned subjects, we calculated the average grade (AG). The score could have a value between 1 and 5.

Data Analysis

SEM analysis was used to investigate the effects between the variables. The structural model was tested in which SC is the predictor, metacognitive self-regulation, ASE and RAI are the mediators, and the AG is the dependent variable (see Figure 1). SEM is an appropriate choice because theoretical and empirical knowledge justifies the assumption of the proposed model of relations between the variables presented in this research.

Results

Table 2 shows the average values, standard deviation, and Pearson's correlation coefficients for all the variables in this research, including those variables on the basis of which the RAI was obtained. It is interesting that the average value for the RAI is negative, which shows that for students motivational styles which are more external and regulated by others predominate. The correlation of ASE with AG is also expectedly high. It is important to emphasize

that the AG does not correlate with external motivation, in contrast to more autonomous motivational styles, where there is a statistically significant positive correlation. The same refers to the relation between SC and regulatory styles of motivation. On the other side, ASE and metacognitive self-regulation positively correlate with external motivation, as well as with those motivational forms close to full autonomous self-regulation. This shows that SC, ASE, and metacognitive self-regulation are connected (their mutual correlations are of medium intensity), as we predicted, but separated constructs.

Table 2
Means, Standard Deviations, and Correlations for the measures

Measures	M	SD	1	2	3	4	5	6	7	8
1	3.68	1.01	-							
2	3.21	0.71	.31**	-						
3	3.77	0.76	.56**	.40**	-					
4	3.58	0.65	.36**	.45**	.58**	-				
5	3.43	0.83	–.02	.01	.22**	.31**	-			
6	3.29	0.86	.10**	.13**	.34**	.43**	.76**	-		
7	3.75	0.93	.29**	.42**	.54**	.64**	.48**	.61**	-	
8	3.03	0.93	.15**	.35**	.412**	.51**	.44**	.60**	.74**	-
9	-.35	2.35	.21**	.40**	.26**	.28**	-.44**	-.19**	.41**	.56**

Note. 1. Average grade; 2. Self-control; 3. Academic self-efficacy; 4. Metacognitive self-regulation; 5. External self-regulation; 6. Introjected self-regulation; 7. Identified self-regulation; 8. Internal self-regulation; 9. RAI; *$p < .05$; **$p < .01$.
* Correlations between External self-regulation and Self-control and Internal self-regulation and Introjected self-regulation are .002 and .596, respectively, but are rounded at .01 and .60, rescpectively for consistency in data presentation.

Figure 2 shows the tested model with the path coefficients (β) and covariances between the measurement errors, while statistically insignificant paths have been omitted. The model corresponds satisfactory to the data, which is shown by the fitting indexes obtained after the insignificant paths were excluded: $\chi^2(3) = 3.11$; $p > .05$; NFI = .99; CFI = 1; RMSEA = .08. SC has a direct effect on academic self-efficacy beliefs, as well on metacognitive and motivational self-regulation. The effect of SC on achievement is mediated by ASE, but there is no direct effect, as we initially predicted. That would mean that students who better regulate their thinking, emotions, and behavior and have stronger habits achieve better results in school only if this self-discipline builds their ASE. On the other hand, the effect of SC on achievement is not mediated either by metacognitive self-regulation, nor motivational styles, as was assumed.
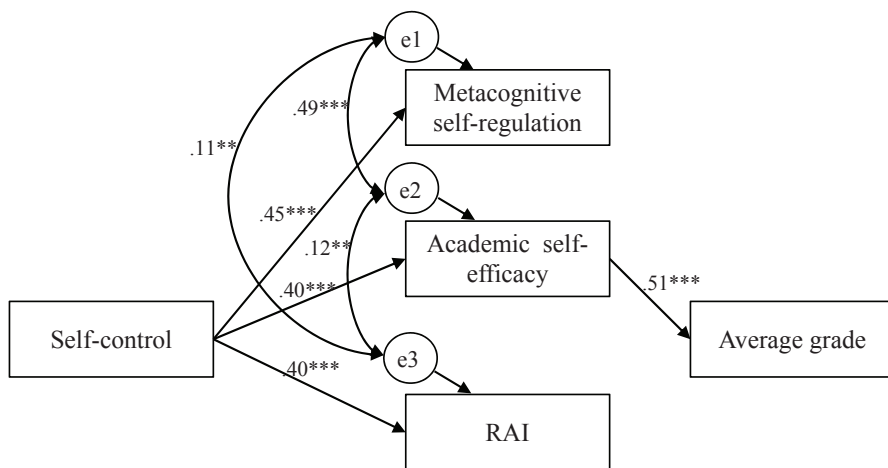
Figure 2. Path coefficients and covariances between variables in the model of the relations between Self-control, Metacognitive self-regulation, Academic self-efficacy, RAI, and Average grade. Note. **$p < .01$; ***$p < .001$.

Discussion and Conclusion

SC correlates positively with introjected as well as identified and intrinsic motivation which supports the assumption of the *twofold nature* of SC, one close to internalized but still controlled regulation and the other in line with autonomous regulation (Muraven 2008). The measure of achievement correlates positively with more internalized and integrated forms of motivation. This is in accordance with previous findings suggesting that external regulation is more frequently associated with low achievement and learning difficulties (Ryan, Connell, & Grolnick, 1992; Utman, 1997). Such a relation, in the light of SDT, may be explained as learning for the sake of personal goals and internal reasons leads to persistence and enjoyment in activity of learning itself, all resulting in better knowledge.

SC has a significant and direct effect on ASE, metacognitive self-regulation and regulatory styles of motivation. Its relationship with achievement, however, is more complex, because it is mediated by ASE. On the other side, there is no mediating effect of SC on achievement through metacognitive self-regulation and regulatory styles of motivation, as we assumed in the tested model. Therefore, strong habits and the ability to change one's own thinking, emotions, impulses, and acts influence the development of a sense of personal competence in the mastery of school tasks, which consequently impacts on high achievement. More precisely, our results show that self-mastery experiences which are characteristic for self-control are necessary pre-condition for developing students' judgments

that they are able to master school tasks, which is the strongest source of ASE (Bandura, 1997; Usher & Pajares, 2009). Such a finding supports our assumption that children by exerting activities and processes connected to SC create the early sense that they can influence their own cognitive and emotional functioning, and this is why SC is important for children's competence self-beliefs. This is in line with the previous research arguing that the motivational self-beliefs such as perceived control and mastery experience are developed through the family interactions during the first years of child's life and transferred to school context (Grolnick, Kurowski, & Gurland, 1999). Therefore, students high in SC enter the educational system with a developed sense that different life outcomes depend on their actions, and therefore approach school activities convinced in success of their engagement in spite of the complexity of school demands.

We should also bear in mind that SC and ASE are predictive for diverse cognitive, metacognitive, and motivational competences responsible for positive academic experiences, such as effort, persistence, or efficient copping with stress and anxiety (Mischel, Shoda, & Peake, 1988; Zimmerman, 2000b; Vallerand, Fortier, & Guay, 1997). In other words, self-disciplined students are much more tight and determined in carrying out school tasks, which results in high performance in school, and this attainment is perceived as an evidence of someone's competence to master school tasks. The significance of the traditional insistence of psychologists and pedagogues on students' work habits thus becomes clearer, especially if we consider the finding that the relationship between SC and various life outcomes is mediated by strong habits (Galla & Duckworth, 2015). Such an effect on ASE also explains the importance of SC for later academic and professional successes, because ASE has a key influence on setting academic goals, choice of educational contents, as well as study and career choices (Pajares, 1996).

Our finding that self-controlled behavior can lead to the development of autonomous motivation is in line with previous research, although with athletes (Pelletier, Fortier, Vallerand, & Brière, 2001). However, although the general ability to establish SC impacts on metacognitive strategies in mastering the school curriculum and autonomous motivation for participation in school activities, these are not processes through which SC influences school achievement. Our data suggests that in order to be successful our students need to be self-disciplined and convinced that they are capable of mastering the school tasks, and not necessary to think deeply about what they learn nor to enjoy it. More precisely, if they are able to manage themselves, and that contributes to their ASE beliefs, students will achieve high results regardless of whether or not they master metacognitive strategies, or whether they are heteronomously or autonomously motivated for achievement. One of the clues to interpret our finding is a research suggesting that students' intrinsic interest in school contents and activities is a week predictor of achievement in the setting which is externally structured by teachers' instructions and primarily driven by extrinsic values as school grades (Köller, Baumert, & Schnabel, 2001). We might assume that the

majority of primary educational systems in the world, including our national, are characterized by the setting which encourages rule following and discipline much more than enjoyment or metacognitive complexity in learning and that might explain the importance of SC as antecedent of the achievement. The specificity of our education system is the centralization and the lack of opportunities for teachers and students to decide on the curriculum, which additionally makes pressure on students to exert SC in order to be better adjusted.

One of the most important implications of our findings is that SC represents a more "precious" resource than motivation when it comes to school achievement. Namely, it is desirable for students to personally value school learning because enjoying the activity provides energy for persistence and is accompanied by positive feelings (Nix et al., 1999). But it is shown in our research that self-determined learners also need SC in order to build ASE and to be school productive. On the other hand students who learn for less autonomous reasons can nevertheless be achievers if they are self-disciplined. What is important, however, is that SC is practiced more autonomously because the problematic implications of its exerting, such as negative emotions and ego-depletion, are minimized in that case (Moller, Deci, & Ryan, 2006; Muraven, 2008).

The main conclusion of the research is that attention should be paid to strengthening students' capacities for SC, because that is the way to influence the psychological mechanisms connected to SRL. Traditional pedagogical approaches which focus on discipline and daily routine in completing school tasks are given fresh confirmation, but we now understand that this discipline is not merely a matter of self-purpose, but it influences ASE believes as an important component of SRL responsible for educational outcomes. However, it is essential for the educational environment to create the conditions for students to understand why it is personally important for them to build habits, delay satisfaction and refrain from undesirable behavior in order to more readily and consistently use these competences. SC can be developed and maintained successfully if it is autonomous and the environment should be autonomy supportive in order to strengthen that kind of SC. Research data about the effects of social context on autonomous motivation give some support for this conclusion (Pelletier et al., 2001; Vallerand, Fortier, & Guay, 1997) but we certainly need additional exploration on how the educational environment can support autonomous SC.

The limitation of the research lies in the fact that the data on SC, ASE, metacognition, and motivational styles are based exclusively on students' self-evaluations. Therefore future research should include additional data collecting procedures, such as observing pupils in situations of exerting SRL or an experience sampling study design (Hofmann et al., 2012). There is also the need for a longitudinal study focused on whether the relationship between the variables in the tested model is a developmental one, i.e., whether ASE mediates the relation between SC and academic outcomes in later life or academic phases.

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Uloga samokontrole, samoefikasnosti, metakognicije i motivacije u predviđanju školskog uspeha

Vladimir Džinović, Rajka Đević i Ivana Đerić

Institut za pedagoška istraživanja, Beograd, Srbija

Pojmovi samokontrole i samoregulisanog učenja odnose se na procese i strategije kojima pojedinac pokazuje agentnost u svom odnosu prema zahtevima obrazovanja. Ovo istraživanje testiralo je strukturni model koji predviđa da samokontrola ima direktan efekat na uspeh u školi, kao i efekat koji je posredovan metakognitivnom samoregulacijom, akademskom samoefikasnošću i stilovima regulisanja motivacije. Istraživanje je sprovedeno na stratifikovanom slučajnom uzorku od 575 učenika osmog razreda (osnovne škole, prim. prev.). Pokazalo se da je efekat samokontrole na postignuće posredovan samoefikasnošću. Drugim rečima, učenici koji imaju povišenu samokontrolu i veruju da su sposobni da odgovore zahtevima škole će biti uspešni u školi bez obzira na kompleksnost njihovog učenja ili toga da li su autonomno motivisani ili ne. Razmatrane su implikacije ovakvog nalaza, kao i ograničenja ovog i pravci za buduća istraživanja.

Ključne reči: samokontrola, samoefikasnost, metakognitivna samoregulacija, stilovi regulisanja motivacije, uspeh u školi