Do Decision-Making Styles Help Explain Health-Risk Behavior among University Students in Addition to Personality Factors?

Jozef Bavoľár, Mária Bačíkova-Slešková

Pavol Jozef Šafárik University in Košice, Slovak Republic

Previous research has indicated that certain decision-making styles are associated with decision outcomes. This article focuses specifically on one area of decision outcomes – health-risk behavior – and examines if decision-making styles explain the variance in risk behavior over the Big Five factors. Five decision-making styles (rational, intuitive, dependent, avoidant, and spontaneous) and five types of risk behavior (alcohol use, internet use, junk food consumption, cigarette smoking, condom use) were identified in 374 university students. The results differ among the types of risk behavior, although generally, decision-making styles help to improve the models explaining risk behavior in the case of alcohol use and problematic internet use with the avoidant and dependent styles having the most prominent role.

Key words: decision-making styles, health-risk behavior, alcohol use, cigarette smoking, internet use

Introduction

The health-risk behavior of university students has been extensively studied (e.g., Keller et al., 2008; Steptoe et al., 2002), as it can have serious consequences on later life. Several health-risk behaviors have been identified in research such as substance use, risk sexual behavior, risk driving, sedentary behavior, prob-

Correspondence concerning this article should be addressed to Jozef Bavolar, Department of Psychology, Faculty of Arts, Pavol Jozef Šafárik University in Košice, Moyzesova 9, 040 01 Košice, Slovak Republic. E-mail: jozef.bavolar@upjs.sk

lematic internet use and unhealthy eating habits. In the present study we focus on those that belong to the most prevalent among university students. There is strong evidence that the incidence of three types of risk behavior (alcohol use, smoking, risk sexual behavior) tend to co-occur among young adults (Meader et al., 2016). Further, keeping good eating habits after starting university is challenging (Deshpande, Basil, & Basil, 2009) and junk food consumption is highly prevalent in this population (Racette et al., 2005). Similarly, the increase of internet availability is related to the increase in problematic internet use, especially in adolescence and emerging adulthood (Anderson, Steen, & Stavropoulos, 2017).

Previous research has identified many risk and protective factors of risk behavior, including demographic, social and personality characteristics. Although the relationships of personality factors including the Big Five factors with health-risk behavior have been well-mapped (e.g., Hong & Paunonen, 2009), the role of cognitive characteristics such as information pro-

cessing modes has rarely been studied (e.g., Jones, Ross, & Hartmann, 1992). Decision-making styles, as a specific way of information processing in a decision context (Kozhevnikov, 2007), are related to a variety of decision outcomes (Bruine de Bruin, Parker, & Fischhoff, 2007), even when studied together with the Big Five personality factors (Dewberry, Juanchich, & Narendran, 2013; Wood & Highhouse, 2014). However, their role in risky behavior has not been investigated directly before. While previous studies focused on the role of decision-making styles in general indicators of decision quality operationalized as a composite score of heterogeneous decision outcomes, the focus on specific situations can provide a more detailed picture reflecting the characteristics of different decision contexts. This article aims to investigate the role of decision-making styles in health-risk behavior, and more specifically, if decision-making styles can explain the variance in health-risk behavior over and above the Big Five factors.

Decision-Making Styles and Risk Behavior

Decision-making styles are the ways people make decisions and they are considered to be stable characteristics manifested in a variety of decision-making situations. Researchers differ only slightly in the definitions of decision-making styles and higher heterogeneity is visible in their classification. Scott and Bruce (1995, p. 820) have defined decision-making styles as "the learned habitual response pattern exhibited by an individual when confronted with a decision situation. It is not a personality trait, but a habit-based propensity to react in a certain way in a specific decision context". Kozhevnikov (2007) views decision-making styles as a sub-component of cognitive styles and Appelt et al. (2011), in a review of decision-making measures, state that the instruments originally constructed to measure cognitive styles are often used to measure decision-making styles. The current study has adopted the classification model proposed by Scott and Bruce (1995) who have identified five decision-making styles (rational, intuitive, dependent, avoidant, spontaneous) in four separate populations and have described them in behavioral terms. The rational style is characterized by the search for and logical evaluation of alternatives. The intuitive style is characterized by attention to detail and a tendency to rely on feelings while the dependent one is characterized by the search for and reliance on the advice of others. The avoidant style is the tendency to avoid decisions whenever possible and the spontaneous style is characterized by a sense of immediacy and desire to complete the decision-making process as soon as possible. The styles are interrelated and a person can use more of them or switch between them in various decision situations.

The question of correlates of decision-making styles in the real world is essential in relation to the current research. The association of all decision-making styles postulated by Scott and Bruce (1995), except for the intuitive style, have been reported in relation to life outcomes (Galotti et al., 2006). Parker, Bruine de Bruin and Fischhoff (2007) found the four decision-making styles, with the exception of the dependent style, to be related (rational and intuitive positively, avoidant and spontaneous negatively) to decision outcomes operationalized as a broad area of life situations including risk behavior. In two studies similar to the current one, decision-making styles and personality factors together have accounted for a substantial amount of variance in general indicators of decision outcomes (Dewberry, Juanchich, & Narendran, 2013; Wood & Highhouse, 2014). These studies also report associations between decision-making styles and the Big Five factors, where the rational, intuitive and dependent styles are positively related to extraversion, openness,

agreeableness, conscientiousness and emotional stability, while the pattern is the opposite when the avoidant and spontaneous styles are considered.

When inspecting the question of real-life correlates of decision-making styles in more detail, the research concerning the associations between decision-making and health-risk behavior has mainly focused on the consequences of substance use on decision-making abilities (e.g., Clark et al., 2006; Zorlu et al., 2013). Phillips and Ogeil (2011) have found that a greater risk of alcohol related problems was linked to lower vigilance scores and increased tendencies towards procrastination. A higher risk of gambling problems was associated with lower decisional self-esteem and increased proneness to hypervigilance or panic. The authors summarize that problem drinkers are avoidant and problem gamblers are impulsive. Moreover, stimulant users report less competent and more maladaptive decision-making styles compared with controls (Gorodetzky et al., 2011). While no differences were found in the two styles viewed as non-adaptive (buck-passing and hypervigilance), the control group reported more frequent use of the only competent decision making style – vigilance – in comparison with cocaine users and less frequent use of procrastination in comparison with amphetamine users (Gorodetzky et al., 2011).

The avoidant decision-making style is similar to the group of avoidance coping strategies that has been found to be related to alcohol use (Cooper et al., 1992; Feil & Hasking, 2008) and internet addiction (Al-Gamal, Alzayyat, & Ahmad, 2015). Similarly, the dependent style is close to social support seeking although it was not a significant predictor of alcohol use (Çavusoglu, 2010; Sacco, Bucholz, & Harrington, 2014). The influence of social support is probably more important in ceasing rather than in retaining risk behavior (e.g., Westmaas, Bontemps-Jones, & Bauer, 2010).

The spontaneous decision-making style has characteristics close to the description of impulsiveness. Impulsive decision-makers have a higher probability of risky sex, use of alcohol or marihuana more often before sex and are more likely to engage in intercourse in comparison with the rational decision-makers (Donohew et al., 2000). Similarly, Tuinstra (1998) found that impulsive adolescents exhibit more unhealthy behavior (alcohol, smoking, soft drugs), while the other three studied decision-making styles (docile, panic and self-confidence) were not related to the risk behavior.

Big Five Factors and Risk Behavior

The concept of five general factors (the Big Five) is generally accepted as a basic theoretical concept of personality structure and the role of the five factors belonging to this model (extraversion, agreeableness, conscientiousness, openness to experience, and neuroticism; Costa & McCrae, 1992) in risk behavior has been widely studied. Alcohol consumption has been operationalized in studies differently (binge drinking, number of drinks per occasion) with heterogeneous associations with the Big Five traits. While alcohol consumption among young adults can be predicted through a high level of neuroticism associated with a low level of agreeableness (Coëffec, 2011), women with higher levels of openness to experience were more at risk for heavy and problematic alcohol use (Martin et al., 2015). Moreover, higher levels of openness to experience and neuroticism were significantly associated with an increased risk of using cigarettes during one's lifetime (Zvolensky et al., 2015) and openness to experience was the sole personality variable accounting for the differences in smoking prevalence (McCann, 2010). Friedman (2000) views the relationship between neuroticism and health-risk behavior as more complicated and distinguishes two types of neurotic personalities. Firstly,

those characterized by emotional instability and pessimism, which can lead to unhealthy behavior and secondly, those who are more anxious and have lower well-being but engage less in risk behavior. When Hong and Paunonen (2009) combined three risk-taking behaviors (tobacco consumption, alcohol consumption, speeding in an automobile), low conscientiousness and low agreeableness were uniformly associated with this cluster of potentially health damaging behaviors. Extraversion was additionally associated with alcohol use.

Present Research

As decision-making styles are significant predictors of decision outcomes, the main aim of the current study was to investigate their role in a more specific outcome – health-risk behavior (aim 1). Moreover, as the Big Five factors are widely recognized factors of risk behavior, we were also concerned with the role of decision-making styles in selected types of risk behavior in addition to them (aim 2). The model of five decision-making styles by Scott and Bruce (1995) belongs to the most widely adopted and the role of their five styles in five types of risk behavior among university students – alcohol use, cigarette smoking, problematic internet use, risk sexual behavior and junk food consumption – was tested. As noted earlier, decision-making styles solely or together with the Big Five factors belong to predictors of decision outcomes (Dewberry, Juanchich, & Narendran, 2013; Wood & Highhouse, 2014), but these outcomes were operationalized very broadly as a summation of a range of heterogeneous situations with no attempt to study their subgroups. Two of the previous studies (Bruine de Bruin, Parker, & Fischhoff, 2007; Dewberry, Juanchich, & Narendran, 2013) used the Decision Outcomes Inventory containing health-related items (e.g., diagnosis of sexually transmitted diseases, unplanned pregnancy, vomiting after

alcohol use, driving while drunk, type 2 diabetes diagnosis) so it can be hypothesized that decision-making styles play a significant role even when focusing on this narrower group of decision outcomes. As decision-making styles are related to some Big Five factors but can be considered as more specific constructs, it was expected that decision-making styles could explain an additional variability in risk behavior that cannot be explained by the Big Five factors only.

Methods

Participants and Procedure

The first part of data was collected from university students in Eastern Slovakia in the second round of the longitudinal SLiCE (Student Life Cohort in Europe) study (www.slice-study.eu), as decision-making styles were not measured in its first round. From the 4062 students asked by the message at their university information system, 600 provided data by completing an online questionnaire in the first round (response rate = 14.8%) and 237 participated also in the second round. The complete data for all measures used in the present study were obtained from 207 students (age 19-36, M_{age} = 21.4, SD_{age} = 1.53, 83.6% females). The participants present only in the first round differed from those continuing also in the second round in alcohol use ($F(1,588) = 9.67, p < .05$), smoking ($\chi^2(1) = 9.48, p < .01$) and extraversion ($F(1,588) = 3.96, p < .05$; in all cases, a higher score in the first group). As the initial sample was disproportionately dominated by women, we also distributed the questionnaires to faculties providing technical education in order to counterbalance the gender ratio. 170 students completed the measures during the classes and the responses from 167 students (only males were present at the classes) with at least one risk-behavior indicator were used (age 19-26,

$M_{age} = 22.6$, $SD_{age} = 1.38$). The mean age of whole sample ($N = 374$) was 21.92 ($SD = 1.58$) with 45.9% females.

Measures

Decision-making styles were assessed by the General Decision-making Styles questionnaire (GDMS, Scott & Bruce, 1995) with five subscales examining the five decision-making styles – rational (e.g., My decision-making requires careful thought), intuitive (e.g., When making decisions I rely upon my instincts), dependent (e.g., I use the advice of other people in making my important decisions), avoidant (I postpone decision-making whenever possible) and spontaneous (e.g., I often make impulsive decisions). The measure contains 25 questions – five in each subscale and all measured on a scale from strongly disagree (1) to strongly agree (5). Higher scores in each subscale as the sum of the related items mean that this style is used more frequently. The Slovak version was translated from English by a native English speaking translator and back-translated. It showed good psychometric characteristics and similar factor structure as foreign versions (Bavoľár & Orosová, 2015).

The Big-Five personality traits were identified by the short Ten Items Personality Inventory (Gosling, Rentfrow, & Swann, 2003) using two items for each factor – openness to experience, conscientiousness, extraversion, agreeableness and emotional stability. The scores in this scale are similar to those obtained by longer Big Five measures (Renau et al., 2013). The factors had Cronbach's alphas in lower levels, but still acceptable for two-item subscales (Schmitt, 1996).

Alcohol use was assessed by The Alcohol Use Disorders Identification Test (AUDIT, Bohn, Babor, & Kranzler, 1995). Ten questions are divided into three subscales – consumption, dependence and alcohol-related problems

although only the total score was used in the present study. As the score in items ranges from 0 to 4, the total score varies from 0 to 40 with values higher than 7 as indicators of hazardous and harmful alcohol use.

The Generalized Problematic Internet Use Scale 2 (GPIUS2, Caplan, 2010) was used to assess problems with the use of the internet. The measure consists of 15 items and the total score as a sum of them was computed with higher values standing for more severe problems with internet use.

The next that examined a type of risk behavior was junk food consumption. The score was computed as the sum of four items inspecting the frequency of consumption of four unhealthy kinds of food [sweets (chocolate, candies), cakes/cookies, snacks and fast food]. The answers were coded from several times a day (1) to never (5) and recoded to have higher scores as a higher level of risk behavior.

One of the questions identifying smoking was selected for the analysis – if participants had smoked at least one cigarette during the last 30 days (yes/no). Risky sexual behavior was operationalized as the use of a condom during the first sexual intercourse (yes/no – 35 of 233 students (15%) with sexual experience did not use one).

Statistical Analysis

Firstly, correlations among the decision-making styles, Big-Five personality traits and risk behavior were examined using Pearson, Kendall's *tau* and point-bisserial correlation. A Log transformation was conducted on the results of AUDIT, GPIUS2 and junk food consumption to meet the assumptions of normality and homoscedasticity needed for the following linear regression models. In order to obtain standardized regression coefficients, these dependent variables were standardized using *z* scores and risk behavior indicators were transformed

using ln (variable + 2 according to the minimum score in standardized scores) for alcohol use, internet use and junk food consumption. In order to assess the role of decision-making styles in health-risk behavior, they were examined as predictors in linear and binary logistic regression models according to the type of dependent variable (linear regression for alcohol use, internet use and junk food consumption, logistic regression for smoking and condom use). Next, the incremental prediction of decision-making styles was examined when the Big-Five personality traits were inserted into the first step and decision-making styles into the second step of regression. As gender differences in health-risk behavior have previously been acknowledged (e.g., Steptoe et al., 2002), gender was also included in all models to control its effect. All risk behavior indicators were coded with the higher values meaning a higher level of risk behavior. All data analyses were conducted in SPSS 21.

Results

The relationships (Table 1) between the decision-making styles and personality factors are in most cases significant but mostly weak with the exception of conscientiousness. It is positively related to the rational and intuitive styles and negatively to the avoidant and spontaneous styles. The intuitive style is positively and avoidant style negatively related to four out of the five personality factors. The overall tendency in relationships between decision-making styles and risk behavior is that the first three decision-making styles (the rational, intuitive, and dependent) tend to be related to risk behavior negatively, while the other two styles (avoidant and spontaneous) positively. However, the correlations are predominantly weak and not significant. As the associations among risk behaviors are very weak with one exception (alcohol use and smoking), an omnibus indicator of risk behavior could not be used and role of decision-making styles and the Big Five factors was examined separately for each type of risk behavior.

Decision-Making Styles and Risk Behavior

A multiple regression analysis (linear regression for alcohol use, problematic internet use and junk food consumption, binary logistic regression for cigarette smoking and condom use) found that decision-making styles together with gender explained 6 to 13 percent of variance in all kinds of risk behavior and the models were significant in alcohol use and internet use. Table 2 shows that the position of decision-making styles in risk behavior varied in the models, where the avoidant style was positively related to alcohol use and internet use and the intuitive style negatively to internet use and junk food consumption. The dependent style was associated positively with problematic internet use and negatively with alcohol use, while the spontaneous style was related to the higher probability of smoking.

Incremental Prediction of Risk Behavior over the Big Five

The role of decision-making styles as predictors of the studied types of risk behavior over and above personality factors was examined in hierarchical regression models with the Big Five factors entered firstly and followed by the decision-making styles inserted in the second step. As shown in Table 3, the Big Five factors significantly predicted four types of risk behavior and decision-making styles brought incremental prediction in alcohol use and problematic internet use. When examining the particular styles, the intuitive style predicted problematic internet use (negatively), the avoidant style alcohol use (positively) and the rational style condom use (negatively). The dependent style

Table 1 *Descriptive statistics, correlations and Cronbach's alphas (on diagonal)*

	Mean	Mdn	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Rational style	19.22	20.00	3.19	.82													
2. Intuitive style	17.97	18.00	3.08	.14**	.76												
3. Dependent style	17.37	18.00	3.60	.15**	.09	.81											
4. Avoidant style	13.22	13.00	4.39	-.24***	-.10	.22***	.87										
5. Spontaneous style	13.77	13.00	3.66	-.40***	.27**	-.02	.28***	.79									
6. Extraversion	4.57	4.50	1.61	-.08	.16**	.00	-.15**	.15**	.68								
7. Agreeableness	4.88	5.00	1.17	.05	.16**	.20**	-.06	-.03	.04	.63							
8. Conscientiousness	5.19	5.50	1.34	.23***	.22***	.02	-.35***	-.21***	.10	.22**	.70						
9. Emotional stability	4.68	4.50	1.39	.13**	.09	-.09	-.23***	-.12*	.18***	.21***	.24***	.65					
10. Openness	5.34	5.50	1.19	.11*	.21***	.02	-.22***	.12*	.51***	.09	.17**	.19***	.62				
11. Alcohol use	5.95	4.00	5.64	-.03	.01	-.10**	.09*	.08*	.08*	.00	-.12**	.07	.04	.85			
12. Internet use	42.86	40.50	18.96	-.04	-.14***	.07	.15***	.02	-.19***	-.12**	-.15***	-.11**	-.18***	.02	.90		
13. Junk food	6.21	6.00	2.01	-.02	-.06	-.05	.06	.04	-.09*	-.05	-.06	-.09*	-.12**	-.02	.10**	.67	
14. Smoking	22.0% yes			-.07	-.03	-.02	.08	.13*	.14**	-.08	-.11*	-.17**	.13*	.28***	-.03	.00	
15. Condom use	15.0% no			-.03	.00	-.03	-.11	-.08	-.03	.02	.02	.03	-.11	.15*	.04	-.04	-.06

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

Table 2 *Regression models inspecting role of decision-making styles in health-risk behavior*

	Alcohol use β	Internet use β	Junk food β	Smoking OR	Condom use OR
Gender (M = 1)	.30***	.21**	-.05	.69	2.04
Rational style	-.02	-.01	.01	1.02	.87
Intuitive style	.02	-.10***	-.06*	.94	1.04
Dependent style	-.04	.07*	-.05	.98	1.04
Avoidant style	.07**	.09**	.02	1.02	.92
Spontaneous style	.05	.02	.03	1.10*	.93
R^2 (Nagelkerke for smoking and condom use)	.13	.11	.03	.04	.06
F (χ^2 for smoking and condom use)	9.34***	7.71***	1.90	10.72	8.47

Note. β – standardized regression weight, OR – odds ratio
*$p < .05$, **$p < .01$, ***$p < .001$

predicted internet use positively, but alcohol use negatively. When compared with the previous models, which did not include the Big Five factors, differences were found in five cases across all of the examined types of health-risk behavior with three styles no longer significant and two styles becoming significant.

Discussion

The role of decision-making styles in various kinds of risk behavior was the center of interest in this study. Risk behavior included alcohol use, problematic internet use, junk food consumption, cigarette smoking, and risk sexual behavior. Multiple linear or binary logistic regression models were used to assess the role of the decision-making styles when inserted alone or after the Big Five factors. Previous studies have reported the role of decision-making styles in different decision outcomes (Bavoľár & Orosová, 2015; Galotti et al., 2006), and partially also when considered together with the Big Five factors (Dewberry, Juanchich, & Narendran, 2013; Wood & Highhouse, 2014). The current study confirmed these findings in

the selected context but only partially – separately as well as when added after the Big Five factors, decision-making styles were able to explain a substantially higher proportions of variance in two kinds of risk behavior – alcohol use and problematic internet use. This result can be compared with the study most similar to ours (Wood & Highhouse, 2014) where the decision-making styles showed incremental predictive validity when added to the Big Five factors predicting decision quality rated by participants themselves, but not when rated by their peers. It points to the possibility that the subjective rating of one's own decisions can be influenced by the stable view of the participant's personality manifested in the decision-making styles as well as in decision outcomes evaluation. In contrast, the more objective data such as peer evaluation or even assessment of one's own risk behavior are subject to subjective adjustment to a much lesser degree (compare Pitel & Mentel, 2017). This explanation can be supported even by the fact that not only decision-making styles, but also the Big Five factors were weaker predictors of the evaluation of decision quality from peers

Table 3 *Regression models inspecting role of decision-making styles in addition to the Big Five factors in health-risk behavior*

	Alcohol use		Internet use		Junk food		Smoking		Condom use	
	β_1	β_2	β_1	β_2	β_1	β_2	OR_1	OR_2	OR_1	OR_2
Step 1: gender and B5										
Gender (M = 1)	.29***	.31***	.11	.15*	-.05	-.06	1.10	1.10	.55	.49
Extraversion	.08**	.08**	-.08**	-.08**	-.04	-.04	1.22*	1.22*	1.23	1.20
Agreeableness	.02	.02	-.05	-.06*	-.01	.00	.93	.96	1.08	1.08
Conscientiousness	-.08***	-.05	-.05	-.02	-.03	-.02	.85	.91	1.08	.96
Emotional stability	.02	.02	-.04	-.02	-.03	-.03	.70**	.71*	1.03	1.00
Openness to experience	.01	.01	-.05	-.04	-.04	-.04	1.32	1.34*	.69	.69
Step 2: decision-making styles										
Rational		-.02		-.01		.02		1.02		.89*
Intuitive		.02		-.07*		-.04		.94		1.05
Dependent		-.05*		.09**		-.05		.97		1.04
Avoidant		.08**		.05		-.01		1.02		.91
Spontaneous		.03		.03		-.04		1.06		.93
R² (Nagelkerke for smoking and condom use)	.13	.18	.12	.17	.04	.06	.12	.13	.05	.09
R² change		.05**		.05**		.02*		.01		.04
F (χ² for smoking and condom use)	9.20***	7.03***	8.63***	6.73***	2.59*	2.10*	30.20***	34.27**	6.79	12.47

Note. β – standardized regression weight, OR – odds ratio
* $p < .05$, ** $p < .01$, *** $p < .001$

than from oneself (Wood & Highhouse, 2014). Similar results were found when decision-making styles, cognitive styles and the Big Five factors were used to explain general decision outcomes as an overall indicator of decision quality including a variety of real life situations (Dewberry, Juanchich, & Narendran, 2013). While four out of the eight inspected decision-making styles were significant predictors of decision outcomes, only the vigilant style (style from The Melbourne Decision Making Questionnaire which is similar to the rational style in the GDMS) remained significant after adding the cognitive styles and personality factors. When summarized together with the current results and other studies (e.g., Bruine de Bruin, Parker, & Fischhoff, 2007), the decision-making styles seem to be related to various decision outcomes although it is likely that other variables, predominantly personality factors and the subjective evaluation of one's own styles and decision outcomes, can partially explain these relationships.

Although decision-making styles offer just a little in addition to personality factors when explaining risk behavior, some of them were found to be significant predictors of certain types of risk behavior. The most dominant is the position of the dependent style whose higher score positively predicted problematic internet use and negatively alcohol use. This points to the impossibility of generalizing its role across types of health-risk behavior. While people who rely more on others while making decisions tend to use the internet excessively, they also have lower alcohol related problems. This finding is in line with previous studies, which have reported negative association of perceived social support (positive correlate of the avoidant style, Bavolar & Bacikova-Sleskova, 2018) with alcohol use (e.g., Steptoe et al., 1996). On the other hand, the internet may serve as another source of support and, according to the positive association between the

avoidant style and internet use, a way to postpone making decisions.

The avoidant decision-making style was found to be a significant predictor of problematic internet use and alcohol use (in this case only without the Big Five factors as predictors). This style is similar to the group of avoidant coping styles that are negatively related to health protective factors (Nes & Segerstrom, 2006; Sagone & De Caroli, 2014) and positively to psychological distress (Miller et al., 1996). More specifically, the avoidant coping is related to higher alcohol use (Hasking, Lyvers, & Carlopio, 2011) and drug use (Nyamathi, Stein, & Brecht, 1995). Thus, the use of this style can be regarded as a risk factor in multiple domains, although it was confirmed only in some cases in this study. It can point to some differences between internet use and other investigated kinds of risk behavior – possibly the easiest way to avoid other responsibilities (including making decisions), in comparison with other risk behavior types, is to use internet services such as social networks that are available immediately.

While the rational (analytical) and intuitive (experiential) styles are considered to be the main modes of information processing (Evans, 2008) and the rational decision-making style helps one to have better general decision outcomes (Bruine de Bruin, Parker, & Fischhoff, 2007; Juanchich et al., 2016), their role in risk behavior seems inferior. While only the intuitive style was associated with some kind of risk behavior (internet use), the role of the rational style in condom use and intuitive style in junk food consumption was also identified in the differences between the regression models including and not including the Big Five factors. The rational style helps one to use protection during the first sexual intercourse, which can be considered an example of highly rational consideration of potential outcomes emphasized in all safe-sex recommendations. The question is why it is not manifested in other risk

behavior types as warnings about the consequences of excessive alcohol drinking, cigarette smoking or unhealthy eating habits are often publicly emphasized.

One of the limitations of the present research is the method of data collection. As most participants completed the measures via the internet and only self-reported data were available, the discrepancy between the reported and real behavior is possible. Some kinds of risk behavior are difficult to recall (e.g., frequency of alcohol use during a time period) or in some cases social desirability can play an important role (Brener, Billy, & Grady, 2003). Moreover, some risk behaviors are very sensitive to report or subjects can purposely underestimate or overestimate the frequency of their occurrence according to the perceived expectations. The used measures asked about the frequent behavior in past decision-making situations, but people's perceptions can be confused and their ability to recall is questionable.

Another problem can arise from the substantial drop-off between the first and second round of data collection in part of the sample, but a great concordance of the found correlations between decision-making styles and the Big Five factors with previous studies (Dewberry, Juanchich, & Narendran, 2013; Wood & Highhouse, 2014) and only slight differences in risk behavior and personality factors between participants from the first and the second round indicate that the decrement rate between the two rounds have not influenced the present findings markedly. Another problem is visible in the Big Five measurement, when the used questionnaire (TIPI) with only two items for each factor had lower internal consistency coefficients. This is common in few-items scales (Schmitt, 1996). A more reliable measure of personality factors should be used to verify the present results.

To conclude, the study gives an insight into the role of decision-making styles in different types of risk behavior and complements past studies dealing with general decision outcomes. The current results can be a starting point for more specific research plans taking into consideration the interaction of decision-making styles with other factors including other personality and socio-psychological characteristics. From the practical view, possible implications may include prevention and intervention programs for groups with a higher risk of the studied decision outcomes where enhancing a certain approach to making decisions can prevent some kinds of risk behavior. As the dependent and avoidant styles were the strongest predictors of risk behavior, the major message is to encourage a more serious decision making approach including considering the potential of short-term as well as long-term consequences of risk behavior without avoiding making decisions.

References

Anderson, E. L., Steen, E., & Stavropoulos, V. (2017). Internet use and problematic Internet use: A systematic review of longitudinal research trends in adolescence and emergent adulthood. *International Journal of Adolescence and Youth, 22*(4), 430–454.

Al-Gamal, E., Alzayyat, A., & Ahmad, M. M. (2016). Prevalence of Internet addiction and its association with psychological distress and coping strategies among university students in Jordan. *Perspectives in Psychiatric Care, 52*(1), 49–61.

Appelt, K. C., Milch, K. F., Handgraaf, M. J., & Weber, E. U. (2011). The Decision Making Individual Differences Inventory and guidelines for the study of individual differences in judgment and decision-making research. *Judgment and Decision Making, 6*(3), 252–262.

Bavolar, J., & Bacikova-Sleskova, M. (2018). Psychological protective factors mediate the relationship between decision-making styles and mental health. *Current Psychology*, 1–10.

Bavoľár, J., & Orosová, O. (2015). Decision-making styles and their associations with decision-making competencies and mental health. *Judgment and Decision Making, 10*(1), 115–122.

Bohn, M. J., Babor, T. F., & Kranzler, H. R. (1995). The Alcohol Use Disorders Identification Test (AUDIT):

Validation of a screening instrument for use in medical settings. *Journal of Studies on Alcohol, 56*(4), 423–432.

Brener, N. D., Billy, J. O., & Grady, W. R. (2003). Assessment of factors affecting the validity of self-reported health-risk behavior among adolescents: Evidence from the scientific literature. *Journal of Adolescent Health*, *33*(6), 436–457.

Bruine de Bruin, W., Parker, A. M., & Fischhoff, B. (2007). Individual differences in adult decision-making competence. *Journal of Personality and Social Psychology, 92*(5), 938–956.

Caplan, S. E. (2010). Theory and measurement of generalized problematic Internet use: A two-step approach. *Computers in Human Behavior*, *26*(5), 1089–1097.

Çavuşoğlu, F., & Bahar, Z. (2010). Influence of socio-economic factors and family social support on smoking and alcohol use among health school students. *International Journal of Caring Sciences*, *3*(2), 77–84.

Clark, L., Robbins, T. W., Ersche, K. D., & Sahakian, B. J. (2006). Reflection impulsivity in current and former substance users. *Biological Psychiatry*, *60*(5), 515–522.

Coëffec, A. (2011). Les apports du modèle des cinq grands facteurs dans le domaine de l'alcoolodépendance [Big five factor contributions to addiction to alcohol]. *L'Encéphale, 37(1)*, 75–82.

Cooper, M. L., Russell, M., Skinner, J. B., Frone, M. R., & Mudar, P. (1992). Stress and alcohol use: Moderating effects of gender, coping, and alcohol expectancies. *Journal of Abnormal Psychology*, *101*(1), 139–152.

Costa, P. T., & MacCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO FFI): Professional manual.* Psychological Assessment Resources.

Deshpande, S., Basil, M. D., & Basil, D. Z. (2009). Factors influencing healthy eating habits among college students: An application of the health belief model. *Health Marketing Quarterly, 26*(2), 145–164.

Dewberry, C., Juanchich, M., & Narendran, S. (2013). Decision-making competence in everyday life: The roles of general cognitive styles, decision-making styles and personality. *Personality and Individual Differences*, *55*(7), 783–788.

Donohew, L., Zimmerman, R., Cupp, P. S., Novak, S., Colon, S., & Abell, R. (2000). Sensation seeking, impulsive decision-making, and risky sex: Implications for risk-taking and design of interventions. *Personality and Individual Differences, 28*(6), 1079–1091.

Feil, J., & Hasking, P. (2008). The relationship between personality, coping strategies and alcohol use. *Addiction Research & Theory*, *16*(5), 526–537.

Friedman, H. S. (2000). Long-term relations of personality and health: Dynamisms, mechanisms, tropisms. *Journal of Personality, 68*(6), 1089–1107.

Galotti, K. M., Ciner, E., Altenbaumer, H. E., Geerts, H. J., Rupp, A., & Woulfe, J. (2006). Decision-making styles in a real-life decision: Choosing a college major. *Personality and Individual Differences*, *41*(4), 629–639.

Gorodetzky, H., Sahakian, B. J., Robbins, T. W., & Ersche, K. D. (2011). Differences in self-reported decision-making styles in stimulant-dependent and opiate-dependent individuals. *Psychiatry Research*, *186*(2), 437–440.

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*(6), 504–528.

Hasking, P., Lyvers, M., & Carlopio, C. (2011). The relationship between coping strategies, alcohol expectancies, drinking motives and drinking behaviour. *Addictive Behaviors*, *36*(5), 479–487.

Hong, R. Y., & Paunonen, S. V. (2009). Personality traits and health-risk behaviours in university students. *European Journal of Personality*, *23*(8), 675–696.

Jones, R. M., Ross, C. N., & Hartmann, B. R. (1992). An investigation of cognitive style and alcohol/work-related problems among naval personnel. *Journal of Drug Education*, *22*(3), 241–251.

Juanchich, M., Dewberry, C., Sirota, M., & Narendran, S. (2016). Cognitive reflection predicts real-life decision outcomes, but not over and above personality and decision-making styles. *Journal of Behavioral Decision Making, 29*(1), 52–59.

Keller, S., Maddock, J. E., Hannöver, W., Thyrian, J. R., & Basler, H. D. (2008). Multiple health risk behaviors in German first year university students. *Preventive Medicine*, *46*(3), 189–195.

Kozhevnikov, M. (2007). Cognitive styles in the context of modern psychology: Toward an integrated framework of cognitive style. *Psychological Bulletin*, *133*(3), 464–481.

Martin, J. L., Groth, G., Longo, L., Rocha, T. L., & Martens, M. P. (2015). Disordered eating and alcohol use among college women: Associations with race and big five traits. *Eating Behaviors*, *17*, 149–152.

McCann, S. J. (2010). Subjective well-being, personality, demographic variables, and American state differences in smoking prevalence. *Nicotine & Tobacco Research*, *12*(9), 895–904.

Meader, N., King, K., Moe-Byrne, T., Wright, K., Graham, H., Petticrew, M., Power, C., White, M., &

Sowden, A. J. (2016). A systematic review on the clustering and co-occurrence of multiple risk behaviours. *BMC Public Health, 16*(1), 657.

Miller, D. L., Manne, S. L., Taylor, K., Keates, J., & Dougherty, J. (1996). Psychological distress and well-being in advanced cancer: The effects of optimism and coping. *Journal of Clinical Psychology in Medical Settings*, *3*(2), 115–130.

Nes, L. S., & Segerstrom, S. C. (2006). Dispositional optimism and coping: A meta-analytic review. *Personality and Social Psychology Review, 10*(3), 235–251.

Nyamathi, A., Stein, J. A., & Brecht, M. L. (1995). Psychosocial predictors of AIDS risk behavior and drug use behavior in homeless and drug addicted women of color. *Health Psychology*, *14*(3), 265–273.

Parker, A. M., De Bruin, W. B., & Fischhoff, B. (2007). Maximizers versus satisficers: Decision-making styles, competence, and outcomes. *Judgment and Decision Making*, *2*(6), 342–350.

Pitel, L., & Mentel, A. (2017). Decision-making styles and subjective performance evaluation of decision-making quality among hospital nurses. *Studia Psychologica, 59*(3), 217–231.

Phillips, J. G., & Ogeil, R. P. (2011). Decisional styles and risk of problem drinking or gambling. *Personality and Individual Differences*, *51*(4), 521–526.

Racette, S. B., Deusinger, S. S., Strube, M. J., Highstein, G. R., & Deusinger, R. H. (2005). Weight changes, exercise, and dietary patterns during freshman and sophomore years of college. *Journal of American College Health, 53*(6), 245–251.

Renau, V., Oberst, U., Gosling, S., Rusiñol, J., & Chamarro, A. (2013). Translation and validation of the ten-item-personality inventory into Spanish and Catalan. *Aloma: Revista de Psicologia, Ciències de l'Educació i de l'Esport*, *31*(2), 85–92.

Sacco, P., Bucholz, K. K., & Harrington, D. (2014). Gender differences in stressful life events, social support, perceived stress, and alcohol use among older adults: Results from a national survey. *Substance Use & Misuse*, *49*(4), 456–465.

Sagone, E., & De Caroli, M. E. (2014). A correlational study on dispositional resilience, psychological well-being, and coping strategies in university students. *American Journal of Educational Research*, *2*(7), 463–471.

Scott, S. G., & Bruce, R. A. (1995). Decision-making style: The development and assessment of a new measure. *Educational and Psychological Measurement*, *55*(5), 818–831.

Schmitt, N. (1996). Uses and abuses of coefficient alpha. *Psychological assessment, 8*(4), 350–353.

Steptoe, A., Wardle, J., Cui, W., Bellisle, F., Zotti, A. M., Baranyai, R., & Sanderman, R. (2002). Trends in smoking, diet, physical exercise, and attitudes toward health in European university students from 13 countries, 1990–2000. *Preventive medicine*, *35*(2), 97–104.

Steptoe, A., Wardle, J., Pollard, T. M., Canaan, L., & Davies, G. J. (1996). Stress, social support and health-related behavior: A study of smoking, alcohol consumption and physical exercise. *Journal of Psychosomatic Research, 41*(2), 171–180.

Tuinstra, J. (1998). *Health in adolescence: An empirical study of social inequality in health, health risk behaviour and decision making styles.* (Doctoral dissertation, University of Groningen). Retrieved August 18, 2015, from http://www.rug.nl/research/portal/files/10658842/c8.pdf.

Westmaas, J. L., Bontemps-Jones, J., & Bauer, J. E. (2010). Social support in smoking cessation: Reconciling theory and evidence. *Nicotine & Tobacco Research*, *12*(7), 695–707.

Wood, N. L., & Highhouse, S. (2014). Do self-reported decision styles relate with others' impressions of decision quality? *Personality and Individual Differences*, *70*, 224–228.

Zorlu, N., Gelal, F., Kuserli, A., Cenik, E., Durmaz, E., Saricicek, A., & Gulseren, S. (2013). Abnormal white matter integrity and decision-making deficits in alcohol dependence. *Psychiatry Research: Neuroimaging*, *214*(3), 382–388.

Zvolensky, M. J., Taha, F., Bono, A., & Goodwin, R. D. (2015). Big five personality factors and cigarette smoking: A 10-year study among US adults. *Journal of Psychiatric Research*, *63*, 91–96.

Goal Commitment Mediates the Relationship between Expected Positive Consequences of Goal Attainment and Effort

Nikola Fabiny, Ladislav Lovaš
Pavol Jozef Šafárik University in Košice, Slovak Republic

Expected positive consequences are predictors of effort expenditure in goal pursuit (Sheldon & Elliot, 1999). However, there are indications that this relationship is moderated (Locke & Latham, 1990) or mediated by commitment. A sample of 388 university students was administrated questionnaires in order to measure goal commitment, effort and positive expected goal attainment consequences. The results suggest that goal commitment is not a moderator of the relationship between positive expected goal attainment consequences and exerted effort but rather mediates the relationship. The findings outline that expected consequences in terms of cost-benefit analysis as another type of expectations are associated with effort, too.

Key words: goal commitment, effort, expected goal attainment consequences

Introduction

Thinking about the future can influence decisions about future behavior (Oettingen et al., 2009; Austin & Vancouver, 1996). Previous research on future thoughts has mainly been focused on expectancy judgments. According to expectancy-value theories, these judgments are predictors of intention formation and the process of goal attainment, including effort expenditure (Liberman & Förster, 2012; Oettingen & Mayer, 2002; Bandura, 1997). In the area of goal pursuing, future oriented expectancies consist of the anticipation of goal attainment as well as judgments of the consequences of goal attainment (Oettingen & Mayer, 2002; Fontaine & Dodge, 2006; Crick & Dodge, 1994). This raises the question if the expected consequences of goal attainment itself are related to effort expenditure. As such, it has been hypothesized that expected positive consequences are predictors of effort expenditure (Sheldon & Elliot, 1999).

An important issue is whether the relationship between the expected consequences of goal attainment and effort expenditure is direct or if this relationship is influenced (modified) by other variables. It is known that commitment plays an important role in the relationship between goals and effort. According to Locke and Latham (1990), the relationship between a goal and exerted effort is strongest if people are committed to their goals. It elicits the question whether goal commitment also has an important role in the relationship between the expected consequences of goal attainment and exerted effort. Locke and Latham (1990) have noted that commitment is a moderator in the relationship between goals and

Correspondence concerning this article should be addressed to Mgr. Nikola Fabiny, Pavol Jozef Šafárik University in Košice, Faculty of Arts, Department of Psychology, Moyzesova 9, 040 59 Košice, Slovak Republic, E-mail: nikola.fabiny@gmail.com

goal attainment, as well as exerted effort. It indicates the differences between people with low and high levels of commitment in this relationship. Therefore, it is possible to consider that commitment could also be a moderator in the relationship between positive expectations and effort. Alternatively, commitment could be an intervening variable in the relationship between expected consequences and effort. According to several authors, commitment can vary in the process of goal pursuit, and the expectations related to goal attainment belong to the antecedents of commitment as well (Fishbach & Finkelstein, 2012; Klein et al., 1999). In this relationship between commitment and effort, it seems that stronger commitment is a condition for an increase in effort. Hence, a hypothesis was constructed where commitment was an interface in the relationship between expected positive consequences and effort. Our current aim was to confirm this assumption as a model in which commitment is a mediator in the relationship between positive expectations related to goal attainment and effort expenditure.

Goal Expectations

According to several psychological theories, the anticipation of future events is an important part in the direction of future activities (Oettingen & Mayer, 2002; Austin & Vancouver, 1996). The estimation of subjective probability as a judgment about whether a specific outcome is likely to occur has been the most common approach (Locke & Latham, 2002). However, thinking about goal attainment has a more complex character. Part of it is anticipation of emotions, which can be elicited by a certain behavior or event. Baumgartner et al. (2008) have called them anticipated emotions. Strathman et al. (1994) have proposed a more widely defined construct called the Consideration of Future Consequences (CFC) and a scale for its assess-

ment. Anticipated consequences play an important role also in social-cognitive information processing models in the sphere of aggressive behavior (Fontaine & Dodge, 2006; Crick & Dodge, 1994).

It is apparent that the anticipation of future behavior consequences is also related to goal pursuit (Beyth-Marom et al., 1993). Goal attainment consequences can be characterized as a kind of "cost benefit analysis" (comparison of positive to negative consequences ratio). It is supposed that positive expected consequences have a motivational effect and thus stimulate a behavior whereas expected negative consequences inhibit a behavior or result in avoidance (e.g., Rutter & Hine, 2005; Archer et al., 2010; Lovaš et al., 2011). The terms positive and negative consequences are similar to the terms positive and negative feedback (Fishbach & Finkelstein, 2012) and expected positive consequences are similar to the term of expected rewards. Rewards are usually studied in the context of their motivational effect on one's subsequent performance.

Hence, in the field of goal pursuit it can be supposed that the expectation of positive consequences fosters activities leading to goal attainment. In contrast, the expectation of largely negative consequences inhibits the goal directed behavior. The representation of goal attainment is associated with the anticipated positive consequences, whereas the representation of failure in attaining a goal is associated with negative anticipated consequences (e.g., Huang, in Pekrun et al., 2014).

Commitment

According to the Goal Setting Theory the relationship of goal – behavior (performance) is strongest when people are committed to their goal (Locke & Latham, 2002). As Locke et al. (1988) have mentioned, commitment is an essential condition of goal attainment because

when there is no commitment, a goal cannot have a motivational effect. Goal attainment has widely been defined as one's determination to attain a goal (Locke & Latham, 1990). Commitment can also be defined as "a volitional psychological bond reflecting dedication to and responsibility for a particular target" (Klein et al., 2012, p. 137).

Commitment has a crucial influence on goal pursuit and is considered a prerequisite for its successful attainment (Oettingen et al., in Burkley et al., 2013). This is because individuals with a high level of commitment expend more effort on goal attainment, possess a greater extent of persistence and are thus more likely to accomplish the goal than persons with a lower level of commitment (Fishbach & Dhar; Klinger, in Burkley et al., 2013).

In the context of the role of commitment in the relationship between thinking about the future and effort expenditure, the question about its antecedents is important. Klein et al. (1999) used an expectancy theory framework to identify the determinants of goal commitment. As the most proximal antecedents of goal commitment they analyzed the attractiveness of goal attainment and the expectancy of goal attainment. The relationship of these variables to motivation has been empirically confirmed several times (Klein et al., 1999; Hollenbeck & Klein, 1987; Locke et al., 1981).

The identification of the antecedents of goal commitment is associated with its flexibility. This is done through possible changes in the attractiveness of goal attainment and the expectancy of goal attainment while pursuing a goal. This allows us to think about goal commitment as a mediator in the relationship between expected positive consequences and effort expenditure. Based on this, the aim of the presented research is to confirm the role of commitment as a moderator, as well as a mediator in the relationship between expected positive consequences and effort expenditure.

Method

The research sample consisted of 388 university students (140 men and 247 women, one participant did not enter their gender, $M = 21.01$ years, $SD = 1.58$). The participants were students from three universities in Košice (Pavol Jozef Šafárik University, the Technical University and The University of Veterinary Medicine and Pharmacy). The statistical analyses (with the exception of the confirmatory factor analysis) were conducted in SPSS 21 using Process Macro (Hayes, 2013) and included correlations (Pearson's coefficient), moderation and mediation analysis.

The questionnaire contained a description of the goal chosen by researchers (successful graduation) to which all the items of the scales were related. Based on the connection between goal attainment representation and the positive anticipated consequences (Huang, in Pekrun et al., 2014), only positive consequences were assessed regarding goal successful attainment.

The original "Expected Positive Consequences of Academic Goal Attainment scale" consists of 12 items inspired by measuring the expected consequences in aggression research (e.g., Archer et al., 2010, e.g., "People closest to me would appreciate it.") and by conducting interviews with 20 university students (e.g., "I would be rewarded by someone (school, parents)."). The participants were asked to rate the probability of each of the 12 items (1 = very unlikely, 6 = very likely; Cronbach's alpha = .84). The scale forms 3 factors according to the exploratory factor analysis – Positive evaluation by others, Positive self-esteem and Objective benefits (Fabiny & Lovaš, 2017). The scale including the items' affinity to the factors is in the Appendix.

As a type of validity testing, a confirmatory factor analysis (CFA) was conducted using SPSS Amos 21. Based on previous reliability

and factor analysis (Fabiny & Lovaš, 2017), one item was deleted from the scale. In spite of the three factors shown by the exploratory factor analysis, the CFA confirmed the suitability of only one factor for subsequent analysis. Factor 1 "Positive evaluation by others" consists of 5 (originally 6) items and explained 19% of variance (the most of all the factors) as well as being reliable ($\alpha = .82$). The CFA tested whether all the items loaded on the factor. As presented in Table 1 and Figure 1, the model showed an acceptable fit, supporting the internal validity

Table 1 *Model fit coefficients for CFA of the scale Positive evaluation by others*

Coefficient	Value
CMIN/DF	4.05
RMR	**.03**
SRMR	**.03**
GFI	**.98**
AGFI	**.94**
CFI	**.98**
PRATIO	.40
PNFI	.39
PCFI	.39
NCP	12.18
RMSEA	.09
PCLOSE	**.06**
AIC	38.18
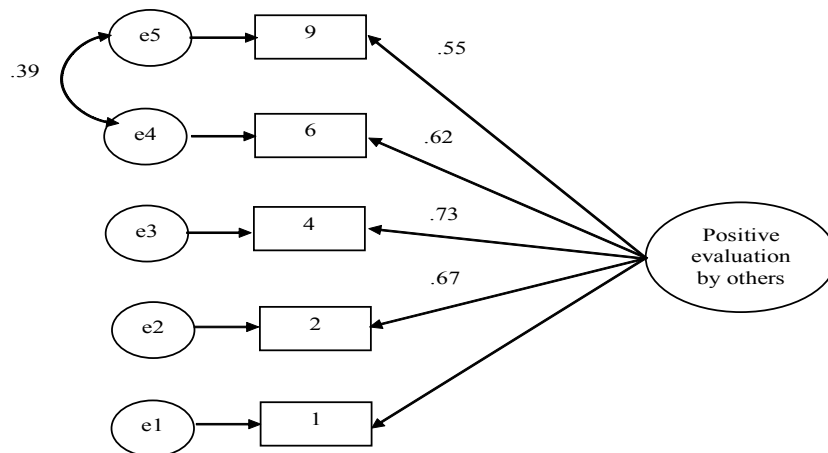
Note: Variables in the rectangles are numbers of items in the scale; standardized regression weights are displayed

Figure 1 CFA of the first factor of the Expected Positive Consequences of Academic Goal Attainment scale

of the scale ($\chi^2 = 16.18$, df = 4) even though it was significant ($p = .003$).

Goal commitment was measured by the KUT (Klein Unidimensional Target-free measure) scale (Klein et al., 2014) and consists of four items ("How committed are you to this target?; To what extent do you care about this target?; How dedicated are you to this target?; To what extent have you chosen to be committed to this target?"). The statements were rated on a 6-point scale (1 = not at all, 6 = completely; $\alpha = .80$).

Effort was rated on a 6-point scale (1 = not much, 6 = a lot; $\alpha = .91$). The three items which represent effort have been adopted from Nelissen et al. (2011) and their scale concerning body weight. It has been modified for the present study to measure effort in general ("How much effort do you make to achieve your target (weight)?; To what extent do you do your best to attain your target (weight)?; How much energy do you spend achieving your target (weight)?").

Note: In the research, more scales concerning goal characteristics were administrated but for the current study these three are considered the most important.

Results

Firstly, we focused on the relationships among the three measured variables. Table 2 displays the correlations between the first factor of the expected positive consequences of academic goal attainment, goal commitment and effort, which were all significant.

According to Locke and Latham (2006), we tested a moderation model. The moderation model is significant ($B = .11$; $SE = .05$; $95\% CI$ [.01; .21]; $p = .04$) and the determination coefficient changed after adding the interaction into the equation only by 1% (R^2 change = .01). The effect size $f^2 = .01$ is, according to Cohen (1988), weak. Thus, it seems that goal commitment moderates the relationship between the expected positive consequences of academic goal attainment (1st factor) and effort even though the moderation effect is weak. The unstandardized coefficients B were $B = .20$ for commitment and $B = -.47$ for the first factor of the expected positive consequences of academic goal attainment. Figure 2 depicts the interaction (slopes).

Following the correlation analyses and testing of the moderation model, the proposed mediation model was tested. Figure 3 supplemented by Table 3 illustrates the full mediation of commitment in the relationship between the expected positive consequences of academic goal attainment (1st factor) and effort, i.e. the significance of the indirect effect mediated by commitment in contrast to the insignificant direct effect ($B = -.02$, $SE = .06$, $95\% CI$ [-.14; .09], $p = .68$) of the first factor of the expected positive conse-

Table 2 *Correlations between expected positive consequences of academic goal attainment (1st factor), goal commitment and exerted effort*

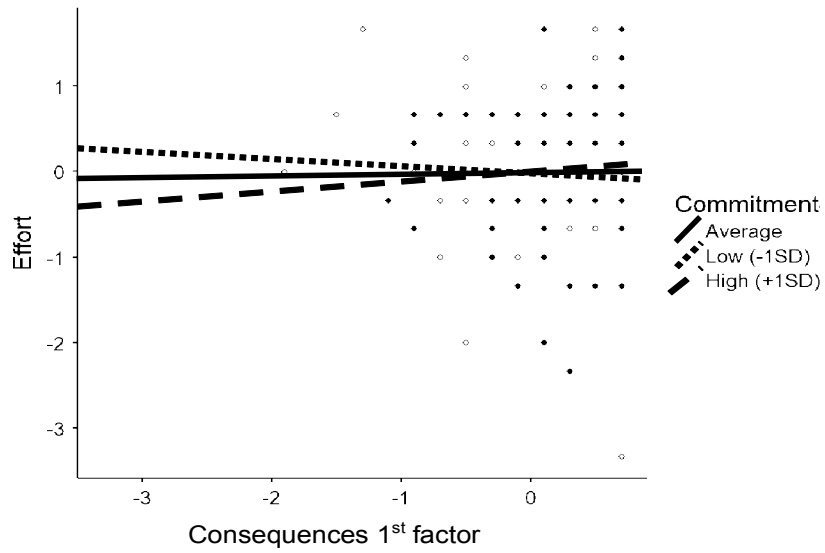|		Consequences 1st factor	Commitment	Effort
Consequences 1st factor	r_{xy}	1		
	Sig.			
Commitment	r_{xy}	.37	1	
	Sig.	.0001		
Effort	r_{xy}	.21	.62	1
	Sig.	.0001	.0001	

Figure 2 Moderating effect of commitment in the prediction of effort by expected positive consequences of academic goal attainment

Table 3 *Indirect effect on effort*

Indirect effect	Estimate (SE)	95% CI
	.32 (.05)	[.23; .42]

Sobel's test $Z = 6.95$; $p \leq .0001$
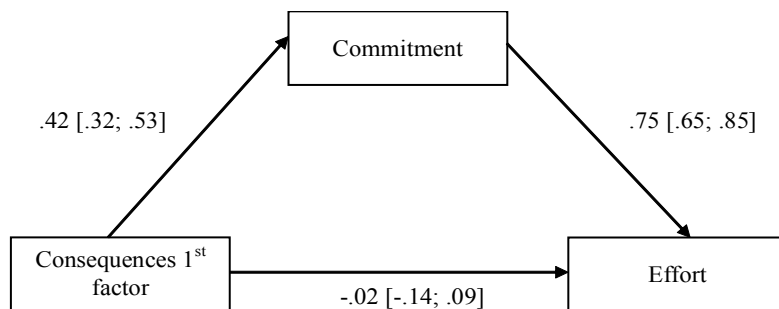
Figure 3 Mediating effect of commitment in the prediction of effort by expected positive consequences of academic goal attainment

quences of academic goal attainment on effort. The 95% CI for the direct effect including .0 supports the non-significance of the direct effect, whereas the 95% CI for the indirect effect missing value .0 confirms that the indirect effect is significant. This suggests that the more positive consequences of (academic) goal attainment are expected, the more effort will be exerted because people are more committed to goals related to positive expectancies. The effect size analysis revealed a strong mediation effect (Cohen's $f^2 = .56$; $R^2_A = .05$; $R^2_{AB} = .39$).

Discussion

The results of this study support the role of goal commitment in the relationship between expected consequences of goal attainment and exerted effort. Goal commitment both moderated (in accordance with the findings of Locke and Latham, 2006) and mediated (consistent with Klein et al., 1999 findings about commitment's antecedents) this relationship.

A full mediation was demonstrated, i.e. the non-significant direct effect of expected consequences of goal attainment on effort and a significant indirect effect via commitment. This is also consistent with the correlation analysis where all the correlations were significant. However, the relationship between expected consequences and effort was very weak in contrast to the relationships with commitment, which had higher correlation coefficient values. The Sobel test showed that the indirect effect of expected consequences on effort through commitment was significant, which could be partly attributed to the large sample size. According to Cohen (1988), f^2 is the effect size attributable to the addition of the mediator variable to the model meaning that the effect of the mediator in the study was large.

The present findings both support the hypotheses about the role of commitment and confirm the role of expectancies in the domain of goals. While commitment and effort are variables typically studied in goal research, the expected consequences (of goal attainment) have not been studied much in this context. Expected consequences are a part of goal choice. Thus, the choice of a goal – an integral part of the decision-making process with its supposed effect on goal pursuit – brings a different point of view to the initial motivation in goal directed behavior. As explained above, expectations (in terms of subjective probability) have a relationship to effort exerted on a goal attainment (Sheldon & Elliot, 1999). The study suggests that expected consequences, operationalized above (in terms of cost-benefit analysis) as another type of expectation, are associated with effort, too.

We are aware of the limitations of the present study concerning several issues. Even though the research sample was relatively large ($n = 388$ participants), it consisted of only university students. This makes the opportunity to generalize the findings rather complicated. On the other hand, there is no evidence for studying the topic on a specific population, since the knowledge in the field is considered general and research is carried out on a "normal" (non-specific) population of which students are a representative example. We should also mention the disadvantages of self-report questionnaires, one of which is the goal given by the researchers instead of an idiographic approach.

The limitation of self-reports could be eliminated by arranging an experimental design, i.e. manipulation with an independent variable, i.e. expected consequences of goal attainment in the present study. We suggest several other perspectives for future research. In the hypothesized model we did not consider the possibility of the simultaneous operation of two types of goal pursuit related expectancies – expected emotions (e.g., Perugini & Bagozzi, 2004) and expected consequences. There is evidence that these two variables could operate in parallel in

goal pursuits. Furthermore, in the current research we only considered positive expected consequences as being relevant in goal successful attainment (consistent with Huang, in Pekrun et al., 2014) but there is a call which needs to be verified. Is goal attainment only associated with positive anticipated consequences? What is the role of negative anticipated consequences in goal attainment?

The term goal attainment itself brings other points worth thinking about. Firstly, we tend to approach goal attainment as a synonym of goal pursuit and use it alternatively. We have studied the anticipated consequences regarding the representation of goal attainment as a result. However, a question arises whether the anticipated consequences related to goal pursuit as a process could also be distinguished. The hypothesis of temporal change of expected consequences in the process of goal pursuit could be based on findings of e.g., Carrera et al. (2012), who describe differences in intensity as well as polarity of anticipated emotions concerning different stages of the process (of risk alcohol consumption). Secondly, while we focused on goal attainment, a representation of failure in goal attainment itself could be an object of research interest.

Conclusion

The first factor Positive evaluation by others of the original Expected Positive Consequences of Academic Goal Attainment scale predicts an effort indirectly through goal commitment. The results show that the more positive consequences of goal attainment are expected, the more people are committed to that goal and, in turn, the more effort they exert to achieve the goal.

References

Archer, J., Fernández-Fuertes, A. A., & Thanzami, V. L. (2010). Does cost-benefit analysis or self-con-trol predict involvement in two forms of aggression? *Aggressive Behavior, 36*, 292–304.

Austin, J. T., & Vancouver, J. B. (1996). Goal constructs in psychology: Structure, process, and content. *Psychological Bulletin, 120*, 338–375.

Bandura, A. (1997). *Self-efficacy: The exercise of control*. New York: Freeman.

Baumgartner, H., Pieters, R., & Bagozzi, R. P. (2008). Future-oriented emotions: Conceptualization and behavioral effects. *European Journal of Social Psychology, 38*, 685–696.

Beyth-Marom, R., Austin, L., Fischhoff, B., Palmgren, C., & Jacobs-Quadrel, M. (1993). Perceived consequences of risky behaviors: Adults and adolescents. *Developmental Psychology, 29*, 549–563.

Burkley, E., Anderson, D., Curtis, J., & Burkley, M. (2013). Vicissitudes of goal commitment: Satisfaction, investments, and alternatives. *Personality and Individual Differences, 54*, 663–668.

Carrera, P., Cabalero, A., & Muňoz, D. (2012). Future-oriented emotions in the prediction of binge-drinking intention and expectation: The role of anticipated and anticipatory emotions. *Scandinavian Journal of Psychology, 53*, 273–279.

Cohen, J. E. (1988). *Statistical power analysis for the behavioral sciences*. Hillsdale, NJ: Lawrence Erlbaum Associates, Inc.

Crick, N. R., & Dodge, K. A. (1994). A review and reformulation of social information-processing mechanisms in children's social adjustment. *Psychological Bulletin, 115*, 74–101.

Fabiny, N., & Lovaš, L. (2017). Očakávané dôsledky dosiahnutia akademického cieľa a ich štruktúra. *Sociálne procesy a osobnosť 2016*. Bratislava: Ústav experimentálnej psychológie, Centrum spoločenských a psychologických vied SAV, 99–106.

Fishbach, A., & Finkelstein, S. R. (2012). How feedback influences persistence, disengagement, and change in goal pursuit. In H. Aarts & A. J. Elliot (Eds.), *Goal-directed behavior* (pp. 203–230). New York: Psychology Press.

Fontaine, R. G., & Dodge, K. A. (2006). Real-time decision making and aggressive behavior in youth: A heuristic model of Response Evaluation and Decision (RED). *Aggressive Behavior, 32*, 604–624.

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: The Guilford Press.

Hollenbeck, J. R., & Klein, H. J. (1987). Goal commitment and the goal-setting process: Problems, prospects, and proposals for future research. *Journal of Applied Psychology, 72*, 212–220.

Klein, H. J., Wesson, M. J., Hollenbeck, J. R., & Alge, B. J. (1999). Goal commitment and the goal-setting process: Conceptual clarification and em-

pirical synthesis. *Journal of Applied Psychology*, *84*, 885–896.

Klein, H. J., Molloy, J. C., & Brinsfield, C. T. (2012). Reconceptualizing workplace commitment to redress a stretched construct: Revisiting assumptions and removing confounds. *Academy of Management Review*, *37*, 130–151.

Klein, H. J., Cooper, J. T., Molloy, J. C., & Swanson, J. A. (2014). The assessment of commitment: Advantages of a unidimensional, target-free approach. *Journal of Applied Psychology*, *99*, 222–238.

Liberman, N., & Förster, J. (2012). Goal gradients, expectancy, and value. In H. Aarts & A. J. Elliot (Eds.), *Goal-directed behavior* (pp. 151–174). New York: Psychology Press.

Locke, E. A., Shaw, K. N., Saari, L. M., & Latham, G. P. (1981). Goal setting and task performance: 1969 – 1980. *Psychological Bulletin*, *90*, 125–152.

Locke, E. A., Latham, G. P., & Erez, M. (1988). The determinants of goal commitment. *Academy of Management Review, 13,* 23–39.

Locke, E. A., & Latham, G. P. (1990). *A theory of goal setting and task performance*. Englewood Cliffs, NJ: Prentice Hall International.

Locke, E. A., & Latham, G. P. (2002). Building a practically useful theory of goal setting and task motivation. A 35-year odyssey. *American Psychologist*, *57*, 705–717.

Locke, E. A., & Latham, G. P. (2006). New directions in Goal-Setting Theory. *Current Directions in Psychological Science*, *15*, 265–268.

Lovaš, L. et al. (2011). *Osobné a situačné kontexty sebakontroly*. Košice: Univerzita Pavla Jozefa Šafárika v Košiciach.

Nelissen, R. M. A., de Vet, E., & Zeelenberg, M. (2011). Anticipated emotions and effort allocation in weight goal striving. *British Journal of Health Psychology*, *16*, 201–212.

Oettingen, G., & Mayer, D. (2002). The motivating function of thinking about the future: Expectations versus fantasies. *Journal of Personality and Social Psychology*, *83*, 1198–1212.

Oettingen, G., Mayer, D., Sevincer, A. T., Stephens, E. J., Pak, H., & Hagenah, M. (2009). Mental contrasting and goal commitment: The mediating role of energization. *Personality and Social Psychology Bulletin*, *35*, 608–622.

Pekrun, R., Cusack, A., Murayama, K., Elliot, A. J., & Thomas, K. (2014). The power of anticipated feedback: Effects on students' achievement goals and achievement emotions. *Learning and Instruction*, *29*, 115–124.

Perugini, M., & Bagozzi, R. P. (2004). An alternative view of pre-volitional processes in decision making: Conceptual issues and empirical evidence. In G. Haddock & G. R. Maio (Eds.), *Contemporary perspectives on the psychology of attitudes: The Cardiff symposium* (pp. 1–50). Hove, UK: Psychology Press.

Rutter, A., & Hine, D. W. (2005). Sex differences in workplace aggression: An investigation of moderation and mediation effects. *Aggressive Behavior*, *31*, 254–270.

Sheldon, K. M., & Elliot, A. J. (1999). Goal striving, need satisfaction, and longitudinal well-being: The self-concordance model. *Journal of Personality and Social Psychology*, *76*, 482–497.

Strathman, A., Gleicher, F., Boninger, D. S., & Edwards, C. S. (1994). The consideration of future consequences: Weighing immediate and distant outcomes of behavior. *Journal of Personality and Social Psychology*, *66*, 742–752.

Appendix

The English translation of the Expected Positive Consequences of Academic Goal Attainment scale (originally administrated in Slovak language)

Factor 1: Positive evaluation by others
1. My surroundings would appreciate it.
2. I would get credit from people close to me, classmates.
4. People closest to me would appreciate it.
6. I would be satisfied that I have achieved something.
8. I would be satisfied that I have done something, got through it.*
9. I would be proud of myself.

Appendix continued

Factor 2: Positive self-esteem
7. I would improve my position compared to others.
10. I would be rewarded by someone (school, parents).
11. My self-esteem would improve.
12. I would be rewarded for that by myself (I would afford something to myself).

Factor 3: Objective benefits
3. It would improve my general knowledge in the field.
5. I would be better prepared for my future work life (career).

*Note: Based on reliability (item) analysis item No. 8 was deleted from the original 12 item scale.

Psychometric Properties of Mind-reading Belief Scale on an Italian Sample and Correlation with the Self-Construal

Francesca Sangiuliano Intra
IRCCS, Don Gnocchi Foundation, Milan, Italy

Semira Tagliabue
Department of Psychology, Università Cattolica del Sacro Cuore, Brescia, Italy

Cinzia Di Dio, Antonella Marchetti, Davide Massaro
Research Unit on Theory of Mind, Department of Psychology,
Università Cattolica del Sacro Cuore, Milan, Italy

Theory of Mind (ToM) is the lifespan developing ability to attribute mental states. This ability enables the individual to predict and interpret one's own and others' behavior. In this respect, *beliefs* about one's own capacity to attribute mental states represent a fundamental component of this construct. The present study aims to compare the unidimensional structure of the Mind-reading Belief Scale, evaluating beliefs about personal ToM skills, with an alternative two-factor model, which could better explain the latent structure of the scale outlining the relational nature of the construct through the articulation self-other. Moreover, the relations with self-construal, as a pivotal element for subjective differentiation, were also investigated. Our data support the two-factor model as a better structuring of the pool of original items. Finally, the correlations found with self-construal scales indicate that self-construal is involved in defining beliefs about one's own meta-representational skills.

Key words: Theory of Mind, self-report, self-construal, mind-reading, self-awareness

Theory of Mind and Beliefs about Mind-Reading Skills

Theory of Mind (ToM) is the ability to predict and anticipate others' behavior through attribution of mental states (Premack & Woodruff, 1978; Wimmer & Perner, 1983), and is one of the fundamental psychological constructs when studying social cognition. ToM enables individuals to get into a relationship and takes advantage of attributing beliefs to others

(Proust, 2007). Such attributions, also called mind-reading, are made by building metarepresentations of what is attributed in terms of thoughts and beliefs, thus, guiding behavior. The psychological development that generates ToM abilities is a lifelong process (see Hughes & Leekam, 2004). In the early Eighties, when ToM research began, the focus was on the early development of ToM during childhood (Charman, Baron-Cohen, Swettenham, Baird, Cox, & Drew, 2000), and on the identification of its developmental steps (Wimmer & Perner, 1985; Astington & Jenkins, 1995). On one hand, increasing evidence has shown that ToM is closely intertwined with other psychological components, such as language, emotions, etc. (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991; Dunn, 1995; Davis & Pratt, 1995; Kinderman, Dunbar & Bentall, 1998;

Hughes & Cutting, 1999; Astington & Jenkins, 1999; Carlson & Moses, 2001; Kühnen & Oysermanb, 2002; Birch & Bloom, 2003, 2004; Apperly, 2012). In this respect, although controversially, gender differences have emerged in ToM abilities suggesting that women, as compared to men, show a greater ToM competence, particularly in relation to the affective dimension of social cognition, such as emotion recognition, social sensitivity, empathy, and emotional intelligence (McClure, 2000; Baron-Cohen, O'Riordan, Stone, Jones, & Plaisted, 1999; Baron-Cohen & Wheelwright, 2004; Brackett & Salovey, 2006; see also, Adenzato et al., 2017). Additionally, it has also been shown that ToM evolution affects all the different epochs of life (Kuhn, 2000; Valle, Massaro, Castelli, & Marchetti, 2015; Cabinio et al., 2015). In this way, the original concept of ToM has been redefined as a multifaceted and life-span evolving psychological construct.

ToM is a constantly online system that, in order to ensure a good level of social adaptation (Moore & Frye, 1991), returns feedbacks to the individual about the quality of his/her metarepresentations deriving from socio-relational experiences. This dynamic seems to have at least two implications. The first concerns an ever increasing awareness of one's own ToM abilities (Nicholas & Stich, 2003). In this respect, several studies have suggested that the ability to use specific psychological skills is variable depending on the level of the individual's awareness of such abilities (Wicklund & Duval, 1971). Similarly, ToM may be also connected to metacognitive knowledge about such awareness. The second implication concerns the need to distinguish between self and others. In fact, it is commonly agreed that reasoning about ToM acquires meaning in the intersubjective and dialogic perspective (Zlatev, Racine, Sinha, & Itkonen, 2008). This means that, within a relationship, it is not sufficient to attribute mental contents to others, but also to consider the other's attribution of our mental contents. In the following paragraphs, these implications will be discussed and shaped into research questions.

Theory of Mind and Self-Construal

In order to be successful during social interactions, it is necessary to be able to distinguish the Self from the Other. Such a well-known dualism has been widely investigated (see Steinbeis, 2016). Evidence from research in developmental psychology suggests that the creation of the concept of Self and the concept of Other proceeds in parallel. This process begins from infancy when these two concepts start to share their most intrinsic nature, and namely that there cannot be self-identification without the recognition of the other, and vice-versa (Neisser, 1991; Aron, Aron, Tudor, & Nelson, 1991; Rochat & Hespos, 1997; Woodward, Sommerville, & Guajardo, 2001). In early childhood, the representation of the Self is partly overlapped with the representation of the Other (Trevarthen, 1979, 1993; Aitken & Trevarthen, 1997). The process of separation and distinction between self-representation and the representation of the other is evident in the child when the child begins to speak in the first-person. This process involves the recruitment from memory of previously learned self-schemas allowing addressing the specific on-going events.

The organization of these self-schemas strongly depends on how the concept of self develops. It has been theorized that self-construal can develop independently of others or interdependently with others (Singelis, 1994; Gore & Cross, 2014). For example, researchers (e.g., Gardner, Gabriel, & Lee, 1999) have suggested that individuals, who are considered as part of a cultural frame, can focus on themselves generating an individualistic Self; on the other hand, if individuals consider themselves as members of a group, they undergo the construc-

tion of a collectivist Self (Triandis, 1988). Self-construal can be then defined as independent, i.e., separated from others' perspective (e.g., culture-related perspective), or interdependent, i.e., shaped in strong connection with others (e.g., group-related perspective; Markus & Kitayama, 1991). Additionally, in order to include the relational meaning of social cognition into the dynamics that contribute to shaping a self-profile, another theoretical concept has been introduced, and namely the relational-interdependent self-construal (Cross, Bacon, & Morris, 2000; Cross, Morris, & Gore, 2002; Cross, Gore, & Morris, 2003). This concept has been developed owing to the impact of the interdependent self-construal on relationships. Interdependency implies a high sharing with others in building one's own self-profile and such a tendency influences the relationships themselves.

In this light, it could be plausible to suggest that self-construal, and namely the way our Self is built, operates implicitly, and that it is ultimately associated with self-awareness about our ToM skills in terms of mind-reading abilities. In other words, the way we regard our mind-reading skills also involves our self-construal. In this respect, it is already known that self-construal is associated with explicit cognitive processes (among which perspective taking; Aron et al., 1991; Gardner et al., 1999; Gore & Cross, 2011; Mandel, 2003), as well as with implicit mechanisms that, within social cognition, do not always operate in a goal-directed fashion or imply awareness. In this light, by operating implicitly, self-construal will be incorporated in a subjective perspective, and, in turn, will be more or less reflected in one's inclination to attribute different mental contents to others.

Mind-Reading Belief Scale

While research on ToM has grown exponentially, little attention has been paid to self-aware-ness about one's own ToM or, in other words, about beliefs regarding one's personal competences of mind-reading. As far as we know, the most substantial work in this respect is Realo et al.'s (2003) research, in which the authors explored the characteristics of the individuals' awareness about their mind-reading abilities. To this purpose, they proposed a Mind-reading Belief Scale (MBS – Realo et al., 2003), to highlight beliefs about one's mind-reading skills.

In particular, Realo and colleagues built a self-report scale based on a wide pool of items (63 items) drawn from the proposal by Davis and Kraus (1997) of four thematic groups of mind-reading abilities. These groups are related to the ability to read others' (I) personality traits, (II) mental states, (III) role or status, in order to predict other's (IV) future behavior. Realo and colleagues initially conducted a principal component analysis, which showed a three-factor structure. These factors were not strictly orthogonal; most of the variance was explained by the first factor and the other 2 factors randomly captured the essence of Davis and Kraus's proposal, thus making it difficult to interpret the three-factor structure in light of the above-mentioned thematic groups. For these reasons, the authors decided to opt for a unidimensional model and to proceed selecting the items of the scale according to several inclusion criteria: the items should have had a high factor loading on the first factor; the scale should have included both direct and reversed items; the items should have covered all four thematic groups. The final version of MBS enlisted 8 items evaluable by means of a 5-point Likert scale. The principal component analysis carried out on the selected items confirmed the presence of only one general factor. The Cronbach's alpha reliability of those 8 items was appropriate, suggesting that the selected items represented the total item-pool well. In light of these results, Realo and colleagues claimed that beliefs about mind-reading ability revolve

around a single and general theme: the more people believe to be good at judging the other's nature, the more they believe to be capable of inferring thoughts, emotions and behavioral intentions. This was in contrast with Davis and Kraus, who concluded that the presence of a generalized mind-reading accuracy is rather weak.

The main purpose of Realo and colleagues was to create a brief and user-friendly scale targeted to adults and, for this reason, they preferred keeping MBS as simple as possible. However, considering that ToM cannot be regarded as a unidimensional psychological construct, but rather multifaceted and context-related, it would be appropriate to hypothesize a more complex organization also for beliefs about one's own ToM ability, able to capture – at least – the distinction between Self and Other that characterizes relationships. Accordingly, we suggest that the latent structure underlying this scale should be more articulated than that described in the unidimensional latent model, even if at the expense of its shortness. This would entail the construction of a two-factor model latent structure able to grasp the dualism between Self and Other underpinning beliefs about ToM skills described above. More specifically, the basic idea with respect to our model structuring is that a model that accounts for the Self-Other dualism would be better at outlining the implicit mechanisms involved in the individuals' responses to the MBS items.

Aims

The first aim of this study was to investigate the psychometric properties of MBS in an Italian sample. Just like ToM and its use, which is variable on the basis of the context, beliefs about one's own mind-reading abilities may also follow the same course in terms of variability. For this reason, it was relevant to assess the psychometric properties of the MBS on a different

population investigating potential discrepancies associated with the appropriateness of the model (Lillard, 1998; Kobayashi, Glover, & Temple 2007). As a matter of fact, this is the first study that investigates the MBS latent structure, validity and reliability in an Italian sample. Other studies in literature have used the MBS; however, as far as we know, none have investigated its psychometric properties (Gavita, 2005; Ames & Kammrath, 2004).

Following the theoretical background above described, we further compared the MBS single-factor model, as suggested in Realo et al., with a two-factor model. The two-factor model should, in fact, take into account the dualism self/others explained above, which can be evinced from the way in which the original eight MBS items have been written (namely four items written in the first-person and four items written in an impersonal form). Accordingly, we grouped the eight items into two clusters, emphasizing the different meanings that mental concepts acquire according to the used pronoun (Gallagher, 2000). To this purpose, we clustered together the items specifically referring to beliefs about one's own mind-reading abilities (the four items written in the first person) and those referring to a general self-awareness about mind-reading abilities (the four items written in an impersonal form). The use of the first-person pronoun is unequivocally self-referential. This principle is usually called "immunity principle" to mean "immunity to error through misidentification relative to the first-person pronoun" (Shoemaker, 1968, p. 559, 1984). On the other hand, items written in an impersonal form could lead individuals to not specifically reason about themselves. Additionally, considering that evidence about ToM has sometimes highlighted gender discrepancies as introduced above (e.g., Adenzato et al., 2017), it is relevant to assess whether measurement of beliefs about one's mind-reading competences is similar between women and men.

After assessing the MBS's psychometric properties, the second aim of this study was to investigate the relationships between the MBS' structure and Self-Construal. The idea is that self-evaluation of mind-reading abilities can decline according to a relational perspective that implies Self and Others. In this respect, the link between the different types of self-construal (i.e., independent, interdependent, and relational) and MBS is worthy of attention in order to account for the complexity that characterizes the self-evaluation process about beliefs of one's own mind-reading abilities.

Methods

Participants and Procedure

Flyers were distributed within Catholic University of the Sacred Heart, Milan, with the invitation to participate in the research. Additionally, people outside the university have been invited through knowledge networks. People interested in participating in the study were requested to send an email and were contacted by phone for a brief interview. Those who reported no psychiatric or neurological impairment and declared no use of drugs or psychotropic drugs were scheduled to come to the University Psychology Department lab to complete the scales. No other exclusion criteria were applied. All participants gave written consent to participate in the study.

Sample 1. The first sample was composed of 256 Italian participants ($F = 50.4\%$; $M = 49.6\%$;), aged between 17-60 years (mean age = 26.41; $SD = 6.58$). The participants were requested to fill out the Mind-reading Belief Scale (MBS), which required about 10 minutes for completion (welcoming participant, giving instructions, and filling out the scale).

Sample 2. The second sample was composed of 102 Italian participants ($F = 80.4\%$; $M = 19.6\%$; mean age = 31.21; $SD = 9.14$). Besides filling out the MBS, participants in this group were also presented with two self-construal scales described below. The completion of all scales required about 20 minutes using a paper-pencil mode (welcoming participant, give instructions, fill the scales).

Scales

Mind-reading Belief Scale (MBS; Realo et al.) is a self-report scale, composed of 8 items exploring individuals' opinions related to their personal mentalization abilities, e.g., *"Usually, I know beforehand what my conversation partner is going to say"*. All items were translated into Italian including the back translation procedure. Participants were required to rate the statements using a 5-point Likert Scale from 0 (*"strongly disagree"*) to 4 (*"strongly agree"*).

The Independence and Interdependence Self construal Scale (ISC; Gudykunst et al., 1996) is a 29 items self-report scale that evaluates the independence (ISC_Id) and interdependence (ISC_It) of the self-construal (15 items for ISC_Id and 14 items for ISC_It); e.g., *"If there is a conflict between my values and the values of groups of which I am a member, I follow my values"* (ISC_Id) and *"I respect the majority's wishes in groups of which I am a member"* (ISC_It). Participants were required to express their degree of agreement using a 7-point Likert Scale from 1 (*"strongly disagree"*) to 7 (*"strongly agree"*). A Confirmatory Factor Analysis was conducted on our sample in order to verify the structure of the scale. Three items that presented non-significant factor loading were deleted. The final version of the scale was composed of 26 items (14 items for ISC_Id and 12 items for ISC_It). Reliability was good: ISC_Id $\omega = 0.837$; ISC_It $\omega = 0.861$.

The Relational-Interdependent Self-Construal Scale (RISC; Cross et al., 2000) is a self-report scale that measures how much people define their own Self in relational-oriented terms.

RISC is composed of 11 items, e.g., "*My close relationships are an important reflection of who I am*", ratable using a 7-point Likert Scale ranging from 1 ("*strongly disagree*") to 7 ("*strongly agree*"). A Confirmatory Factor Analysis was then conducted on our sample subjects in order to assess the unidimensional structure of the scale. Five items presented a non-significant factor loading and were deleted. The final version of the scale was composed of 6 items. Reliability was only acceptable: RISC ω = 0.665.

Results

Psychometrics Properties of MBS

The first aim of this study was to evaluate the MBS structure proposed by Realo and colleagues (2003). A Confirmative Factorial Analysis (CFA) assessing a one-latent-factor structure was tested using Mplus (Muthén & Muthén, 1998-2011), and χ^2; the Comparative Fit Index (CFI), and the Root Mean Square Error of Approximation (RMSEA) were used to evaluate the fit of the model. The χ^2 should be non-significant in order to consider the CFA model as fitting the observed data; however, since it is largely affected by sample size (Hu & Bentler, 1995), we examined other fit indices (Hu & Bentler, 1998): 1) CFI, an incremental fit index sensitive to complex model misspecification, was examined considering that the cut off can be set according to two criteria. Models with acceptable fit present a RMSEA < .08 and CFI > .90 (Bentler, 1990), whereas models with optimum fit present a RMSEA < .05 and CFI > .95

(Hu & Bentler). The one-factor structure of the MBS showed a poor fit (Table 1).

With the aim to compare the single-factor model above with a two-factor model that takes into account the dualism self/others, we hypothesized a possible reorganization of the items considering their wording, as well as the macro distinction among the ways in which the Self can be defined (i.e., independent, interdependent, and relational). According to this idea, we clustered the items into two categories that give rise to the bi-factorial latent structure here shown. The first factor, named SELF, summarizes the four self-referential items (i.e., items that are written in the first person asking about personal mind-reading abilities used with respect to others). The self-referential items SELF are: #1, #2, #4, #6. The second factor, named SELF&OTHERS, groups the other four items (#3, #5, #7, #8) that, although being designed as other-directed, can equally refer to oneself (i.e., items that are written in an impersonal form result more general and potentially allow participants to think also about themselves). In this respect, we conducted a two-factor CFA. Results confirmed the goodness of the bi-factorial model, showing good fit indices (see Table 1).

All items significantly charged on the respective latent factors (>.40). Furthermore, considering gender as a potential element of differentiation with respect to the thematic here examined, gender multigroup analyses were conducted in order to test the invariance of the model (Steenkamp & Baumgartner, 1998). The ΔCFI and ΔRMSEA, with cut-off points

Table 1 *(a) Fit indexes of the original model replicated in an Italian sample, One-factor model. (b) Fit indexes of the bi-factorial model proposed in the present study, Two-factor model*

MBS structure	χ^2 (p)	Df, N	CFI	RMSEA (90% C.I.)
(a) One-factor	64.94 (.001)	20, 256	0.85	0.094 (0.069 – 0.12)
(b) Two-factor	33.63 (<.05)	20, 256	0.95	0.055 (0.022 – 0.058)

of ΔCFI < .01 and of ΔRMSEA < .015 (Chen, 2007), were used to evaluate the significance of the difference between the model tested on the two groups (in each step the model with a higher number of constrains was compared to the previous model). Firstly, we tested the configural invariance to identify the invariant structure across groups. Subsequently, metric and scalar factorial invariances were conducted in the two groups. Metric invariance was found (Table 2), whereas scalar invariance was not: three of the total pool of items could not be constrained to have the same intercept. In particular, item #4 (A stranger's character is revealed to me at first sight; Intercepts M = 1.60, F = 1.786); item #7 (It is hard to judge if somebody is lying or not by their appearance; Intercepts M = 2.17, F = 1.70); and, item #8 (It is not possible to say what a person actually feels by their covert behavior; Intercepts M = 1.82, F = 1.49). Then, in order to obtain the scalar partial invariance, these three items were unconstrained. Finally, the strict in-

variance was also computed showing acceptable parameters (see Table 2).

The internal reliability of the scale was tested by using McDonald's ω (McDonald, 1999), which is considered more accurate compared to the Conbach's α (Revelle & Zinbarg, 2009). Results showed acceptable ω values (SELF ω = 0.69; SELF&OTHERS ω = 0.61) confirming the reliability of the scale supported by the two-factor model proposed in the present study.

MBS and Self-Construal

With the aim to deepen our understanding of the relation between awareness about one's own mind-reading abilities and self-construal, Pearson's correlation analyses were carried out among the different administered scales (IBM SPSS Statistics Version 23). Results showed a positive correlation between the MBS' factor SELF and the ISC_Id. Differently, the MBS factor SELF&OTHERS does not correlate with the Self-construal scale administered (see Table 3).

Table 2 *MBS gender invariance*

	χ^2 (Df)	RMSEA (90% C.I)	CFI	ΔRMSEA	ΔCFI
Configural	58.334 (38)*	0.065 (0.027 – 0.096)	0.937	-	-
Metric	75.874 (52)*	0.060 (0.026 – 0.088)	0.926	-0.005	0.011
Scalar	107.791 (60)	0.079 (0.054 – 0.103)	0.851	0.019	0.075
Scalar P.I.	82.577 (57)*	0.059 (0.027 – 0.086)	0.921	-0.020	-0.070
Strict	89.592 (59)*	0.064 (0.035 – 0.089)	0.905	0.005	0.016

Note. P.I. = Partial Invariance
* Significance of the Chi-Square test of model fit at the 0.05 level

Table 3 *Pearson's correlation analyses between the two latent factors of MBS (SELF and SELF&OTHERS) and Self-construal scales, i.e., Independent Self-construal (ISC_Id), Interdependent Self-construal (ISC_It) and Relational-Interdependent Self-Construal (RISC)*

MBS	ISC_Id	ISC_It	RISC
SELF	.169*	.159	.103
SELF&OTHER	.029	.068	.089

Note. * The correlations are significant at the 0.05 level (1-tailed)

Discussion

The first aim of the present research was to assess the psychometric properties of the MBS on an Italian sample comparing the original MBS unidimensional structure proposed by Realo et al. (2003) with a two-factor model latent structure using CFA, as well as its invariance based on a gender multigroup approach. Secondly, we investigated the relationships between the two latent factors of the model and the self-construal.

Data from the present study do not confirm the original exploratory structure proposed by Realo and colleagues showing poor model fit. The two-factorial model was evaluated through a confirmative approach. Results support the presence of two latent variables, SELF and SELF&OTHERS, which better capture the complexity of the construct. Analyzing the items content, in fact, the items written in the first person charged on the first factor, SELF, and reflected the participants' beliefs about their mind-reading abilities. These include, for example, the ability to anticipate others' reactions or responses in a conversational frame or lies recognition. On the other hand, the second latent factor, SELF&OTHERS, included those items that were written impersonally, i.e., the subject of the sentence was non-specific. As a matter of fact, MBS presents this self/other dualism expressed by four items that are written in the first person and by the other four items that are impersonal. With our model we bring support to the existence of this dualism when presenting items in the first person or impersonally (see Appendix 1 for the full items' wording and factor loading).

Items that compose the factor SELF say something about what exactly individuals think of their abilities in terms of mind-reading: by reading the items, it is clear that people should only refer to their own abilities. On the contrary, the impersonal form of the SELF&OTHERS items invites people to weight the described abilities in relational terms; that is, it is not one's own specific mentalization ability, rather the ability that people generally express within a relational exchange. Therefore, the two-factor model, in which these two perspectives are considered and kept divided, appears to be more informative in that it better captures the two components associated with the individuals' beliefs about ToM abilities (Paal & Bereczkei, 2007). From a theoretical perspective, the two factors encompass both the Piagetian (Piaget, 1954) and the Vygotskijan points of view (Vygotskij, 1978). The first factor is more solipsistic: taking the Piagetian position, the person is in the world without being influenced by contextual factors. On the other hand, the second latent factor calls for the intersubjective point of view, which also characterizes the individual use of mentalization skills. This interpretation is closer to the Vygotskian view, in which it is exactly the intersubjective sharing that defines how each person uses ToM skills. Nevertheless, both our latent factors led individuals to mentally figure out events in which they use ToM competences to judge their personal level of such abilities. This perspective is in line with Harris' simulation theory (1989, 1991), according to which children develop an understanding of other's mental contents by using a simulation mechanism based on their previous experiences of similar situations. Individuals infer mental states of others through the "work of imagination" (Harris, 2000), i.e., simulating what they would feel/think if they were that person and then generate the reaction (Goldman, 1989, 1992, 2006; Gordon, 1986, 1995; Heal, 1986; Harris, 1990, 1995a, 1995b; Harris, Johnson, Hutton, Andrews, & Cooke, 1989). In both cases, and namely, acting a behavior or judging a personal competence, the simulation process could be active, allowing people to use their self-knowledge in order to manage social interactions.

Furthermore, considering gender as a potential element of differentiation with respect to measurement of one's beliefs about personal ToM abilities, gender multigroup analyses showed no overall differences between women and men, supporting the robustness of MBS two-factor structure. Considering the intercepts of the underlying items, however, we found that women diverged from men on three items. It is important to note that this gender difference in our measurement affects the estimation of the two latent variables, determining a difficulty in directly comparing men and women on the construct's level. Thus, our results highlight that women respond differently from men on specific items of the MBS measurement, and suggest that future uses of this tool should take into consideration such differences.

With respect to the link between MBS and self-construal profiles, our results showed that the latent factor SELF correlated only with the independent-self construal. Findings on the SELF are in line with the hypothesis that self-construal is involved when MBS requests individuals to *clearly* express an opinion about themselves (Stapel & Koomen, 2001; Haberstroh, Oyserman, Schwarz, Kühnen, & Ji, 2002; Escalas & Bettman, 2005). In other words, self-construal is involved in a reasoning through which the individuals evaluate their socio-relational competences that involve recall to the Self. On the other hand, when MBS items are written in an impersonal form, such as in the SELF&OTHER dimension, their interpretation in terms of self-construal appears to be inapplicable. More specifically, a MBS item falling within the SELF&OTHER category prompts reasoning about a general situation that may involve a more empirical rather than introspective thinking. For example, the MBS sentence "It is hard to judge if somebody is lying or not by their appearance" does not necessarily describe or involve any typologies of Self (independent or interdependent), because – at this

level – the theoretical constructs of MBS and self-construal appear to not combine.

Particular attention goes to the RISC scale. The scale – so as used in this study – proved to be unreliable in assessing the construct of relational-interdependent self-construal in our sample. In fact, the confirmatory analysis that we carried out to evaluate the reliability of RISC highlighted some important limits of the scale, at least in our Italian sample. That is, to obtain acceptable reliability indexes, it was necessary to remove 5 out of 11 total items. This result stresses the ambiguity dimension that precisely characterizes this construct, which embeds both the dimension of a Self that is built interdependently, and the tendency to think of oneself in terms of relationships with close others. This observation necessarily prompts further exploration of the multidimensionality of the Relational-Interdependent Self-Construal construct.

Generally, the present results support the usefulness of investigating the nature of beliefs about ToM skills, which can be briefly defined as a meta-knowledge about ToM that ought to take into account its different dimensions. The latter point further puts emphasis on the idea that the original unidimensional model, while having the advantages of shortness and simplicity, has also the potential limit of not fully capturing the richness of belief-related contents. With our two-factor model we suggest that this limit can be in part overcome by specifying the distinction between Self and Others associated to beliefs about one's mind-reading abilities.

From a clinical perspective, the MBS could be useful to expand the pool of ToM tasks currently used to assess theory of mind competences in patients, especially those with neurodegenerative pathologies. In fact, several studies have shown how social cognition competences are impaired in several clinical populations as an effect of the patient's pathological condition (Mohr, Classen, & Barrera, 2004; Grytten & Måseide,

2006). In particular, MBS could be useful to explore the patient's perception of his/her social competences in order to understand, for example, if a rehabilitation program focused on social competences is not only effective in terms of improvements of such abilities, but also in terms of self-awareness. Moreover, this scale could be usefully employed to assess the caregivers' representation of their mind-reading competences since their own social skills may be at risk of impairment due to the daily interaction (often in the absence of socio-psychological support) with people affected by neuro-degenerative diseases. Finally, in order to implement the potential of the MBS as an assessing tool, future studies should explore a development of the MBS, which takes also into account the link here emerged with self-construal, trying to better understand how the distinction between Self and Other in defining beliefs on ToM abilities contributes to self-shaping, as well as a possible link with ToM performances.

References

Adenzato, M., Brambilla, M., Manenti, R., De Lucia, L., Trojano, L., Garofalo, S., ... & Cotelli, M. (2017). Gender differences in cognitive Theory of Mind revealed by transcranial direct current stimulation on medial prefrontal cortex. *Scientific Reports*, 7, 41219. doi: 10.1038/srep41219

Aitken, K. J., & Trevarthen, C. (1997). Self/other organization in human psychological development. *Development and Psychopathology, 9*(4), 653–677.

Ames, D. R., & Kammrath, L. K. (2004). Mind-reading and metacognition: Narcissism, not actual competence, predicts self-estimated ability. *Journal of Nonverbal Behavior, 28*(3), 187–209. doi: 10.1023/B:JONB.0000039649.20015.0e

Apperly, I. A. (2012). What is "theory of mind"? Concepts, cognitive processes and individual differences. *The Quarterly Journal of Experimental Psychology, 65*(5), 825–839. doi: 10.1080/17470218.2012.676055

Aron, A., Aron, E. N., Tudor, M., & Nelson, G. (1991). Close relationships as including other in the self. *Journal of Personality and Social Psychology*, 60(2), 241–253. doi: 10.1037/0022-3514.60.2.241

Astington, J. W., & Jenkins, J. M. (1995). Theory of mind development and social understanding. *Cognition & Emotion*, 9(2-3), 151–165. doi: 10.1080/02699939508409006

Astington, J. W., & Jenkins, J. M. (1999). A longitudinal study of the relation between language and theory-of-mind development. *Developmental Psychology, 35*(5), 1311. doi: 10.1037/0012-1649.35.5.1311

Baron-Cohen, S., O'Riordan, M., Stone, V., Jones, R., & Plaisted, K. (1999). Recognition of faux pas by normally developing children and children with Asperger syndrome or high-functioning autism. *Journal on Autism and Developmental Disorders, 29*, 407–418. doi: 10.1023/A:1023035012436

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: An investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal on Autism and Developmental Disorders, 34*, 163–175. doi: 10.1023/B%3AJADD.0000022607.19833.00

Brackett, M. A., & Salovey, P. (2006). Measuring emotional intelligence with the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT). *Psicothema* (Suppl. 18), 34–41. doi: 10.1037/1528-3542.3.1.97

Bentler, P. M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, *107*(2), 238–246. doi: 10.1037/0033-2909.107.2.238

Birch, S. A., & Bloom, P. (2004). Understanding children's and adults' limitations in mental state reasoning. *Trends in Cognitive Sciences, 8*(6), 255–260. doi: 10.1016/j.tics.2004.04.011

Birch, S. A., & Bloom, P. (2003). Children are cursed: An asymmetric bias in mental-state attribution. *Psychological Science, 14*(3), 283–286. doi: 10.1111/1467-9280.03436

Cabinio, M., Rossetto, F., Blasi, V., Savazzi, F., Castelli, I., Massaro, D., et al. (2015). Mind-reading ability and structural connectivity changes in aging. *Frontiers in Psychology, 6*, 1808. doi: 10.3389/fpsyg.2015.01808

Carlson, S. M., & Moses, L. J. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development, 72*(4), 1032–1053. doi: 0009-3920/ 2001/7204-0007

Charman, T., Baron-Cohen, S., Swettenham, J., Baird, G., Cox, A., & Drew, A. (2000). Testing joint attention, imitation, and play as infancy precursors to language and theory of mind. *Cognitive Development, 15*(4), 481–498. doi: 10.1016/S0885-2014(01)00037-5

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*(3), 464–504. doi: 10.1080/10705510701301834

Cross, S. E., Bacon, P. L., & Morris, M. L. (2000). The relational-interdependent self-construal and relationships. *Journal of Personality and Social Psychology, 78*(4), 791. doi: 10.1037/0022-3514.78.4.791

Cross, S. E., Morris, M. L., & Gore, J. S. (2002). Thinking about oneself and others: The relational-interdependent self-construal and social cognition. *Journal of Personality and Social Psychology, 82*(3), 399–418. doi: 10.1037/0022-3514.82.3.399

Cross, S. E., Gore, J. S., & Morris, M. L. (2003). The relational-interdependent self-construal, self-concept consistency, and well-being. *Journal of Personality and Social Psychology*, *85*(5), 933–944. doi: 10.1037/0022-3514.85.5.933

Davis, H. L., & Pratt, C. (1995). The development of children's theory of mind: The working memory explanation. *Australian Journal of Psychology, 47*(1), 25–31. doi: 10.1080/00049539508258765

Davis, M. H., & Kraus, L. A. (1997). Personality and empathic accuracy. In W. J. Ickes (Ed.), *Empathic accuracy* (pp. 144–168). New York, NY, US: Guilford Press. TDD/TTY: 202-336-6123

Dunn, J. (1995). Children as psychologists: The later correlates of individual differences in understanding of emotions and other minds. *Cognition & Emotion, 9*(2-3), 187–201. doi: 1080/02699939508409008

Dunn, J., Brown, J., Slomkowski, C., Tesla, C., & Youngblade, L. (1991). Young children's understanding of other people's feelings and beliefs: Individual differences and their antecedents. *Child Development, 62*(6), 1352–1366. doi: 10.2307/1130811

Escalas, J. E., & Bettman, J. R. (2005). Self-construal, reference groups, and brand meaning. *Journal of Consumer Research, 32*(3), 378–389. doi: 10.1086/497549

Gallagher, S. (2000). Philosophical conceptions of the self: Implications for cognitive science. *Trends in Cognitive Sciences*, *4*(1), 14–21. doi: 10.1016/S1364-6613(99)01417-5

Gardner, W. L., Gabriel, S., & Lee, A. Y. (1999). "I" value freedom, but "we" value relationships: Self-construal priming mirrors cultural differences in judgment. *Psychological Science, 10*(4), 321–326. doi: 10.1111/1467-9280.00162

Gavita, O. (2005). Can we read others' minds? Rational beliefs, positive illusions and mental health, *Journal of Cognitive & Behavioral Psychotherapies*, *5*(2), 159–179.

Goldman, A. I. (1989). Interpretation psychologized. *Mind & Language*, *4*(3), 161–185. doi: 10.1111/j.1468-0017.1989.tb00249

Goldman, A. I. (1992). In defense of the simulation theory. *Mind & Language*, *7*(12), 104–119. doi: 10.1111/j.1468-0017.1992.tb00200

Goldman, A. I. (2006). *Simulating minds: The philosophy, psychology, and neuroscience of mindreading*. Oxford University Press. ISBN: 9780195369830

Gordon, R. M. (1986). Folk psychology as simulation. *Mind & Language*, *1*(2), 158–171. doi: 10.1111/j.1468-0017.1986.tb00324

Gordon, R. (1995). Simulation without introspection or inference from me to you. In T. Stone, & M. Davies (Eds.), *Mental Simulation*. Oxford: Blackwell. ISBN: 0631198733

Gore, J. S., & Cross, S. E. (2011). Conflicts of interest: Relational self-construal and decision making in interpersonal contexts. *Self and Identity, 10*(2), 185–202. doi: 10.1080/15298861003684390

Gore, J. S., & Cross, S. E. (2014). Who am I becoming? A theoretical framework for understanding self-concept change. *Self and Identity*, *13*(6), 740–764. doi: 10.1080/15298868.2014.933712

Grytten, N., & Måseide, P. (2006). When I am together with them I feel more ill. The stigma of multiple sclerosis experienced in social relationships. *Chronic Illness, 2*(3), 195–208. doi: 10.1179/174592006X129482

Gudykunst, W. B., Matsumoto, Y., Ting-Toomey, S., Nishida, T., Kim, K., & Heyman, S. (1996). The influence of cultural individualism-collectivism, self construals, and individual values on communication styles across cultures. *Human Communication Research, 22*(4), 510–543. doi: 10.1111/j.1468-2958.1996.tb00377.x.

Haberstroh, S., Oyserman, D., Schwarz, N., Kühnen, U., & Ji, L. (2002). Is the interdependent self more sensitive to question context than the independent self? Self-construal and the observation of conversational norms. *Journal of Experimental Social Psychology, 38*(3), 323–329. doi: 10.1006/jesp.2001.1513

Harris, P. L. (1989). *Children and emotion: The development of psychological understanding*. Cambridge, MA, US: Basil Blackwell. ISBN: 0631198736

Harris, P. L., Johnson, C. N., Hutton, D., Andrews, G., & Cooke, T. (1989). Young children's theory of mind and emotion. *Cognition and Emotion*, *3*, 379–400. doi: 10.1080/02699938908412713

Harris, P. L. (1990). The child's theory of mind and its cultural context. In G. B. Butterworth & Peter (Eds.), *Causes of development: Interdisciplinary perspectives*. Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc. ISBN: 0745006647

Harris, P. L. (1991). The work of the imagination. In A. Whiten (Ed.), *Natural theories of mind: Evolution, development and simulation of everyday mindreading*. Oxford: Basil Blackwell. ISBN: 978-0631171942

Harris, P. L. (1995a). From simulation to folk psychology: The case for development. In M. Davies, & T. Stone (Eds.), *Folk psychology* (pp. 207–231). Oxford: Blackwell. ISBN: 0631195157

Harris, P. L. (1995b). Imagining and pretending. In M. Davies, & T. Stone (Eds.), *Mental simulation: Evaluations and applications* (pp. 170–184). Oxford: Blackwell. ISBN: 0631198733

Harris, P. L. (2000). *The work of the imagination.* Oxford: Wiley-Blackwell. ISBN: 978-0-631-21886-9

Heal J. (1986). Replication and functionalism. In J. Butterfield (Ed.), *Language, mind, and logic*. Cambridge, MA: Cambridge University Press. doi: 10.2307/2220274

Hu, L. T., & Bentler, P. M. (1995). Evaluating model fit. In R. H. Hoyle (Ed.), *Structural equation modeling: Concepts, issues, and applications* (pp. 76–99). Thousand Oaks, CA, US: Sage Publications, Inc. ISBN: 0-8039-5317-8

Hu, L., & Bentler, P. M. (1998). Fit indices in covariance structure modeling: Sensitivity to underparameterized model misspecification. *Psychological Methods, 3*(4), 424. doi: 10.1037//1082-989X.3.4.424

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal, 6*(1), 1–55. doi: 10.1080/10705519909540118

Hughes, C., & Cutting, A. L. (1999). Nature, nurture, and individual differences in early understanding of mind. *Psychological Science, 10*(5), 429–432. doi: 10.1111/1467-9280.00181

Hughes, C., & Leekam, S. (2004). What are the links between theory of mind and social relations? Review, reflections and new directions for studies of typical and atypical development. *Social Development, 13*(4), 590–619. doi: 10.1111/j.1467-9507.2004.00285.x

Kinderman, P., Dunbar, R., & Bentall, R. P. (1998). Theory-of-mind deficits and causal attributions. *British Journal of Psychology, 89*(2), 191–204. doi: 10.1111/j.2044- 8295.1998.tb02680.x

Kobayashi, C., Glover, G. H., & Temple, E. (2007). Cultural and linguistic effects on neural bases of 'Theory of Mind' in American and Japanese children. *Brain Research, 1164*, 95–107. doi: 10.1016/j.brainres.2007.06.022

Kuhn, D. (2000). Theory of mind, metacognition, and reasoning: A life-span perspective. In P. Mitchell, & K. J. Riggs (Eds.), *Children's reasoning and the mind* (pp. 301–326). Hove, England: Psychology Press/Taylor & Francis (UK). ISBN: 1317715217

Kühnen, U., & Oyserman, D. (2002). Thinking about the self influences thinking in general: Cognitive consequences of salient self-concept. *Journal of Experimental Social Psychology, 38*(5), 492–499. doi: 10.1016/S0022-1031(02)00011-2

Lillard, A. (1998). Ethnopsychologies: Cultural variations in theories of mind. *Psychological Bulletin, 123*(1), 3–32. doi: 10.1037/0033-2909.123.1.3

Mandel, N. (2003). Shifting selves and decision making: The effects of self-construal priming on consumer risk-taking. *Journal of Consumer Research, 30*(1), 30–40. doi: 10.1086/374700

Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*(2), 224. doi: 10.1037/0033-295X.98.2.224

McClure, E. B. (2000). A meta-analytic review of sex differences in facial expression processing and their development in infants, children, and adolescents. *Psychological Bulletin, 126*(3), 424–453. doi: 10.1037/0033-2909.126.3.424

McDonald, R. P. (1999). *Test theory: A unified treatment.* Mahwah, NJ, US: Lawrence Erlbaum Associates Publishers. ISBN 0–8058–3075–8

Moore, C., & Frye, D. (1991). The acquisition and utility of theories of mind. *Children's Theories of Mind: Mental States and Social Understanding,* Lawrence Associates Inc., New York. ISBN: 978-0-805-80417-1

Mohr, D. C., Classen, C., & Barrera, M. (2004). The relationship between social support, depression and treatment for depression in people with multiple sclerosis. *Psychological Medicine, 34*(03), 533–541. doi: 10.1017/S0033291703001235

Muthén, L. K, & Muthén, B. O. (1998–2011). Mplus (version 6.12) [Computer software]. Los Angeles, CA.

Neisser, U. (1991). Two perceptually given aspects of the self and their development. *Developmental Review, 11*(3), 197–209. doi: 10.1016/0273-2297(91)90009-D

Nichols, S., & Stich, S. P. (2003). *Mindreading: An integrated account of pretense, self-awareness, and understanding other minds.* Clarendon Press/Oxford University Press. ISBN: 0198236107

Paal, T., & Bereczkei, T. (2007). Adult theory of mind, cooperation, Machiavellianism: The effect of mindreading on social relations. *Personality and Individual Differences, 43*(3), 541–551. doi: 10.1016/j.paid.2006.12.021

Perner, J., & Wimmer, H. (1985). 'John thinks that Mary thinks that….': Attribution of second-order false-belief by 5 to 10-years-old-children. *Journal of Experimental Child Psychology, 5*, 125–137. doi: 10.1016/0022-0965(85)90051-7

Piaget, J. (1954). *The construction of reality in the child.* (M. Cook, Trans). New York, NY, US: Basic Books. doi: 10.1037/11168-000

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1*(04), 515–526. doi: 10.1017/S0140525X00076512

Proust, J. (2007). Metacognition and metarepresentation: Is a self-directed theory of mind a precondition for metacognition? *Synthese, 159*(2), 271–295. doi: 10.1007/s11229-007-9208-3

Realo, A., Allik, J., Nõlvak, A., Valk, R., Ruus, T., Schmidt, M., et al. (2003). Mind-reading ability: Beliefs and performance. *Journal of Research in Personality, 37*(5), 420–445. doi: 10.1016/S0092-6566(03)00021-7

Revelle, W., & Zinbarg, R. E. (2009). Coefficients alpha, beta, omega, and the GLB: Comments on Sijtsma. *Psychometrika, 74*, 145–154. doi: 10.1007/s11336-008-9102-z

Rochat, P., & Hespos, S. J. (1997). Differential rooting response by neonates: Evidence for an early sense of self. *Early Development and Parenting, 6*(34), 105–112. CCC: 1057-3593/97/030105

Shoemaker, S. (1968). Self-reference and self-awareness. *Journal of Philosophy, 65*, 555–567. doi: 10.2307/2024121

Shoemaker, S. (1984). Self-reference and self-awareness. In *Identity, cause and mind*. Cambridge, Cambridge University Press. ISBN: 9780199264698

Singelis, T. M. (1994). The measurement of independent and interdependent self-construals. *Personality and Social Psychology Bulletin, 20*(5), 580–591. doi: 10.1177/0146167294205014

Stapel, D. A., & Koomen, W. (2001). I, we, and the effects of others on me: How self-construal level moderates social comparison effects. *Journal of Personality and Social Psychology, 80*(5), 766–781. doi: 10.1037/0022-3514.80.5.766

Steenkamp, J. B. E., & Baumgartner, H. (1998). Assessing measurement invariance in cross-national consumer research. *Journal of Consumer Research, 25*(1), 78–90. doi: 10.1086/209528

Steinbeis, N. (2016). The role of self–other distinction in understanding others' mental and emotional states: Neurocognitive mechanisms in children and adults. *Philosophical Transactions of the Royal Society B, 371*(1686), 20150074. doi: 10.1098/rstb.2015.0074

Trevarthen, C. (1979). Communication and cooperation in early infancy: A description of primary intersubjectivity. In M. Bullowa (Ed.), *Before speech: The beginning of human communication* (pp. 321–347). Cambridge, UK: Cambridge University Press.. ISBN: 978-0521295222

Trevarthen, C. (1993). The self born in intersubjectivity: The psychology of an infant communicating. In U. Neisser (Ed.), *Emory symposia in cognition, 5. The perceived self: Ecological and interpersonal sources of self-knowledge* (pp. 121–173). New York, NY, US: Cambridge University Press. ISBN: 0521030404

Triandis, H. C., Bontempo, R., Villareal, M. J., Asai, M., & Lucca, N. (1988). Individualism and collectivism: Cross-cultural perspectives on self-ingroup relationships. *Journal of Personality and Social Psychology, 54*(2), 323–338. doi: 10.1037/0022-3514.54.2.323

Valle, A., Massaro, D., Castelli, I., & Marchetti, A. (2015). Theory of mind development in adolescence and early adulthood: The growing complexity of recursive thinking ability. *Europe's Journal of Psychology, 11*(1), 112. doi: 10.5964/ejop.v11i1.829

Vygotsky, L. S. (1978). *Mind in society: The development of higher psychological processes.* Harvard University Press. ISBN: 0674576292

Wicklund, R. A., & Duval, S. (1971). Opinion change and performance facilitation as a result of objective self-awareness. *Journal of Experimental Social Psychology, 7*(3), 319–342. doi: 10.1016/0022-1031(71)90032-1

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children's understanding of deception. *Cognition, 13*(1), 103–128. doi: 10.1016/0010-0277(83)90004-5

Woodward, A. L., Sommerville, J. A., & Guajardo, J. J. (2001). How infants make sense of intentional action. In B. F. Malle, L. J. Moses, & D. A. Baldwin (Eds.), *Intentions and intentionality: Foundations of social cognition* (pp. 149–169). Cambridge, MA, US: The MIT Press. ISBN: 0262133865

Zlatev, J., Racine, T. P., Sinha, C., & Itkonen, E. (2008). *The shared mind: Perspectives on intersubjectivity.* John Benjamins Publishing Company. ISBN: 978-9027239006

Appendix

Appendix 1. Table shows the full wording of Mind-reading Belief Scale's items as proposed in the original work from Realo et al. (2003) divided in the two latent variables (Self and Self&Other) explored in the present study and the respective factor loading according with the standardized model results. All factor loadings are significant ($p < 0.001$).

Two-factors model of Mind-reading belief scale	
Factor: Self	*Factor Loading*
Item 1 Usually, I know beforehand what my conversation partner is going to say	0.608
Item 2 I can read people's intentions in their faces	0.657
Item 4 I can read people's intentions in their faces	0.561
Item 6 I do not think I am good at knowing human nature/ judging people	0.524
Factor: Self&Other	
Item 3 It is possible to deduce from a persons' attitude what they are going to do next	0.423
Item 5 It is hard to tell a persons' thoughts by their looks	0.592
Item 7 It is hard to judge if somebody is lying or not by their appearance	0.676
Item 8 It is not possible to say what a person actually feels by their covert behavior	0.522

Emotional Intelligence and Marital Quality:
Dyadic Data on Croatian Sample

Ana Babić Čikeš
Faculty of Humanities and Social Sciences,
J. J. Strossmayer University of Osijek

Dragica Marić
OŠ "August Cesarec" Ivankovo,
Elementary school

Daniela Šincek
Faculty of Humanities and Social Sciences,
J. J. Strossmayer University of Osijek

The aim of this study was to examine if emotional intelligence (EI) measured by tests and self-reports contributes to the explanation of self and partner's assessments of marital quality. Ninety eight married heterosexual couples participated. Each partner completed for itself measures of EI, quality of marriage, personality inventory and some socio-demographics. Models showed that socio-demographics, personality traits, and EI measure explained between 21% and 27% of own and partner's quality of marriage, with 5% – 7% of specific contribution of EI measures to quality of marriage. Among EI measures, ability to regulate one's own and others' emotions was significant predictor of own and partner's quality of marriage, while self-reported measure of regulation and managing of emotions significantly predicted own quality of marriage. Other significant predictors were extraversion for both own and partner's quality of marriage, and agreeableness, length of acquaintance before marriage and cohabitation for partner's quality of marriage only.

Key words: emotional intelligence, marital quality, marriage

Introduction

In Croatia, as well as in other countries, marriage rate has decreased and divorce rate has increased. For example, in 2013 in Croatia 19169 couples got married and 5992 married couples got divorced (Croatian Bureau of Statistics, 2014). Divorce is an extremely stressful event for couples, their children and their broader family (e.g., Swisher, 2015). So the important question is what can we do to make marriages more stable and to decrease the number of divorces?

Low marital quality is one of the psychological indicators of potential divorce (e.g., Tach & Halpern-Meekin, 2012). Marital quality refers to an evaluation of marital satisfaction and marital adjustment of marriage partners (Obradović & Čudina-Obradović, 1998). It includes positive experiences, such as feeling loved, cared for, and satisfied in a relationship, as well as negative experiences such as demands from one's spouse and marital conflicts (Umberson & Williams, 2005). However, in the literature on marital quality, other similar constructs are used for describing marital quality, like marital satisfaction and marital happiness. Marital happiness

is based on an affective evaluation of a relationship (positive and negative emotions in marriage, emotional affection, partner's emotionality, etc.), while marital satisfaction includes affective evaluation and cognitive evaluation of a relationship according to some standards (e.g., equitable distribution of responsibilities, maintaining of reciprocal esteem, agreement upon important questions, joint decision-making and joint interests) (Glenn, 2003). Marital adjustment, however, refers to partners' satisfaction with all aspects of married life (Spanier, 1976). All these constructs are, according to contemporary perceptions, narrower concepts than marital quality and they are seen as dimensions of marital quality (Glenn, 2003).

Marital quality is connected to different attributes of marital partners (e.g., gender, age, education, employment, personality traits), characteristics of marriage and marriage processes (e.g., duration of marriage, stage of marriage, number and age of children, partner's positive behavior, sexual satisfaction, conflict resolution methods, stressful events, intimacy of partners) and characteristics of social environment (nuclear or expanded family, income of the family) (Karney & Bradbury, 1995).

Marriage is a consensual and contractual relationship recognized by law (Merriam-Webster online dictionary, 2018). For individuals who enter into marriage in western cultures, marriage has individual meaning too, such as an intimate, permanent relationship with a partner (Bird & Melville, 1994). Also, marriage is characterized by love and other positive emotions and by negative, sometimes very intense, emotions. The way partners deal with their emotions and how successfully they can identify and manage their own and their partner's emotions, could be important for marital quality, satisfaction and happiness.

The construct of emotional intelligence (EI) refers to abilities connected with processing of emotional information (Mayer & Salovey, 1997).

It includes four levels of emotional abilities: perception and expression of emotion (1st), utilization of emotions to facilitate cognition (2nd), emotional knowledge and understanding of emotion (3rd) and managing emotions (4th). According to the theory and to the results of different studies as well, people with a higher level of EI have better social skills and better social relationships (e.g., Brackett et al., 2006; Côté, Lopes, Salovey, & Miners, 2010). It has been considered that emotional abilities could be more important for intimate relationships than previously thought. Understanding of the partner's and one's own emotions could contribute to the maintaining of intimacy and a positive emotional atmosphere. Managing emotions could be crucial for successfully dealing with emotionally tensed situations and conflicts.

Two approaches in the conceptualization and investigation of EI have emerged. The first approach is represented by the aforementioned authors of the construct and states that EI includes abilities of emotional information processing (Mayer, Salovey, & Caruso, 2000). Accordingly, ability tests are the best method for measuring EI (Mayer, Caruso, & Salovey, 2016). The second approach conceptualizes EI as a personality trait ("trait EI") and refers to the self-perception of emotional abilities and different characteristics connected to emotion processing, like optimism, empathy, frustration tolerance, etc. (Blanco, García, & Aluja, 2016). Trait EI is measured by questionnaires measuring typical behavior. Due to the differences in conceptualizations and measurement, correlations of these two constructs with other constructs differ as well. Much research has confirmed a positive connection between self-report measured EI and different measures of marital or romantic relationships quality (e.g., Batool & Khalid, 2012; Eslami, Hasanzadeh, & Jamshidi, 2014; Foran, O'Leary, & Williams, 2012). Results of a meta-analysis conducted on data from 6 studies (Malouff, Schutte, &

Thorsteinsson, 2014) showed a correlation between self-rated EI and relationship satisfaction of $r = 0.32$. Self-rated EI is connected not only to self-rated relationship satisfaction, but also to relationship satisfaction rated by the partner (e.g., Batool & Khalid, 2012). Especially worthwhile investigations are those that include both self and partner's ratings and observe predictors of marital quality regarding both partners' perception of their marriage.

However, we found only one study of the relationship between EI tests and marital quality. Zeidner, Kloda, and Matthews (2013) examined the relations of self-rated EI and EI tests with marital quality on a sample of one hundred newlywed heterosexual couples. The total results of both EI measures were associated with marital quality, but only for an individual partner. EI of an individual was not connected to their partner's marital quality. It was also shown that the relationship between EI and marital quality is mediated by dyadic coping.

The theory presumes the importance of the relationship between emotional abilities and marital quality assessments, which has been confirmed by the above findings. Since there is a lack of research concerning that problem in the context of ability EI models, the aim of the present study was to examine the specific contribution of EI measured by self-reports (trait EI) and by EI tests (ability EI) to marital quality (both partners self-reports were used as the criterion), after controlling for demographic characteristics, characteristics of marriage and personality traits.

Method

98 married heterosexual couples from the area of Osijek, Croatia participated in this study. The age of participants varied from 19 to 60 years ($M = 41.93$; $SD = 11.32$). The characteristics of participants (age, education, family income) are shown in Table 1. In the same table some char-

Table 1 *Characteristics of the participants and their marriages (N=196)*

Characteristic	Categories	Number of participants	Percentage of participants
Age	19-29	31	15.8%
	30-39	57	29.1%
	40-49	35	17.9%
	50-60	73	37.2%
Education	Elementary school	6	3.1%
	High school	115	58.7%
	Bachelor or higher expertise	29	14.8%
	Master or high expertise	46	23.5%
Income of the family	Lower than average	18	9.2%
	Average	137	69.9%
	Better than average	41	20.9%
Cohabitation	YES	60	30.6%
	NO	136	69.4%
First marriage	YES	188	95.9%
	NO	8	4.1%
Number of children	0	33	16.8%
	1	59	30.1%
	2	83	42.3%
	3	21	10.7%

Table 2 *Descriptive statistics of continuous variables of mariage characteristics (N=196)*

	N	M	SD	Min.	Max.
Length of acquaintance before marriage (years)	196	4.23	3.32	0.25	18.00
Age when got married	196	26.09	4.38	17	49
Duration of the marriage	196	15.88	12.01	0.16	38.00

acteristics of the participants' marriages (pre-marriage cohabitation, first or repeated marriage and number of children) are shown as well. Descriptive statistics of continuous variables of marriage characteristics are shown in Table 2.

Snowball sampling was used – first recruits were the authors' acquaintances, and they recommended other married couples who could be contacted. The researcher visited couples in their home where she gave them a short explanation of the study and booklets with questionnaires and tests. Questionnaires and tests were administered to both partners at the same time, and the researcher supervised to make sure that there is no communication between partners while completing the research material. The first page of the booklet with tests and questionnaires contained general information about the investigation. Participants coded their booklets, so the investigators could match the couple's data. Questionnaires and tests were sequenced in the following way: Questionnaire of general sociodemographic data, Emotional Management Test, Emotional Competence Questionnaire, Emotion Analysis Test, Marital Quality Index and Big Five Inventory. Duration of the administration was between 45 and 60 minutes.

The following instruments were used in this study:

1. Emotional Competence Questionnaire-45 (UEK-45, Takšić, 2002) is a shortened version of the Emotional Intelligence Questionnaire-136 (UEK-136, Takšić, 1998). It consists of 45 items (statements) grouped in three subscales: Perception and understanding of emotions, Ex-

pressing and labeling of emotions and Regulation and managing of emotions. Participant estimated each statement on a 5 points Likert scale (1 – "I don't feel or think in that way at all"; 5 – "I always feel or think in that way"). Total results are formed for each subscale like linear combination of ratings. Cronbach α coefficients for the Perception and understanding of emotions subscale are in the range from 0.82 to 0.88, for the Expressing and labeling of emotions subscale in the range from 0.78 to 0.84 and for the Regulation and managing of emotions subscale from 0.68 to 0.72 (Dobrota & Reić Ercegovac, 2012; Takšić, Mohorić, & Munjas, 2006). In this research those coefficients are even higher (Table 3). A somewhat shortened version (42 items) of the questionnaire is used and validated in different European countries, but under the name Emotional Skills and Competence Questionnaire (Costa, Faria, & Takšić, 2016).

2. Emotion Analysis Test (TAE, Kulenović, Balenović, & Buško, 2001) is an ability test intended to measure understanding and analysis of emotions. It consists of 25 problems. For a word that describes a complex emotional state (like disappointment) six basic emotions are offered (guilt, sadness, joy, shame, surprise, malice). The participants' task was to mark 2 out of 6 emotions that are most often or always present in that complex emotional state and two emotions that are never or very rarely present in that state. The total result is formed as a sum of correct answers and, theoretically, it varies between 0 and 100. The test has satisfactory psychometric properties on students' samples

(Kulenović, Balenović, & Buško, 2000; Maslić Seršić, Vranić, & Tonković, 2004). In this research, Cronbach α coefficient was 0.81.

3. Emotion Management Test (TUE) is an ability test developed for this research by the authors, and is designed to measure the ability to regulate one's own and others' emotions in the adult population. The previous version of this test is aimed at adolescents (Buško & Babić Čikeš, 2013). The test consists of thirteen problem situations. Each problem includes a short description of the situation in which the main character experiences an intense emotion (fear, sadness, disappointment, worry, anger, frustration, happiness, proud, content). For each situation four potential actions are offered. The participant's task was to assess, on a 7-point scale (-3 = very harmfully, 3 = very useful), the usefulness of each of the four suggested reactions in mitigating the negative or maintaining the positive emotions in the situation. For example: *Tomorrow at work Sandro has to give an important presentation. His promotion depends on it and he feels frightened. Please indicate how helpful are each of the following actions for Sandro to reduce his stage fright.*

a) Telling himself that he is prepared and that everything will go well.

b) Complaining to a friend.

c) Thinking about everything that can go wrong.

d) Hoping for a miracle so that he won't be obliged to give the presentation.

The accuracy of the answers is determined by the expert criteria where the correct answer is awarded 2, the adjacent answer 1, and others 0 points. The total score is the sum of points in individual items. Cronbach α coefficient for the test in this research is 0.72 and it correlates positively with the Regulation and managing of emotions subscale of UEK-45 ($r = 0.20$, $p < 0.01$) and TAE ($r = 0.36$, $p < 0.001$).

4. Quality of Marriage Index (Norton, 1983) is the measure of marriage quality that gives quality of marriage index and global assessment of marital quality. It consists of six items, which describe the relationship of a person with their partner. Participants assess their agreement with the first five items on a 7-point Likert scale (1 – strongly disagree, 7 – strongly agree). A linear combination of answers to these first five items refers to *the quality of marriage index*. The sixth item refers to overall assessment of marital satisfaction on a 10-point Likert scale (1 – very unhappy, 10 – very happy) and presents *the global assessment of marital quality*. The results of married couples are connected to each other by code, so each participant has two self-report outcomes and two partner's outcomes.

5. Big Five Inventory (Benet-Martinez & John, 1998) is a questionnaire intended to measure the Big Five personality traits (extraversion, neuroticism, agreeableness, conscientiousness, openness to experience). It consists of 44 behavioral descriptions. Each description represents one of the personality traits. Participants assess the extent to which each statement applies to them (1 – doesn't apply to me at all, 5 – totally applies to me). The total results are calculated separately for each dimension. The bigger the result, the more expressed the trait.

6. Questionnaire of General Sociodemographic Data is used to collect sociodemographic and marriage characteristics data (gender, age, education, employment, income, length of acquaintance before marriage, duration of cohabitation, age when married, duration of the marriage, first of repeated marriage and number of children).

Results

Main descriptive statistics of the variables are presented in Table 3.

Although K-S values indicate that the distribution of the most of the variables differs from normal distribution, Kline (2005) criteria (skewness values lower than +/- 3, kurtosis values

Table 3 *Main descriptive statistics of personality traits. emotion intelligence and marital quality variables*

Variables	M	SD	Min.	Max.	K-S	Skewness		Kurtosis		α
Neuroticism	2.65	0.62	1.13(1)	4.25(5)	0.06	0.16	0.17	-0.20	0.35	0.80
Openness to experience	3.35	0.65	1.80(1)	4.90(5)	0.08**	-0.23	0.17	-0.35	0.35	0.86
Conscientiousness	3.81	0.50	2.44(1)	5.00(5)	0.07**	-0.21	0.17	0.01	0.35	0.78
Extraversion	3.50	0.56	2.13(1)	5.00(5)	0.07*	-0.14	0.17	-0.08	0.35	0.76
Agreeableness	3.70	0.53	1.89(1)	5.00(5)	0.09	-0.32	0.17	0.71	0.35	0.74
TAE	67.69	9.50	35(0)	88(100)	0.11**	-0.91	0.17	0.86	0.35	0.81
TUE	59.72	9.90	12(0)	79(104)	0.08**	-0.97	0.17	2.26	0.35	0.72
UEK-P/U	52.23	7.35	29(15)	74(75)	0.06	0.00	0.17	0.61	0.35	0.90
UEK-E/N	50.04	6.65	32(14)	68(70)	0.08**	-0.12	0.17	-0.02	0.35	0.84
UEK-R/M	59.49	5.95	42(16)	78(80)	0.06	-0.10	0.17	0.14	0.35	0.75
Quality of marriage index	30.89	4.93	10(5)	35(35)	0.20**	-1.87	0.17	4.29	0.35	0.95
Global assessment of MQ	8.84	1.40	2(1)	10(10)	0.22**	-2.07	0.17	6.20	0.35	-

Note. K-S – Kolmogorov-Smirnov test values; TAE – Emotion Analysis Test; TUE – Emotion Management Test for Adults; UEK-P/U – Emotional Competence Questionnaire-45. Perception and emotion understanding subscale; UEK-E/N – Emotional Competence Questionnaire-45. Expression and nomination of emotions subscale; UEK-R/M – Emotional Competence Questionnaire-45. Regulation and emotion management subscale.

* $p < 0.05$;   ** $p < 0.01$; *** $p < 0.001$

lower than +/-10) and the same (negative) direction of asymmetry (Petz, 2004) allows using of parametric statistics with due caution in interpreting results.

Correlations of demographic and marriage characteristics variables, EI variables and personality traits with marriage quality variables are presented in Table 4.

None of the demographic characteristics correlated with marriage quality variables. Among variables measuring marriage characteristics, only length of acquaintance before marriage and cohabitation correlated with partner's assessments of marital quality, but those correlations are low. Longer acquaintance and lack of cohabitation before marriage correlated with lower

marital quality. Correlations of personality traits with marital quality are mostly small. Only openness to experiences did not correlate with any marital quality variable. Neuroticism is in a negative correlation, while conscientiousness, extraversion and agreeableness are all in positive correlation with marital quality variables, as expected. Among EI variables, TUE and UEK-R/M correlate significantly and positively with marital quality variables. Marital quality index and global assessment of marital quality are highly intercorrelated. Self-assessments of marital quality are also highly correlated with partners' assessments of marital quality.

Hierarchical regression analyses were conducted to estimate the potential role of EI in ex-

Table 4 *Correlations of demographic and marriage characteristics variables, EI variables and personality traits with marriage quality variables (N=196)*

	Quality marriage index	Global assessment of marital quality	Partner's quality marriage index	Partner's global assessment of marital quality
1. Age	.02	.01	-.01	-.02
2. Gender	.02	-.03	.02	-.03
3. Education	.03	.05	.09	.07
4. Income	-.01	.01	.01	-.01
5. Length of acquaintance before marriage	-.10	-.12	-.18*	-.25***
6. Cohabitation	-.10	-.07	-.16*	-.15*
7. Age when got married	-.12	-.10	-.11	-.13
8. Duration of marriage	.06	.05	.03	.03
9. Number of children	-.06	-.06	-.02	-.02
10. Neuroticism	**-.19****	**-.17***	**-.15***	**-.16***
11. Openness to experience	.00	-.03	.01	-.03
12. Conscientiousness	**.19****	**.17***	**.16***	**.17***
13. Extraversion	**.22****	**.15***	**.15***	.05
14. Agreeableness	**.19****	**.18***	**.23****	**.28****
15. TAE	-.02	-.02	-.02	.01
16. TUE	**.20****	**.21****	**.25*****	**.25*****
17. UEK-P/U	.07	.06	.09	.07
18. UEK-E/N	.11	.05	.11	.10
19. UEK-R/M	**.28*****	**.27*****	**.20****	**.22****
20. MQ index	1	**.89****	**.62****	**.57****
21. Global assessment of MQ		1	**.57****	**.63****

Note. The point biserial correlation coefficients are calculated for the categorical variables and the Pearson correlation coefficients for the continuous variables. TAE – Emotion Analysis Test; TUE – Emotion Management Test for Adults; UEK-P/U – Emotional Competence Questionnaire-45, Perception and emotion understanding subscale, UEK-E/N – Emotional Competence Questionnaire-45, Expression and nomination of emotions subscale, UEK-R/M – Emotional Competence Questionnaire-45, Regulation and emotion management subscale.
*** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$.

planation of the variance of marital quality variables with control of demographic characteristics, characteristics of marriage and personality traits. We conducted four regression analyses for all marital quality variables as criterion variables (individual and partner's marital quality index and individual and partner's global assessment of marital quality). In the first step of regression

analysis demographic variables are entered, in the second characteristics of marriage, in the third personality traits, and, finally, in the fourth step EI variables were entered. Duration of marriage is excluded from these analyses due to its high correlation ($r = .93$) with the variable of age. Results of all hierarchical regression analyses are presented in Table 5.

Table 5 *Results of hierarchical regression analysis for prediction of self and partner rated quality of marriage variables (quality of marrage indeks and global assessment of marital quality)*

Predictor set of variables	Quality marriage index		Global assessment of marital quality		Partner's quality marriage index		Partner's global assessment of marital quality	
	β	*β¹*	*β*	*β¹*	*β*	*β¹*	*β*	*β¹*
1.　step								
Age	.02	.25*	.02	.19	.01	.19*	-.01	.14
Gender	.02	-.07	-.04	-.13	.00	-.05	-.05	-.10
Education	.05	.05	.07	.07	.12	.18*	.11	.17*
Income	-.03	.03	-.02	.05	-.07	-.02	-.06	-.01
	R=.05 R²=.00		R=.07 R²=.01		R=.11 R²=.01		R=0.10 R²=.01	
2.　step								
Length of acquaintance before marriage	-.08	-.05	-.11	-.08	-.19*	-.16*	-.27**	-.23**
Cohabitation	-.16	-.16	-.11	-.10	-.24**	-.23**	-.21*	-.20*
Age when got married	-.17*	-.25**	-.14	-.22**	-.11	-.19*	-.12	-.18*
Number of children	-.17	-.17	-.14	-.14	-.06	-.06	-.06	-.05
	R=.25 R²= .06 ΔR²=.06		R=.23 R²=.05 ΔR²=.04		R=.32 R²= .10 ΔR²=.09**		R=.36 R²= .13 ΔR²=.12**	
3.　step								
Neuroticism	-.03	.02	-.04	.01	.09	.11	.08	.11
Openness	-.17	-.15	-.18*	-.15	-.14	-.13	-.14	-.13
Conscientiousness	.09	.03	.10	.04	.06	.02	.09	.05
Extraversion	.26**	.25**	.20*	.21*	.19*	.19*	.09	.07
Agreeableness	.14	.09	.12	.07	.24**	.19*	.29**	.24**
	R=.41 R²= .18 ΔR²=.12**		R=.37 R²= .14 ΔR²=.10*		R=.43 R²= .18 ΔR²=.08***		R=.47 R²=.22 ΔR²=.09***	
4.　step								
TAE	-.12	-.12	-.14	-.14	-.14	-.14	-.12	-.12
TUE	.19*	.19*	.21**	.21**	.24**	.24**	.21**	.21**
UEK-P/U	-.06	-.06	-.03	-.03	-.00	-.00	-.03	-.03
UEK-E/N	-.03	-.03	-.08	-.08	.01	.01	.02	.02
UEK-R/M	.20*	.20*	.21*	.21*	.08	.08	.13	.13
	R=.48 R²= .23 ΔR²=.05***		R=.46 R²=.21 ΔR²=.07***		R=.49 R²=.24 ΔR²=.06***		R=.52 R²=.27 ΔR²=.05***	

Note. β – standardized partial regression coefficients; *β¹*– values of *β* coefficient in the last analysis equation; *R* – multiple correlation coefficient; Δ*R²* – change in the coefficient of multiple determination
* *p* < 0.05; ** *p* < 0.01; *** *p* < 0.001

Predictor sets of variables presented above explained between 21 and 27% of variance of marital quality variables. Demographic variables and characteristics of marriage did not contribute significantly to the explanation of self-assessed marital quality. However, the participant's age when they got married showed to be a significant predictor of both self-assess-ments criteria. Marital quality decreases with the increase in age at the time of marriage. But the contribution of that variable is very small and it is possible that, in part, it is a product of the suppression effect. The same effect is detected at the variable of age in the analysis for both marital quality indexes predictions (self and partner's). Age is not significantly correlated

with the criteria, but in the last equations its contributions became significant.

Personality traits contribute significantly to the self-assessments of marital quality. Only extraversion is a significant predictor for both criteria.

Emotional intelligence variables explained additional 5% (marital quality index) and 7% (global assessment) of the criteria variance. Emotion regulation is a significant predictor, measured by a test (TUE) and self-reports (UEK-R/M), for both self-assessments criteria.

Regression analysis regarding the partner's marital quality assessments revealed similar, but somewhat different results. Demographic characteristics did not explain the significant amount of criteria variance but education is a significant predictor for both criteria. Participants whose partners are more educated have higher assessments of marital quality.

Marriage characteristics explained additional 9% (marital quality index) and 12% (global assessment) of the variance of the partner's marital quality assessments. Significant predictors are length of acquaintance before marriage, cohabitation and age at the time of marriage. The partner's assessments of marital quality were higher if acquaintance before marriage was shorter, if the couple cohabitated and if the partner was younger when they got married.

Personality traits explained additional 8% and 9% of the criteria variance. Significant predictors are partner's extraversion (marital quality index) and agreeableness (both criteria).

Emotional intelligence variables explained additional 6% (marital quality index) and 5% (global assessment) of the criteria and only TUE was shown to be a significant predictor for both.

Discussion

The aim of this study was to examine if EI measured by tests (ability EI) and self-reports (trait EI) contributes to the explanation of self and partner's assessments of marital quality. Ninety-eight couples that have been married between a few months and 38 years participated in the study. Participants mostly finished high-school or higher levels of education, and have average or better than average income. For most of them this is their first marriage and they mostly have one or two children. In the continuation of the Discussion we are going to explore marital quality in relation to demographic characteristics, marriage characteristics, personality traits and emotional intelligence abilities.

Marital Quality and Demographic Characteristics

Demographic characteristics of the participants did not explain a significant proportion of marital quality assessments. In our research, age and duration of marriage were highly correlated, so we decided to include only age in the regression analysis. Previous research indicated different patterns of relationship between duration of marriage and marital quality (Glenn, 1990), but according to the latest, marital quality decreases with time (VanLaningham, Johnson, & Amato, 2001). The decrease could be explained by conflicts over the allocations of marital obligations between partners, adjustment to conflicts in long-term relationships, changes in partners' personality traits and changes in perception of equality in marriage and habit. In our sample, marital quality assessments showed to be independent of age/duration of marriage, as some other research showed (Goddard et al., 2016; Smith, Heaven, & Ciarrochi, 2008). One possible explanation of such results could be that changes in marital quality are more connected to some other processes or specific events in life of the partners (like birth of a child, career development, illness in a family, etc.) than with the simple flow of

time. Furthermore, some authors suggest that longitudinal courses of marital quality could stay uncovered if a sample is heterogeneous in marital length (Proulx, Helms, & Buehler, 2007), which is the case in this study.

There are no gender differences in marital quality assessments either. According to previous investigations, women have generally lower marital quality assessments (Karney & Bradbury, 1995). Their burden of household and children care obligations, as well as fewer opportunities for achieving their own progress were seen as causes of their lower satisfaction with marriage. More recent studies imply fewer or no gender differences (Jackson, Miller, Oka, & Henry, 2014), probably due to more equality in marriages nowadays. Considering that our sample includes average and above average participants, according to their education and income, and that the same proportion of women and men are employed, we could assume that their marriages are more egalitarian. Consequently, gender differences in marital quality assessments have not been found.

Education and income of the family also failed to contribute to marital quality variables explanation. Given that education and income of the family generally present factors of security and stability, it is assumed that they could have a positive contribution to marital quality (Karney & Bradbury, 1995; Obradović & Čudina-Obradović, 2000). It is possible that the positive selection of our sample did not enable the effects of those characteristics to manifest.

Marital Quality and Characteristics of Marriage

The examined marital characteristics explained a small but significant proportion of the criteria variance. The contribution is larger for partner's assessments than self-assessments. It is unexpected, considering that marital characteristics are the same for both partners and both partners participated in the study. Still, it clearly shows the importance of perception – objectively same characteristics could be viewed differently by partners. The length of acquaintance before marriage and cohabitation are significant predictors of both partner's marital quality criteria. Partners who knew each other for a longer time before they married have lower quality of marriage. This evidence is contrary to the majority of research, which showed that marital quality is higher for those couples who dated for a longer time (Lauer & Lauer, 1994). However, some research showed that marriage quality of couples that were in a pre-marriage relationship longer is lower because they married when the quality of their relationship already started to decrease (Alder, 2010). Cohabitation showed to be a significant predictor of partner's marital quality assessments, but it seems that the result is the consequence of the suppression effect (correlation coefficients between those variables are very low). So we can say that cohabitation does not contribute to marital quality in this research. Other research found negative correlation between cohabitation and marital quality (Goddard et al., 2016).

Age when they got married is not in a significant correlation with the marital quality variables, and its significant contribution in regression analysis probably represents an effect of suppression. Other research implies that there is an optimal period to get married (Glenn, Uecker, & Love Jr., 2010), and that is between 22 and 25 years of life. In our sample, there are participants who got married younger and older compared to that age, so that could be the reason why age at the time marriage is not connected to marital quality in our sample.

Number of children is not a significant predictor of marital quality in this research either. Some other studies showed that married couples without children are more satisfied with their marriages compared to couples with children (Obradović & Čudina-Obradović, 2000). Our

investigation includes couples at different stages of life, marriage and life cycle of the family, so maybe the effects of the number of children on marital quality variables are confounded.

Marital Quality and Personality Traits

The Big Five personality traits explained a significant proportion of variance of all marital quality criteria. For self-assessments of marital quality only extraversion showed to be a significant predictor. Its contribution is positive, which means that people who are higher on extraversion rate the quality of their marriages higher. Extroverted people are focused on more people in their life, so maybe, compared to introverted people, they focus less on marriage issues and problems. That could result in higher marital quality assessments. Other research has found the same results (Barelds, 2005). Neuroticism, conscientiousness and agreeableness are in significant, although rather small, correlations with marital quality self-assessments, but their contribution in regression analysis is insignificant. Other research reported that those traits are significant predictors of marital quality (Barelds, 2005; Claxton, O'Rourke, Smith, & DeLongis, 2012). Neuroticism proved to be especially problematic for quality of relationships. Claxton et al. (2012) pointed out the reasons for the differences in research results concerning the role of different personality traits in marital quality explanation. One of them is the change over the course of marriage, meaning that in different periods of married life different traits could play a significant role. Our sample includes couples with duration of marriage from a couple of months to thirty-eight years, so maybe the strongest effect proved to be significant, but others, connected to different stages of life and marriage, stayed undisclosed.

Agreeableness showed to be a significant predictor for partner's assessment of marital quality. Individuals who are high on this personality dimension are polite and caring and it is expected that their behavior contributes positively to their partners' satisfaction with marriage. Extraversion is a significant predictor for partner's quality of marriage index, but not for the global assessment of marital quality. It could be that partner's extraversion contributes to some aspects of marriage quality, like maybe a sense of partnership, but not to the general satisfaction with marriage. Extroverts are more open in relationships, they communicate more with other people, probably with their partners too, and those qualities could be positively connected to the partner's satisfaction in marriage. Neuroticism and conscientiousness are in significant correlations with partner's assessments of marital quality, but they failed to be significant predictors of these criteria. As said before, it is expected that neuroticism contributes to both, self and partner's marital quality assessments in negative way. Many research studies confirmed these assumptions (e.g., Robins, Caspi, & Moffitt, 2002) and it is hard to say why in our investigation its contribution is not significant. One reason could be that social desirability affected the results in a way that the participants were underestimating their negative behaviors and characteristics, and accenting the positive one. In that case neuroticism lost its power in marital quality criteria explanation while agreeableness acquired it. Another reason could be that only couples that are satisfied with their marriages participated in the study, so neuroticism is not showed to be a significant predictor in this sample.

Marital Quality and EI

Previous investigations confirmed that self-rated EI is connected to marital quality (e.g., Batool & Khalid, 2012; Eslami et al., 2014), however, there is not much evidence for the correlation of EI tests with this criteria (Zeidner et al., 2013). According to the theory, abilities on the

third and fourth level of Mayer and Salovey's model (1997) – understanding of emotions and managing emotions – should contribute to the explanation of self and partner's assessments of marital quality. If a person understands the partner's different emotional states and his/her own as well, and they can regulate their own and their partner's negative emotional states, it should result in a positive effect on the quality of their romantic relationship or marriage.

This study confirmed the contribution of managing emotions to marital quality explanation, measured by test and self-reports as well. The TUE is a significant predictor for both self and partner's assessments of marital quality, as expected. That means that an individual's knowledge of the right actions in emotional situations is reflected on the quality of marriage in general, whether assessed by him/her or by his/her partner. However, the contribution is rather small. If we consider that TUE consists of descriptions of different emotional situations, not those that can occur in marriage, we could assume that some other measure, focused on marriage situations only, would have a bigger contribution to marital quality explanation. It is also important to emphasize that TUE does not measure behavior in real situations, so the ability to manage emotions could be even more important than research shows. In this research, the ability to understand emotions measured by TAE is not correlated to marital quality variables, which suggests that only specific EI abilities contribute to marital quality. It seems that person's knowledge about emotions does not contribute to marital quality, but its ability to manage one's own and emotions of other people does. It makes sense if we realize that a person, who has good knowledge about emotions does not need to use that knowledge to positively contribute to the emotional atmosphere in a marriage. On the contrary, competence in managing emotions implies positive effects on the individuals involved. Of all self-rated EI variables, only the third, Regulation and managing of emotions, contributes to marital quality, but only for self-assessments. A person who assesses that their abilities of regulation and managing emotions are high, has higher ratings of marital quality. In other words, this type of person believes in their own capacities in regulating emotions, which affects their marital quality in a positive way. Self-assessments of regulation and managing emotions are correlated with partner's assessments of marital quality, but they fail to be significant predictors. It seems that, for a partner, it is more important how a person actually manages their emotions than what he/she thinks about their own abilities to regulate emotions. However, while interpreting the results we should consider the fact that self-report measures were used for measuring both, trait EI and marital quality, and that some part of the shared variance between those variables could be derived from the method used (method variance). That is one of the most commonly mentioned limitations of self-report measures of EI (trait EI). In this research only the third subscale of UEK correlates with the criteria, so we can exclude that it is due to method variance. In Zeidner et al. (2013) research, partners' EI measured by test and self-assessment was not connected to assessments of marital quality, but they measured only global EI, not specific abilities.

Limitations of the study mostly concern the methodology. A snowball sampling method was used, and as a consequence it is a biased sample, which does not fully represent the general population of Croatia. The low socio-economic status group is not sufficiently represented and couples, who consented to participate in the study probably do not have any bigger problems in their marriage. In line with that, distributions of marital quality variables are negatively asymmetric, which means that most of the couples are rather satisfied with their marriages. In sum, we think that some

trends found in this study would be emphasized if the study was conducted on a sample that is representative for the whole population of Croatia. Another limitation is connected to the well-known disadvantage of self-reports, and social desirability. In our opinion, social desirability could have affected the results even more because the investigator visited couples in their home. Furthermore, there is a disadvantage of self-reports that is connected to assessing one's own emotional abilities. The question is can a person assess their own emotional abilities, especially if they are low? The correlation between the test and the self-report intended to measure managing emotions in this research is low ($r = 0.20$, $p < 0.01$) and it is in line with other research (Brackett et al., 2006). So it is questionable what is actually measured by this measure. Finally, a longitudinal design would enable us to make much more convincing conclusions concerning the role of emotional intelligence and other relevant factors in the quality of married life.

To conclude, considering the results of this study, the ability to manage one's own and others' emotions is a significant factor for marital quality, reported by the individual and his/her partner as well. It is important to emphasize that a rather small proportion of variance was explained by all variables included in the research. It seems that quality of marriage is a complex construct affected by many different individual, couple and environmental factors that are all hard to include in just one study.

Marital quality is important for quality of life of married couples, their children and broader circle of family and friends. We could say that it represents a factor of stability in a community. So, it is in the interest of the whole society to invest in all factors connected to marital quality, such as emotional intelligence. Different programs aimed to support the development of emotional intelligence of children, adolescents, and even the adult population are welcomed, because they increase a chance for a marriage or other intimate relationships to be successful.

References

Alder, E. S. (2010). *Age, education level, and length of courtship in relation to marital satisfaction* (master's thesis). Pacific University. Retrieved from: http://commons.pacificu.edu/spp/145

Barelds, D. P. (2005). Self and partner personality in intimate relationships. *European Journal of Personality*, *19*(6), 501–518. doi: 10.1002/per.549

Bar-On, R. (2000). Emotional and social intelligence: Insights from the Emotional Quotient Inventory (EQ-i). In R. Bar-On, & J. D. A. Parker (Eds.), *Handbook of emotional intelligence* (pp. 363–388). San Francisco: Jossey-Bass.

Batool, S. S., & Khalid, R. (2012). Emotional intelligence: A predictor of marital quality in Pakistani couples. *Pakistan Journal of Psychological Research, 27*(1)*, 65–88.

Benet-Martinez, V., & John, O. P. (1998). Los cincos grandes across cultures and ethnic groups: Multitrait-multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology, 75*, 729–750. doi: 10.1037//0022-3514.75.3.729

Bird, G., & Melville, K. (1994). *Families and Intimate Relationships*. New York: McGrow-hill, Inc.

Blanco, E., García, L. F., & Aluja, A. (2016). The location of the Trait Emotional Intelligence in the Zuckerman's Personality Model space and the role of General Intelligence and social status. *Scandinavian Journal of Psychology, 57*, 453–463. doi: 10.1111/sjop.12307

Brackett, M. A., Rivers, S. E., Shiffman, S., Lerner, N., & Salovey, P. (2006). Relating emotional abilities to social functioning: A comparison of self-report and performance measures of emotional intelligence. *Journal of Personality and Social Psychology, 91*(4), 780–795. doi: 10.1037/0022-3514.91.4.780

Buško, V., & Babić Čikeš, A. (2013). Emotional intelligence in early adolescence: Validation data based on peer ratings and an objective ability-based test. *International Journal of Humanities and Social Science Invention*, *2*(5), 54–62.

Clarkberg, M., Stolzenberg, R. M., & Waite, L. J. (1995). Attitudes, values, and entrance into cohabitational versus marital unions. *Social Forces, 74*, 609–632. doi: 10.2307/2580494

Claxton, A., O'Rourke, N., & Smith, J. Z. (2012). Personality traits and marital satisfaction within

enduring relationships. *Journal of Social and Personal Relationships, 29*(3), 375–396. doi: 10.1177/0265407511431183.

Côté, S., Lopes, P. N., Salovey, P., & Miners, C. T. H. (2010). Emotional intelligence and leadership emergence in small groups. *The Leadership Quarterly, 21*, 496–508. doi: 10.1016/j.leaqua.2010.03.012

Dobrota, S., & Reić Ercegovac, I. (2012). Odnos emocionalne kompetentnosti i prepoznavanja emocija u glazbi [Relation of emotional competence and recognition of emotions in music]. *Društvena Istraživanja, 21*(4), 969–988.

Eslami, A. A., Hasanzadeh, A., & Jamshidi, F. (2014). The relationship between emotional intelligence health and marital satisfaction: A comparative study. *Journal of Education and Health Promotion, 3*, 36–41. doi: 0.4103/2277-9531.127616

Foran, H. M., O'Leary, K. D., & Williams, M. C. (2012). Emotional abilities in couples: A construct validation study. *American Journal of Family Therapy, 40*(3), 189–207. doi: 10.1080/01926187.2011.601214

Glenn, N. D. (1990). Quantitative research on marital quality in the 1980s: A critical review. *Journal of Marriage and the Family, 52*, 818–831. doi: 10.2307/353304

Glenn, N. D. (2003). Marital quality. International Encyclopedia of Marriage and Family Encyclopedia.com. Retrieved September 25, 2017, from Encyclopedia.com: http://www.encyclopedia.com/reference/encyclopedias-almanacs-transcripts-and-maps/marital-quality

Glenn, N. D., Uecker, J., & Love Jr., R. W. B. (2010). Later first marriage and marital success. *Social Science Research 39*(5), 787–800. doi: 10.1016/j.ssresearch.2010.06.002.

Goddard, H. W., Olson, J. R., Galovan, A. M., Schramm, D. G., & Marshall, J. P. (2016). Qualities of character that predict marital well-being. *Family Relations, 65*, 424–438. doi: 10.1111/fare.12195

Goleman, D. (1995). *Emocionalna inteligencija – zašto je važnija od kvocijenta inteligencije? [Emotional Intelligence – Why it can matter more than IQ].* Zagreb: Mozaik knjiga.

Gutiérrez-Cobo, M. J., Cabello, R., & Fernández-Berrocal, P. (2017). The three models of emotional intelligence and performance in a hot and cool go/no-go task in undergraduate students. *Frontiers in Behavioral Neuroscience, 11*(33). doi: 10.3389/fnbeh.2017.00033

Jackson, J. B., Miller, R. B., Oka, M., & Henry, R. G. (2014). Gender differences in marital satisfaction: A meta-analysis. *Journal of Marriage and Family, 76*, 105–129). doi : 10.1111/jomf.12077

Karney, B. R., & Bradbury, T. N (1995). The longitudinal course of marital quality and stability: A review of theory, method and research. *Psychological Bulletin, 118*, 3–34. doi: 10.1037/0033-2909.118.1.3

Kulenović, A., Balenović, T., & Buško, V. (2000). Test analize emocija: Jedan pokušaj objektivnog mjerenja sposobnosti emocionalne inteligencije [Emotion analysis test: Attempt at designing an objective measure of a component of emotional intelligence]. *Suvremena Psihologija, 3*, 27–48.

Lauer, R. H., & Lauer, J. C. (1994). *Separation and divorce. Marriage and family: The quest for intimacy.* Wisconsin, Iowa: Brown & Benchmark.

Malouff, J. M., Schutte, N. S., & Thorsteinsson, E. B. (2014). Trait emotional intelligence and romantic relationship satisfaction: A meta-analysis. *The American Journal of Family Therapy, 42*, 53–66. doi: 10.1080/01926187.2012.748549

marriage. 2018. In *Merriam-Webster.com.* Retrieved March 22, 2018, from https://www.merriam-webster.com/dictionary/marriage

Maslić Seršić, D., Vranić, A., & Tonković, M. (2004). Prilog validaciji dva hrvatska testa za mjerenje emocionalne inteligencije [Toward a validation of two Croatian instruments measuring emotional intelligence]. *Suvremena Psihologija, 7*(2), 231–242.

Mayer, J. D., Caruso, D. R., & Salovey, P. (2016). The ability model of emotional intelligence: Principles and updates. *Emotion Review, 8*(4), 290–300. doi: 10.1177/1754073916639667

Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In P. Salovey, & D. Sluyter (Eds.), *Emotional development and emotional intelligence: Implications for educators* (pp. 3–31), New York: Basic Books.

Mayer, J. D., Salovey, P., & Caruso, D. R. (2000). Models of emotional intelligence. In R. J. Sternberg (Ed.), *Handbook of Intelligence* (pp. 396–420). Cambridge: Cambridge University Press. doi: 10.1017/cbo9780511807947.019

Norton, R. (1983). Measuring marital quality: A critical look at the dependent variable. *Journal of Marriage and the Family, 45,* 141–151. doi: 10.2307/351302

Obradović, J., & Čudina-Obradović, M. (1998). Bračna kvaliteta: Poimanje, uzroci i posljedice [Marital quality: Definition, causes and consequences]. *Društvena Istraživanja, 7*(4-5), (36-37), 659–682.

Obradović, J., & Čudina-Obradović, M. (2000). Broj djece u obitelji i spol bračnog partnera kao prediktori bračne kvalitete [The number of children in the family and gender of marital partner as predictors of marital quality]. *Društvena Istraživanja, 10*(4-5), 709–730.

Proulx, C. M., Helms, H. M., & Buehller, C. (2007). Marital quality and personal well-being: A meta-analysis. *Journal of Marriage and Family, 69*, 576–593.

Robins, R., Caspi, A., & Moffitt, T. (2002). It's not just who you're with, it's who you are: Personality and relationship experiences across multiple relationship. *Journal of Personality and Social Psychology, 70*, 925–964. doi: 10.1111/1467-6494.05028

Smith, L., Heaven, P. C. L., & Ciarrochi, J. (2008). Trait emotional intelligence, conflict communication patterns, and relationship satisfaction. *Personality and Individual Differences, 4*, 1314–1325. doi: 10.1016/j.paid.2007.11.024

Spanier, G. B. (1976). Measuring dyadic adjustment: New scales for assessing the quality of marriage and similar dyads. *Journal of Marriage and the Family, 38*, 15–28. doi: 10.2307/350547

Swisher, T. K. (2015). The role of personality in adaptation to stress associated with separation and divorce: A guide for human services professionals and mental health providers. *Journal of Human Services, 35*(1), 50–61.

Tach, L. M., & Halpern-Meekin, S. (2012). Marital quality and divorce decisions: How do premarital cohabitation and nonmarital childbearing matter? *Family Relations, 61*, 571–585. doi: 10.1111/j.1741-3729.2012.00724.x

Takšić, V. (1998). *Validacija konstrukta emocionalne inteligencije* [Validation of the construct of emotional intelligence](Unpublished doctoral dissertation). Faculty of humanities and social sciences, University of Zagreb, Zagreb, Croatia.

Takšić, V. (2002). Upitnici emocionalne inteligencije (kompetentnosti) [Emotional intelligence (competence) questionnaires]. In K. Lacković-Grgin, A. Bautović, V. Ćubela, & Z. Penezić (Eds.), *Zbirka psihologijskih skala i upitnika* (pp. 27–45). Zadar: Filozofski fakultet u Zadru.

Takšić, V., Mohorić, T., & Munjas, R. (2006). Emocionalna inteligencija: Teorija, operacionalizacija, primjena i povezanost s pozitivnom psihologijom [Emotional intelligence: Theory, operationalization, implementation and relationship with positive psychology]. *Društvena Istraživanja, 15*(4-5), 729–752.

Umberson, D., & Williams, K. (2005). Marital quality, health, and aging: Gender equality*?. The Journals of Gerontology Series B*: *Psychological Sciences and Social Sciences, 60*, 109–113. doi: 10.1093/geronb/60.special_issue_2.s109

VanLaningham, J., Johnson, D. R., & Amato, P. (2001). Marital happiness, marital duration, and the U-shaped curve: Evidence from a five-wave panel study. *Social Forces, 78*(4), 1313–1341. doi: 10.1353/sof.2001.0055

Zeidner, M., Kloda, I., & Matthews, G. (2013). Does dyadic coping mediate the relationship between emotional intelligence (EI) and marital quality?. *Journal of Family Psychology, 27*(5), 795–805. doi: 10.1037/a0034009

Influence of Fluid Intelligence on Accuracy of Metacognitive Monitoring in Preschool Children Fades with the Calibration Feedback

Kamila Urban
Institute for Research in Social Communication,
Slovak Academy of Sciences,
Bratislava, Slovak Republic

Marek Urban
Department of History and Theory of Art,
Faculty of Art and Design,
Jan Evangelista Purkyně University,
Ústí nad Labem, Czech Republic

Higher fluid intelligence leads to better accuracy in metacognitive monitoring, but in school age this influence is moderated by the child's development and education. The goal of the study is to examine the interaction between fluid intelligence and performance feedback or calibration feedback on monitoring accuracy in 88 preschool children. The children in the group that received performance (PF) or calibration feedback (CF) were significantly more accurate at monitoring than the children without feedback (NF). Fluid intelligence correlated with monitoring accuracy for the whole dataset and explained 49% of variance in monitoring accuracy in the NF group; 26% in the PF group (feedback alone explained 20%) and only 12% in the CF group, not reaching significance (however, feedback alone explained 26%). Results indicate that calibration feedback could potentially fulfil the role of later education and development in improving monitoring accuracy and moderate the effect of fluid intelligence already in preschoolers.

Key words: fluid intelligence, monitoring accuracy, metacognition, feedback, preschool children

Metacognitive monitoring is the ability to monitor one's mental states and accurately assess how these states affect present and future performance in cognitive tasks (Nelson & Narens, 1994). Monitoring ongoing activities is essential for planning and coordinating operations and resources that enable the person to choose, change or improve their strategy for

attaining educational goals. More accurate monitoring is required for better performance (Dunlosky & Rawson, 2012; Roebers, Krebs, & Roderer, 2014; Serra & Metcalfe, 2009). Being overconfident about task performance often leads to worse study performance (Dunlosky & Rawson, 2012), because the students do not spent sufficient time learning (Metcalfe & Finn, 2008). For these reasons, Dunlosky and Rawson (2012) have suggested that an appropriate intervention could be developed to improve monitoring accuracy and decrease overconfidence.

We take up this suggestion and discuss the effect of performance feedback (Lipowski, Merriman, & Dunlosky, 2013; Van Loon, Destan, Spiess, De Bruin, & Roebers, 2017) and calibration feedback (Callender, Franco-Watkins, & Roberts, 2016; Nietfeld, Cao, & Osborne, 2006) on monitoring accuracy in preschool children

solving analogical reasoning tasks. To evaluate the influence of performance feedback and calibration feedback on the accuracy of metacognitive monitoring in more detail, this study examines their interaction with fluid intelligence. Previous research has linked higher fluid intelligence with more accurate metacognitive monitoring (Rozencwajg, 2003; Saraç, Önder, & Karakelle, 2014), and the present study will investigate whether proper feedback can moderate the influence of fluid intelligence on the accuracy of metacognitive monitoring.

Development of Metacognitive Monitoring

Being overconfident about one's performance is a life-long problem, and from preschool age individuals increasingly learn to judge their performance with greater accuracy on a continuum from very sure to very unsure (Flavell, 2000). For many years it was assumed that metacognitive skills develop from primary school age and that preschool children are not able to monitor their performance more accurately and are often overconfident (for review: Lipko, Dunlosky, & Merriman, 2009; Schneider, 1998). But a number of researchers have found that children are able to monitor their own uncertainty from the age of 3 (Lyons & Ghetti, 2011; Marulis, Palincsar, Berhenke, & Whitebread, 2016), seeking help when they are unsure about perception tasks (Coughlin, Hembacher, Lyons, & Ghetti, 2015) or skipping an item when they are not sure whether they know the solution (Balcomb & Gerken, 2008). From the age of 5 children learn to differentiate correct solutions from incorrect solutions when completing more complex memory tasks (Destan & Roebers, 2015; Hembacher & Ghetti, 2014) and analogical reasoning tasks (Urban, Van Loon, & Roebers, 2016).

The development of the ability to monitor one's performance also depends on the nature of the task and socioeconomic background (Lipko et al., 2009; Urban, 2017; Zápotočná, 2013). Urban and Zápotočná (2017) used two Piagetian tasks and two text-comprehension tasks to test the ability of preschool children (5 and 6 year olds) to monitor performance. They found that children were more accurate in monitoring text comprehension tasks than Piagetian tasks. Urban (2017) found that while 5 and 6 year old children from middle class families correctly monitored their correct answers on text comprehension tasks in 90-96% of cases, children from lower socioeconomic backgrounds monitored their correct responses significantly less accurately.

Researchers are therefore interested in finding ways to decrease overconfidence in preschool children (Lipko et al., 2009; Urban et al., 2016; Van Loon et al., 2017) and in gaining a better understanding of the influence social and individual factors have on metacognition (Arslan, Akin, & Çítemel, 2013; Sarikam, 2015; Urban, 2017; Urban & Zápotočná, 2017; Zápotočná, 2013). As we will discuss further, one of these factors is intelligence (Alexander, Johnson, Albano, Freygang, & Scott, 2006; Veenman & Spaans, 2005).

Intelligence and Metacognition

Three general theories about the relationship between metacognition and intelligence have developed over time. The first model regards metacognition as the manifestation of intellectual ability and as an integral part of the cognitive toolbox. According to this intelligence model, metacognitive skills cannot have a predictive value for learning independent of intellectual ability (Sternberg, 1979). In the second, contrasting model, intellectual ability and metacognition are regarded as entirely independent predictors of learning, that is, as entirely separate toolboxes (Swanson, 1990). Finally, according to the mixed model, metacognition is related to intellectual ability to a certain extent,

but it also has a surplus value on top of the intellectual ability for the prediction of learning (Van der Stel & Veenman, 2014; Veenman, Kok, & Blöte, 2005; Veenman, Wilhelm, & Beishuizen, 2004). The independence and mixed models imply that metacognition can be fostered regardless of intelligence, suggesting the efficacy of metacognitive training for children with a whole range of intellectual abilities.

A closer examination of previous research reveals that the relationship between metacognition and intelligence depends on the components of metacognition (knowledge, monitoring and control) and the nature of intelligence (fluid or crystallized) investigated in the research (Alexander, Carr, & Schwanenflugel, 1995). In general, children of higher intelligence demonstrate better metacognitive knowledge (Alexander et al., 2006; Alexander & Schwanenflugel, 1996; Swanson, 1992) and metacognitive monitoring (Slife, Weiss, & Bell, 1985; Snyder, Nietfeld, & Linnenbrink-Gracia, 2011). Highly intelligent students (aged 12 and 15) exhibited more metacognitive activities relative to students with lower intelligence (Veenman & Spaans, 2005). In research with 12 and 13 year olds, Rozencwajg (2003) found a high correlation between crystallized intelligence and metacognitive knowledge, while metacognitive monitoring was more closely associated with fluid intelligence. In the same age group, Saraç et al. (2014) discovered a significant correlation between fluid intelligence and metacognitive monitoring, but did not find a significant correlation between fluid intelligence, metacognitive knowledge and metacognitive control.

In the learning environment, metacognitive abilities in general outweigh intelligence as a predictor of learning performance (Minnaert & Janssen, 1999; Pishghadam & Khajavy, 2013; Van der Stel & Veenmam, 2014; Veenman et al., 2005). More importantly, research suggests that intelligence has a decreasing influence during child development and education (Veenman et al., 2004), but that the impact of metacognition on learning performance remains important throughout the whole lifespan (Dunlosky & Rawson, 2012; Metcalfe & Finn, 2008; Roebers, 2017).

These conclusions indicate the need to foster metacognition rather than intelligence to achieve better learning performance (Sarzyńska, Żelechowska, Falkiewicz, & Nęcka, 2017). Peťková (2014) created a metacognitive (think-aloud) intervention for preschool children scoring below the 10th percentile in performance on Piagetian tasks. The children performed significantly better in post-test. The next section therefore examines the role of intervention in fostering metacognition.

Interventions Fostering Metacognition

There are basically two interventional strategies for improving metacognition. Firstly, there are repeated measures research designs, in which the same kind of task is repeatedly solved with the assumption that more experience solving similar tasks improves both performance and accuracy (Kruger & Dunning, 1999). However, while adults become underconfident after the first study trial (Finn & Metcalfe, 2014), children do not become underconfident with practice (Lipko et al., 2009), therefore, for children the use of repeated measures design is insufficient on its own.

Secondly, different kinds of feedback are given externally after task-solving. In research by Van Loon et al. (2017) two age groups (6 and 8 year olds) were overconfident about incorrect responses, but benefited from performance feedback (information on whether the task solution was correct or incorrect). However, the bulk of the research suggests that children's predictions about future performance are minimally influenced by their past performance or performance feedback (Lipko et al., 2009;

Lipowski et al., 2013). Following this assumption, Hembacher and Ghetti (2014) asked whether preschoolers might benefit from an intervention that emphasized the monitoring accuracy.

Feedback on calibration is commonly used to target the accuracy of metacognitive monitoring. Calibration is the relationship between performance and monitoring judgment on an item-by-item basis (Dunlosky & Thiede, 2013; Hacker, Bol, & Bahbahani, 2008; Nietfeld et al., 2006; Schraw, 2009). Therefore, calibration feedback provides information about the correctness of task performance as well as the accuracy of the metacognitive judgment regarding it. Most promising are mixed interventional designs that benefit from both repeated testing and provided feedback (Hacker, Bol, & Keener, 2008), especially in low performing students (Krajč, 2008; Miller & Geraci, 2011; Ryvkin, Krajč, & Ortmann, 2012). Nietfeld et al. (2006) found a significant treatment effect (repeated testing) on monitoring accuracy and performance in students who received monitoring feedback (overall calibration and bias scores) but not in students who received no feedback. In a similar setting Callender et al. (2016) found significant improvements in performance and metacognitive accuracy in students.

Present Study

In the present study we tested the effect of two interventions designed to enhance accuracy of metacognitive monitoring in preschool children: performance feedback (Van Loon et al., 2017) and calibration feedback (Nietfeld et al., 2006). We assume that the children in the group without feedback (hereafter NF) will be significantly more overconfident than children in the groups who receive performance feedback (hereafter PF) and calibration feedback (hereafter CF). This is hypothesis 1(a). Previ-

ous research indicates that performance feedback has a smaller effect on metacognitive accuracy in this age group (Lipko et al., 2009; Van Loon et al., 2017), so we assume that the children in the CF group will be the least overconfident. This is hypothesis 1(b).

To further examine the influence of performance feedback and calibration feedback on the accuracy of metacognitive monitoring, we will investigate the explanatory effect of fluid intelligence on accuracy of metacognitive monitoring in all three groups (NF, PF, CF). Following research by Rozencwajg (2003) and Saraç et al. (2014), we assume that fluid intelligence positively correlates with the accuracy of metacognitive monitoring, that is, children with a higher fluid intelligence will be more accurate in their monitoring. This is hypothesis 2(a). But research by Veenman et al. (2004) suggests that metacognition is only partly dependent on intelligence and that with continuing development and education, the influence of intelligence fades. We are interested whether also feedback can moderate the relationship between intelligence and monitoring accuracy. For this reason we assume that intelligence will explain less variance in the PF and CF groups, because of the effect of performance feedback and calibration feedback. This is hypothesis 2(b).

Method

Participants

The sample described in Table 1 consisted of a total of 88 children (33 girls and 55 boys) from 5.0 to 6.7 years old (mean age = 6.2 years, SD = 0.4). All the children were purposely recruited and tested in eight public preschools in Slovakia and were native Slovak speakers. The participants were predominantly Caucasian and from middle class families. Written consent was obtained from the children's parents and verbal assent from the children.

Table 1 *Number of participants, mean age and mean score in Coloured Progressive Matrices (CPM) among the feedback groups. (Standard deviations of the mean in parentheses.)*

	NF	PF	CF	Overall
N of Participants	28 (9 girls)	29 (10 girls)	31 (14 girls)	88 (33 girls)
Mean Age	6.19 (.40)	6.30 (.31)	6.06 (.44)	6.18 (.40)
Mean CPM score	24.39 (3.96)	25.21 (3.66)	24.16 (3.35)	24.58 (3.64)

Note. Separate ANOVAs did not show significant effect of feedback group on age, fluid intelligence and gender [$F(2, 85) = 2.61$, $p =$ ns.; $F(2, 85) = .67$, $p =$ ns.; $F(2, 85) = .60$, $p =$ ns., respectively]

Measures

The Analogical Reasoning Tasks were adapted from the mini LÜK children's game (two examples of tasks are present in the Appendix). We used 10 tasks (e.g., Urban et al., 2016) in which children had to analogically relate targets according to color (1 task), shape (3 tasks), color and shape (3 tasks) and complete a pattern (3 tasks). Each of the 10 tasks consisted of 12 target items, which were solved in the same way as the example. There was one correct solution for each target item on the solution sheet. The solution sheet was the same for all 12 target items and each child had 12 possible solutions to choose from for each item.

The metacognitive monitoring judgments were provided retrospectively (confidence judgments) by each child for each item solved. The children used a two-color traffic light system: red and green (e.g., Urban, 2017; Urban et al., 2016; Urban & Zápotočná, 2017). The children selected green if they thought the response to the task was correct and red if they thought the response to the task was incorrect.

Fluid intelligence was measured by Coloured Progressive Matrices, CPM (Raven, Court, & Raven, 1991). The CPM contains three sections with 12 tasks of increasing difficulty. Each task consisted of an incomplete design and the chil-

dren were given six alternatives to select a solution. Each section increased in difficulty and knowledge from the previous item was required to answer the next item.

Procedure

The data were collected on five consecutive days. The children were randomly assigned to one of the three groups (NF, PF and CF) before the first testing. They were tested individually by the first author before noon in a quiet room in the preschool. Before the first testing, the Coloured Progressive Matrices (CPM) were administered individually by a trained experimenter.

The order of the testing was altered each day and the testing lasted from 10 to 15 minutes per child. The task order and assessment procedure were identical for all children. Each day, the children solved two analogical reasoning tasks and provided monitoring judgments on their performance. The children analogically solved the 12 items in each task using the example by pointing to the answer on the solution sheet. After each item was solved, the experimenter elicited a monitoring judgment by asking: "Do you think you got it right or wrong? Show me using the traffic light." The traffic light system had been explained before testing through the telling of a short story about how

we cross the street and when we can be sure we can cross and how the children should point to the red and green colors of the traffic light to indicate whether they thought their response was correct or incorrect. The experimenter explained: "Point to the green if you think your answer was right, and point to the red if you think your answer was wrong." The explanation was concluded once it had been ascertained the child understood.

Feedback

The difference in the experimental conditions lies in the feedback provided. The children in the control group (NF) solved each task and provided metacognitive monitoring judgments once they had solved each item.

The children in the PF group solved each item, provided a monitoring judgment and finally received performance feedback from the experimenter as to whether their response was correct. When the response was correct, the experimenter said: "Yes, it was the right answer". When the answer was incorrect the experimenter said: "No, it was not the right answer."

The children in the CF group solved each item, provided a monitoring judgment and finally received calibration feedback on the accuracy of their judgment and the correctness of their answer. After the children provided a monitoring judgment for a solved item, the experimenter provided one of four types of feedback: a) When the solution was correct and the child pointed at the green light the experimenter said: "Well done, you thought your answer was correct and indeed it was." b) When the solution was incorrect and the child pointed at the green light the experimenter said: "Oh no, you thought your answer was correct but it was not." c) When the solution was incorrect and the child pointed at the red light, the experimenter said: "Well done, you thought you gave the wrong an-

swer and indeed, you did." d) When the answer was correct and the child pointed to the red light, the experimenter said: "Oh no, you thought you gave the wrong answer, but it was actually right," (e.g., Urban et al., 2016).

Data Analysis

To assess monitoring accuracy, we first calculated the mean Bias Index from the 10 tasks (120 items) for each child. The Bias Index shows the discrepancy between confidence judgment (a "red" light was coded 0 and a "green" light 1) and performance (0 for an incorrect answer, and 1 for a correct answer). Moreover, the Bias Index assesses the degree to which the children are overconfident or underconfident by providing information about the direction of the discrepancy between the specific judgment and the performance. If the confidence judgment is high and the performance low, the individual is overconfident, and the value of the Bias Index is close to 1. If the confidence judgment is low and the performance is high, underconfidence occurs, and the value of the Index is close to -1. The closer to 0 the value is, the more it reflects better accuracy (Schraw, 2009).

To test our hypothesis concerning the influence feedback has on the accuracy of monitoring judgments, a one-way ANOVA was conducted in SPSS 20. The independent variable was the feedback groups (NF, PF, CF), and the dependent variable was the Bias Index. A significant main effect was followed up with a Post-hoc Tukey test. Next, correlation analyses were performed to determine the strength of the relationship between fluid intelligence and accuracy of metacognitive monitoring in the three groups separately. Finally, a hierarchical regression analysis was conducted to predict the influence of feedback (PF or CF) and fluid intelligence on the accuracy of metacognitive monitoring.

Results

In the results section we first test our hypothesis that performance feedback and calibration feedback have a positive impact on the accuracy of preschool children's metacognitive monitoring. We then report on whether the children in the CF group are the most accurate or not. Then we investigate the relationship between children's intelligence and accuracy of metacognitive monitoring. In the analysis that follows we examine the explanatory effect of intelligence on the accuracy of metacognitive monitoring in the NF control group and the PF and CF experimental groups. Finally, we ascertain whether performance and calibration feedback explain more variance in the accuracy of metacognitive monitoring than intelligence does.

In hypothesis 1(a), we assumed there is a significant difference in the accuracy of metacognitive monitoring between all three groups (NF, CF, PF). Hypothesis 1(b) states that the CF group will be the least overconfident. The analysis of variance (ANOVA) yielded significant variation among the feedback groups [$F(2, 85) = 14.84$, $p < .001$, $\eta p^2 = .26$] and supports hypothesis 1(a). Figure 1 shows children's monitoring accuracy for each group. The post hoc Tukey test indicates that the PF group ($M = 0.13$, $SD = 0.06$) was significantly less overconfident ($p < .001$) than the NF group ($M = 0.24$, $SD = 0.15$), and also the CF group ($M = 0.11$, $SD = 0.07$) was significantly less overconfident ($p < .001$) than the NF group. However, the difference between the PF and CF groups was not significant (0.02, 95% CI: [$-0.04 - 0.08$], $p = .74$). Hypothesis 1(b) is therefore only partially supported. These results indicate the positive im-
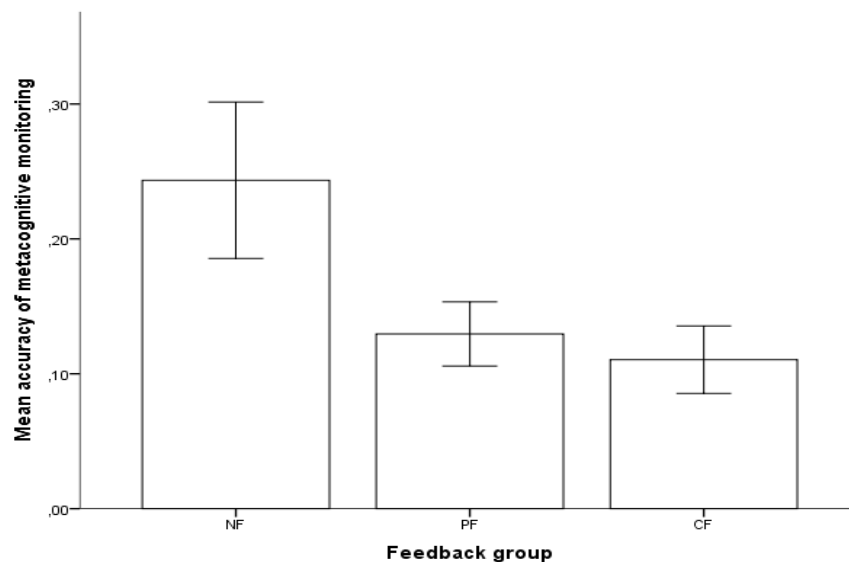
Note. Closer to zero indicates more accurate monitoring

Figure 1 Mean monitoring accuracy in feedback groups (NF, PF, CF). Error bars indicate a 95% confidence interval

pact performance feedback and calibration feedback have on preschoolers' metacognitive accuracy, but at this point we cannot assume that it is the calibration feedback that makes the children less overconfident rather than the performance feedback. To better understand the performance and calibration feedback effects we will describe their interaction with intelligence.

Hypothesis 2(a) assumed that fluid intelligence positively correlates with accuracy of metacognitive monitoring, that is, children of higher intelligence are less overconfident in monitoring. But hypothesis 2(b) suggests that intelligence explains less variance in the PF and CF groups because of the effect of performance feedback and calibration feedback respectively. As we can see in Table 2, the Pearson's r data analysis revealed a significant correlation between intelligence and monitoring accuracy in the NF group ($r = -.699, n = 28, p < .001$) and less significant correlation in the PF group ($r = -.513, n = 29, p = .005$). Surprisingly, there was no correlation between intelligence and accuracy of metacognitive monitoring in the CF group ($r = -.339, n = 31, p = .061$). However, the

Pearson's r data analysis for the whole dataset revealed a significant correlation between intelligence and monitoring accuracy ($r = -.471, n = 88, p < .001$). Also, Fisher's r-to-z transformation did not proved significant differences between correlations in the NF and PF group ($z = -1.07, p = .285$) and the NF and CF group ($z = -1.87, p = .062$). Therefore, we conclude hypothesis 2(a) as supported.

To better understand the interaction of intelligence and feedback on the accuracy of metacognitive monitoring, we conducted a hierarchical regression analysis with intelligence entered in the equation first for all three groups (NF, PF, CF) separately. As we can see in Table 3, intelligence alone explains 49% of the variance in accuracy of metacognitive monitoring in the NF group, 26% in the PF group and only 12% in CF group not reaching significance [$F(1,29) = 3.79, p = .061$]. These results indicate the weakening influence of intelligence in the PF and CF groups.

To examine the effect of feedback alone, performance feedback (for the PF group) and calibration feedback (for the CF group) were en-

Table 2 *Correlation between fluid intelligence and monitoring accuracy in feedback groups*

	NF	PF	CF	Overall
Correlation Intelligence / Accuracy	-.699***	-.513**	-.339	-.471***

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

Table 3 *Percentage of variance accounting for metacognitive accuracy*

	Intelligence unique	Feedback unique	Shared
NF	49	-	-
PF	26	20	56
CF	12	26	57

Note. Intelligence unique refers to the unique contribution of fluid intelligence to the accuracy of metacognitive monitoring; Feedback unique refers to the unique contribution of feedback (performance feedback in the PF group, and calibration feedback in the CF group) to the accuracy of metacognitive monitoring; Shared refers to the shared contribution of fluid intelligence and feedback to the accuracy of metacognitive monitoring.

tered into the equation alone (dummy coded). Performance feedback alone explained 20% of the variance, and calibration feedback alone explained 26%. The calibration feedback had a greater explanatory effect than performance feedback. Together these findings support hypothesis 2(b).

In the second step, in the PF group, intelligence and performance feedback together explained 50% of the variation in accuracy of metacognitive monitoring reaching significance at level $p < .001$. Next, the interaction term between intelligence and performance feedback was added to the regression model, which accounted for a significant proportion of the variation in monitoring accuracy ($p < .001$). This model explained 56% of the variation in monitoring accuracy, with significant influence of both intelligence ($\beta = -.03, p < .001$) as well as performance feedback ($\beta = -.53, p = .001$).

In the CF group intelligence and calibration feedback together explained 50% of the variance in accuracy of metacognitive monitoring reaching significance at level $p < .001$. Together with the interaction term between intelligence and calibration feedback the regression model explained 57% of the variation in monitoring accuracy again with significant influence of both intelligence ($\beta = -.03, p < .001$) as well as calibration feedback ($\beta = -.61, p < .001$).

Comparing the standardized beta coefficients we can see that calibration feedback had a stronger influence than did performance feedback on the accuracy of metacognitive monitoring. The findings from the regression analysis further support hypothesis 1(b).

Discussion

In the present study we investigated the influence of performance feedback and calibration feedback on monitoring accuracy in preschool children and how the two kinds of feedback interacted with fluid intelligence. The children solved 10 analogical reasoning tasks in five consecutive days and provided confidence judgments once each item had been solved.

We found a strong relationship between fluid intelligence and accuracy of metacognitive monitoring in preschool children. The children in the group with no additional feedback and with higher fluid intelligence were less overconfident than the children with lower intelligence. Our results with the preschool children correspond to the findings of previous studies conducted with primary school children (Rozencwajg, 2003; Saraç, Önder, & Karakelle, 2014). In our research, fluid intelligence explained 49% of the variance in monitoring accuracy in preschool children solving analogical reasoning tasks.

However, our findings from the feedback groups indicate that the influence of fluid intelligence on the accuracy of metacognitive monitoring can be moderated by feedback. This supports the previous line of research, which found that education and development leads to metacognition becoming partly independent from intelligence (Van der Stel & Veenman, 2014; Veenman et al., 2005) and to the children gaining better metacognitive accuracy (Finn & Metcalfe, 2014; Flavell, 2000; Roebers et al., 2014; Van Loon et al., 2017). We found that both (performance and calibration) feedback ameliorated children's monitoring accuracy. The preschool children in the two feedback groups were significantly less overconfident than their peers in the control group. At this point we should add that research with wider sample of children would also better examine the effect of performance and calibration feedback, while our research did not prove the significant differences in metacognitive accuracy between the PF and CF group.

However, performance feedback alone explained 20% of the variance in monitoring accuracy, indicating that performance feedback has a significant influence on monitoring accu-

racy. In the performance feedback group, fluid intelligence explained 26% of the variance in monitoring accuracy, indicating that fluid intelligence had a smaller influence when compared to the non-feedback group (26% < 49%). The results of the performance feedback group correspond to previous research, where it was assumed that preschool age children remained overconfident because they could not take full account of the performance feedback when monitoring their performance (Lipko et al., 2009; Lipowski et al., 2013; Van Loon et al., 2017). In our study, the preschool children in the performance feedback group monitored their performance more accurately than did the children without the feedback, but fluid intelligence still had a significant influence on their monitoring accuracy. The children with a lower fluid intelligence continued to display greater overconfidence even after the performance feedback had been administered.

Calibration feedback, in the line with previous research (Krajč, 2008; Miller & Geraci, 2011; Ryvkin et al., 2012), seems to produce more promising results. Calibration feedback alone explained 26% of the variance in monitoring accuracy; 6% more than performance feedback did. But more importantly, in the calibration feedback group, fluid intelligence explained only 12% of the variance in monitoring accuracy, and it was not significant. These results indicate the potential of calibration feedback to fulfill the role of later education and development in fostering metacognition already at the preschool age. In other words, preschool children can learn to better monitor their performance despite their level of fluid intelligence thanks to the calibration feedback.

These findings further support the mixed model of metacognition and intelligence (Van der Stel & Veenman, 2014; Veenman et al., 2004; 2005). We can see the influence of fluid intelligence on the accuracy of metacognitive monitoring under conditions where there is no inter-vention, but the effect of intelligence fades due to the feedback.

However, future research should address the question of whether preschool children can retain the performance feedback or calibration feedback effect for longer periods as well (Sarzyńska et al., 2017). While our sample consisted of 5 to 6 year olds, it would be beneficial to investigate the potential additional effect performance feedback or calibration feedback may have on top of the ordinary educational and developmental effects of the first year of primary school. Moreover, Ryvkin et al. (2012) described the changing effect of performance and calibration feedback while solving different kinds of tasks in different environments, therefore it would be beneficial to research more closely the differences between performance and calibration feedback in experimental and real learning environments.

Nevertheless, these findings could have an impact on everyday classroom practice. Calibration feedback can be beneficial for children with lower fluid intelligence, as the present study has shown, but it is also of benefit to children with learning disabilities who constantly overestimate their performance (Slife et al., 1985) and for children from lower socioeconomic backgrounds, who cannot monitor their performance accurately (Urban, 2017).

References

Alexander, J. M., Carr, M., & Schwanenflugel, P. J. (1995). Development of metacognition in gifted children: Directions for future research. *Developmental Review, 15,* 1–37.

Alexander, J. M., Johnson, K. E., Albano, J., Freygang, T., & Scott, B. (2006). Relations between intelligence and the development of metaconceptual knowledge. *Metacognition and Learning, 1,* 51–67.

Alexander, J. M., & Schwanenflugel, P. J. (1996). Development of metacognitive concepts about thinking in gifted and nongifted children: Recent research. *Learning and Individual Differences, 8*(4), 305–325.

Arslan, S., Akin, A., & Çítemel, N. (2013). The predictive role of grit on metacognition in Turkish uni-

versity students. *Studia Psychologica, 55(4),* 311–320.

Balcomb, F. K., & Gerken, L. (2008). Three-year-old children can access their own memory to guide responses on a visual matching task. *Developmental Science, 11*(5), 750–760.

Callender, A. A., Franco-Watkins, A. M., & Roberts, A. S. (2016). Improving metacognition in the classroom through instruction, training, and feedback. *Metacognition and Learning, 11*(2), 215–235.

Coughlin, C., Hembacher, E., Lyons, K. E., & Ghetti, S. (2015). Introspection on uncertainty and judicious help-seeking during the preschool years. *Developmental Science, 18*(6), 957–971.

Destan, N., & Roebers, C. M. (2015). What are the metacognitive costs of young children's overconfidence? *Metacognition and Learning, 10*(3), 347–374.

Dunlosky, J., & Rawson, K. A. (2012). Overconfidence produces underachievement: Inaccurate self-evaluations undermine students' learning and retention. *Learning and Instruction, 22*, 271–280.

Dunlosky, J., & Thiede, K. W. (2013). Four cornerstones of calibration research: Why understanding students' judgments can improve their achievement. *Learning and Instruction, 24*(1), 58–61.

Finn, B., & Metcalfe, J. (2014). Overconfidence in children's multi-trial judgments of learning. *Learning and Instruction, 32*, 1–9.

Flavell, J. H. (2000). Development of children's knowledge about the mental world. *International Journal of Behavioral Development, 24*(1), 15–23.

Hacker, D. J., Bol, L., & Bahbahani, K. (2008). Explaining calibration accuracy in classroom context: The effects of incentives, reflection, and explanatory style. *Metacognition and Learning, 3(2),* 101–121.

Hacker, D. J., Bol., L., & Keener, M. C. (2008). Metacognition in education: A focus on calibration. In J. Dunlosky, & R. A. Bjork (Eds.), *Handbook of memory and metacognition* (pp. 429–455). New York, NY, US: Psychology Press.

Hembacher, E., & Ghetti, S. (2014). Don't look at my answer: Subjective uncertainty underlies preschoolers' exclusion of their least accurate memories. *Psychological Science, 25*(9), 1768–1776.

Krajč, M. (2008). *Are the unskilled really that unaware? Understanding seemingly biased self-assessments.* Prague: CERGE-EI.

Kruger, J., & Dunning, D. (1999). Unskilled and unaware of it: How difficulties in recognizing one's own incompetence lead to inflated self-assessments. *Journal of Personality and Social Psychology*, 77(6), 1121–1134.

Lipko, A. R., Dunlosky, J., & Merriman, W. E. (2009). Persistent overconfidence despite practice: The role of task experience in preschoolers' recall predictions. *Journal of Experimental Child Psychology, 103*, 152–166.

Lipowski, S. L., Merriman, W. E., & Dunlosky, J. (2013). Preschoolers can make highly accurate judgments of learning. *Developmental Psychology, 49*(8), 1505–1516.

Lyons, K. E., & Ghetti, S. (2011). The development of uncertainty monitoring in early childhood. *Child Development, 82*(6), 1778–1787.

Marulis, L. M., Palincsar, A. S., Berhenke A. L., & Whitebread, D. (2016). Assessing metacognitive knowledge in 3-5 year olds: The development of a metacognitive knowledge interview (McKI). *Metacognition and Learning, 11*(3), 339–368.

Metcalfe, J., & Finn, B. (2008). Evidence that judgments of learning are causally related to study choice. *Psychonomic Bulletin and Review, 15*(1), 174–179.

Miller, T. M., & Geraci, L. (2011). Training metacognition in the classroom: The influence of incentives and feedback on exam predictions. *Metacognition and Learning, 6*(3), 303–314.

Minnaert, A., & Janssen, P. J. (1999). The additive effect of regulatory activities on top of intelligence in relation to academic performance in higher education. *Learning and Instruction, 9*, 77–91.

Nelson, T. O., & Narens, L. (1994). Why investigate metacognition? In J. Metcalfe, & A. P. Shimamura (Eds.), *Metacognition: Knowing about knowing* (pp. 1–25). Cambridge, MA: MIT Press.

Nietfeld, J. L., Cao, L., & Osborne, J. W. (2006). The effect of distributed monitoring exercises and feedback on performance, monitoring accuracy, and self-efficacy. *Metacognition and Learning, 1*(2), 159–179.

Peťková, K. (2014). The use of zone of proximal development when solving Piagetian tasks in preschool children. *Proceedings of the International Scientific Conference on MMK 2014* (vol. V., pp. 2122–2131). Hradec Králové: Magnanimitas.

Pishghadam, R., & Khajavy, G. H. (2013). Intelligence and metacognition as predictors of foreign language achievement: A structural equation modeling approach. *Learning and Individual Differences, 24*, 176–181.

Raven, J. C., Court, J. H., & Raven, J. (1991). *Farebné progresívne matice (CPM)*. Bratislava: Psychodiagnostika.

Roebers, C. M. (2017). Executive function and metacognition: Towards a unifying framework of cognitive self-regulation. *Developmental Review, 45*, 31–51.

Roebers, C. M., Krebs, S. S., & Roderer, T. (2014). Metacognitive monitoring and control in elementary school children: The interrelations and their

role for test performance. *Learning and Individual Differences, 29,* 141–149.

Rozencwajg, P. (2003). Metacognitive factors in scientific problem-solving strategies. *European Journal of Psychology of Education, 18*(3), 281–294.

Ryvkin, D., Krajč, M., & Ortmann, A. (2012). Are the unskilled doomed to remain unaware? *Journal of Economic Psychology*, *33*(5), 1012–1031.

Saraç, S., Önder, A., & Karakelle, S. (2014). The relations among general intelligence, metacognition and text learning performance. *Education and Science, 39*(173), 40–53.

Sariçam, H. (2015). Metacognition and happiness: The mediating role of perceived stress. *Studia Psychologica, 57(4),* 271–283.

Sarzyńska, J., Żelechowska, D., Falkiewicz, M., & Nęcka, E. (2017). Attention training in school children improves attention but fails to enhance fluid intelligence. *Studia Psychologica, 59*(1), 50–65.

Schneider, W. (1998). Performance prediction in young children: Effects of skill, metacognition and wishful thinking. *Developmental Science, 1*(2), 291–297.

Schraw, G. (2009). Measuring metacognitive judgments. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of metacognition in education* (pp. 415–429). New York, NY: Routledge.

Serra, M. J., & Metcalfe, J. (2009). Effective implementation of metacognition. In D. J. Hacker, J. Dunlosky, & A. C. Graesser (Eds.), *Handbook of metacognition in education* (pp. 278–298). New York, NY: Routledge.

Slife, B. D., Weiss, J., & Bell, T. (1985). Separability of metacognition and cognition: Problem solving in learning disabled and regular students. *Journal of Educational Psychology, 77*(4), 437–445.

Snyder, K. E., Nietfeld, J. L., & Linnenbrink-Garcia, L. (2011). Giftedness and metacognition: A short-term longitudinal investigation of metacognitive monitoring in the classroom. *Gifted Child Quarterly, 55*(3), 181–193.

Sternberg, R. J. (1979). The nature of mental abilities. *American Psychologist, 34*(3), 214–230.

Swanson, H. L. (1990). Influence of metacognitive knowledge and aptitude on problem solving. *Journal of Educational Psychology, 82*(2), 306–314.

Swanson, H. L. (1992). The relationship between metacognition and problem solving in gifted children. *Roeper Review, 15*(1), 43–48.

Urban, K. (2017). Metakognitívny monitoring [Metacognitive monitoring]. In O. Zápotočná, & Z. Petrová (Eds.), *Raná jazyková gramotnosť detí zo socioekonomicky znevýhodneného prostredia* [Early literacy of children from socio-economically disadvantage backgrounds] (pp. 79–98). Trnava: Typi Universitatis Tyrnaviensis & Bratislava: VEDA.

Urban, K., Van Loon, M. H. & Roebers, C. (2016, August 23 to 26). Metacognitive monitoring in preschool children when solving analogical reasoning tasks. In *Metacognition 2016: Proceedings of the 7th Biennial Meeting of the EARLI Special Interest Group 16 Metacognition*. Nijmegen, Radboud University Nijmegen, 2016, 118.

Urban, K., & Zápotočná, O. (2017). Metakognitívny monitoring pri riešení verbálnych a neverbálnych úloh u detí predškolského veku [Metacognitive monitoring in preschool children when solving verbal and nonverbal tasks]. *Československá Psychologie, 61*(6), 521–535.

Van Loon, M. H., Destan, N., Spiess, M., De Bruin, A. B. H., & Roebers, C. (2017). Developmental progression in performance evaluations: Effects of children's cue-utilization and self-protection. *Learning and Instruction, 51*, 47–60.

Van der Stel, M., & Veenman, M. V. J. (2014). Metacognitive skills and intellectual ability of young adolescents: A longitudinal study from a developmental perspective. *European Journal of Psychology of Education, 29*(1), 117–137.

Veenman, M. V. J., Kok, R., & Blöte, A. W. (2005). The relation between intellectual and metacognitive skills in early adolescence. *Instructional Science, 33,* 193–211.

Veenman, M. V. J., & Spaans, M. A. (2005). Relation between intellectual and metacognitive skills: Age and task differences. *Learning and Individual Differences, 15,* 159–176.

Veenman, M. V. J., Wilhelm, P., & Beishuizen, J. J. (2004). The relation between intellectual and metacognitive skills from a developmental perspective. *Learning and Instruction, 14,* 89–109.

Zápotočná, O. (2013). *Metakognitívne procesy v čítaní, učení a vzdelávaní* [Metacognitive processes in reading, learning and education]. Trnava: Typi Universitatis Tyrnaviensis.

Appendix

Examples of analogical reasoning tasks.

a) Task used in Session 1.

b) Task used in Session 5.

What is the next step?