Unpacking the Roles of Metacognition and Theory of Mind in Turkish Undergraduate Students' Academic Achievement: A Test of Two Mediation Models

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Abstract

This study investigated the relationships among metacognition, theory of mind, and academic achievement using self-report measures. Cross-sectional data were collected from 198 Turkish undergraduate students majoring in early childhood education in a public university. Two mediation models were tested to investigate the roles of theory of mind and metacognition in academic achievement. The results demonstrated that (1) metacognition played a role in explaining the relation between theory of mind and academic achievement, and (2) theory of mind played a role in explaining the relation between metacognition and academic achievement. This study contributes to research in two important ways. Firstly, we have shown that metacognition and theory of mind significantly predicted academic achievement. Secondly, both metacognition and theory of mind can be regarded as partial mediators in explaining the relations among these constructs that are linked to academic achievement. Educational implications and suggestions for future research are discussed.

Keywords: *academic achievement; mediation; metacognition; Reading the Mind in the Eyes Test; Theory of Mind*

Introduction

The possession of individual's theory of mind is seen as fundamental to human cognition and social behaviour (Sodian and Kristen, 2010) and accepted as an important step in an individual's social-cognitive development (Flavell, 2004). Theory of Mind (ToM) – also coined to the term 'mentalizing' (Morton, Frith, & Leslie, 1991) – refers to one's understanding about his/her own and others' mental states (Flavell, Miller, & Miller, 1993). Through having a ToM one can recognize that another person's knowledge is different from his/her own, and thus have some idea about what is in other people's minds (Frith & Frith, 2005). Individuals displaying advanced ToM are able to monitor themselves, understand others, and control the interaction between self and others (Lieberman, 2007). Besides, they identify and interpret the emotions in facial expressions (Comparelli, Corigliano, De Carolis, Mancinelli, Trovini, Ottavi, & Girardi, 2013) that can be seen as simplified actions for reading minds (i.e., mind-reading) (Whiten, 1991), building successful relationships or navigating social environment (i.e., social intelligence) (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997), and sharing someone else's feelings (i.e., empathy) (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Drawing on previous research that focused on the developmental trajectory (see Flavell, 2004; Sodian, 2005; Wellman, 2002; for reviews) and individual differences (Lang and Perner, 2002; Liu, Wellman, Tardif, & Sabbagh, 2008; Lockl & Schneider, 2007) in these abilities in children, it is essential to investigate the potential consequences of individual differences in theory-of-mind abilities of adults, especially the differences that can be observed later on when they have entered university. These mentalizing skills play a critical role in adults' social and communicative interactions (Ahmed & Miller, 2001), allowing successful and mutual exchanges of information (e.g., understand why others behave in a certain way they do, predict forthcoming behaviour) (Brown, Tas, Gonzalez, & Brüne, 2014). Therefore, having a ToM can help undergraduate students to manage their emotions, relationships, and to learn self-control within the university life (Pintrich, 2004). However, empirical evidence provided from studies with adult samples are sparse and most studies investigating relationships between ToM and other constructs have concentrated on clinical and social functioning aspects, and the interrelations among ToM, clinical, and social functioning in patients with schizophrenia (Lysaker, Dimaggio, & Brüne, 2014). To date, little is known about the impact of ToM abilities on cognitive and/or affective constructs (e.g., achievement, metacognition) considering adults (Keysar, Lin, & Barr, 2003) in general, and undergraduate students (Kinderman, Dunbar, & Bentall, 1998) in particular.

There are several reasons to assume an association between ToM and metacognition. One theoretical rationale to link ToM and metacognition has been put forward by Frith and Frith (1999), thereby extending an idea by Wellman (1985) and Bartsch

and Estes (1996). They propose that the initial acquisition of mental state concepts provides the individual with the opportunity to develop metacognition and that many metacognitive abilities such as monitoring and controlling come easier to those whose ToM is more advanced. In their view, metacognition consists of a large theory-of-mind understanding.

Along this continuum, metacognition sets the stage for students to reflect upon, understand, monitor, and control their own cognitive processes. It refers to one's knowledge about cognition and regulation of cognition (Schraw & Dennison, 1994) and can also be applied to others, in which case it is known as mentalizing (Frith, 2012). Much documented evidence points to a strong association between ToM and metacognition (Lockl & Schneider, 2007; Sperling, Walls, & Hill, 2000). Research examining the relationships between ToM and metacognition typically compared the emergence of domain-specific metacognitive abilities (e.g., reading, problem-solving) and the earliest reported abilities were addressed under the false-belief, pretence, intention, and/or deception areas of ToM. Viewed together, ToM understanding in combination with metacognitive abilities provide the basis for children's ability to acquire knowledge about the mind (i.e., mental states), understand the contrast between appearance and reality, and realize that one's own and another person's beliefs may differ from reality and that beliefs can be false due to misinformation (i.e., false-belief) (Frye & Moore, 1991). Individuals' understanding of mental states, which probably reflects an advanced ToM, might be helpful in order to explain, predict, and manipulate the behaviour of others, especially when the focus is on interpreting one's own actions and interactions (Astington, Harris, & Olson, 1988).

In addition to the idea that ToM may be relevant for metacognition and may help to effectively know and regulate behaviour, aspects of metacognition (i.e., knowledge of cognition and regulation of cognition) have to be considered, as they may also constitute a possible link between ToM and academic achievement.

Most researchers recognize that metacognition must play an important role in students' learning, achievement, and problem-solving (Hacker, Dunlosky, & Graesser, 2009). A multitude of studies has established positive relationships between metacognitive constructs and learning outcomes (Dignath & Buttner, 2008; Schoenfeld, 1992; Schraw & Dennison, 1994; Veenman, Van Hout-Wolters, & Afflerbach, 2006). Especially in the last decades, many studies on the relationship between metacognitive constructs and student cognitive development have been performed (Azevedo, 2009; Desoete & Roeyers, 2006; Koriat, 2012; Schneider & Artelt, 2010; Winne & Nesbit, 2010). Of additional emphasis in present research and practice is the recognition of the critical role metacognition plays in students' academic achievement (Schraw, Crippen, & Hartley, 2006; Sperling, Richmond, Ramsay, & Klapp, 2012). For example, students who are more aware of their strengths and weaknesses while learning are more adept at selecting the appropriate strategies to be carried out or monitoring their thought processes effectively (Prins, Veenman, & Elshout, 2006).

Some contradictory evidence about the relationship between metacognition and academic achievement has also been reported. Research confirmed that there is a small to moderate (Schraw & Dennison, 1994; Sperling et al., 2012) or no significant (Allon, Gutkin, & Bruning, 1999) relation between metacognitive constructs (e.g., knowledge of cognition, regulation of cognition) and achievement (e.g., aptitude, grade point average) constructs. However, in the majority of the studies, researchers continue to suggest that the use of metacognitive approaches is particularly important in university education as metacognition makes a unique contribution to explaining academic achievement (Veenman, Kok, & Blöte, 2005; Young & Fry, 2008). Whilst a link between metacognition and academic achievement has been mostly supported, many questions regarding the relationship between metacognition and student academic achievement remain unclear. There has been, however, some evidence clearly linking metacognition to achievement (Otero, Campanario, and Hopkins, 1992; Sperling, Howard, Miller, & Murphy, 2002; Taraban, Rynearson, & Kerr, 2000), particularly measured by students' grade point average (GPA) in the first semester of the year of their university studies (Coutinho and Neuman, 2008; Robbins, Lauver, Le, Davis, Langley, & Carlstrom, 2004). Previous research showed that GPA is a valid predictor of student success throughout higher education as it is not only the summary of student learning, but also an important indicator of performance (e.g., achievement, success, learning) at all levels of education (Kuncel, Credé, & Thomas, 2005). It is widely acknowledged that the GPA is the single best indicator of university students' academic achievement (Frisby, 2001), and thus much educational and psychological research has been devoted to the examination of factors that significantly affect students' academic achievement (Nietfeld, Cao, & Osborne, 2005; Plant, Ericsson, Hill, & Asberg, 2005). On a similar note, research has shown that metacognition is strongly associated with students' GPA (Dunning, Johnson, Ehrlinger, & Kruger, 2003; Thiede, Anderson, & Therriault, 2003). Specifically, students aware of their own capabilities are able to effectively organize information (knowledge of cognition) or consciously focus their attention on important information (regulation of cognition), and thus, are more likely to have higher GPAs. Having taken together the contradictory results established for the relations between metacognition and academic achievement in general and academic achievement indexed by GPA in particular, we hypothesized that metacognition is a moderate but significant predictor of achievement as measured by students' overall GPA.

Similar findings have been reported for the relationship between ToM and student academic achievement: individual differences in ToM matter for success in school, which is, in turn, crucial for the context of overall metacognition (Sperling et al., 2000). As researchers underline, students require a more advanced understanding of mind in order to build metacognitive skills and exhibit both verbal and nonverbal metacognitive behaviours in school settings (Meichenbaum & Biemiller, 1992)

that in turn have been repeatedly shown to have positive impacts on learning outcomes (Dunlosky & Metcalfe, 2009). Indeed, students with more sophisticated ToM understanding reflect on their own understanding more often or control their own learning more efficiently, and thus show more metacognitive knowledge (e.g., interpretation of a learning situation and task demands) or metacognitive regulation (e.g., control of learning in a particular task) behaviours (Schneider & Lockl, 2008). In addition to theoretical support, there is empirical support for the interrelationships among ToM, metacognition, and achievement. Considering Meichenbaum and Biemiller's (1992) characterization of a child (i.e., self-directed child) who shows a critical awareness of his/her own learning, knows which strategies should be applied and employs them without being directed, it is likely that students with an advanced understanding of mind may also practice these strategies to facilitate learning, understanding, and comprehension (Wellman, 2016). Henceforth, metacognitive knowledge and regulation could mediate between a student's ToM and academic achievement. Longitudinal studies have given examples of how students' ToM predicts their metacomprehension and metamemory (Lecce, Demicheli, Zocchi, & Palladino, 2015; Lecce, Zocchi, Pagnin, Palladino, & Taumoepeau, 2010). In this vein, there are two possible mechanisms suggesting a link between ToM and academic achievement. The first one is metacognitive knowledge (i.e., student's beliefs about learning). For instance, Lecce, Caputi, and Pagnin (2015) demonstrated that students with a more sophisticated early ToM were more likely to construct knowledge and meaning from their experiences, which might have implications and positive impact on their actual learning behaviour in the future. The second one is metacognitive regulation (i.e., student's evaluation about learning). For instance, Sperling et al. (2000) indicated that student's initial acquisition of mental state concepts provides a foundation for their appropriate strategy use while problem-solving. Along similar lines, other researchers argued that there may be an association between students' ToM and their ability to learn by instruction and collaboration (Astington & Pelletier, 1996), which might also shed light on their academic achievement.

Taken together, ToM abilities have been shown to be related to aspects of social functioning in school (e.g., interpret, analyse, and remember information about the classroom setting) and to facets of metacognitive knowledge and metacognitive regulation. It is likely that these aspects may also play an important role in building a link between ToM and academic achievement.

The Present Study

Given the dearth of studies investigating the associations among ToM, metacognition, and academic achievement, the aim of the present study was to gather these three constructs and examine whether they matter for the associations between one another. Notably, researchers have focused largely on the particular relations between ToM and metacognition (Sperling et al., 2000), ToM and academic achievement (Wang,

2015) and metacognition and academic achievement (Veenman, Kok, & Blöte, 2005). The question of whether the relationship between ToM and academic achievement is mediated by metacognition or whether ToM mediates the relationship between metacognition and academic achievement, however, remains entirely unexplored in university students. More specifically, we were interested in the mediating role of knowledge of cognition on the one hand and the mediating role of regulation of cognition on the other when the association between ToM and academic achievement (indexed by GPA) is being analysed. Moreover, we aimed to investigate whether knowledge of cognition and regulation of cognition, mediated by ToM, continue to be important contributors to the academic achievement of undergraduate students. The bulk of the literature has primarily focused on the underlying relations between ToM and metacognitive constructs in young children (Kuhn, 2000; Sperling et al., 2000), thereby excluding adult samples (i.e., university students). As such, most studies addressing the influence of metacognition on performance investigated elementary (Baker, 1984), middle (Sperling et al., 2012), and high school students (Zimmerman, 1990) and little, if any, research efforts have attempted to examine university students (Schraw & Dennison, 1994). It is important to note that studies including a sample of adults were carried out in the medical field and focused on the impacts of the link between social cognition, that to some extent reflects ToM, and metacognition on cognitive and social functioning in schizophrenia (see Lysaker, Dimaggio, and Brüne (2014) for a detailed review). In addition, previous work has lacked exploration of the joint relationships among ToM, metacognition, and academic achievement. The current work, therefore, investigates the interrelations between ToM, metacognitive constructs (i.e., knowledge of cognition and regulation of cognition), and academic achievement (i.e., GPA). Given the consistently found relations between effective ToM and metacognition on the one hand (Sperling et al., 2000), and between metacognition and performance on the other hand (Desoete & Roeyers, 2006; Sperling et al., 2012), we additionally test whether (a) knowledge of cognition and regulation of cognition might mediate the association between ToM and academic achievement and whether (b) ToM might mediate the association between knowledge of cognition and regulation of cognition and academic achievement. To ensure conceptual clarity in the identification of these relations, we rely on mediation analysis (Preacher & Hayes, 2004) allowing us to locate the direct and indirect benefits of ToM on metacognition and academic achievement, as well as metacognition on ToM and academic achievement.

To date, there have been no studies that have empirically assessed the explanatory role of metacognition on the path between ToM and academic achievement or the explanatory role of ToM on the path between metacognition and academic achievement. Importantly, there have been no studies that investigated the directional links between the constructs of ToM, metacognition, and academic achievement.

This is so in spite of the fact that there are well-established links between ToM and metacognitive regulation (Sperling et al., 2000), metacognitive knowledge,

metacognitive regulation and academic achievement (Sperling et al., 2002), and also the discussions about the usefulness of a social cognitive conception of self-regulation for improving student learning and academic achievement (Zimmerman, 1989). Findings in support of our hypothesized models may have some relevance to the integration of social cognitive theory with metacognition that has resulted in a much deeper understanding of the metacognitive (i.e., knowledge of cognition and regulation of cognition) and social cognitive (i.e., theory of mind) constructs that underlie academic achievement (i.e., GPA). This study tests the following hypotheses:

Hypothesis 1. (H1). The effects of theory of mind on GPA will be significantly mediated by knowledge of cognition.

Hypothesis 2. (H2). The effects of theory of mind on GPA will be significantly mediated by regulation of cognition.

Hypothesis 3. (H3). Knowledge of cognition would indirectly predict higher levels of GPA via theory of mind.

Hypothesis 4. (H4). Regulation of cognition would indirectly predict higher levels of GPA via theory of mind.

Method

Participants and procedure

During the fall semester of the academic year 2017/2018, we used a convenience sample comprised of 198 Turkish undergraduates in their second year ($n = 50$; sophomores), third year ($n = 108$; juniors), and fourth year ($n = 40$; seniors) of early childhood education degree at the Faculty of Education in a public university. All participants participated voluntarily and anonymously, and they adequately answered the measures (answer rate of 97.53%). Five students were excluded from the study (two completed only one of the two measures, and three did not complete any of the measures). The students who made up the sample (female $n = 163$; male $n = 35$) had an average age of 22 years ($SD = 5.62$), with an age range between 18 and 23 years.

Along with the instruments, the students' self-reports on demographic (age, gender, GPA, department) and socioeconomic (mother's educational level and father's educational level) variables were collected. The instruments were administered to the participants during 90-minute double periods by the third researcher.

Measures

Metacognitive Awareness Inventory

The Metacognitive Awareness Inventory (MAI) was used to measure students' metacognition. It assesses both knowledge of cognition and regulation of cognition. The MAI, originally, developed by Schraw and Dennison (1994) and adapted into Turkish by Akın, Abacı, and Çetin (2007) includes 52 items. The two subscales were: (1) Knowledge of cognition ("I understand my intellectual strengths and weaknesses.") involving 25 items and (2) Regulation of cognition ("I consider several

alternatives to a problem before I answer.") involving 27 items. The items were rated on a 5-point scale (1 = *absolutely inappropriate* to 5 = *absolutely appropriate*). Higher scores on the MAI indicate higher levels of metacognitive awareness and regulation. The Turkish version of the MAI demonstrated adequate internal reliability as well as three-week test-retest reliability (.95 and .95, respectively) (Cohen, 1988).

Reading the Mind in the Eyes Test

The Reading the Mind in the Eyes Test (RMET) was used to measure students' social cognition. It can be considered both an advanced ToM test (participants, who are shown a photograph, initially have to put themselves into the mind of the person presented in the photograph, and then attribute a relevant mental state to that person) and an emotion recognition test (participants can make judgements only on the basis of the facial expression). The RMET, originally developed by Baron-Cohen et al. (2001), and adapted into Turkish by Yıldırım, Kasar, and Güdük (2011) includes 32 items with still pictures of the eye regions illustrating emotionally charged or neutral mental states. Students respond to each item (see Figure 1) by matching a semantic definition (four descriptive words) of a mental state ('serious', 'ashamed', 'alarmed', and 'bewildered').
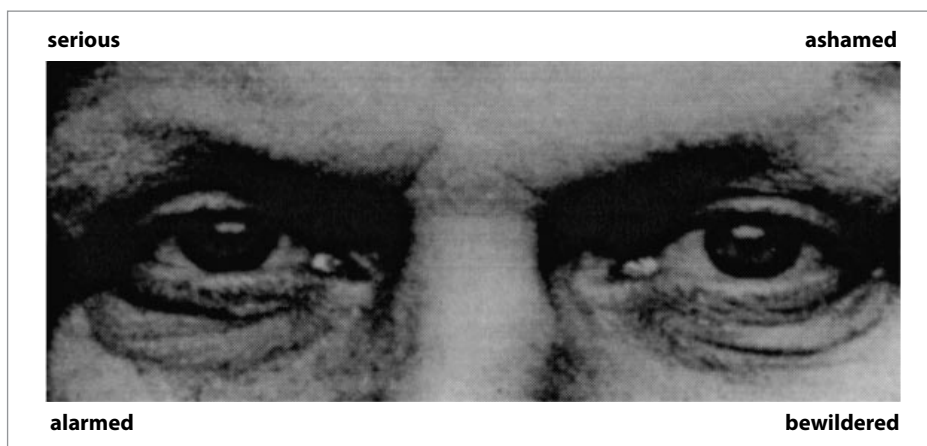

Figure 1. An example of a (male) stimulus used in the RMET

Each test picture was scored 1 (correct) if the target word was chosen correctly and 0 (incorrect) if a wrong word was chosen. The total score on the RMET ranged from 0 to 32 (0 = low social cognition and/or low ability to decode feelings and interpret thoughts of others from the eyes; 32 = high social cognition and/or high ability to decode feelings and interpret thoughts of others from the eyes). The Turkish version of the RMET demonstrated adequate internal reliability with Kuder-Richardson 20 coefficient reported at .72 and acceptable test-retest reliability with an Intraclass Correlation Coefficient reported at .65 (Cohen, 1988).

Academic achievement

The GPA was figured out by the ratio of the grade points earned to the number of credits attempted in the previous semester. It served as an indicator of students' current academic achievement at the university. In Turkey, the GPAs that were analysed in the present study were based on a percentage system with 0 indicating very poor and 100 indicating excellent achievement.

Statistical analyses

In a preliminary analysis preceding the mediation analysis, assumptions were checked (linearity, normality, homogeneity of error variances) and no violations were detected. Subsequently, three steps were taken in investigating the relations among variables. In Step 1, Pearson's correlation coefficients were computed to examine the intercorrelations among social cognition (ToM), metacognition (knowledge of cognition and regulation of cognition), and academic achievement (GPA). In Step 2, a stepwise multiple regression analysis was conducted using the variables from Step 1, which have significant intercorrelations and, age and gender variables were controlled. Stepwise selection indicates that multiple covariables with a statistically significant effect can be used and they can be simultaneously adjusted to each other in the regression model and that interactions among them can be assessed (Steyerberg, Eijkemans, & Habbema, 1999).

Finally, in Step 3, two mediation models were tested controlling age and gender. The PROCESS macro for SPSS (Hayes, 2012) was used to test the principal mediation hypotheses. The total effect of the independent variable (ToM) on the outcome variables, the direct effect of the independent variables on the outcome variables, the total indirect effect via mediator (regulation of cognition), and individual indirect effects for the mediator were calculated. Bootstrapped resampling (5,000 iterations) was used to get robust bootstrapped standard errors (SE) and 95% bias-corrected accelerated confidence intervals (BCa and CIs) for the mediation effects. If bootstrapped CIs crossed zero, the significance of the indirect effect (Path Path =) was ruled out. Bootstrapping approach accounts for non-normality of the sampling distribution for indirect effects, and thus serves as a superior approach for mediation analysis (Preacher & Hayes, 2008). All analyses were performed with IBM Statistical Package for Social Sciences 21.0 (SPSS, 2012).

Results

Correlation analyses

Pearson correlations among the study variables (ToM, GPA, knowledge of cognition, and regulation of cognition) are presented in Table 1. As expected, the GPA was positively related to ToM and the two metacognitive constructs, knowledge of cognition (KNOOFCOG) and regulation of cognition (REGOFCOG). Both KNOOFCOG and REGOFCOG were not significantly related to the ToM.

Table 1

Summary of correlations, means, and standard deviations among study variables.

Variable	1	2	3	4	Mean	SD
1. GPA	-	.24**	.26**	.17*	75.84	9.15
2. KNOOFCOG		-	.82**	.05	62.54	8.41
3. REGOFCOG			-	.04	125.69	18.31
4. ToM				-	17.36	2.46

Notes: GPA = grade point average, KNOOFCOG = knowledge of cognition, REGOFCOG = regulation of cognition, ToM = theory of mind

*p < .05; **p < .01; N = 198.

Mediation analyses

Multiple regression procedures were employed to test the hypothesis that metacognition (KNOOFCOG and REGOFCOG) mediated the effects of social cognition (ToM) on academic achievement (GPA). The stepwise selection method was applied in the regression model. Accordingly, GPA was assumed as the dependent variable and KNOOFCOG, REGOFCOG, and ToM were entered as independent variables in the regression. Age and gender variables were controlled in all steps. The total variance explained by the model as a whole was 14%, $F(3, 194)= 10.89$, $p < .001$. In the final model, only the REGOFCOG ($F(3, 194)= .12$, $p< .001$) and ToM ($F(3,194)= .51$, $p< .001$) were statistically significant, but the KNOOFCOG was not ($F(3, 194)= .11$, p= .32). Regarding that, the following mediation analyses were conducted with GPA, REGOFCOG and ToM variables. Two models (Model A and Model B) were tested in which the REGOFCOG and ToM were treated as the mediator and the independent variable or vice versa, respectively. Results for the mediation analysis, where the REGOFCOG was tested as the mediator, are shown in Figure 2. Results for the mediation analyses, where the ToM was tested as the mediator, are shown in Figure 3.

Turning first to Model A (REGOFCOG is the mediator between ToM and GPA), the criteria (Baron & Kenny, 1986) for concluding that the mediation exists were the following: (1) ToM (predictor) has a significant direct effect on GPA (criterion variable); (2) ToM (predictor) has a significant effect on REGOFCOG (mediator); (3) REGOFCOG (mediator) predicts unique variance in GPA (criterion variable); and (4) the direct effect from ToM (predictor) to GPA (criterion variable) is significantly reduced after controlling for the indirect effect produced by REGOFCOG (mediator). Results revealed that ToM was a significant predictor of REGOFCOG and a significant predictor of GPA (see Figure 2) supporting the first and second conditions of mediation analysis. On a similar note, REGOFCOG significantly predicted reduced GPA after controlling ToM, supporting the third condition. Finally, ToM significantly predicted GPA after controlling for the indirect effect of ToM via REGOFCOG.
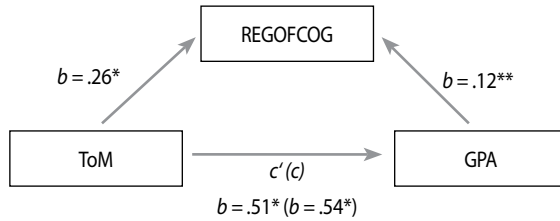
Figure 2. Mediation model of ToM, REGOFCOG, and GPA (Model A)

Notes: Standardized coefficients () are significant at *p < .001 and **p < .05. ToM = Theory of Mind; REGOFCOG = Regulation of cognition; GPA = Grade point average. The value in parenthesis is the relationship between ToM and GPA before REGOFCOG is taken into account.

Following that, bootstrapping approaches were employed to determine whether the indirect effect of ToM on GPA via REGOFCOG was significant. The true indirect effect was estimated to lie between -.17 (95% confidence interval lower limit) and -.08 (95% confidence interval upper limit) with 5,000 resampling iterations. This indicated that REGOFCOG partly mediated the effect of ToM on GPA in the first model, Model A. Path (and Path (were significant. While path was significant, path was smaller than path (= .51 vs = .54). Viewed together, ToM had a significant indirect effect on GPA partially mediated by REGOFCOG (= .14, BCa 95% CIs= -.17 – -.08).

Moving to Model B (ToM is the mediator between REGOFCOG and GPA), the criteria (Baron & Kenny, 1986) for concluding that the mediation exists were the following: (1) REGOFCOG (the predictor) has a significant direct effect on GPA (criterion variable); (2) REGOFCOG (the predictor) has a significant effect on ToM (mediator); (3) ToM (mediator) predicts unique variance in GPA (criterion variable); and (4) the direct effect from REGOFCOG (the predictor) to GPA (criterion variable) is significantly reduced after controlling for the indirect effect produced by ToM (mediator). Results showed that REGOFCOG was a significant predictor of ToM and a significant predictor of GPA (see Figure 3), supporting the first and second conditions of mediation analysis. Similarly, ToM significantly predicted reduced GPA after controlling REGOFCOG, supporting the third condition. Finally, REGOFCOG significantly predicted GPA after controlling for the indirect effect of REGOFCOG via ToM.
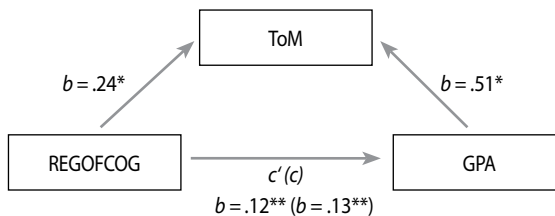

Figure 3. Mediation Model of REGOFCOG, ToM, and GPA (Model B)

Notes: Standardized coefficients () are significant at *p < .001 and **p < .05. ToM = Theory of mind; REGOFCOG = Regulation of cognition; GPA = Grade point average. The value in parenthesis is the relationship between REGOFCOG and GPA before ToM is taken into account.

Following that, bootstrapping approaches were employed to determine whether the indirect effect of REGOFCOG on GPA via ToM was significant. Similar to Model A, the indirect effect was nonsignificant (i.e., zero did not fall between the confidence intervals of the bootstrap estimate). The true indirect effect was estimated to lie between -.03 (95% confidence interval lower limit) and -.01 (95% confidence interval upper limit) with 5,000 resampling iterations. This indicated that ToM partly mediated the effect of REGOFCOG on GPA in the second model, Model B. Path (and Path (were significant. While path was significant, path was smaller than path (= .12 vs = .13). Viewed together, REGOFCOG had a significant indirect effect on GPA partially mediated by ToM (= .13, BCa 95% CIs= -.03 – -.01).

In sum, as the results of Model A and Model B have shown, REGOFCOG mediated the effect of ToM on GPA through an indirect path controlling for age and gender (see Model A in Figure 2) and ToM mediated the effect of REGOFCOG on GPA through an indirect path controlling for age and gender (see Model B in Figure 3). These results supported our hypotheses as the indirect effect of ToM on GPA via REGOFCOG was significant, and REGOFCOG operated as a partial mediator in the effect between ToM and GPA (Hypothesis 2), and as the indirect effect of REGOFCOG on GPA via ToM was significant, and ToM operated as a partial mediator in the effect between ToM and GPA (Hypothesis 4).

Discussion

The two defining features of human beings are their ability (a) to think and be aware of their own thinking, and (b) to socialize and build relationships with other people (Pennington, 2000). Taken together, these features point to ToM: the manner in which we interpret, analyse, and remember information about the social world (Baron & Branscombe, 2012). ToM includes two component processes: (a) the social-perceptual process by which individuals decode mental states from nonverbal cues (e.g., eyes), and (b) the social-cognitive process by which individuals reason about another's mental state (e.g., intentions, feelings, perception, and false beliefs) (Sabbagh, 2004).

Previous research on the ToM suggested that the eyes can be regarded as the window to the soul (Adams et al., 2010) and therefore hold special prominence in mentalizing (Baron-Cohen et al., 2001). Indeed, the eye region richly informs us about individual behaviour and attracts significantly more attention than do other areas of the face (Farroni, Csibra, Simion, & Johnson, 2002), and thus are heavily relied upon in social communication (Vinette, Gosselin, & Schyns, 2004). If the eyes play a dominant role in how people perceive and interpret the information they generate themselves (intrapersonal) and from others (interpersonal), then this raises the question: Is there a language of the eyes? Based on the evidence from previous research (Adams et al., 2010; Baron-Cohen et al., 2001), there does appear to be a language of the eyes that enables individuals to recognize the mental state of others

using just the expressions around the eyes, but whether this language is related to academic achievement or whether the relation between these two constructs is mediated by metacognition has not been previously examined and is the primary focus of the current research.

For this study, we were interested in knowing whether ToM, knowledge of cognition, regulation of cognition, and academic achievement matter for one another when the associations between the four are analysed. In general terms, we used mediation analysis to investigate the role of (1) metacognition as a mediator between ToM and academic achievement, and (2) ToM as a mediator between metacognition and academic achievement. The findings supported the primary hypotheses: (1) ToM significantly predicted academic achievement, and this effect was partially reinforced by the significant positive effect of ToM on metacognition, and (2) Metacognition significantly predicted academic achievement, and this effect was partially reinforced by the significant positive effect of metacognition on ToM.

In relation to our mediation Model A (see Figure 2), the positive impact of ToM on metacognition in general (Bartsch & Estes, 1996) and self-regulation in particular (Zimmerman, 1989) was consistent with research that has shown that individuals with higher levels of ToM are more able to regulate their own of cognition (Sperling et al., 2000). These results provide some support for previous research that highlights the benefits of ToM task implementation on metacognition (Flavell, Miller, & Miller, 1993). Using theory of mind tasks based on a deeper understanding of the sources of knowledge may help promote self-regulatory skills such as planning, evaluating, and monitoring (Sperling et al., 2000). Based on the present results showing that higher levels of regulation of cognition predict higher levels of GPA, it is possible that by improving self-regulatory processes, ToM abilities may enhance student learning, and thus academic achievement as measured by the GPA. Henceforth, it may be beneficial for educators and researchers to consider a formulation of metacognition polished with a sophisticated ToM understanding for low-achieving students to address their weaknesses in activating self-regulatory processes and improve academic outcomes. For instance, educators may use ToM and problem-solving tasks together to foster low-achievers' understanding of an intention and predicting performance and then providing evidence of a systematic approach.

The results of our mediation Model B (see Figure 3) were in line with previous research (Flavell, 2004; Wellman & Gelman, 1998) that conceptualized individuals' development of metacognitive awareness and regulation as the development of ToM. In addition, results revealed that higher levels of ToM predicted higher levels of GPA. It is possible that by improving social interactions and the understanding of mental states in social interaction, metacognitive regulation may enhance academic achievement. We suggest that a broader understanding of metacognition has to be anchored in a comprehensive account of ToM and requires a better understanding of the link between ToM and academic achievement. We hope that the present study

will serve as a stepping-stone towards the role of such mechanisms (cognitive/non-cognitive psychological phenomena, social/non-social experiences) in academic achievement.

The present study had a number of limitations that need to be taken into account when interpreting the results. Firstly, the participants consisted of undergraduate students majoring in early childhood education. Since this represents a relatively narrow population the generalizability of the study's findings is limited. Future similar work with a more diverse population (education, engineering, and science students) is necessary. Secondly, participants were not partitioned in terms of their academic achievement levels and therefore the extent to which these findings would generalize to those with low, medium, and high academic achievement is unclear. Future research that would address the mediating roles of social cognition and metacognition with particular samples of low-, medium-, and high-achievers is needed. Observations, in general, and think-aloud protocols or interviews, in particular, might provide additional insight into the ToM and regulation of cognition of the students. Finally, the cross-sectional design employed in the current study does not allow conclusions regarding causality in terms of the relationships between ToM, metacognition, and academic achievement. Future studies can employ an experimental design by carrying out interventions of theory of mind and/or metacognition (metacognitive training prior to solving theory of mind tasks) to untangle the causal directionality. Besides, a longitudinal design can be employed to unravel the developmental trajectory of the theory of mind associated with the regulation of cognition and in turn, academic achievement.

Despite these limitations, the results from this study add to past research in support of the relations between ToM and metacognition (Sperling et al., 2000), metacognition and academic achievement (Sperling et al., 2002), and further highlight the potential benefits of ToM on academic achievement, a phenomenon that is in its first stages to inform educational practice and likely to contribute to educators' understanding of their students' academic achievement.

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Tumačenje uloge metakognicije i teorije uma u akademskim postignućima studenata u Turskoj: testiranje pomoću dva medijacijska modela

Sažetak

U ovom su se istraživanju ispitivale veze između metakognicije, teorije uma i akademskih postignuća studenata pomoću samoizvješća. Presječni podatci prikupljeni su od 198 studenata dodiplomskoga studija Ranog i predškolskog odgoja u Turskoj. Testirana su dva medijacijska modela kako bi se ispitala uloga teorije uma i metakognicije u akademskim postignućima. Rezultati su pokazali da (1) metakognicija ima ulogu u tumačenju veze između teorije uma i akademskih postignuća te (2) da teorija uma ima ulogu u tumačenju veze između metakognicije i akademskih postignuća. Ova studija doprinosi istraživanjima na dva važna načina. Prvo, pokazali smo da metakognicija i teorija uma značajno predviđaju akademska postignuća. Drugo, i metakognicija i teorija uma mogu se smatrati djelomičnim medijatorima u tumačenju odnosa između ovih konstrukata koji utječu na akademska postignuća. Dalje se raspravlja o implikacijama za obrazovanje i iznose se preporuke za buduća istraživanja.

Ključne riječi: *akademska postignuća; medijacija; metakognicija; test čitanja misli iz očiju; teorija uma*

Uvod

Činjenica da svaki pojedinac posjeduje teoriju uma smatra se osnovom ljudske kognicije i ponašanja čovjeka u društvu (Sodian i Kristen, 2010) te važnim korakom u društveno-kognitivnom razvoju pojedinca (Flavell, 2004). Teorija uma, za koju se često koristi i termin „mentalizacija" (Morton, Frith i Leslie, 1991), podrazumijeva način na koji pojedinac shvaća vlastita mentalna stanja i mentalna stanja drugih ljudi (Flavell, Miller i Miller, 1993). Kroz vlastitu teoriju uma možemo prepoznati da je znanje druge osobe drugačije od našega i tako možemo do neke mjere znati što se događa u umu drugih ljudi (Frith i Frith, 2005). Pojedinci koji imaju razvijenu

teoriju uma mogu upravljati sobom, razumjeti druge i kontrirati svoju interakciju s drugim ljudima (Lieberman, 2007). Osim toga, oni mogu prepoznati i protumačiti emocije u izrazu lica (Comparelli, Corigliano, De Carolis, Mancinelli, Trovini, Ottavi i Girardi, 2013), što se može smatrati pojednostavljenim procesom čitanja misli (Whiten, 1991), razvijanja uspješnih veza s drugim ljudima i snalaženja u društvenom okruženju (socijalna inteligencija) (Baron-Cohen, Jolliffe, Mortimore, & Robertson, 1997) te suosjećanja s drugim ljudima (empatija) (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001). Na temelju prijašnjih istraživanja koja su se fokusirala na razvojnu trajektoriju (vidi recenzije u Flavell, 2004; Sodian, 2005; Wellman, 2002) i individualne razlike (Lang i Perner, 2002; Liu, Wellman, Tardif i Sabbagh, 2008; Lockl & Schneider, 2007) u tim sposobnostima kod djece, neophodno je ispitati potencijalne posljedice individualnih razlika u sposobnostima teorije uma kod odraslih osoba. To se posebno odnosi na one razlike koje se mogu primijetiti kasnije, kada se osobe upišu na fakultet. Takve vještine mentalizacije imaju važnu ulogu u socijalnim i komunikacijskim interakcijama kod odraslih (Ahmed i Miller, 2001) te im omogućavaju uspješnu razmjenu informacija (npr. razumjeti zašto se ostali ponašaju na određeni način ili predvidjeti buduće ponašanje) (Brown, Tas, Gonzalez i Brüne, 2014). Stoga, ako studenti imaju razvijenu teoriju uma, to im može pomoći upravljati vlastitim emocijama i vezama s drugim ljudima te ih naučiti samokontroli u fakultetskom okruženju (Pintrich, 2004). Međutim, empirijski dokazi dobiveni u raznim studijama provedenim na uzorku odraslih osoba su nedostatni pa je većina studija koje ispituju veze između teorije uma i drugih konstrukata usmjerena na kliničke aspekte i aspekte funkcioniranja u društvu, kao i na način na koji pacijenti oboljeli od shizofrenije funkcioniraju u društvu (Lysaker, Dimaggio i Brüne, 2014). Do danas se nije došlo do većih saznanja o utjecaju sposobnosti teorije uma na kognitivne i/ili afektivne konstrukte (kao što su postignuća i metakognicija) kod odraslih općenito (Keysar, Lin i Barr, 2003), a posebno kod studenata (Kinderman, Dunbar i Bentall, 1998).

Postoji nekoliko razloga zbog kojih se može pretpostaviti da postoji veza između teorije uma i metakognicije. Jedno teorijsko objašnjenje za povezivanje teorije uma s metakognicijom iznijeli su Frith i Frith (1999) i tako razradili ideju koju su prikazali Wellman (1985) i Bartsch i Estes (1996). Oni smatraju da inicijalno usvajanje koncepata o mentalnim stanjima daje pojedincu priliku za razvoj metakognicije i da su mnoge metakognitivne sposobnosti, poput praćenja i kontroliranja, lakše kod ljudi s bolje razvijenom teorijom uma. S njihova gledišta, metakognicija se sastoji od dubinskoga razumijevanja teorije uma.

U skladu s tim, metakognicija studentima stvara podlogu za refleksiju, razumijevanje, praćenje i kontroliranje vlastitih kognitivnih procesa. Metakognicija odnosi se na znanje koje pojedinac ima o kogniciji i reguliranju kognicije (Schraw i Dennison, 1994), a može se primijeniti i na druge ljude. U tom slučaju, radi se o mentalizaciji (Frith, 2012). Dokazi koji su do sada u većoj mjeri zabilježeni upućuju na jaku vezu

između teorije uma i metakognicije (Lockl i Schneider, 2007; Sperling, Walls i Hill, 2000). Istraživanja u kojima se ispitivala veza između teorije uma i metakognicije uglavnom su uspoređivala pojavu metakognitivnih sposobnosti specifičnih za određenu domenu (npr. čitanje, rješavanje problema), a sposobnosti koje se najranije javljaju klasificirale su se u različita područja teorije uma – lažna uvjerenja, pretvaranje, namjere i/ili obmanjivanje. Kada se zajedno analiziraju, shvaćanje teorije uma u kombinaciji s metakognitivnim sposobnostima stvara osnovu za sposobnost djece da usvajaju znanje o umu (tj. mentalnim stanjima), razumiju kontrast između privida i stvarnosti te shvate da se njihova uvjerenja i uvjerenja drugih ljudi mogu razlikovati od onoga što je istinito zbog dezinformacija (lažnih uvjerenja) (Frye i Moore, 1991). Način na koji pojedinac shvaća mentalna stanja, što vjerojatno odražava naprednu teoriju uma, može biti od koristi pri objašnjavanju, predviđanju i upravljanju ponašanjem drugih osoba, pogotovo kada je naglasak na interpretaciji vlastitih postupaka i interakciji s drugim ljudima (Astington, Harris i Olson, 1988).

Uz ideju da teorija uma može biti važna za metakogniciju i da može pomoći uspješnom prepoznavanju i reguliranju ponašanja, potrebno je razmotriti aspekte metakognicije, tj. znanje o kogniciji i reguliranje kognicije, jer oni mogu biti potencijalna veza između teorije uma i akademskih postignuća.

Većina je istraživača svjesna da metakognicija zasigurno ima važnu ulogu u procesu učenja kod studenata, njihovim postignućima i načinu na koji rješavaju probleme (Hacker, Dunlosky i Graesser, 2009). U mnogobrojnim studijama pronađena je pozitivna veza između metakognitivnih konstrukata i ishoda učenja (Dignath i Buttner, 2008; Schoenfeld, 1992; Schraw i Dennison, 1994; Veenman, Van Hout-Wolters i Afflerbach, 2006). U posljednjih nekoliko desetljeća proveden je posebno velik broj istraživanja o vezi između metakognitivnih konstrukata i kognitivnoga razvoja studenata (Azevedo, 2009; Desoete & Roeyers, 2006; Koriat, 2012; Schneider i Artelt, 2010; Winne i Nesbit, 2010). Dodatno bi u aktualnim istraživanjima i praksi trebalo naglasiti prepoznavanje važne uloge koju metakognicija ima u akademskim postignućima studenata (Schraw, Crippen i Hartley, 2006; Sperling, Richmond, Ramsay i Klapp, 2012). Na primjer, studenti koji imaju veću svijest o vlastitim jačim stranama i o svojim slabostima, mogu se u procesu učenja bolje prilagoditi odabiru odgovarajućih strategija pomoću kojih mogu uspješno provesti ili pratiti vlastite misaone procese (Prins, Veenman i Elshout, 2006).

Međutim, uočeni su i kontradiktorni dokazi o vezi između metakognicije i akademskih postignuća. Istraživanja su potvrdila da postoji mala ili umjerena (Schraw i Dennison, 1994; Sperling i sur., 2012) ili neznačajna (Allon, Gutkin i Bruning, 1999) veza između metakognitivnih konstrukata (znanje o kogniciji, regulacija kognicije) i konstrukata postignuća (sposobnosti, prosječna ocjena). No, u većini studija istraživači i dalje naglašavaju da je primjena metakognitivnih pristupa posebno važna u fakultetskom obrazovanju jer metakognicija daje izniman doprinos tumačenju akademskih postignuća (Veenman, Kok i Blöte, 2005; Young i

Fry, 2008). Dok se veza između metakognicije i akademskih postignuća uglavnom podržava, na neka pitanja o vezi između metakognicije i akademskih postignuća studenata još uvijek nije dan jasan odgovor. Postoje, međutim, neki dokazi koji jasno povezuju metakogniciju i postignuća (Otero, Campanario i Hopkins, 1992; Sperling, Howard, Miller i Murphy, 2002; Taraban, Rynearson, i Kerr, 2000), koja se uglavnom mjere pomoću prosječne ocjene studenata u prvom semestru prve godine studija (Coutinho i Neuman, 2008; Robbins, Lauver, Le, Davis, Langleynn i Carlstrom, 2004). Ranija su istraživanja pokazala da je prosječna ocjena valjani prediktor uspjeha studenata u visokom obrazovanju, jer ona nije samo rezultat učenja, nego i važan prediktor rada (postignuća, uspjeh, učenje) na svim razinama obrazovanja (Kuncel, Credé i Thomas, 2005). Uvelike je poznato da je prosječna ocjena najbolji pokazatelj akademskoga uspjeha studenata (Frisby, 2001) te su brojna istraživanja u području obrazovanja i psihologije fokusirana na ispitivanje čimbenika koji značajno utječu na akademska postignuća studenata (Nietfeld, Cao i Osborne, 2005; Plant, Ericsson, Hill i Asberg, 2005). Isto tako, istraživanja su pokazala da je metakognicija jako povezana s prosječnom ocjenom studenata (Dunning, Johnson, Ehrlinger i Kruger, 2003; Thiede, Anderson i Therriault, 2003). Studenti koji su svjesni vlastitih sposobnosti mogu učinkovito organizirati informacije (znanje o kogniciji) ili svjesno usmjeriti pažnju na važne informacije (regulacija kognicije) pa pa se tako može očekivati da će njihova prosječna ocjena biti veća. Kada se skupa sagledaju, kontradiktorni rezultati koji su dobiveni za veze između metakognicije i akademskih postignuća općenito te akademskih postignuća mjerenih prosječnom ocjenom, možemo stvoriti hipotezu da je metakognicija umjeren, ali i značajan prediktor postignuća mjerenih općom prosječnom ocjenom studenata.

Slični rezultati dobiveni su i za vezu između teorije uma i akademskih postignuća studenata: individualne razlike u teoriji uma utječu na uspjeh u školi, što je opet važno za kontekst opće metakognicije (Sperling i sur., 2000). Kako naglašavaju istraživači, studentima je potrebno naprednije razumijevanje uma kako bi mogli izgraditi metakognitivne vještine i pokazati i verbalno i neverbalno metakognitivno ponašanje u obrazovnom okruženju (Meichenbaum i Biemiller, 1992), za što se kontinuirano dokazuje da ima pozitivan utjecaj na ishode učenja (Dunlosky i Metcalfe, 2009). Uistinu, studenti koji mogu bolje razumjeti teoriju uma češće provode refleksiju o vlastitom razmišljanju ili uspješnije kontroliraju svoj proces učenja te tako pokazuju veće metakognitivno znanje (npr. interpretacija situacije učenja i onoga što se u zadatku traži) ili metakognitivnu regulaciju (npr. kontroliranje procesa učenja u određenom zadatku) (Schneider i Lockl, 2008). Uz teorijsku podlogu postoji i empirijska podloga koja ide u prilog međusobnoj povezanosti teorije uma, metakognicije i postignuća. Uzimajući u obzir način na koji su Meichenbaum i Biemiller (1992) karakterizirali dijete (samousmjereno dijete) koje pokazuje kritičku osviještenost o vlastitom učenju, koje zna koje primijeniti strategije i koje ih primjenjuje samostalno, možemo reći da vjerojatno i studenti koji imaju napredno shvaćanje o umu također prakticiraju iste

strategije kako bi si olakšali proces učenja i razumijevanja (Wellman, 2016). Stoga, metakognitivno znanje i regulacija mogu posredovati između studentove teorije uma i njegovih akademskih postignuća. Longitudinalna istraživanja dala su primjere kako teorija uma studenta predviđa njegovo metarazumijevanje i metamemoriju (Lecce, Demicheli, Zocchi i Palladino, 2015; Lecce, Zocchi, Pagnin, Palladino i Taumoepeau, 2010). Sukladno tome, postoje dva moguća mehanizma koji idu u prilog vezi između teorije uma i akademskih postignuća. Prvi je metakognitivno znanje (tj. studentova uvjerenja o učenju). Na primjer, Lecce, Caputi i Pagnin (2015) su pokazali da studenti s ranije i bolje razvijenom teorijom uma u većoj mjeri konstruiraju znanje i značenje iz vlastitih iskustava, što može imati implikacije i pozitivan utjecaj na njihovo stvarno učenje u budućnosti. Drugi je metakognitivna regulacija (tj. studentova evaluacija učenja). Na primjer, Sperling i sur. (2000) su naveli da studentovo inicijalno usvajanje koncepta o mentalnim stanjima stvara osnovu za primjenu odgovarajuće strategije tijekom procesa rješavanja problema. Drugi istraživači tvrde da može postojati i veza između teorije uma studenata i njihove sposobnosti da uče kroz nastavu i suradnju (Astington i Pelletier, 1996), što također može razjasniti njihova akademska postignuća.

Kada se zajedno analiziraju, sposobnosti teorije uma povezane su s aspektima društvenoga funkcioniranja u školi (npr. u tumačenju, analiziranju i pamćenju informacija o razrednom okruženju) i s karakteristikama metakognitivnoga znanja i metakognitivne regulacije. Izgledno je da ovi aspekti također imaju važnu ulogu u povezivanju teorije uma i akademskih postignuća.

Aktualno istraživanje

S obzirom na mali broj studija koje ispituju veze između teorije uma, metakognicije i akademskih postignuća, cilj je ovoga istraživanja bio udružiti ta tri konstrukta i ispitati jesu li oni važni za međusobne veze. Istraživači su se uglavnom usredotočili na određene veze između teorije uma i metakognicije (Sperling i sur., 2000), teorije uma i akademskih postignuća (Wang, 2015) te metakognicije i akademskih postignuća (Veenman, Kok i Blöte, 2005). Na pitanje posreduje li u vezi između teorije uma i akademskih postignuća metakognicija ili posreduje li teorija uma u vezi između metakognicije i akademskih postignuća, međutim, još nije odgovoreno u istraživanjima na uzorku koji čini studentska populacija. Točnije, zanimala nas je posrednička uloga znanja o kogniciji s jedne strane, te posrednička uloga regulacija kognicije s druge strane kada se analizirala veza između teorije uma i akademskih postignuća (prikazanih pomoću prosječne ocjene). Štoviše, cilj nam je bio ispitati jesu li znanje o kogniciji i regulacija kognicije, uz posredničku ulogu teorije uma, i dalje važni čimbenici koji pridonose akademskim postignućima studenata. U većini relevantne literature pažnja je prvenstveno usmjerena na dubinske veze između teorije uma i metakognitivnih konstrukata kod male djece (Kuhn, 2000; Sperling i sur., 2000), što isključuje uzorak koji čine odrasle osobe (npr. studenata). Kao takve,

mnoge studije koje se bave ispitivanjem utjecaja metakognicije na uspjeh provedene su na uzorku osnovnoškolaca nižih razreda (Baker, 1984), osnovnoškolaca viših razreda (Sperling i sur., 2012) te srednjoškolaca (Zimmerman, 1990), dok je mali ili nikakav trud uložen u istraživanja na uzorku studenata (Schraw i Dennison, 1994). Važno je napomenuti da su studije na uzorku odraslih osoba provedene uglavnom u području medicine te su se fokusirale na utjecaj veze između socijalne kognicije (koja u određenoj mjeri odražava teoriju uma) i metakognicije na kognitivne i društvene funkcije oboljelih od shizofrenije (za više detalja vidi: Lysaker, Dimaggio i Brüne (2014)). K tomu, u ranijim radovima nedostajala su istraživanja zajedničkih veza između teorije uma, metakognicije i akademskih postignuća. Ovo istraživanje, stoga, ispituje međusobne veze između teorije uma, metakognitivnih konstrukata (tj. znanja o kogniciji i regulaciji kognicije) i akademskih postignuća (prosječne ocjene). S obzirom na to da se u istraživanjima redovito uočavaju veze između učinkovite teorije uma i metakognicije s jedne strane (Sperling i sur., 2000) te između metakognicije i radnoga učinka s druge strane (Desoete i Roeyers, 2006; Sperling i sur., 2012), dodatno smo ispitali (a) može li znanje o kogniciji i regulacija kognicije posredovati u vezi između teorije uma i akademskih postignuća te (b) može li teorija uma posredovati u vezi između znanja o kogniciji i regulacije kognicije i akademskih postignuća. Kako bi se osigurala konceptualna jasnoća u prepoznavanju ovih veza, oslonili smo se na medijacijsku analizu (Preacher i Hayes, 2004), koja nam je omogućila da uočimo izravnu i neizravnu korist teorije uma za metakogniciju i akademska postignuća te za dobrobit koju metakognicija ima za teoriju uma i akademska postignuća.

Do danas nisu provedena istraživanja koja su empirijski istraživala eksplanatornu ulogu metakognicije u vezi između teorije uma i akademskih postignuća ili eksplanatornu ulogu teorije uma u vezi između metakognicije i akademskih postignuća. Važno je reći da ne postoje istraživanja koja su ispitivala direktne veze između konstrukata teorije uma, metakognicije i akademskih postignuća.

Stanje je takvo usprkos činjenici da postoje davno uočene veze između teorije uma i metakognitivne regulacije (Sperling i sur., 2000) te metakognitivnoga znanja, metakognitivne regulacije i akademskih postignuća (Sperling i sur., 2000). Također postoje i rasprave o korisnosti društvenoga kognitivnog shvaćanja samoregulacije za poboljšanje procesa učenja kod studenata i za poboljšanje njihovih akademskih postignuća (Zimmerman, 1989). Rezultati koji idu u prilog našim hipotetski postavljenim modelima možda mogu biti važni za integraciju društvene kognitivne teorije i metakognicije, koja je rezultirala boljim razumijevanjem metakognitivnih (znanje o kogniciji i regulacija kognicije) i društvenih kognitivnih (teorija uma) konstrukata koji se nalaze u pozadini akademskih postignuća (prosječna ocjena). U istraživanju su se testirale sljedeće hipoteze:

Hipoteza 1. (H1). Utjecaji teorije uma na prosječnu ocjenu bit će značajno posredovani kroz znanje o kogniciji.

Hipoteza 2. (H2). Utjecaji teorije uma na prosječnu ocjenu bit će značajno posredovani kroz regulaciju kognicije.

Hipoteza 3. (H3). Znanje o kogniciji neizravno će predvidjeti veću prosječnu ocjenu kroz teoriju uma.

Hipoteza 4. (H4). Regulacija kognicije neizravno će predvidjeti veću prosječnu ocjenu kroz teoriju uma.

Metode

Sudionici i postupak

Tijekom zimskoga semestra akademske godine 2017./2018. koristili smo prigodan uzorak koji se sastojao od 189 studenata dodiplomskoga studija Ranoga i predškolskog odgoja druge godine (n = 50), treće godine (n = 108) te četvrte godine (n = 40) na državnom Fakultetu obrazovnih znanosti u Turskoj. Svi su sudionici u istraživanju sudjelovali dobrovoljno i anonimno te su na primjeren način odgovorili na sva pitanja koja su se koristila za mjerenje (stopa odgovora bila je 97,53 %). Pet studenata isključeno je iz daljnjega istraživanja (dvoje je odgovorilo samo na dva pitanja, a troje ni na jedno). Studenti koji su sačinjavali uzorak (163 ženskoga i 35 muškoga spola) imali su prosječnu dob od 22 godine (*SD* = 5,62), s rasponom godina od 18 do 23.

Uz mjerne instrumente, prikupljena su samoizvješća studenata o demografskim (dob, spol, prosječna ocjena, odsjek) i socioekonomskim (stručna sprema majke i oca) varijablama. Instrumenti su primijenjeni tijekom blok satova od 90 minuta, a postupak je proveo treći istraživač.

Mjerenja

Inventar metakognitivne osviještenosti

Inventar metakognitivne osviještenosti koristio se za mjerenje metakognicije studenata. Pomoću njega se procjenjuje i znanje o kogniciji i regulacija kognicije. Inventar metakognitivne osviještenosti izradili su Schraw i Dennison (1994), a turskom kontekstu prilagodili su ga Akın, Abacı, i Çetin (2007). Inventar uključuje 52 tvrdnje. Dvije subskale bile su: (1) Znanje o kogniciji („Razumijem svoje intelektualne prednosti i nedostatke") s 25 tvrdnji i (2) Regulacija kognicije („Prije nego odgovorim, razmislim o nekoliko alternativnih rješenja istoga problema.") s 27 tvrdnji. Tvrdnje su se procjenjivale na skali od 5 stupnjeva (1 = *potpuno neprikladno* do 5 = *potpuno prikladno*). Veći rezultat Inventara metakognitivne osviještenosti upućuje na viši stupanj metakognitivne osviještenosti i regulacije. Turska verzija Inventara pokazala je adekvatnu internu pouzdanost, kao i test-retest pouzdanost nakon tri tjedna (.95 and .95, za svaku vrijednost pojedinačno) (Cohen, 1988).

Test čitanja misli iz očiju

Test čitanja misli iz očiju korišten je za mjerenje socijalne kognicije studenata. Može se smatrati i naprednim testom teorije uma (sudionici, kojima se pokaže fotografija, moraju se staviti u um osobe prikazane na fotografiji te odrediti njezino

odgovarajuće mentalno stanje) i testom prepoznavanja emocija (sudionici mogu donijeti prosudbu samo na temelju izraza lica). Test čitanja misli iz očiju, koji su izradili Baron-Cohen i sur. (2001), a turskom kontekstu prilagodili Yıldırım, Kasar, i Güdük (2011), sastoji se od 32 tvrdnje s fotografijama očiju i područja oko očiju, a koje prikazuju emocionalna ili neutralna mentalna stanja. Studenti odgovaraju na svaku tvrdnju (slika 1) tako što s njom spajaju semantičke definicije (4 opisne riječi) mentalnoga stanja („ozbiljan", „posramljen", „zabrinut" i „zbunjen").

Slika 1

Svaka fotografija koja se u testu koristi ocjenjuje se 1 bodom (točno) ako je odgovor točan ili s 0 bodova (netočno) ako je odabrana pogrešna riječ. Ukupan rezultat na Testu čitanja misli iz očiju kreće se u rasponu od 0 do 32 (0 = nizak stupanj socijalne kognicije i/ili slaba sposobnost prepoznavanja osjećaja i interpretacije misli drugih ljudi gledajući ih u oči; 32 = visok stupanj socijalne kognicije i/ili velika sposobnost prepoznavanja osjećaja i interpretacije misli drugih ljudi gledajući ih u oči). Turska verzija Testa čitanja misli iz očiju pokazala je odgovarajuću internu pouzdanost s Kuder-Richardsonovim 20 koeficijentom od 0,72 te prihvatljivu test-retest pouzdanost s međuklasnim korelacijskim koeficijentom od 0,65 (Cohen, 1988).

Akademska postignuća

Prosječna ocjena izračunava se pomoću omjera pojedinačnih ocjena i broja ECTS bodova u prethodnom semestru. Služila je kao pokazatelj trenutačnoga akademskog uspjeha studenata na fakultetu. U Turskoj su prosječne ocjene koje su analizirane u ovome istraživanju temeljene na postotnom sustavu, gdje 0 pokazuje jako slab uspjeh, dok 100 pokazuje izvrstan uspjeh.

Statističke analize

U preliminarnim analizama provedenima prije medijacijske analize, provjerene su pretpostavke (linearnost, normalnost, homogenost ili varijance pogreške) te nisu uočena nikakva odstupanja. Nakon toga su kroz tri faze ispitane veze među varijablama. U prvoj fazi izračunati su Pearsonovi koeficijenti korelacije kako bi se ispitale međusobne korelacije između socijalne kognicije (teorije uma), metakognicije (znanja o kogniciji i regulacije kognicije) i akademskih postignuća (prosječne ocjene). U drugoj fazi provedena je stupanjska višestruka regresijska analiza pomoću varijabli iz prve faze, a koje imaju značajne međusobne korelacije, dok su dob i spol kao varijable bile kontrolirane. Stupanjska selekcija pokazuje da se višestruke kovarijable sa statistički značajnim učinkom mogu koristiti i da mogu istovremeno biti prilagođene jedna drugoj u regresijskom modelu, kao i da se interakcije među njima mogu procijeniti (Steyerberg, Eijkemans i Habbema, 1999).

Na kraju, u trećoj fazi, testirana su dva medijacijska modela koja kontroliraju dob i spol. Za testiranje glavnih medijacijskih hipoteza korišten je PROCESS macro za

SPSS (Hayes, 2012). Zatim je izračunat ukupan učinak nezavisne varijable (teorije uma) na izlazne varijable, izravan učinak nezavisnih varijabli na izlazne varijable, ukupan neizravan učinak kroz medijator (regulacija kognicije) te neizravan individualni učinak na medijatora. Ponovno uzorkovanje *bootstrap* metodom (5000 iteracija) korišteno je kako bi se došlo do robusnih *bootstrap* standardnih pogrešaka (SE) i 95 % ubrzanih intervala pouzdanosti s korigiranom pristranošću (BCa i CIs) za učinke medijacije. Ako je *bootstrap* vrijednost intervala pouzdanosti prešla vrijednost 0, isključena je značajnost indirektnoga učinka (Putanja Putanja =). *Bootstrap* pristup objašnjava nenormalnost distribucije uzorkovanja za indirektan učinak te tako služi kao superioran pristup medijacijskoj analizi (Preacher i Hayes, 2008). Sve analize provedene su pomoću IBM statističkoga paketa za društvene znanosti 21.0 (SPSS, 2012).

Rezultati
Korelacijske analize

Pearsonove korelacije između varijabli korištenih u istraživanju (teorija uma, prosječna ocjena, znanje o kogniciji i regulacija kognicije) prikazane su u tablici 1. Kao što se i očekivalo, prosječna ocjena u pozitivnoj je vezi s teorijom uma i metakognitivnim konstruktima – znanjem o kogniciji (KNOOFCOG) i regulacijom kognicije (REGOFCOG). Nijedan od tih konstrukata nije značajno povezan s teorijom uma.

Tablica 1

Medijacijske analize

Primijenjeni su višestruki regresijski postupci kako bi se testirala hipoteza da metakognicija (znanje o kogniciji i regulacija kognicije) posreduje učinke socijalne kognicije (teorije uma) na akademska postignuća (prosječnu ocjenu). U regresijskom modelu primijenjena je stupanjska metoda selekcije. Shodno tomu, pretpostavljeno je da je prosječna ocjena zavisna varijabla, dok su znanje o kogniciji, regulacija kognicije i teorija uma unesene u regresijski model kao nezavisne varijable. Dob i spol kao varijable bile su kontrolirane u svim fazama. Ukupna varijanca objašnjena modelom bila je 14 % $F(3, 194) = 10.89$, $p < .001$. U konačnom modelu, samo su regulacija kognicije ($F(3, 194) = .12$, $p < .001$) i teorija uma ($F(3,194) = .51$, $p < .001$) bile statistički značajne, ali znanje o kogniciji nije ($F(3, 194) = .11$, p = .32). Uzimajući to u obzir, provedene su sljedeće medijacijske analize s prosječnom ocjenom, regulacijom kognicije i teorijom uma kao varijablama. Testirana su dva modela (Model A i Model B), u kojima su regulacija kognicije i teorija uma tretirane kao medijator i nezavisna varijabla, ili obrnuto. Rezultati medijacijske analize, gdje je regulacija kognicije testirana kao medijator, prikazani su na slici 2. Rezultati medijacijske analize u kojoj je teorija uma testirana kao medijator prikazani su na slici 3.

Prvo je analiziran Model A (regulacija kognicije je medijator između teorije uma i prosječne ocjene), a kriteriji (Baron i Kenny, 1986) koji su doveli do zaključka da

medijacija postoji bili su sljedeći: (1) teorija uma (prediktor) ima značajan direktan učinak na prosječnu ocjenu (kriterijsku varijablu); (2) teorija uma (prediktor) ima značajan učinak na regulaciju kognicije (medijator); (3) regulacija kognicije (medijator) predviđa jedinstvenu varijancu u prosječnoj ocjeni (kriterijskoj varijabli) te (4) izravan učinak teorije uma (prediktora) na prosječnu ocjenu (kriterijsku varijablu) značajno je smanjen nakon kontroliranja indirektnoga učinka koji ima regulacija kognicije (medijator). Rezultati su pokazali da je teorija uma značajan prediktor regulacije kognicije i značajan prediktor prosječne ocjene (vidi sliku 2), što ide u prilog prvom i drugom uvjetu medijacijske analize. Slično tome, regulacija kognicije značajno je predvidjela smanjenu prosječnu ocjenu nakon kontroliranja teorije uma, što ide u prilog trećem uvjetu. Na kraju, teorija uma značajno je predvidjela prosječnu ocjenu nakon kontroliranja indirektnoga učinka teorije uma kroz regulaciju kognicije.

Slika 2

S tim u vezi, korišteni su *bootstrap* pristupi kako bi se odredilo je li indirektan učinak teorije uma na prosječnu ocjenu putem regulacije kognicije značajan. Procijenjeno je da je indirektan učinak između -0,17 (95 % donje granice intervala pouzdanosti) i -0,08 (95 % gornje granice intervala pouzdanosti) s 5000 iteracija ponovnoga uzorkovanja. To je pokazalo da regulacija kognicije djelomično posreduje učinak teorije uma na prosječnu ocjenu u prvome modelu, Modelu A. Putanja (i putanja (bile su značajne. Dok je putanja bila značajna, putanja bila je manja od putanje (= .51 vs = .54). Kada se analiziraju usporedno, teorija uma imala je značajniji indirektan učinak na prosječnu ocjenu djelomično posredovan regulacijom kognicije (= .14, BCa 95 % CIs = -.17 – -.08).

Sljedeća je analiza Modela B (teorija uma je medijator između regulacije kognicije i prosječne ocjene). Kriteriji (Baron i Kenny, 1986) koji su doveli do zaključka da medijacija postoji bili su sljedeći: (1) regulacija kognicije (prediktor) ima značajan izravan učinak na prosječnu ocjenu (kriterijsku varijablu); (2) regulacija kognicije (prediktor) ima značajan učinak na teoriju uma (medijator); (3) teorija uma (medijator) predviđa jedinstvenu varijancu u prosječnoj ocjeni (kriterijskoj varijabli) i (4) direktan učinak regulacije kognicije (prediktora) na prosječnu ocjenu (kriterijsku varijablu) značajno je smanjen nakon kontroliranja indirektnoga učinka koji ima teorija uma (medijator). Rezultati su pokazali da je regulacija kognicije bila značajan prediktor teorije uma i značajan prediktor prosječne ocjene (vidi sliku 3), što podržava prvi i drugi uvjet medijacijske analize. Slično tome, teorija uma značajno je predvidjela smanjenu prosječnu ocjenu nakon kontroliranja regulacije kognicije, što podržava treći uvjet. Na kraju, regulacija kognicije značajno je predvidjela prosječnu ocjenu nakon kontroliranja indirektnoga učinka regulacije kognicije kroz teoriju uma.

Slika 3

Uzimajući to u obzir, primijenjen je *bootstrap* pristup kako bi se odredilo je li indirektan učinak regulacije kognicije na prosječnu ocjenu kroz teoriju uma značajan.

Slično Modelu A, indirektan učinak nije bio značajan (tj. vrijednost 0 nije se nalazila između intervala pouzdanosti *bootstrap* procjene). Procijenjeno je da je pravi indirektan učinak između -0,03 (95 % donje granice intervala pouzdanosti) i -0,01 (95 % gornje granice intervala pouzdanosti) s 5000 iteracija ponovnoga uzorkovanja. To upućuje na činjenicu da teorija uma posreduje učinak regulacije kognicije na prosječnu ocjenu u drugom modelu, Modelu B. Putanja (i putanja (bile su značajne. Dok je putanja bila značajna, putanja bila je manja od putanje (= .12 vs = .13). Kada se promatraju usporedo, regulacija kognicije imala je značajan indirektan učinak na prosječnu ocjenu koji je djelomično posredovala teorija uma (= .13, BCa 95 % CIs= -.03 – -.01).

Sve u svemu, kako su pokazali rezultati Modela A i B, regulacija kognicije posredovala je učinak teorije uma na prosječnu ocjenu kroz indirektnu putanju koja je kontrolirala dob i spol (vidi Model A na slici 2). Teorija uma posredovala je učinak regulacije kognicije na prosječnu ocjenu kroz indirektnu putanju koja je kontrolirala dob i spol (vidi Model B na slici 3). Ovi rezultati potvrđuju naše hipoteze jer je indirektan učinak teorije uma na prosječnu ocjenu kroz regulaciju kognicije bio značajan, a regulacija kognicije bila je djelomični medijator učinka između teorije uma i prosječne ocjene (Hipoteza 2). Kako je indirektan učinak regulacije kognicije na prosječnu ocjenu kroz teoriju uma bio značajan, teorija uma bila je djelomičan medijator učinka između teorije uma i prosječne ocjene (Hipoteza 4).

Rasprava

Dva obilježja karakteristična za ljudska bića su: (a) sposobnost da razmišljaju i budu svjesni vlastitoga misaonog procesa i (b) sposobnost da se druže i grade odnose s drugim ljudima (Pennington, 2000). Kada se gledaju zajedno, ova obilježja upućuju na teoriju uma: način na koji tumačimo, analiziramo i pamtimo informacije o društvenom svijetu (Baron i Branscombe, 2012). Teorija uma uključuje dva sastavna procesa: (a) socijalno-perceptualni proces pomoću kojega pojedinci dekodiraju mentalna stanja iz neverbalnih znakova (npr. očiju) i (b) socijalno-kognitivni proces pomoću kojega pojedinci razmišljaju o mentalnim stanjima drugih ljudi (npr. njihovim namjerama, osjećajima, percepcijama, lažnim uvjerenjima) (Sabbagh, 2004).

Ranija istraživanja teorije uma pokazala su da se oči mogu smatrati prozorom duše (Adams i sur., 2010) te stoga imaju istaknutu ulogu u mentalizaciji (Baron-Cohen i sur., 2001). Doista, područje oko očiju daje mnogobrojne informacije o ponašanju pojedinca i privlači puno više pažnje nego drugi dijelovi lica (Farroni, Csibra, Simion i Johnson, 2002) pa se stoga na njih često oslanjamo u društvenoj komunikaciji (Vinette, Gosselin i Schyns, 2004). Ako oči imaju ključnu ulogu u načinu na koji ljudi percipiraju i tumače informacije koje sami stvaraju (intrapersonalne) i koje „čitaju" u drugima (interpersonalne), tada se postavlja sljedeće pitanje: *postoji li jezik očiju*? Na temelju dokaza dobivenih u ranije provedenim istraživanjima (Adams i sur., 2010; Baron-Cohen i sur., 2001), zaista se čini da postoji jezik očiju koji nam pomaže da prepoznamo mentalna stanja drugih ljudi gledajući samo izraze

oko očiju. No, nije istraženo je li taj jezik povezan s akademskim postignućima i posreduje li u vezi između ta dva konstrukta metakognicija pa je to primarni fokus ovoga istraživanja.

U ovom istraživanju htjeli smo saznati jesu li teorija uma, znanje o kogniciji, regulacija kognicije i akademska postignuća međusobno važni kada se analiziraju veze između njih. Općenito govoreći, koristili smo medijacijsku analizu kako bismo ispitali ulogu (1) metakognicije kao medijatora između teorije uma i akademskih postignuća i (2) teoriju uma kao medijatora između metakognicije i akademskih postignuća. Rezultati su potvrdili prve hipoteze: (1) teorija uma značajno predviđa akademska postignuća, a taj se učinak djelomično povećava značajnim pozitivnim učinkom teorije uma na metakogniciju; (2) metakognicija je značajno predvidjela akademska postignuća, a taj se učinak djelomično povećava značajnim pozitivnim učinkom metakognicije na teoriju uma.

U vezi s medijacijskim modelom A (vidi sliku 2), pozitivan učinak teorije uma na metakogniciju općenito (Bartsch i Estes, 1996) i na samoregulaciju pogotovo (Zimmerman, 1989) bio je u skladu s istraživanjem koje je pokazalo da pojedinci s visoko razvijenom teorijom uma imaju bolju sposobnost reguliranja vlastite kognicije (Sperling i sur., 2000). Ovi rezultati donekle idu u prilog ranijim istraživanjima koja su naglašavala dobrobit teorije uma i izvršenja zadatka za metakogniciju (Flavell, Miller i Miller, 1993). Primjena zadataka baziranih na teoriji uma i na dubljem razumijevanju izvora znanja može pomoći u poticanju vještina samoregulacije, kao što su planiranje, evaluacija i praćenje (Sperling i sur., 2000). Na temelju rezultata ovoga istraživanja, koji pokazuju da više razine regulacije kognicije predviđaju i veću prosječnu ocjenu, može se smatrati da kroz poboljšanje procesa samoregulacije sposobnosti teorije uma mogu poboljšati proces učenja kod studenata, a samim time i akademska postignuća koja se mjere pomoću prosječne ocjene.

Stoga bi bilo korisno kada bi obrazovni djelatnici i istraživači razmotrili mogućnost formulacije metakognicije u kombinaciji s detaljnim razumijevanjem teorije uma i primijenili je u radu sa studentima čija su akademska postignuća slabija. To bi im moglo pomoći da aktiviraju procese samoregulacije i poboljšaju akademske ishode. Na primjer, obrazovni djelatnici mogli bi koristiti teoriju uma i problemske zadatke u kombinaciji i tako pomoći slabijim studentima u razumijevanju namjera i predvidjeti njihov uspjeh. Tada bi mogli dobiti dokaze o sustavnom pristupu.

Rezultati medijacijskoga modela B (vidi sliku 3) bili su u skladu s rezultatima ranijih istraživanja (Flavell, 2004; Wellman i Gelman, 1998) koja su konceptualizirala razvoj metakognitivne osviještenosti kod ljudi i regulaciju kao proizvod teorije uma. Osim toga, rezultati su pokazali da viša razina teorije uma predviđa višu prosječnu ocjenu. Moguće je da kroz poboljšanje socijalnih interakcija i razumijevanje mentalnih stanja pri socijalnoj interakciji metakognitivna regulacija može poboljšati akademska postignuća. Predlažemo da se bolje razumijevanje metakognicije temelji na sveobuhvatnijem tumačenju teorije uma, a ono zahtijeva i bolje razumijevanje

veze između teorije uma i akademskih postignuća. Nadamo se da će ovo istraživanje poslužiti kao odskočna daska za ulogu takvih mehanizama (kognitivnih/nekognitivnih psiholoških fenomena, društvenih/nedruštvenih iskustava) u akademskim postignućima.

Ovo je istraživanje imalo brojna ograničenja koja je trebalo uzeti u obzir kada su se tumačili rezultati. Kao prvo, sudionici su bili studenti dodiplomskog studija Ranog i predškolskog odgoja. Kako je to relativno mala populacija, ograničena je i generalizacija rezultata istraživanja. Potrebno je u budućnosti provesti slična istraživanja na raznolikom uzorku (studenti obrazovnih studija, strojarstva, prirodnih znanosti). Kao drugo, sudionici se nisu dijelili prema stupnju akademskih postignuća, pa tako nije jasno u kojoj bi se mjeri ovi rezultati mogli generalizirati i na studente s niskim, osrednjim i visokim akademskim postignućima. Potrebno je u daljnjim istraživanjima ispitati medijatorske uloge socijalne kognicije i metakognicije na posebnim uzorcima studenata s niskim, osrednjim i visokim akademskim postignućima. Opažanja općenito, protokoli razmišljanja naglas ili intervjui mogli bi pružiti dodatni uvid u teoriju uma i regulaciju kognicije kod studenata. Na kraju, presječni dizajn kojim smo se koristili u ovome istraživanju ne dozvoljava zaključke o kauzalnosti s obzirom na veze između teorije uma, metakognicije i akademskih postignuća. Buduća bi istraživanja trebala koristiti eksperimentalni dizajn tako što bi provela intervencije u teoriju uma i/ili metakogniciju (metakognitivni trening prije rješavanja zadataka teorije uma) kako bi se razjasnila kauzalna direkcionalnost. Osim toga, longitudinalni dizajn također se može koristiti kako bi se razjasnila razvojna trajektorija teorije uma povezana s regulacijom kognicije, a samim time i s akademskim postignućima.

Usprkos navedenim ograničenjima, rezultati ovoga istraživanja daju svoj doprinos već provedenim istraživanjima te idu u prilog vezama između teorije uma i metakognicije (Sperling i sur., 2000), metakognicije i akademskih postignuća (Sperling i sur., 2002) te dodatno naglašavaju moguće dobrobiti teorije uma za akademska postignuća. Taj je fenomen u svojim ranim fazama, a mogao bi poslužiti za informiranje obrazovne zajednice te će vjerojatno doprinijeti načinu na koji obrazovni djelatnici shvaćaju akademska postignuća svojih studenata.

The Effect of Teacher Characteristics on Student Achievement: A Meta-Analysis Study

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Abstract

Hypothesizing that teacher characteristics may have an impact on learning outcomes, the current study tested this assumption, presenting statistical evidence of the findings. In this meta-analysis study, teacher characteristics were determined in the light of the existing literature, followed by an analysis of the relationships between teacher characteristics and student achievement. The analysis protocol of the literature review encompassed a total of 1,042 correlational values drawn from 209 independent research articles or theses/dissertations, which included 3,225,488 study subjects. The results of the application of a random effect model showed that teacher characteristics had a low-level positive effect on student achievement. The positive effect is discussed in terms of teacher competences and qualifications. In the context of the components of teacher characteristics, the effects of all dimensions in the framework were found to be significant. More specifically, student achievement was found to be influenced at the greatest level by teachers' personal qualities, while it was least impacted by instructional management. Some suggestions are recommended for future studies in light of the conclusions.

Keywords: *meta-analysis; student achievement; teacher characteristics*

Introduction

Teachers, as the individuals directly involved with learners, play a key role in achieving the goals of education and are critical in shaping educational activities. This role has evolved over the course of time. For instance, in the 21st century, considerable changes

have been made in terms of educational philosophy, resulting in approaches such as "learning to learn," rather than passive acquisition of pre-determined topics; or "active learning" in place of passive reception of information (Güler, 2014). These evolving philosophies have led to discussions on the impact of teachers' knowledge, skills and affective features on the learning process. Moreover, due to the failure of research to define systematic relationships between policy variables and student achievement, recent studies have focused specifically on "teacher variables" (Kukla-Acevedo, 2009). Likewise, in this study, we touch briefly on teacher characteristics identified in the literature as relevant to student achievement. Afterwards, we present a framework of teacher characteristics in accordance with our synthesis of the literature.

Teacher Characteristics

In discussing the qualities and characteristics of an effective teacher, one important element is noted the knowledge needed to teach a topic or concept. In this regard, educational studies have reached a consensus on the types of knowledge that a teacher should possess. The idea of knowledge for teaching was systematically introduced for the first time by Shulman (1986), whose work later inspired other researchers, and the types of knowledge were adapted to various disciplines, such as mathematics, physics, and so on (e.g., Ball, Thames, & Phelps, 2008; Grossman, 1990; Koehler & Mishra, 2009). This type of knowledge concerns the *professional knowledge* that the teacher should have and comprises pedagogical knowledge and knowledge for teaching, along with content knowledge of the course to be taught (Baki, Baki, & Arslan, 2011). Many educators have indicated that a teacher's professional knowledge is related to student achievement (Metzler & Woessmann, 2012; Selling, Gargia, & Ball, 2016), a claim that has been supported by the findings of Baumert et al. (2010), who showed a substantial positive impact of pedagogical content knowledge on student learning.

From another perspective, the teacher's use of professional knowledge in the classroom is also related to instructional management. In other words, effective teaching knowledge requires an adequate approach to classroom organization. Instructional management consists of a series of components, from how the classroom is arranged to the teaching styles and teaching practices to be used within the classroom (Martin & Sass, 2010). The main purpose of instructional management is to create a classroom environment that is beneficial to student achievement; however, while it has been emphasized that instructional management is an influential indicator of teacher effectiveness (Corbett & Wilson, 2002), no consensus exists on which method or strategy is more appropriate for increasing student achievement (Brannon, 2010; Churchward, 2009). On the other hand, it is generally accepted that a student-centred approach provides greater motivation to learn, deeper conceptual understanding of the material, and a more positive attitude toward the subject being taught (Collins & O'Brien, 2003; Meyers & Jones 1993). As such, new curricula are often developed according to a constructivist approach, which defers to student-based learning (Henson, 2015; Tan, 2017).

Moreover, teachers, as a part of their school organization, are constantly communicating with their colleagues, school administrators and students. According to attachment theory (Ainsworth, 1982), one of the basic assumptions is that positive relationships between teachers and students are essential for a safe and secure learning setting, enabling scaffolding for academic achievement as well as developing social skills (Košir & Tement, 2014; O'Connor, Dearing, & Collins, 2011). Thus, in addition to professional knowledge and instructional management, social factors are considered in terms of teacher characteristics. In a detailed study, Lee (2012) investigated whether student-teacher relationships affect student achievement using OECD USA data. As expected, he found that the student-teacher relationship was a significant predictor of reading performance in American high school students. Furthermore, in their critical review, Stronge, Tucker, and Hindman (2004) detailed the characteristics of effective teachers as a social phenomenon, referring to humour, caring, respect and fairness as components of social interaction with students. Finally, communication has been highlighted as a crucial element of socialization between students and teachers and is accepted as another component that affects student achievement. Given the critical role of communication in motivating students to engage in a topic (Robinson & Xavier, 2007), Stronge et al. (2004) assert that "effective communicators are likely to be more effective teachers" (p. 10).

In addition to the social factors mentioned above, teachers' personal qualities are crucial in the teaching and learning process. According to Sandel (2006), the personal qualities of teachers are key to student achievement, yet they are often overlooked. Different and independent from social factors, personal qualities relate to teachers' self-characteristics, such as self-communication skills (Prozesky, 2000), effort, morality, openness to new ideas or approaches (Hare, 2002), readiness to teach, and beliefs about teaching and learning (Ernest, 1989). In a recent study, Timmermans et al. (2016) investigated the link between teachers' expectations and student achievement and found a positive relationship. Similarly, in his book on the philosophy of mathematics education, Ernest (1991) discussed how teachers' beliefs affect their instructional decisions and drew a conceptual framework for the case of mathematics. Furthermore, another study by Xu (2012) revealed the impact of teachers' beliefs on teacher consciousness, teaching methods and teaching policy. On the other hand, in investigating another component of personal qualities, Loy (2006) demonstrated the impact of communication skills in a learning setting on student achievement; while Klusmann, Richter, and Lüdtke (2016) also tested whether teachers' emotional exhaustion impacts student achievement and found a negative relationship between those variables.

Finally, related to but distinct from professional knowledge, teachers' backgrounds may also affect student achievement. In this sense, background refers to the source of a teacher's fund of knowledge. For instance, whether the type of school from which a teacher has graduated is a variable in the success of their students is a question that has been frequently studied (e.g., Alexander & Fuller, 2004; Wenglinsky, 2000). Alexander

and Fuller (2004), for example, compared the scores on the Texas Assessment of Academic Skills (TAAS) of students who were taught by certified teachers compared to those taught by non-certified teachers. Their results revealed a statistically significant difference in favour of students of certified teachers. Similarly, teaching experience (years of teaching) and teaching degrees are seen as important components of background. In this regard, Sauceda (2017) investigated whether both years of experience and teaching degree had an impact on student achievement and revealed a positive relationship, as expected. Similar findings have been reported by researchers such as Dial (2008), Ferguson (2005) and Woolridge (2003).

Given all of the characteristics and qualities discussed above, we have constructed a conceptual relational network in order to frame our meta-analysis in a rational manner. The network is illustrated below, in Figure 1.
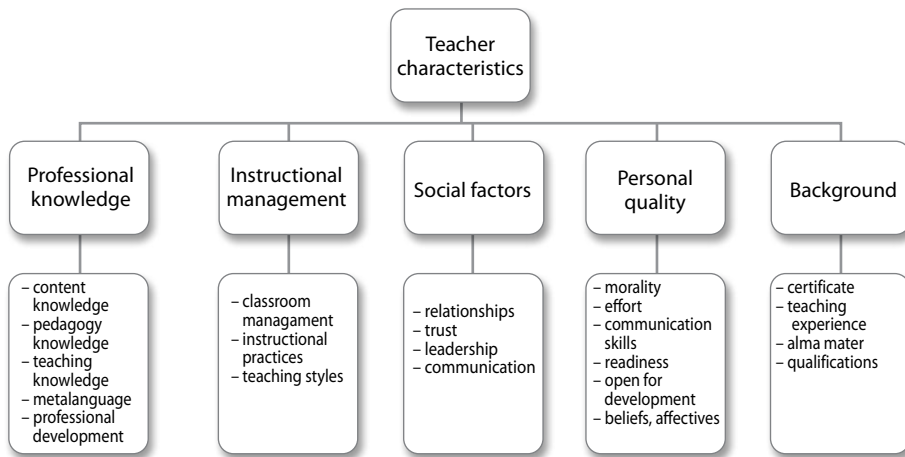

Figure 1. Components of teacher characteristics

Many researchers have arrived at the consensus that teacher characteristics have an important effect on student achievement. However, the extent of this importance is open to discussion and has multi-dimensional characteristics. Moreover, the effect of teacher characteristics on student achievement is a complicated issue, as academic achievement can be influenced by many factors, both in school and out of school. Furthermore, it is very difficult to test the effect of teacher characteristics on student achievement alone, and the generalizability of data obtained from a limited number of subjects is rather low. Due to these limitations, investigating the effects of characteristics from different perspectives using a large number of studies and reaching a general conclusion can give more reliable results.

Numerous studies have investigated the relationship between teacher characteristics and student achievement, ranging from issues such as teachers' professional knowledge to instructional management style, personal qualities, background and social factors. However, differing results were found concerning the effects of various factors on student

achievement. For example, while Gbore and Daramola (2013) revealed that teachers' backgrounds had a high correlation to student achievement, Bice (2016) found a low correlation between social factors and achievement. Likewise, differences have been noted in terms of subjects being taught. Bird (2017), for instance, found a significant relationship between students' science achievement and teachers' personal qualities, while he found a negative relationship for language. In addition, while Wilson (2012) found no relationship between student achievement and instructional management at the elementary school level, Akbari and Allvar (2012) did observe that classroom management had an impact on achievement at the high school level.

As can be seen in these examples, the effect of teacher characteristics on student achievement is influenced by many variables, such as subjects taught and grade levels. Moreover, aside from these issues, the roles of teachers varying with time have often been mentioned by researchers. As Cranston (2000) points out, teachers' skills and knowledge competencies, as well as their classroom activities, are in the process of change in the 21st century. Moreover, when the cultural dimension of education is considered, it has also been that this differentiation varies according to country. For example, Nortvedt et al. (2016) revealed a surprising conclusion in their large-scale study, which examined 37 education systems in TIMSS 2011 and PIRLS 2011 and revealed a significant positive correlation between instructional quality and reading and mathematics achievement in fewer than half the participating educational systems. This raises the question of whether the effect of teacher qualities on student achievement varies from country to country. Finally, it has been observed that the changing role of education and schools inevitably brings about changes in the roles of teachers, as well, requiring them to adapt accordingly (Griffin, Care, & McGaw, 2012). This brings to mind the question of how the characteristics of teachers impacting student achievement have changed over time.

Research Hypotheses

Considering the variables mentioned above, and considering the existing studies on the relationship between teacher characteristics and student achievement, this study aimed to test the following hypotheses, bringing together the results of previous research:

H_1 Teacher characteristics have a positive effect on student achievement.

H_2 The sample group is a moderator for the positive effect of teacher characteristics on student achievement.

H_3 The school subject/course is a moderator for the positive effect of teacher characteristics on student achievement.

H_4 Country is a moderator for the positive effect of teacher characteristics on student achievement.

H_5 The year in which a study was conducted is a moderator for the positive effect of teacher characteristics on student achievement.

H_6 The type of teacher characteristics is a moderator for the positive effect of expectation on student achievement.

Method

Study Design

In this study, the effect of teacher characteristics on student achievement was tested through meta-analysis, which is a research design used to gather the results of several independent studies on certain subjects and to apply a statistical analysis to the findings (Littel et al., 2008; Petitti, 2000; Wampold, Ahn, & Kim, 2000).

Review Strategy and Criteria for Inclusion/Exclusion

To determine which studies to include in the meta-analysis, the Science-Direct, ProQuest and EBSCO academic databases were used to conduct a review of the literature. For this process, the titles of the studies were screened for the appearance of the terms *teacher* and *achievement/ success/ performance,* while the main texts were screened for the term *correlation.* Since there is a very high volume of studies on teacher characteristics, the term "teacher" was used as a keyword to search the databases for relevant research on teacher characteristics. The start and end dates for the research to be included in the current study were identified as January 1, 2000, and December 31, 2017; i.e., research published between these dates was included. Types of research that were targeted included doctoral dissertations and master's theses, as well as peer-reviewed journals. The reason for the inclusion of the dissertations and theses was to eliminate possible publication bias.

A number of strategies were used to identify the research studies that were appropriate for the meta-analysis. Firstly, the full-text studies that were identified according to the review strategy explained above were examined via their titles and abstracts to determine their relevance to the aim of this research. Secondly, a study pool of 1321 documents was established by downloading the seemingly relevant studies according to their titles and abstracts after refining all the studies according to the keywords. Thirdly, all studies in the pool were examined in detail to see whether they meet the criteria to be included in the meta-analysis. At this stage, the relevant studies including the required quantitative measures were coded, while those studies that did not meet the criteria set by the researchers were omitted from the analysis. According to the results of the coding, a total of 209 of the studies in the pool were found to be appropriate, while 1112 of them were found to be irrelevant and were hence eliminated. The 209 studies yielded 1042 correlation coefficients. The descriptive statistics of the 209 studies included in the analysis are presented in Table 1.

The criteria for inclusion of the studies in the analysis were identified as follows:

❏ To have the statistical information necessary for correlational meta-analysis (n and r, or R^2 values);
❏ To be a study measuring the correlation between a sub-domain of teacher characteristics and student achievement/ success/ performance.
❏ Reasons for not including a study in the meta-analysis were as follows:

❑ Having no quantitative data (i.e., qualitative research);
❑ Not having a correlation coefficient;
❑ Not focusing on student achievement;
❑ Not focusing on teacher characteristics.

Table 1

Characteristics of the studies included in the meta-analysis

Options		1	2	3	4	5	6	Total
Type of publication		Article	Thesis/ Dissertation					-
	n	231	811					1042
	%	22.1	77.9					100
Sample group/unit		Preschool	Elementary school	Midd le school	High school	University	Mixed	
	n	71	377	178	221	28	167	1042
	%	6.9	36.2	17.1	21.2	2.6	16	100
School subject/ course		General	Language	Mathematics	Science	Other		
	n	167	308	418	113	36		1042
	%	16	29.5	40	10.8	3.4		100
Country		V-C	H-I					
	n	82	960					1042
	%	7.9	92.1					100
Publication year		2000-2005	2006-2011	2012-2017				
	n	169	447	426				
	%	16.2	42.9	40.9				100
Type of teacher characteristics		Background	Instructional	Personal quality	Professional knowledge	Social factors		
	n	207	221	405	14	195		1042
	%	19.8	21.2	38.8	1.3	18.9		100

Coding Process

The coding process was essentially a data sorting process used to ascertain which data were clear and suitable for the study. In this scope, a coding form was developed before the statistical analysis was conducted, and the coding was conducted according to the form. The main aim was to develop a specific coding system that allowed the researchers to see the entirety of the studies in a general way, without missing any of the characteristics of each individual study. The coding form that was developed for this study was comprised of:
❑ References for the research;
❑ Sample information;
❑ Type of publication;

❑ Sample group;
❑ School subject/course;

❏ Country;
❏ The years in which the studies were conducted;
❏ Type of teacher characteristics;
❏ Quantitative values (n and r or R^2).

Although all the studies with a correlation coefficient between teacher characteristics and student achievement were coded, not all of them were included in the meta-analysis. One of the reasons for this was that some of the studies examined the relationship using more than one sub-domain of the teacher characteristics determined in our theoretical framework as an integrated characteristic, rather than examining them separately. Hence, we could not decide under which sub-domain to include those correlations. Another reason for exclusion was that the studies included teacher characteristics irrelevant to those that were defined in the theoretical framework, such as teacher salary and teacher absence.

Data Analysis

The effect size acquired in the meta-analysis was a standard measurement value used in the determination of the strength and direction of the relationship in the study (Borenstein, Hedges, Higgins, & Rothstein, 2009). Pearson's correlation coefficient (r) was determined to be the effect size in this study. Because the correlation coefficient has a value between *+1* and *-1,* the *r*-value was evaluated by converting it into the value as it appears in the *z* table (Hedges & Olkin, 1985). Provided that more than one correlation value was given between the same structure categories in correlational meta-analysis studies, two different approaches were used in the determination of which to use in the meta-analysis (Borenstein et al., 2009; Kulinskaya, Morgenthaler, & Staudte, 2008). For the purposes of this study, (*i*) if the correlations were independent, all the related correlations were included in the analysis and were considered to be independent studies; and (*ii*) if there were dependent correlations, then the *highest correlation value* was accepted. Since we wanted to encompass all teacher characteristics, we attempted to include all the independent correlations in our analysis. Moreover, a *random-effect model* was used for the meta-analysis processes in this study, and the *Comprehensive Meta-Analysis* (CMA) program was applied. In interpreting the values obtained from CMA, Cohen's criterion (1988) for effect size was considered. In accordance with Cohen, the values between 0.10 – 0.30 were identified as a low (small), between 0.30 – 0.50 as a medium and 0.50 and greater as a high (large) effect size.

Moderator analysis

Moderator analysis is a method used to test the direction of the differences between subgroups and between the average effect sizes of the variables (Karadağ, Bektaş, Çoğaltay, & Yalçın, 2015). The statistical significance of the difference between moderator variables is tested using the Q statistic method developed by Hedges and Olkin (1985). Through this method, Q-within (Qw) tests the internal homogeneity

of the moderator variable, while Q-between (Qb) tests the homogeneity between the groups (Borenstein et al., 2009).

To determine the statistical significance of the differences between the moderators of the study, only the Q_b values were used. Five moderator variables that were expected to have a role in the average effect size were identified in the study. The first of these was the *sample group,* which was thought to play a role on the average impact of teacher characteristics on student achievement. The second was the type of teacher characteristics, which was also thought to have an effect on the relationship between teacher characteristics and student achievement. The others were *school subject/course, country* and *year in which the studies were conducted.*

Reliability and validity

To ensure the reliability and validity of the research, we took into consideration the following:

- For inclusion and exclusion, we evaluated the field related to the research variables and attempted to include all related studies except those that were irrelevant. We carried out a thorough literature review to outline the components of teacher characteristics, making an effort to include distinct and comprehensive categories. The criteria for inclusion and exclusion are presented in the methodology section. In this sense, the authors attempted to include all correlations related to different teacher characteristics but not to include repeated measures.
- The moderator analysis assisted in examining the effects from different perspectives as a means to reach more appropriate conclusions.
- Publication bias was examined to determine whether it influenced the effect size.
- To determine the reliability of the coding system, two researchers performed the coding process independently. Cohen's Kappa reliability coefficient was determined between the coders to be .91, which is an acceptable value for reliability.

Publication Bias

A funnel plot was used to determine the existence of publication bias in the studies selected for the analysis. Evidence from the funnel plot that publication bias affected the studies can be seen in Figure 2. A serious asymmetry would be expected in the funnel plot if there were a publication bias. In this regard, the concentration of the plots on one side under the line of average effect size, particularly in the bottom section of the funnel, would suggest the probability of publication bias in the studies. In the present study, no evidence of partiality of the publications was observed in any of the 1042 data points subjected to meta-analysis.

Although no partiality in publications was observed in the funnel plot, the results of Duval and Tweedie's trim and fill test, which was applied to determine the effect of partiality in publications acquired with the meta-analysis using the random effect model, have also been examined. As is seen in Table 2, there is no difference between

the effect observed and the artificial effect size created to address the effect of the partiality of the publications. The research on each side of the centre line is symmetrical; this is an indicator of non-difference. Because there is no evidence indicating lost data on either side of the centre line, the difference between the fixed effect size and observed effect size is zero.
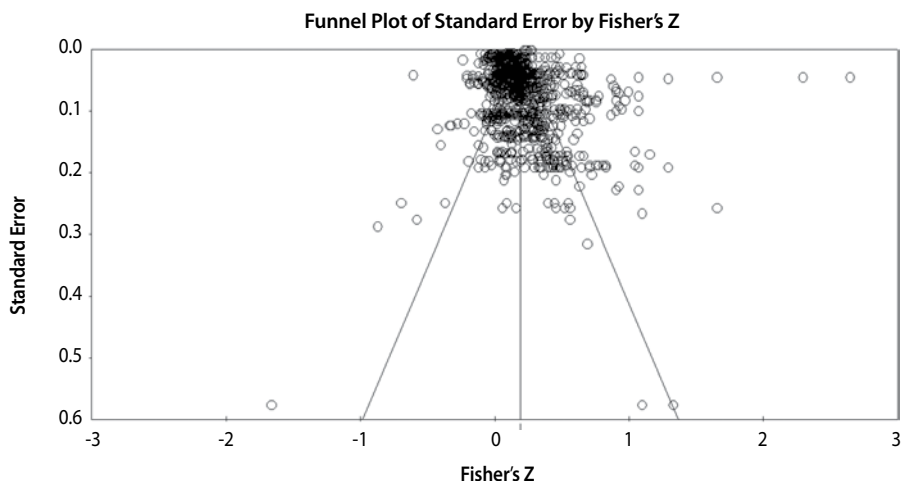

Funnel Plot of Standard Error by Fisher's Z

Figure 2. Effect size funnel for publication bias

Table 2

Duval and Tweedie's trim and fill test results

	Excluded Studies	Point Estimate	CI (Confidence Interval)		Q
			Lower Limit	Upper Limit	
Observed values		.19	.19	.20	45155.37
Adjusted values	0	.19	.19	.20	45155.37

Table 3 shows the results of the meta-analysis in terms of student achievement and teacher characteristics. The findings supported H_1, which posits that there is a positive relationship between student achievement and teacher characteristics. The effect size of teacher characteristics on student achievement was calculated to be .19. This value shows that teacher characteristics have a low-level effect (see Cohen, 1988) on student achievement.

The findings also supported hypothesis H_2, which asserts that the sample group plays a moderator role on the level of effect that teacher characteristics have on student achievement. The moderator analysis showed that the difference between the level of effect of a sample group was statistically significant ($Qb=117.650, p<.01$). In line with this, the analysis revealed that the level of effect of teacher characteristics on student achievement is statistically significant for preschool [r=.22], elementary school [r=.17], middle school [r=.14], high school [r=.26], university [r=.22], and mixed school levels [r=.19]; and all these effect sizes can be accepted to be low-level.

Table 3

Findings regarding the relationship between student achievement and expectation: Meta-analysis results

Variable	K	N	R	CI (Confidence Interval)		Q	Q$_b$
				Lower Limit	Upper Limit		
Teacher Characteristics	1042	3,225,488	.19*	.18	.20	**45155.37***	
Moderator [Sample Group]							**117.650***
Preschool	71	68,775	.22*	.20	.25		
Elementary school	377	477,526	.17*	.16	.19		
Middle school	178	297,736	.14*	.12	.16		
High school	221	2,272,302	.26*	.24	.28		
University	28	30,380	.22*	.18	.26		
Mixed	167	78,769	.19*	.17	.21		
Moderator [School Subject/ Course]							**107.677***
General	167	166,279	.22*	.20	.24		
Language	308	293,517	.22*	.20	.23		
Mathematics	418	2,587,752	.15*	.13	.16		
Science	113	160,025	.21*	.19	.23		
Other	36	17,915	.32*	.28	.35		
Moderator [Country]							**24.358***
V-C	82	57,659	.26*	.23	.29		
H-I	960	3,167,829	.19*	.18	.20		
Moderator [Year of Publication]							**0.553**
2000-2005	169	1,946,331	.20*	.18	.21		
2006-2011	447	613,758	.19*	.18	.20		
2012-2017	426	665,399	.19*	.18	.20		
Moderator [Type of Teacher Characteristics]							**248.941***
Background	207	2,132,912	.14*	.12	.15		
Instructional management	221	412,189	.13*	.11	.15		
Personal Quality	405	455,209	.27*	.26	.28		
Professional Knowledge	14	5,451	.23*	.16	.30		
Social Factors	195	219,727	.17*	.15	.18		

*p<.01

The moderator analysis likewise supported hypothesis H$_3$, which presumes that school subject/course is a moderator variable for the effect of teacher characteristics on student achievement, as there was a statistically significant difference in the level of effect for school subjects (Qb=107.677, p<.01). The findings also revealed that the level of effect of teacher characteristics on student achievement is statistically significant and low for general achievement [r=.22], for language [r=.22], for mathematics [r=.15], for science [r=.21], and for other courses such as sociology, history, physical science and so on) [r=.32].

Moreover, the results of the moderator analysis showed that hypothesis H_4, regarding the moderator role of the country on the level of effect of teacher characteristics on student achievement, was also supported. The moderator analysis also showed that the difference between the level of effect of countries was statistically significant (Qb=24.358, p<.01). In this scope, it was found that teacher characteristics in studies conducted in vertical-collectivist [r=.26] and horizontal-individualist [r=.19] countries had a low-level effect on student achievement, and the countries with the higher level of effect were found to be vertical-collectivist cultures.

The results did not support H_5, which hypothesized that publication year plays a moderator role in expectation having an effect on student achievement. Namely, the moderator analysis did not reveal a statistically significant difference in the level of effect for publication year of the studies (Qb=0.553, p>.05), suggesting that the strength of the relationship is similar among publications from different time intervals. On the other hand, a low-level effect of teacher characteristics on student achievement was found in regard to publications dated between 2000 and 2005 [r=.20], between 2006 and 2011 [r=.19], and 2012 and 2017 [r=.19].

In comparing the strength of the relationships across types of teacher characteristics (H_6), it was found that the average weighted correlation for each type of teacher characteristic and student achievement was significantly different (Qb=248.941, p<.01). Additionally, it was found that the effect of teacher background [r=.14], instructional management [r=.13], personal qualities [r=.27], professional knowledge [r=.23], and social factors [r=.17] on the student achievement were significant and low-level. Hence, it was found that personal qualities had the strongest effect on student achievement.

Conclusion and Discussion

A total of 1042 correlation values from 209 independent research studies published between 2000 and 2017, with a total of 3,225,488 participants, were included in this meta-analysis to examine the magnitude of the effect size of teacher characteristics on student achievement. Sample group, school subject/course, country, year of publication, and type of teacher characteristics were considered as moderator variables in the study. The results show that teacher characteristics have a low-level positive effect on student achievement. No similar study examining the aforementioned relationship has been encountered in the literature, but there are other studies investigating the different types of teacher characteristics that have concluded that these characteristics played a significant role on student achievement. Although a significant difference was expected, the low level of the effect may be seen as surprising, given the claims that teacher characteristics are the main determinants of student achievement. As Jepsen (2005) indicated, there is a common and strong belief on the effect of teacher characteristics on student achievement, but the specific characteristics that affect student achievement are difficult to identify. Therefore, the moderator analysis using the classification in Fig. 1 gave us the opportunity to demonstrate the effect sizes of the dimensions.

In this sense, the moderator analysis for the sample group was significant in terms of the effect of teacher characteristics on student achievement. The results of existing studies examining the relationship between teacher characteristics and student achievement in different types of schools are in conflict, with some suggesting a positive and strong relationship in middle school (e.g., Akiba et al., 2017; Baker, 2013), and others suggesting no relationship (Marszalek et al., 2010; Odom & Bell, 2015) for the same level. Similar inconsistencies exist in relation to high schools (e.g., Gbore & Daramola, 2013; Jarvis, 2006). The current meta-analysis study, however, revealed that the level of effect size is significant for all school levels and that high school has the highest effect size, although it is close to the effect sizes for the preschool and undergraduate levels. One reason for the increase in effectiveness may be the academic difficulty of the disciplines addressed in high school and higher education. On the other hand, the relationship between student achievement and teacher characteristics at the preschool level is important, since it exhibits the role of the teacher at the first stage of schooling, as indicated by many researchers (Boye, 2014; Gaias, Abry, Swanson, & Fabes, 2016).

Furthermore, when the effect of teacher characteristics on student achievement was examined in terms of subjects/courses, a significant and positive effect was found for all subjects. The effect sizes were found to be similar for science, language and general achievement, and lowest for mathematics. The existing research supports this result in that they found the effect of teacher characteristics on student achievement in non-math courses to be higher than for math courses (e.g., Ferguson & Ladd, 1996; Scrivner, 2009) as well as little effect of teacher characteristics in students' mathematics achievement (Leavy, 2016; Oliveras, 2014). The low-level effect revealed for mathematics in comparison to other courses is thought to be a result of the nature of mathematics and its axiomatic structure. In other words, conceptual understanding, rather than repetition, is at the forefront in mathematics (Rittle-Johnson, Siegler, & Alibali, 2001). For this reason, it is known that a different type of intelligence is dominant in mathematics learning (Gardner, 1994). According to the results of the moderator variable analysis for countries in which the study samples were chosen, the country variable was found to play a moderator role on the effect of teacher characteristics on student achievement. The sample groups chosen from vertical-collectivist countries yielded a higher level of effect sizes than the horizontal-individualist countries. This may be the result of the properties of this dual categorization of countries in that the people in the vertical-collectivist countries focus on enhancing the cohesion and status of their in-groups, while the people in the horizontal-individualist countries tend to express their uniqueness and self-reliance (Shavitt, Johnson, & Zhang, 2011). Triandis and Gelfand (1998) also define vertical collectivism as seeing the self as a part of a collective, and horizontal individualism as seeing the self as fully autonomous. Hence, it may be asserted that the students in vertical-collectivist countries are more collaborative than those in horizontal-individualist countries, which affects their achievement positively. Hence, it may be claimed that students and teachers in vertical-collectivist countries work more collaboratively than those in horizontal-individual countries.

The moderator analyses carried out in regard to the year of publication showed that the level of effect of teacher characteristics on student achievement was not statistically significant for its sub-categories. However, the effect sizes for the unique sub-categories of publication year were significant and similar. This shows that the results regarding the relationship between the teacher characteristics and student achievement did not change over three consecutive five-year periods. Thus, although this result restricts the effect of time on the impact of the teacher on the student, the effect does not change over the years. Finally, the study also tested the effect of types of teacher characteristics as a moderator variable. According to the moderator analysis, this variable plays a moderator role on the effect of teacher characteristics on student achievement. This suggests that the effect sizes of different types of teacher characteristics differentiate from one another. Moreover, the two highest effect sizes belong to personal qualities and professional knowledge, which is supported by a number of studies asserting that teachers' personal qualities (Eells, 2011; Yu & Singh, 2018) and professional knowledge (Hill, Rowan, & Ball, 2005; Kraft, Blazar, & Hogan, 2016) are influential on student achievement. In light of the results of this study, it can be stated that teacher characteristics have a meaningful effect on student performance, which is thought to be the main outcome of education.

When the results of this study are examined, it can be concluded that the moderator variables of the sample group, school subject/course, country, the publication year of a study and type of teacher characteristics have an impact on the relationship between teacher characteristics and student achievement. In other words, the level of this relationship may change according to these moderator variables. The findings related to the hypotheses of this research have been summarized in Table 4. As seen in the table, all the hypotheses except H_5 have been accepted.

Table 4

Findings regarding the relationship

Hypotheses	Independent Variables	Dependent Variable	Effect Size	Decision
H_1	Teacher Characteristics	Achievement	.19	Accept
	Moderators			
H_2	Sample Group			Accept
H_3	School Subject/ Course			Accept
H_4	Country			Accept
H_5	Year of Publication			Reject
H_6	Type of Teacher Characteristics			Accept

Limitations and future research

The current study aimed to investigate whether teacher characteristics have an effect on student achievement. Although this study found a low but significant impact of teacher characteristics on student achievement, there are considerable limitations, as well as suggestions for future research. First, the analyses were restricted to the existing body of literature. Therefore, even if a researcher who has conducted quantitative integrations sees that his or her work could have been improved, there is no way to put such changes into practice. Second, as one of the major disadvantages of the current study, the research from which the data were obtained were correlational. Thus, it is not possible to objectively claim that the results can better explain causal influences, considering that qualitative studies are more effective in explaining the nature of teacher characteristics. Third, given the fact that the studies included in this meta-analysis were carried out in the English language, the majority of these studies were centred on English-speaking countries. Considering the influence of culture on education, this situation may raise questions about generalizability. Finally, the present study examined the influence of the teacher characteristics on student achievement by taking a large framework into consideration. As such, the comments made were of a general nature.

Considering all of these limitations, the following suggestions are made for future research:

1. There is a need for studies to specifically examine the impact of sub-components (e.g., content knowledge, pedagogical knowledge, instructional practices, relationships, and so on) on student achievement in terms of each component in the framework (professional knowledge, instructional management, social factors, personal qualities and background).
2. This analysis was limited to three databases, with studies conducted in the English language. Further meta-analysis studies should consider other databases, as well as studies in other languages.
3. Quantitative studies are better able to explain a given situation; as such, further investigations are needed to examine why the expected components had little effect on student achievement.

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Utjecaj osobina učitelja na učenička postignuća: metaanalitička studija

Sažetak

Pretpostavljajući da osobine učitelja imaju utjecaj na rezultate učenja, istraživanjem su se ispitali stavovi te su izneseni statistički dokazi i rezultati istraživanja. U ovoj metaanalitičkoj studiji osobine učitelja određene su na temelju postojeće literature na osnovi koje su analizirani odnosi osobine učitelja i učeničkih postignuća. Analitički protokol pregleda literature pokriva u cijelosti 1,042 međuovisne vrijednosti pronađenih u 209 neovisnih istraživačkih članaka ili teza/ disertacija, koje uključuju 3 225 488 sudionika istraživanja. Rezultati primjene modela slučajnoga učinka pokazuju da osobine učitelja imaju nizak pozitivan utjecaj na učenička postignuća. Pozitivni utjecaji analizirani su u okviru učiteljskih vještina i kvalifikacija. U kontekstu sadržajnih elemenata učiteljskih vještina posljedice svih dimenzija unutar okvira pokazale su se značajnima. Preciznije, pokazalo se da na učenička postignuća ponajviše utječu učiteljske osobne kvalitete, dok je najmanji učinak ostavljao proces upravljanja učenjem. U svjetlu ovih zaključaka dane su određene sugestije i preporuke za buduća istraživanja.

Ključne riječi: metaanaliza, učeničko postignuće, učiteljske osobine

Uvod

Učitelji, koji su u izravnom kontaktu s onima koje poučavaju, imaju ključnu ulogu u postizanju ciljeva obrazovanja i presudni su za oblikovanje obrazovnih aktivnosti. Ova se uloga razvijala tijekom vremena. U 21. stoljeću su, npr. napravljene značajne promjene u obrazovnoj filozofiji što je dovelo do pristupa kao što su „učenje učenja" nasuprot pasivnom stjecanju predodređenih sadržaja kao i „aktivno učenje" umjesto pasivnoga usvajanja informacija (Güler, 2014). Navedeni izmijenjeni pristupi doveli su do rasprava o važnosti učiteljskoga znanja, vještina i afektivnih značajki na proces učenja.

Štoviše, uzrokovano neuspjehom da se u istraživanju sustavno definira odnos između varijabli politika i učeničkih postignuća, novije studije posebice su se usredotočile na „učiteljsku varijablu" (Kukla-Acevedo, 2009). I ova studija također, u jednom dijelu analizira osobine učitelja opisane u literaturi kao značajne za učenička postignuća.

Nakon provedene analize donosimo okvir osobina učitelja usklađen s našom sintezom postojeće literature.

Učiteljske osobine

U raspravi o kvalitetama i osobinama učinkovitoga učitelja važan je element njegovo znanje potrebno za poučavanje o određenoj temi ili ideji. U tome smislu istraživanja o učiteljskim osobinama imaju jedinstveni stav o vrstama znanja koje učitelj treba posjedovati. Ideju znanja o poučavanju sustavno je po prvi put uveo Shulman (1986) čiji je rad nadahnuo druge istraživače. Znanje o poučavanju prilagođeno je specifičnim disciplinama kao što su matematika, fizika itd. (npr. Ball, Thames, i Phelps, 2008; Grossman, 1990; Koehler i Mishra, 2009). Ova vrsta znanja tiče se prvenstveno *profesionalnoga znanja* koje učitelj treba posjedovati i obuhvaća pedagoško znanje i znanje o poučavanju te poznavanje gradiva nastavnoga predmeta (Baki, Baki, & Arslan, 2011). Brojni poučavatelji naveli su kako je učiteljevo profesionalno znanje povezano s učeničkim postignućima (Metzler i Woessmann, 2012; Selling, Gargia, i Ball, 2016), a ovu tvrdnju potvrđuju i rezultati istraživanja Baumerta i sur. (2010) koji pokazuje značajan pozitivan utjecaj pedagoškoga znanja na učeničko učenje.

Iz drugog kuta gledanja, učiteljevo korištenje profesionalnoga znanja u učionici je povezano i s upravljanjem učenja. Drugim riječima, učinkovito poučavanje zahtijeva prikladan pristup organizaciji učionice. Upravljanje učenjem sastoji se od niza elemenata, od toga kako je učionica uređena do stila i prakse poučavanja koja se u njoj izvode (Martin & Sass, 2010). Glavna svrha upravljanja učenjem je stvaranje učioničke okoline pogodne za ostvarivanje učeničkih postignuća. Unatoč tome, dok je upravljanje učenjem naglašeno kao značajan pokazatelj učiteljeve učinkovitosti (Corbett i Wilson, 2002), ne postoji konsenzus o metodi ili strategiji koja bi bila učinkovitija u postizanju većih učeničkih postignuća (Brannon, 2010; Churchward, 2009). S druge strane opće je prihvaćeno da pristup koji u središte stavlja učenika, stvara veću motivaciju za učenjem, dublje konceptualno razumijevanje materijala i pozitivniji stav prema poučavanom predmetu (Collins i O'Brien, 2003; Meyers i Jones 1993). Zbog toga su novi kurikuli često usmjereni na konstruktivistički pristup koji upućuje na učenje usredotočeno na učenika (Henson, 2015; Tan, 2017).

Osim toga, učitelji kao dio školske organizacije kontinuirano komuniciraju s kolegama, školskom upravom i učenicima. Prema teoriji vezivanja (Ainsworth, 1982) jedna je od osnovnih pretpostavki da su pozitivni odnosi između učitelja i učenika nužni za stvaranje sigurnoga okruženja za učenje, stvaranje mostova za akademski napredak i razvoj društvenih vještina (Košir i Tement, 2014; O'Connor, Dearing, i Collins, 2011). Iz toga su razloga uz profesionalno znanje i upravljanje učenjem, i socijalni faktori uzeti u obzir kao osobine učitelja . U detaljnoj studiji Lee (2012) na osnovi OECD USA podataka istražuje utječu li odnosi učitelja i učenika na učenička postignuća. Kako je i očekivano, utvrdio je kako su odnosi učitelja i učenika značajan prediktor vještine čitanja među američkim srednjoškolcima. Usto su, u svojem kritičkom pregledu, Stronge,

Tucker i Hindman (2004) precizirali pokazatelje djelotvornih učitelja kao društvene fenomene, navodeći humor, brigu, poštovanje i pravednost kao sastavnice društvene interakcije s učenicima. Naposljetku, komunikacija je istaknuta kao ključni element socijalizacije među učenicima i učiteljima i prihvaćena je kao još jedan čimbenik koji utječe na učenička postignuća. Uzimajući u obzir važnost komunikacije u motiviranju učenika za sudjelovanje u obradi nekog nastavnoga sadržaja (Robinson i Xavier, 2007) Stronge i sur. (2004) procjenjuju da će „djelotvorni komunikatori vjerojatnije biti i djelotvorni učitelji" (str. 10).

Kao dodatak gore navedenim društvenim čimbenicima, osobne kvalitete učitelja ključne su u poučavanju i procesu učenja. Prema Sandelu (2006), osobne kvalitete učitelja ključ su za učenička postignuća, no one su, bez obzira na to, često zanemarene. Različite i neovisne o društvenim čimbenicima, osobne kvalitete odnose se na učiteljeve osobine kao što su samo-komunikacijske vještine (Prozesky, 2000), trud, moralnost, otvorenost prema novim idejama ili pristupima (Hare, 2002), spremnost na poučavanje i stavovi o poučavanju i učenju (Ernest, 1989). U skorijim studijama Timmermans i sur. (2016) istražuju vezu između učiteljskih očekivanja i učeničkih postignuća pri čemu pronalaze međusoban pozitivan odnos. Slično tomu, u svojoj knjizi o filozofiji poučavanja matematike, Ernest (1991) razmatra kako učiteljska uvjerenja utječu na njihove nastavne odluke i oslikava konceptualni okvir u slučaju matematike. Dodatno, studija Xua (2012) rasvjetljava utjecaj učitejevih uvjerenja na njegovu svijest, metode poučavanja i pristup poučavanju. S druge strane, istražujući drugi čimbenik osobnih kvaliteta Loy (2006) demonstrira utjecaj komunikacijskih vještina u prostoru poučavanja na učenička postignuća; dok Klusmann, Richter i Lüdtke (2016) također testiraju utječe li iscrpljenost učitelja na učenička postignuća i pronalaze negativnu vezu među varijablama.

Konačno, povezano, ali jasno odvojeno od profesionalnoga znanja, životna iskustva učitelja mogu utjecati na učenička postignuća. U tome smislu životna iskustva učitelja odnose se na izvore učiteljskoga znanja. Na primjer, ima li utjecaja škola koju je učitelj završio na uspjeh njegovih učenika pitanje je koje se često istraživalo (npr., Alexander i Fuller, 2004; Wenglinsky, 2000). Alexander i Fuller (2004), na primjer, uspoređuju rezultate na Teksaškom ispitu akademskih vještina (TAAS) među učenicima koje su poučavali certificirani učitelji i onima koje su poučavali necertificirani učitelji. Njihovi rezultati otkrivaju statistički značajnu razliku u korist učenika certificiranih učitelja. Slično, učiteljevo iskustvo (godine poučavanja) i njegova diploma smatraju se važnim sastavnicama učiteljevih životnih iskustava. S tim u vezi Sauceda (2017) istražuje imaju li i godine radnoga iskustva i učiteljska diploma utjecaj na učenička ostvarenja te, očekivano, otkriva pozitivan odnos. Do sličnih su zaključaka došli i istraživači kao što su Dial (2008), Ferguson (2005) i Woolridge (2003).

Uzimajući sve osobine i kvalitete razmotrene u gornjem tekstu sastavili smo konceptualnu mrežu veza kako bismo našu metaanalizu uobličili na racionalan način. Mreža je prikazana na slici 1.

Slika 1.

Brojni su istraživači došli do konsenzusa da osobine učitelja imaju važan učinak na učenička postignuća. Bez obzira na to, mjera u kojoj je tomu tako otvorena je za raspravu i obilježena višedimenzijskim svojstvima. Usto, učinci osobina učitelja na učenička postignuća složeno je pitanje jer akademsko postignuće može biti potaknuto mnoštvom čimbenika u školi i izvan nje. Nadalje, iznimno je teško povjeriti učinke osobina učitelja na učenička postignuća izdvojeno dok je generalizacija podataka skupljenih od ograničenoga broja ispitanika razmjerno mala. Zbog tih ograničenja istraživanje učinaka osobina iz različitih kutova korištenjem velikog broja studija i postizanje općenitijega zaključka može dati vjerodostojnije rezultate.

Brojne studije istraživale su odnos između osobina učitelja i učeničkih postignuća u rasponu od pitanja kao što su učiteljeva profesionalna znanja do stila upravljanja poučavanjem, osobnih kvaliteta, životnih iskustava i društvenih čimbenika. Međutim, raznovrsni su rezultati pronađeni u istraživanju učinaka različitih čimbenika na učenička postignuća. Na primjer, dok Gbore i Daramola (2013) otkrivaju da učiteljeva životna iskustva imaju visok utjecaj na studentska postignuća, Bice (2016) pronalazi malu vezu između društvenih čimbenika i postignuća. Slično tomu, razlike su uočene i u odnosu predmeta koji se uče i poučavaju. Bird (2017) npr. pronalazi značajnu vezu između postignuća učenika u znanosti i učiteljevih osobnih kvaliteta, dok pronalazi negativnu vezu s jezicima. Nadalje, dok Wilson (2012) ne pronalazi vezu između učeničkih postignuća i upravljanja poučavanjem na osnovnoškolskoj razini, Akbari i Allvar (2012) zamjećuju kako upravljanje poučavanjem ostavlja utjecaj na srednjoškolskoj razini.

Kao što iz prethodnih primjera možemo vidjeti, djelovanje učiteljevih osobina na učenička postignuća pod utjecajem je brojnih čimbenika uključujući predmete i razinu obrazovanja. Dodatno, ostavimo li po strani ova pitanja, uloga učitelja mijenja se i vremenom, što je također spomenuto u istraživanjima. Kako Cranston (2000) ističe, mijenjaju se učiteljske kompetencije, vještine i znanja kao i njihove aktivnosti u učionici u 21. stoljeću. Usto, kada se razmatra i kulturna dimenzija, dolazi se do različitih zaključaka ovisno o zemlji u kojoj je provedeno istraživanje. Na primjer, Nortvedt i sur. (2016) dolazi do iznenađujućih zaključaka u svojoj opsežnoj studiji koja ispituje 37 obrazovnih sustava u TIMSS 2011 i PIRLS 2011 i zaključuje kako postoji značajna pozitivna korelacija između kvalitete poučavanja i čitateljskih i matematičkih postignuća u manje od polovine obrazovnih sustava uključenih u istraživanje. To dovodi do pitanja variraju li učinci učiteljskih kvaliteta na učenička postignuća u različitim zemljama. U konačnici, uočeno je kako promjene u školskom obrazovanju neizbježno dovode do promjena u ulozi učitelja te od njih zahtijeva da im se prilagode (Griffin, Care i McGaw, 2012). To također dovodi i do pitanja kako se utjecaj učiteljevih osobina na postignuća učenika mijenjao tijekom vremena.

Istraživačke hipoteze

Razmatrajući prethodno navedene čimbenike te razmatrajući postojeće studije o odnosu između osobina učitelja i učeničkih postignuća, ova studija nastoji provjeriti sljedeće hipoteze, uzimajući u obzir i rezultate prijašnjih istraživanja:

H₁ Osobine učitelja imaju pozitivan utjecaj na učenička postignuća.

H₂ Uzorak ispitanika je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.

H₃ Školski predmet je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.

H₄ Država je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.

H₅ Godina u kojoj je ova studija provedena je moderator pozitivnih učinaka osobina učitelja na učenička postignuća.

H₆ Tip osobina učitelja je moderator pozitivnih učinaka očekivanih učeničkih postignuća.

Metodologija
Oblikovanje istraživanja

U ovom istraživanju utjecaj osobina učitelja na postignuća učenika testiran je metaanalizom, što je istraživački dizajn koji se koristi za prikupljanje rezultata nekoliko neovisnih studija o određenim temama i primjenu statističke analize na dobivene rezultate (Littel i sur., 2008; Petitti, 2000; Wampold, Ahn i Kim, 2000).

Pregled strategije i uvjeta za uključivanje/isključivanje

Kako bi se odredilo koja istraživanja uključiti u metaanalizu, pregledana je postojeća literatura pri čemu su korištene znanstvene baze podataka Science-Direct, ProQuest i EBSCO. U tome procesu naslovi istraživanja pretraženi su prema pojavnosti termina *učitelj* i *postignuće/ uspjeh/ performansa*, dok je glavni tekst pretražen prema pojavnosti termina *korelacija*. Kako postoji velik opseg studija o osobinama učitelja, termin „učitelj" korišten je kao ključna riječ u pretraživanju baza podataka kako bi se došlo do relevantnih istraživanja o osobinama učitelja. Kao početni i završni datum u pretraživanju relevantnih istraživanja uključenih u ovu studiju određeni su 1. siječanj 2000. i 31. prosinac 2017., tj. istraživanja objavljena u razdoblju između dva datuma. U pretražena istraživanja uključene su doktorske disertacije, diplomski radovi kao i članci objavljeni u stručnim časopisima. Razlog uključivanja disertacija i diplomskih radova jest eliminacija moguće pristranosti u odabiru vrste publikacija.

Značajan broj strategija korišten je pri identificiranju istraživačkih studija adekvatnih za provedbu metaanalize. Prvo, cjeloviti radovi koji su identificirani prema ranije pojašnjenoj strategiji ispitani su preko naslova i sažetaka kako bi se odredila njihova važnost za ciljeve ovoga istraživanja. Drugo, preuzimanjem relevantnih radova načinjen je istraživački fond od 1321 dokumenta, koji su se nakon početne pretrage po ključnim riječima na osnovi naslova i sažetka činili potencijalno značajnima. Treće, sve studije u istraživačkom fondu detaljno su proučene kako bi se utvrdilo ispunjavaju li preduvjete za uključivanje u metaanalizu. Ovdje su značajne studije, zajedno s traženim kvantitativnim mjerama, kodirane, dok su studije koje nisu ispunjavale preduvjete izostavljene iz daljnje analize. Prema rezultatima kodiranja, ukupno je 209 studija iz

fonda utvrđeno kao primjereno, dok je 1112 utvrđeno kao irelevantno i stoga nisu uvrštene u daljnji proces istraživanja. 209 studija dalo je 1042 korelacijska koeficijenta. Deskriptivna statistika 209 studija uključenih u analizu prikazana je u tablici 1.

Tablica 1.

Kriteriji za uključivanje studija u analizu određeni su na sljedeći način:

❏ Posjeduju statističke informacije neophodne za korelacijsku metaanalizu (*n* i *r,* ili *R²* vrijednosti)
❏ Radi se o studiji koja mjeri korelaciju između poddomena osobina učitelja i učeničkih postignuća/ uspjeha/ performansi.

Razlozi za neuključivanje studija u metaanalizu bili su sljedeći:
❏ Ne posjeduje kvantitativne podatke (tj. radi se o kvalitativnom istraživanju)
❏ Ne posjeduje korelacijski koeficijent
❏ Nije usredotočena na učenička postignuća
❏ Nije usredotočena na osobine učitelja.

Proces kodiranja

Proces kodiranja svodio se primarno na proces sortiranja korištenih podataka koji su relevantni za ovo istraživanje. U okviru toga, kodiranje je razvijeno prije nego što je rađena statistička analiza, te je proces kodiranja usklađen s tom formom. Glavni cilj bio je razviti specifičan sustav kodiranja koji bi omogućio istraživačima da u cjelosti vide cjeline studija, a da istodobno ne propuste bilo koju karakteristiku svake pojedine studije. Format kodiranja razvijen za ovu studiju sastoji se od:
❏ izvora istraživanja
❏ informacija o uzorku
❏ vrste publikacije
❏ uzorka ispitanika
❏ školskog predmeta
❏ zemlje
❏ godina u kojima je istraživanje provedeno
❏ vrste osobina učitelja
❏ kvantitativnih vrijednosti (n i r ili R2).

Iako su sve studije s korelacijskim koeficijentom između osobina učitelja i učeničkih postignuća kodirane, nisu sve uključene u metaanalizu. Jedan je od razloga za to što neke od studija istražuju odnos korištenjem više od jedne poddomene osobina učitelja utvrđenih u našem teorijskom okviru u obliku integriranih karakteristika umjesto da ih ispituju pojedinačno. Iz toga razloga nismo mogli odlučiti pod koju poddomenu uključiti integrirane korelacije. Drugi je razlog za isključivanje što studije uključuju one osobine učitelja koje se nisu dio našega teorijskog okvira kao što su osobni dohodak i odsutnost učitelja.

Analiza podataka

Učinak obujma postignut u metaanalizi je standardna mjera vrijednosti korištenih u određivanju jačine i smjera odnosa u studiji (Borenstein, Hedges, Higgins i Rothstein, 2009). Pearsonov korelacijski koeficijent *r* određen je kao efekt dimenzija studije. Kako korelacijski koeficijent ima vrijednost između *+1* i *-1* vrijednost *r* je evaluirana pretvaranjem u vrijednosti koje se pojavljuju u tablici *z* (Hedges i Olkin, 1985). Podrazumijevajući postojanje više od jedne korelacijske vrijednosti između istih strukturalnih kategorija u korelacijskim metaanalitičkim studijama, korištena su dva različita pristupa pri utvrđivanju koje korelacije koristiti u ovoj metaanalizi (Borenstein i sur., 2009; Kulinskaya, Morgenthaler i Staudte, 2008). Za potrebe ove studije, (*i*) ukoliko su korelacije neovisne, sve povezane korelacije uključene su u analizu i smatrane neovisnim studijama; (*ii*) ukoliko su korelacije ovisne, tada je uzeta *najviša korelacijska vrijednost*. Kako smo željeli obuhvatiti sve učiteljske osobine, nastojali smo uključiti sve neovisne korelacije u našu analizu. Dodatno, *model slučajnog učinka* korišten je za metaanalizu procesa studije kao te je primijenjen i *Comprehensive Meta-Analysis* (CMA). Pri tumačenju vrijednosti dobivenih korištenjem CMA u obzir je prema Cohenovu kriteriju (1988) uzet i učinak veličine. U skladu sa Cohenom, vrijednosti između 0.10 – 0.30 smatrane su niskim (malim), između 0.30 – 0.50 kao srednje i od 0.50 naviše kao visoke (velike) po intenzitetu učinka.

Moderatorska analiza

Moderatorska analiza je metoda koja se koristi za testiranje smjera razlika između podgrupa i između prosječnih posljedičnih veličina varijabli (Karadağ, Bektaş, Çoğaltay i Yalçın, 2015). Statistička važnost razlike među moderatorskim varijablama testirana je korištenjem Q statističke metode koju su razvili Hedges i Olkin (1985). Ovom metodom, Q- unutar (Qw) provjerava se unutarašnja homogenost moderirane varijable, dok Q-između (Qb) testira homogenost među grupama (Borenstein et al., 2009).

Samo su *Qb* vrijednosti korištene pri određivanju statistički značajne razlike među moderatorima. Identificirano je pet moderatorskih veličina za koje se očekivalo da će imati ulogu u prosječnom intenzitetu efekta. Prva od njih bila je veličina uzorka ispitanika za koju se vjerovalo da će imati važnost za prosječni učinak osobina učitelja na učenička postignuća. Druga je bila vrsta osobina učitelja za koju se također mislilo da će imati utjecaj na odnos između učiteljskih osobina i učeničkih postignuća. Ostale su bile *školski predmet*, *zemlja* i *godina u kojoj je istraživanje provedeno*.

Pouzdanost i opravdanost

Kako bi se osigurala pouzdanost i opravdanost istraživanja, u obzir smo uzeli sljedeće:
- ❏ Pri uvrštavanju i neuvrštavanju evaluirali smo područje povezano s istraživanim varijablama i nastojali uvrstiti sve vezane studije osim onih koje su se pokazale irelevantnim. Proveli smo detaljan pregled literature kako bismo utvrdili zajedničke sastavnice osobina učitelja, nastojeći pritom uključiti različite sveobuhvatne

kategorije. Kriteriji za uvrštavanje ili neuvrštavanje objašnjeni su u metodološkom dijelu. U određenom smislu autor je nastojao uvrstiti sve korelacije vezane uz različite osobine učitelja, ali istovremeno ne uvrstiti ponovljene vrijednosti.

❏ Moderatorska analiza pomogla je u ispitivanju utjecaja različitih perspektiva kao načina za postizanje primjerenih zaključaka.

❏ Pristranost u odabiru publikacija ispitana je da bi se odredilo koliko ona utječe na intenzitet utjecaja.

❏ Kako bi se odredila pouzdanost sustava kodiranja, dva su istraživača izvela postupak kodiranja odvojeno. Cohenov Kappa je utvrdio kako je koeficijent pouzdanosti između dva kôda 91, što je prihvatljiva razina pouzdanosti.

Pristranost u odabiru publikacija

Dijagram lijevka upotrijebljen je kako bi se utvrdila pristranost u odabiru publikacija među studijama odabranima za ovu analizu. Dokazi iz dijagrama lijevka o utjecaju publikacijske pristranosti vidljivi su u slici 2. Očekivana bi bila značajna asimetrija ako postoji pristranost u odabiru publikacija. U tom smislu koncentracija lijevka na jednoj strani ispod crte prosječnoga utjecaja, posebice u donjem dijelu lijevka, upućivala bi na vjerojatnost pristranosti u odabiru publikacija u studiji. U ovom istraživanju nije pronađen dokaz za pristranost u odabiru publikacija u bilo kojem među 1042 skupa podataka u metaanalizi.

Slika 2.

Iako nije utvrđena pristranost u izboru literature, pri korištenju dijagrama lijevka rezultati su ispitani i Duvalovim i Tweedijevim testom izrezivanja i dopune korištenjem slučajnog efekta kako bi se utvrdile posljedice djelomičnosti u publikacijama prikupljenim u metaanalizi. Kao što je vidljivo u tablici 2, ne postoji razlika između primijećenog učinka i veličine umjetnoga učinka stvorenoga da se riješi učinak pristranosti publikacija. Istraživanje pokazuje središnju simetriju na objema stranama, što je indikator ujednačenosti. Kako ne postoji dokaz koji bi upućivao na nedostatak podataka na bilo kojoj strani od središnje linije, razlika između utvrđene posljedične veličine i promatrane posljedične veličine je nula.

Tablica 2.

Tablica 3 pokazuje rezultate metaanalize u odnosu na učenička postignuća i osobine učitelja. Dobiveni reultati potvrđuju H_1, što znači da postoji pozitivan odnos između učeničkih postignuća i osobina učitelja. Veličina učinka osobina učitelja na učenička postignuća izračunata je na vrijednost .19. Ta vrijednost pokazuje da osobine učitelja imaju mali učinak (vidi Cohen, 1988) na učenička postignuća.

Rezlutati potvrđuju i hipotezu H_2, kojom se tvrdi kako uzorak ispitanika igra moderatorsku ulogu na razini utjecaja osobina učitelja na učenička postignuća. Analiza moderatora pokazuje kako je razlika između razine učinka na uzorku ispitanika statistički značajna (Qb=117.650, p<.01). S tim u vezi analiza otkriva kako

je razina posljedičnosti osobina učitelja na učenička postignuća statistički značajna na predškolskoj razini [r=.22], nižim razredima osnovne škole [r=.17], višim razredima osnovne škole [r=.14], srednjoj školi [r=.26], sveučilištu [r=.22] i mješovitoj kategoriji razina [r=.19] i da svi učinci mogu biti uzeti kao niski.

Analiza moderatora potvrđuje i hipotezu H_3, kojom se tvrdi kako je školski predmet moderator varijable učinka osobina učitelja na učenička postignuća, budući da se pokazala statistički značajna razlika na razini učinka za različite školske predmete (Qb=107.677, p<.01). Ovi rezultati otkrivaju kako su osobine učitelja na učenička postignuća statistički značajne i niske za općenita postignuća [r=.22], za jezike [r=.22], matematiku [r=.15], znanost [r=.21] i ostale predmete kao što su sociologija, povijest, fizika, tjelesni i tako dalje [r=.32].

Štoviše, rezultati analize moderatora pokazuju i kako je pretpostavka o ulozi države na razinu utjecaja osobina učitelja na učenička postignuća, kako je pokazano u hipotezi H_4, također utemeljena. Analiza moderatora također pokazuje kako je razlika u razinama učinka među državama statistički značajna (Qb=24 358, p<.01). U tom okviru utvrđeno je kako osobine učitelja u studijama provedenim u okomito-kolektivističkim [r=.26] i vodoravno-individualističkim [r=.19] državama rezultiraju u malom učinku na učenička postignuća i da u zemljama sa snažnijim učinkom pronalazimo okomito-kolektivističke kulture.

Rezultati ne potvrđuju pretpostavku H_5, kojom se tvrdi kako godina objavljivanja igra ulogu moderatora u očekivanju postojanja učinka na učenička postignuća. Naime, analiza moderatora ne otkriva statistički značajnu razliku na razini učinka na osnovi godine objavljivanja studije (Qb=0.553, p>.05), što upućuje kako je veličina učinka slična među publikacijama iz različitih razdoblja. S druge strane, nizak učinak osobina učitelja na učenička postignuća pronađena je među publikacijama objavljenim između 2000. i 2005. [r=.20], između 2006. i 2011. [r=.19] i 2012. i 2017. [r=.19].

Uspoređujući intenzitet odnosa između različitih tipova osobina učitelja (H_6) utvrđeno je kako je prosječni intenzitet korelacije za različite tipove osobina učitelja i učeničkih postignuća značajno različit (Qb=248.941, p<.01). Dodatno je utvrđeno kako su učiteljeva životna iskustva [r=.14], upravljanje obrazovanjem [r=.13], osobne kvalitete [r=.27], profesionalno znanje [r=.23] i društveni faktori [r=.17] u odnosu na učenička postignuća značajna i niska. Time je utvrđeno kako osobne kvalitete imaju najjači učinak na učenička postignuća.

Tablica 3.

Zaključak i rasprava

Kako bi se istražile dimenzije učinka osobina učitelja na učenička postignuća, odabrano je ukupno 1042 korelacijske vrijednosti iz 209 nezavisnih studija objavljenih između 2000. i 2017. s ukupno 3 225 488 sudionika koje su uključene u metaanalizu. Kao moderator uzet je uzorak ispitanika, školski predmet, zemlja, godina objavljivanja

publikacije i vrsta osobina učitelja. Rezultati pokazuju kako osobine učitelja imaju mali pozitivan utjecaj na učenička postignuća. U literaturi nije pronađena slična studija gore spomenutoga odnosa, ali postoje druge studije koje istražuju različite vrste učiteljskih osobina i zaključuju kako te osobine imaju značajnu ulogu u učeničkim postignućima. Iako je značajna razlika bila očekivana, nizak utjecaj može se smatrati iznenađujućim uzme li se u obzir tvrdnja kako su osobine učitelja glavna odrednica učeničkih postignuća. Kako Jespen (2005) upućuje, postoji uobičajeno i snažno vjerovanje o učinku osobina učitelja na učenička postignuća, ali je teško utvrditi specifične osobine koje utječu na učenička postignuća. Zbog toga nam je analiza moderatora korištena pri klasifikaciji u slici 1 poslužila za pokazivanje veličine učinka korištenih dimenzija.

U tom smislu, analiza moderatora za uzorak ispitanika bila je značajna pri utvrđivanju učinka osobina učitelja na učenička postignuća. Rezultati postojećih studija koje ispituju odnos između osobina učitelja i učeničkih postignuća u različitim vrstama škola nisu podudarni jer neke ukazuju na pozitivnu i snažnu vezu u višim razredima osnovne škole (npr. Akiba i sur., 2017; Baker, 2013) dok druge ukazuju na nepostojanje veze (Marszalek i sur., 2010; Odom i Bell, 2015) za istu razinu. Slične nedosljednosti postoje u odnosu na srednje škole (npr. Gbore i Daramola, 2013; Jarvis, 2006). Ova metaanalitička studija, međutim, otkriva kako je razina učinka značajna na svim školskim razinama i da je najviša u srednjoj školi, iako neznatno viša od predškolske i preddiplomske razine. Jedan od uzroka povećanoga učinka može biti akademska zahtjevnost obrađenih disciplina u srednjoj školi i visokom obrazovanju. S druge strane, odnos učiteljskih osobina i učeničkih postignuća na predškolskoj razini važan je jer ukazuje na ulogu učitelja na prvoj razini obrazovanja, na što upućuju rezultati nekih istraživanja (Boye, 2014; Gaias, Abry, Swanson i Fabes, 2016).

Nadalje, kada je učinak učiteljskih osobina na učenička postignuća ispitan prema školskim predmetima, značajan i pozitivan učinak pronađen je za sve predmete. Razina učinka podudarala se za znanost, jezik i opći uspjeh, a najniža bila je za matematiku. Postojeća istraživanja potvrđuju ovaj rezultat jer i ona pronalaze veći učinak u ne-matematičkim predmetima nego za matematiku (npr. Ferguson i Ladd, 1996; Scrivner, 2009) kao i nizak učinak osobina učitelja na učenička postignuća u području matematike (Leavy, 2016; Oliveras, 2014). Za nisku razinu učinka otkrivenu kod matematike u odnosu na druge predmete vjeruje se da potječe iz njezine aksiomatske strukture. Drugim riječima, konceptualno razumijevanje umjesto ponavljanja u matematici je prioritet (Rittle-Johnson, Siegler i Alibali, 2001), stoga je poznato kako je pri učenju matematike dominantna druga vrsta inteligencije (Gardner, 1994). U odnosu na rezultate za države u kojima je istraživanje provedeno kao varijable moderatora utvrđeno je kako države imaju moderatorsku ulogu na učinak osobina učitelja na učenička postignuća. Uzorak ispitanika izabrani u okomito-kolektivističkim državama davali su više razine učinka nego one iz vodoravno-individualističkih država. To može biti rezultat karakteristika dvojne kategorizacije država u kojima se ljudi u okomito-kolektivističkim državama usredotočuju na osnaživanje kohezije i statusa njihovih

unutarnjih grupa, dok ljudi u vodoravno-individualističkim državama nastoje iskazati svoju jedinstvenost i samodostatnost (Shavitt, Johnson i Zhang, 2011). Triandis i Gelfand (1998) također definiraju okomiti kolektivizam kroz težnju k identifikaciji unutar kolektiva, a vodoravni individualizam kroz identifikaciju putem osobne i pune autonomije. Stoga možemo procijeniti kako su učenici u okomito-kolektivističkim zemljama skloniji suradnji od onih u vodoravno-individualističkim zemljama, što pozitivno utječe na njihova postignuća. Iz istoga se razloga može tvrditi kako učenici i učitelji u okomito-kolektivističkim zemljama intenzivnije rade zajedno od onih u vodoravno-individualističkim zemljama.

Moderatorska analiza provedena o pitanju godine objave publikacije pokazuje kako razina učinka osobina učitelja na učenička postignuća nije statistički značajna za potkategorije. Unatoč tome, efekti veličina za pojedine potkategorije godina izdanja bili su značajni i slični. To pokazuje kako se rezultati u odnosu između osobina učitelja i učeničkih postignuća nisu mijenjali u tri uzastopna petogodišnja razdoblja. Stoga, iako rezultati ograničavaju vremenske posljedice utjecaja učitelja na učenike, utjecaj se ne mijenja tijekom godina. Zaključno, u istraživanju ispitani su učinci tipa osobina učitelja kao moderatorske varijable. Prema moderatorskoj analizi, ova varijabla imamoderatorsku ulogu u utjecaju osobina učitelja na učenička postignuća. To upućuje na činjenicu kako se intenzitet utjecaja pojedinih vrsta učiteljskih osobina međusobno razlikuje. Dodatno, dva najviša intenziteta utjecaja pripadaju osobnim iskustvima i profesionalnom znanju, što potvrđuju i brojna istraživanja koje ističu učiteljske osobne kvalitete (Eells, 2011; Yu i Singh, 2018) i profesionalno znanje (Hill, Rowan i Ball, 2005; Kraft, Blazar i Hogan, 2016) kao utjecajne na učenička postignuća. U svjetlu rezultata provedenoga istraživanja može se reći kako osobine učitelja imaju smislen utjecaj na učenička ostvarenja, što se smatra glavnim rezultatom obrazovanja.

Kada se analiziraju rezultati ovoga istraživanja, može se zaključiti kako moderatorske varijable uzorak ispitanika, školski predmet, zemlja, godina objavljivanja studije i tip učiteljskih osobina utječu na odnos između osobina učitelja i učeničkih postignuća. Drugim riječima, razina ovoga odnosa može se promijeniti na osnovi tih moderatorskih varijabli. Rezultati vezani uz hipoteze ovoga istraživanja objedinjeni su u tablici 4. Kako se iz tablice vidi, sve su hipoteze osim H_5 prihvaćene.

Tablica 4.

Ograničenja i buduća istraživanja

Istraživanjem se nastojalo ispitati imaju li osobine učitelja utjecaj na učenička postignuća. Iako je istraživanjem potvrđeno kako postoji nizak, ali značajan utjecaj osobina učitelja na učenička postignuća, uočena su i značajna ograničenja koja mogu biti osnova za buduća istraživanja. Kao prvo, analiza je bila ograničena na postojeću bazu literature. Stoga, ako istraživač koji provodi kvantitativne integracije uoči kako bi se njegov rad mogao poboljšati, ne postoji mogućnost da se te izmjene primijene u praksi. Kao drugo, jedan od najvećih nedostataka ovoga istraživanja jest taj što su

istraživanja iz kojih su prikupljani podatci bila u međuodnosu. Zato nije moguće objektivno tvrditi kako rezultati mogu bolje objasniti kauzalne utjecaje, uzimajući u obzir da su kvalitativne studije efikasnije u objašnjavanju prirode osobina učitelja. Treće, uzimajući u obzir činjenicu kako su istraživanja uvrštena u ovu metaanalizu provedene na engleskom jeziku, većina tih studija koncentrirana je na zemlje engleskoga govornog područja. Razmatrajući utjecaj kulture na obrazovanje, ova okolnost može otvoriti pitanja o mogućnosti generalizacije. Konačno, u istraživanju su se ispitivali utjecaji osobina učitelja na učenička postignuća uzimajući u obzir široki okvir. Stoga su i komentari koji iz ovoga istraživanja proizlaze opće prirode.

Razmatrajući sva navedena ograničenja, dani su sljedeći prijedlozi za buduće istraživanje:

Postoji potreba za istraživanjem utjecaja specifičnih potkategorija (npr. poznavanje sadržaja, pedagoško znanje, nastavna praksa, odnosi i tako dalje) na učenička postignuća u odnosu na svaku pojedinu kategoriju koja čini širi okvir (profesionalno znanje, upravljanje znanjem, društveni faktori, osobne kvalitete i životna iskustva).

Ova je analiza ograničena na tri baze podataka sa studijama provedenim na engleskom jeziku. Buduće metaanalitičke studije trebaju u obzir uzeti druge baze podataka kao i studije provedene na drugim jezicima.

Kvantitativne studije uspješnije su u objašnjenju postojeće situacije, stoga su potrebna buduća istraživanja koja će ispitati zašto očekivani elementi imaju slab utjecaj na učenička postignuća.