Studia Psychologica, Vol. 62, No. 1, 2020, 5-22
https://doi.org/10.31577/sp.2020.01.788

# A Strong Argumentative Orientation Makes the Cognitive Closure Easier: The Case for a Persuasive Health Message

Vincent Coppola[1], Fabien Girandola[2], Odile Camus[3]
[1] University of Toulouse 3, LERASS, 115 route de Narbonne, 310177, Toulouse, France
[2] University of Aix-Marseille, LPS, 29 avenue Robert Schuman, 13621, Aix-en-Provence, France
[3] University of Rouen, CRFDP, Rue Lavoisier, 76821, Mont Saint Aignan, France

The rationale of this study is that scalar adverbs are likely to act as a convenient means to achieve cognitive closure because they stress the argumentative orientation of the message. Based on this assumption, an experiment shows that the introduction of scalar adverbs in the message decreases the extent of its cognitive elaboration and increases its perceived quality and effectiveness for people high in need for closure, but not for people low in need for closure, for whom the outcomes are reversed with regard to perceived quality and persuasiveness of the message. To what extent such outcomes are likely to be affected by some variables traditionally studied in the persuasion literature is addressed in the discussion.

*Key words*: argumentative orientation, message processing, need for closure, persuasion, health communication

Social psychologists have always been interested in the processes by which human judgments are formed and goal-directed (Kruglanski, 1990; Kruglanski & Azjen, 1983; Kunda, 1990; for a review, see Molden & Higgings, 2012). In particular, the "need for closure" concept, originally embedded in the Kruglanski's (1989) lay epistemic theory, has been defined as the "desire for *an* answer on a given topic, *any* answer, as compared to confusion and ambiguity" (Webster & Kruglanski, 1994, p. 1049). As such, it has been viewed as a motivation to draw a conclusion quickly and terminate cognitive processing related to the issue (Kruglanski, Orehek, Dechesne, & Pierro, 2010; Roets & Van Hiel, 2011a).

Furthermore, in the area of pragmatics, argumentation has been approached through the way lexical items give orientations to utterances, and the meaning of a particular utterance has been viewed as the set of all possible argumentative entailments that can be made from it (Malrieu, 1999). In particular, the concept of "argumentative orientation", originally defined as "the type of conclusions suggested to the recipient, the conclusions that the statement offers as one of the discursive aims" (Anscombre & Ducrot, 1983, p. 149), has been advanced to describe how the introduction of scalar adverbs in a given utterance direct the interlocutor towards a clear-cut conclusion (Moeschler, 2016).

Correspondence concerning this article should be addressed to Vincent Coppola, University of Toulouse 3, LERASS, 115 route de Narbonne, 310177, Toulouse, France. E-mail: vincent.coppola@iut-tarbes.fr
ORCID https://orcid.org/0000-0003-0899-6693
Received March 12, 2019

The current study relies on these two theoretical frameworks, and addresses the question of whether matching the message argumentative orientation to the recipients' need for closure impacts his or her attitude toward the message and, as a consequence, its effectiveness. It is designed as follows. First, a brief overview of the "need for closure" concept is made. It consists in presenting its main theoretical features. Second, the rationale of the study is advanced. Grounded in the framework of integrated pragmatics, it consists in arguing that the message argumentative orientation is a feature likely to be congruent with the need for closure expressed by the recipients, resulting in a more favorable attitude toward the message. Third, a study carried out on university campus in the context of a health promotion intervention is offered as the empirical core in response to the above-mentioned research question.

**The Need for Closure: An overview**

Broadly speaking, the need for (non specific) closure has been defined as reflecting the desire for an answer on a given topic, any answer as long as it is clear, definite, and secure, as opposed to the undesirable alternative of ambiguity and confusion (Kruglanski, 1990; Kruglanski & Webster, 1996). Engaged in an ongoing decision-making process, people may experience an urgent desire to attain a swift and firm decision so that forming a clear-cut opinion or reaching a definite conclusion becomes a goal in itself. In that case, they are willing to promote cognitive activities and/or strategies that best meet their immediate goal in the ongoing decision-making process and, as a result, display a series of cognitive bias well documented in the field of social cognition (Kruglanski & Freund, 1983; Kruglanski & Fishman, 2009). Once the closure is attained, people can be reluctant to have their opinion and conclusion challenged, and thus promote cognitive activities in order to maintain it and stick to it, no matter what (Kruglanski, Webster, & Klem, 1993).

Embedded in the conceptual definition of the need for closure, the urgency tendency and the permanence tendency have been outlined as the two distinct ways whereby the motivation toward cognitive closure exerts its effects (Kruglanski & Webster, 1996; Roets, Van Hiel, & Cornelis, 2006). The urgency tendency has been defined as "an individual's inclination to attain closure as soon as possible", whereas the permanence tendency has been defined as "an individual's inclination to maintain it for as long as possible" (Kruglanski & Webster, 1996, p. 263). The former promotes behavior in which people seize on early available evidence or information that allows them to decide and conclude without sacrificing their sense of validity; the later may lead to behavior in which people freeze on the reached decision or conclusion and are reluctant to reconsider it (Kruglanski & Webster, 1996; Roets & Van Hiel, 2006). As Kunda (1999) argued: "When we are motivated to achieve closure, we may "freeze" our thinking process early on, as soon as we have arrived at what seems like a good enough solution" (p. 242). Defined through the two aforementioned concepts, the need for closure is a typical illustration of a motivational mechanism influencing the extent of efforts and care people invest in information processing aimed at reaching a decision (for reviews of the empirical evidence, see Kruglanski, 2004; Kruglanski & Chun, 2008; Kruglanski & Fishman, 2009; Kruglanski & Webster, 1996; Webster & Kruglanski, 1998).

Particularly relevant for the current study is the seizing process. When people succumb to the urge to make a decision or reach a conclusion, they are more likely to quickly select and prioritize in their environment the most salient and easily accessible information. They are also more likely to quickly rely on cues presumably in order to supply quick closure, so that the need for closure should finally affect not only the *amount* but also the *type* of information processed. Kruglanski & Webster (1996) argued that: "people under a heightened need for closure may seize on information appearing early in a sequence [and] should base their judgments predominantly

on early or preexisting cues" (p. 265) and also argued for a "speeded-up reliance on early cues implied by seizing" (p. 268). Similarly, Sankaran, Szumowska and Kossowska (2017) argued that "given a choice, individuals high in need for closure would choose the effortless, i.e., easiest and quickest, way to attain closure" (p. 309).

Numerous studies have confirmed the tendency of individuals under a heightened need for closure to select peripheral cues as a quick and easy route to closure. For instance, in a research dealing with persuasion, Klein & Webster (2000, Study 1) showed that attitudes of individuals high in dispositional need for closure were more affected by the number of arguments (i.e., "the message-length heuristic") than by argument quality, whereas low need for closure individuals were more likely to be influenced by the quality of the arguments (i.e., systematic processing). Particularly interesting in the Klein and Webster's (2000) research was the fact that individuals high in dispositional need for closure processed a message systematically if a heuristic cue was unavailable to provide an easy means for closure (Study 2). In a study dealing with consumer information processing and purchase decisions, Cronley, Posavac, Meyer, Kardes, and Kellaris (2005) showed that the degree to which price was perceived to predict quality (i.e., "the price-quality heuristic") was overestimated when consumers' need for cognitive closure was high. Similarly, Vermeir, Van Kehnove, and Hendrickx (2002) showed that dispositional high need for closure consumers generally demonstrated a higher search effort for price and promotional information, which are supposed to be heuristic decision cues in the shopping context (see also Vermeir & Van Kehnove, 2005). Using a knowledge task, Wesson and Pulford (2005) showed that individuals high in dispositional need for closure used to a greater extent the speaker's confidence cue, when making choices, and concluded that the use of this "confidence heuristic" could satiate their desire to make quick decisions and confident choices.

This idea that "the higher the magnitude of their need for closure […] the greater their tendency to rely on simple judgmental heuristics" (Pierro, Manetti, Erb, Spiegel, & Kruglanski, 2005, p. 103) is one of the most important implications of the research on need for cognitive closure. And this is of critical importance for the rationale of this study, insofar as it will be now addressed whether scalar adverbs are likely to act as judgmentally relevant cues, on which people could seize when they process an informational message under a heightened need for closure.

**Scalar Adverbs as Argumentative Markers: An Easy-Way Out Option?**

In the area of pragmatics, it has been largely argued that the meaning of words conditions the dynamics of discourse and a single fact can be understood in different ways according to its linguistic formulation (Portolés & Yates, 2014). This direction has been explicitly and exhaustively taken in the Anscombre and Ducrot's (1983) "Theory of Argumentation within Language", with the purpose to show that language itself is argumentative, both at the level of the basic sentence and individual words themselves. This theory supported the concept that the meaning of utterances can be captured in terms of the conclusions for which they can be used as arguments and the argumentative function of language should be seen as primary, compared to its informative and descriptive function (Anscombre & Ducrot, 1976; Ducrot, 1993; Iten, 2000). For this reason, the Anscombre and Ducrot's (1983) theory of argumentation has been judged as a "*radically ascriptivist*" approach of semantics (Rocci, 2017, p. 124).

Anscombre and Ducrot's approach emanates from their interest in describing how words such as "*almost*, *only*, *even*, *already*, *more than, near from*, *at least*, *no less than*", work as argumentative operators, in that they direct the interlocutor for the recovering of the "argumentative orientation" (also called "argumentative force") of the utterances in which they occur (Van Eemeren, 2001; Van Eemeren,

Grootendorst, & Snoeck Henkemans, 1996). The argumentative orientation can be thought of as the set of inferences that can be drawn from a given utterance and it has been largely claimed that it can be stimulated by the words referred to above, called "scalar adverbs" (Bassano, 1991; Champaud & Bassano, 1987; Defrise & Nirenburg, 1990; Mc Keown & Elhadad, 1991). Scholars have described the role of these word cues as adding constraints on the argumentative orientation of the sentences they modify (Henning, 1982; Kay, 1990; Sadock, 1981). In particular, Anscombre and Ducrot (1983) argued that "the presence of some morphemes (*nearly* for instance) in some sentences gives an intrinsic argumentative orientation to these sentences, predisposing them to be used in some types of conclusions rather than others" (p. 149).

In this "meaning is orienting" view of language fiercely supported in the radical argumentativism approach, scalar adverbs are conceptualized as adding a guidance function to utterances and as such encoding "instructions" (i.e., procedural content) rather than "concepts" (descriptive content)[1]. As Verhagen (2008) argued:

"an addressee takes an utterance not (just) as an instruction to construe an object of conceptualization in a particular way, but (also) as an instruction to engage in a reasoning process, and to draw certain conclusions; it is typically [...] understanding what the speaker/writer is getting at (what he wants you to *infer*), that counts as successful communication" (p. 316).

The current study aims at exploring the guidance function that scalar adverbs can have in the processing of an informational message about a disease presented as a new emerging sexually transmitted infection. It was reasoned that when people are processing a health message about an unfamiliar disease with the aim to form an opinion about its severity, the introduction of scalar adverbs in the message was supposed to serve the seizing process and the urgency tendency, intrinsically related to a high need for cognitive closure. For instance, an utterance such as "2400 people have *already* contracted the virus *just* for the period from January to June" was supposed to guide the recipients about the (perceived) seriousness of the disease, more than the same utterance without "*already*" and "*just*". Similarly, an utterance such as "Since the outbreak of the disease three years ago, *up to* 6000 new persons have contracted the virus each year" was supposed to have the same guidance function, more than the same utterance without "*up to*". Said differently, the addition of scalar adverbs in the message was expected to be a convenient means to attain closure, and as such, of a greater relevance for people *high in need for closure,* who are supposed to seize quickly on an early available solution (i.e., "speeded-up reliance on early cue phenomena", Kruglanski & Webster, 1996, p. 268), than for people *low in need for closure*, who are engaged in a more extensive information search before deciding on the issue. In relation with this reasoning were the following hypotheses: "People with high need for cognitive closure will process the message containing scalar adverbs more superficially (H1), rate it better with regard to its quality (H2), and judge it more convincing (H3) than people with lower need for cognitive closure".

## Method

### Participants

Participants were undergraduate students aged 18 to 23 years old attending in a management and accountability course at a large public University in the south of France. They were invited to participate in a health promotion intervention about a sexually transmitted infection. Upon arrival to the session, student volunteers were told that participation in the study entailed reading a fact sheet about the "Paramyxoviridae infection" and then complet-

[1] For the distinction between "conceptual content" and "procedural content", see also Deirdre Wilson (2011).

ing a questionnaire. They were told that this fact sheet had been designed by the Health Promotion Department with the purpose of informing them about this new and emerging disease and enabling them to assess its severity. To make sure participants were unfamiliar with the "Paramyxoviridae infection", they were asked to answer the following questions: "Do you know of the Paramyxoviridae infection?", and "Did someone in your environment inform you about the Paramyxoviridae infection?"

Table 1 *Sample manipulations in each of two versions of the epidemiological report*

| Non-scalar argumentation | Scalar argumentation |
|---|---|
| ▪ Since the outbreak of the disease three years ago, 6000 new persons have contracted the virus each year. | ▪ Since the outbreak of the disease three years ago, *up to* 6000 new persons have contracted the virus each year. |
| ▪ The virus has contaminated *1238* persons the last year throughout Europe. | ▪ The virus has contaminated *no less than 1238* persons the last year throughout Europe. |
| ▪ 250 infections have been registered in our country, of which *180 from January to June.* | ▪ *Already* 250 infections have been registered in our country, of which *180 just for January to June.* |
| ▪ 50 new cases occurred during the last six months for the people aged from 18 to 25 years old. Considering those who do not know they are positive, *this number is higher than 50.* | ▪ *Almost* 50 new cases occurred during the last six months for the people aged from 18 to 25 years old, *and even more than 50* when it is considered those who do not know they are positive. |
| ▪ As for other sexually transmitted infections, people can expose themselves during a single act of unprotected intercourse and it is now anticipated that 1500 sexually active young adults will catch the virus within the next two years. | ▪ As for other sexually transmitted infections, people can expose themselves during a single act of unprotected intercourse and it is now anticipated that *not less than* 1500 sexually active young adults will catch the virus within the next two years. |
| ▪ Many people will get sick and twenty percent of those who develop symptoms will die. | ▪ Many people will get sick and twenty percent of those who develop symptoms will die. |
| ▪ By contracting this new virus, they will develop brain damage and suffer from breathing difficulties. | ▪ By contracting this new virus, they will develop brain damage and suffer from breathing difficulties. |
| ▪ Because younger adults are especially susceptible, university communities are at risk for widespread viral outbreaks. | ▪ Because younger adults are especially susceptible, university communities are at risk for widespread viral outbreaks. |
| ▪ According to Professor Schwartz, from the National Student Health Center, one out of four students will exhibit the most serious form of the Paramyxoviridae infection in a near future. | ▪ According to Professor Schwartz, from the National Student Health Center, *almost* one out of four students will exhibit the most serious form of the Paramyxoviridae infection in a near future. |
| ▪ It is estimated that a vaccine will not be found until the next 5 years, so the adoption of safer sex practices nowadays is the only way to protect yourself. | ▪ It is estimated that a vaccine will not be found until the next 5 years, so the adoption of safer sex practices nowadays is the only way to protect yourself. |

**Independent Variables**

The current study was implemented in the context of a health promotion intervention on university campus. A fictitious sexually transmitted infection referred to as the "*Paramyxoviridae infection*" served as the main topic in this study and was presented as an emergent disease. The first experimental manipulation consisted in varying the scalar argumentation in a text presented as an epidemiological report about the "*paramyxoviridae infection*". In one version, scalar adverbs were incorporated in some of statements so it was referred to as the "scalar argumentation version", while in another version, no scalar adverbs were included so it was referred to as the "non-scalar argumentation version". Both versions were prepared with the concern of maintaining them as identical as possible in terms of length (scalar = 234 vs. non scalars = 220), sentence structure, and content. Sample manipulations are provided in Table 1.

The need for closure was the other relevant factor. In this study, the need for closure was treated as an individual-difference variable (i.e., dispositional need for closure), and measured with the Roets and Van Hiel's (2011b) abridged version of the Need For Closure Scale, initially developed by Webster and Kruglanski (1994)[2]. This scale consists of 15 items (e.g., "I dislike questions which could be answered in many different ways", "I don't like situations that are uncertain"), all loaded on one dimension, each of them being rated on 6-point Likert scales ranging from 1 (completely disagree) to 6 (completely agree) with higher scores indicating a greater (dispositional) need for closure. So, based on the scores obtained with this short version of the need for closure scale, it was possible to classify subjects as "high in need for closure" vs. "low in need for closure".

**Dependent Variables**

*The information processing*. A thought-listing task was used to assess how much the message was cognitively processed. Participants were provided with a paper sheet with 10 boxes and instructed as follows:

*We are now interested in what you were thinking about as you were reading the message. Simply write down the first thought and idea that came to your mind in the first box, the second idea in the second, etc. Please put only one idea or thought in a box. You should try to record only those ideas that you were thinking while you were reading the message. You will have 3 minutes to write down all these thoughts and ideas. Please be completely honest and list all of the thoughts that you had* (adapted from Petty & Cacioppo, 1977, p. 648).

Two coders, blind to the experimental hypotheses, were asked to evaluate whether these collected thoughts were message content – and topic – relevant elaborations ("Young adults like me are highly susceptible to this infection", "This new disease seems to be serious", I will continue to use a condom", "It is not a risk as long as condom is used", "I am not concerned because I am mono-partner", etc.), or not ("It looks like an exam", "I am happy to take part in this questionnaire", "I need to smoke a cigarette", etc.). Intercoder agreement was on 88% of the listed thoughts, and discussions between coders and the experimenter took place to resolve any disagree-

[2] Though need for closure may vary as a function of the situation, the possibility that it could be a dimension of stable individual differences has been largely explored in the past research, giving rise to the Need for Closure Scale (Webster & Kruglanski, 1994). High scorers on the Need for Closure Scale are supposed to make judgments in a flash, feel intrinsically motivated to obtain answers, conclusion and decision as swiftly as possible, being in the quest for a fast and efficient processing of information whenever possible. On the contrary, low scorers on the Need for Closure Scale are supposed to ponder excessively and postpone their judgment as long as possible, engaging in a more enduring search for information and effortful processing. In this study, the use of the Roets and Van Hiel's (2011) abridged version was driven by practical considerations, since the completion of the NFCS was only one part of the procedure.

ments. An index of the amount of relevant thought in which recipients engaged when exposed to the experimental message was created by summing the total number of message content – topic – relevant cognitions.

The extensiveness of the processing of the issue – relevant information was also measured through the memorization of specific pieces of information delivered in the message. Participants were faced with four multiple-choice questions, each of them offering four alternative responses. They were asked to select which of the four options tallied with the message content and received a score from 0 to 4, which was used as the index of their cognitive investment in the processing of the message[3].

*The perceived quality of the message*. Three dimensions were assessed and treated separately in the subsequent analyses: clarity, cognitive challenge, and relevance. With regard to clarity and cognitive challenge dimensions, items were adapted from the "Perceived Message Cognition Value Scale" (Lane, Harrington, Donohew, & Zimmerman, 2006). Participants were asked to indicate on a scale from 1 "no, not at all" to 7 "yes, absolutely" how "*understandable*", "*comprehensible*", and "*clear*" the message was. Participants' responses to these three Likert-type scale items were averaged to obtain a general index of the perception of the intelligibility of the message (Cronbach's $\alpha$ = .94). Participants also indicated on a scale from 1 "no, not at all" to 7 "yes, absolutely" how "*intellectually interesting*", "*intellectually appealing*", and "*thought provoking*" the message was. Participants' responses to these three Likert-type scale items were averaged to obtain a general index of the perception of how much cognitively stimulating the message was (Cronbach's $\alpha$ = .92). For the relevance dimension, participants indicated on a scale from 1 "no, not at all" to 7 "yes, absolutely" *how "useful", "worthwhile" the message was, and to what extent "they would recommend that this message be published in the campus magazine". Again, a general index of the perceived relevance was calculated by averaging participants' responses to these items* (Cronbach's $\alpha$ = .95).

*The persuasiveness of the message.* Participants were asked to indicate on the same 7-point Likert type scale *"how likely they could make changes in their sexual behavior (i.e., safer sex) based on the message they read",* and *"how the message they read made them thinking to be more cautious with regard to their sexual practices".* These two items were combined into a single overall measure of message persuasiveness ($r$ = .83/ Cronbach's $\alpha$ = .91).

### Procedure

The study was conducted in the classroom where students usually received classes in groups of 25 to 30 people. At the beginning of the experimental session, participants were told that the "Preventive Medicine and Health Promotion Department" was implementing an information program for students that consisted in informing them about some "emerging" infectious diseases. They were told that the participation in the session entailed reading a fact sheet, which had been designed in order to make the students aware of an unfamiliar disease and able to rate its gravity. It was clarified that they were expected to make a decision about the severity of the disease and report it at the end of the session. This was used as a pretext to induce and make the focus on what the closure was about regarding the ongoing session. Furthermore, they were told that it was necessary to collect their opinions and judgments by means of an anonymous questionnaire in order to prepare a group discussion scheduled at the end of the session. They were also informed that the "Preventive Medicine and Health Promotion

[3] Although the "cognitive response approach" has been historically preferred to a "memorization task" to assess the degree of cognitive elaboration, in a large number of studies, memory performance has been used to measure how deeply the message content was processed (Cacioppo, Petty, & Morris, 1983; Peltier & Schibrowsky, 1994; Petty & Cacioppo, 1979).

Department" intended to circulate the fact sheet on campus, and therefore, needed to collect their judgments on its clarity, appeal and strength. All this introductory speech served to justify the study.

Participants received two distinct booklets. The first one contained the informational message stimulus (i.e., the fictitious epidemiological report). It began with a short presentation of the "Preventive Medicine and Health Promotion Department" (purposes, phone numbers, staff, hours of duty office and other diverse information) and then referred to the topic. Under the following heading: "Paramyxoviridae infection: Let us take stock of the situation" was delivered the message stimulus, which focused on the prevalence and incidence of the disease and harbored the linguistic manipulation.

The second booklet included the Need for Closure Scale and items relative to the dependent measures. The filling in of the Need for Closure questionnaire was presented as training for the filling in of the rest of the booklet. In particular, the participants were made to believe that it was necessary to start by completing the Need for Closure questionnaire in order to get used to these data collection methods and thus make sure that they correctly complete the rest of the questionnaire (i.e., dependent measures). So, one hundred sixty two students completed the Roets and Van Hiel's (2011b) Need for Closure Scale. Respondents' composite scores were calculated by summing across each of the individual items and, as for previous research, a tertiary split was used to categorize high and low need for closure respondents. Participants scoring in the upper third of the distribution (total score > 64) were identified as the "high need for closure" group ($n$ = 53) while participants scoring in the lower third of the distribution (total score < 41) were labelled as the "low need for closure" group ($n$ = 54).

In sum, one hundred and seven subjects participated in the study resting on a 2 X 2 between-subjects factorial design with two degrees of dispositional need for closure (high vs. low), orthogonally crossed with the two scalar argumentation conditions (scalar argumentation vs. non-scalar argumentation). No time constraint was imposed while participants read the first booklet, completed the NFCS and the dependent variables booklet. Finally, they were thanked and dismissed after they were told about the true objectives of the study.

## Results

**The Information Processing** (see Table 2)

The first hypothesis stated that the presence of scalar adverbs would have the effect of reducing the information processing, especially for people with higher need for cognitive closure. The hypothesis was sustained by a need

Table 2 *Means (M) and Standard Deviation (SD) for the extent of message information processing as a function of the scalar argumentation and the dispositional need for closure*

| | ***Low* Need for Closure** | | ***High* Need for Closure** | |
|---|---|---|---|---|
| | ***Non Scalar* Argumentation** $n$ = 26 | ***Scalar* Argumentation** $n$ = 28 | ***Non Scalar* Argumentation** $n$ = 25 | ***Scalar* Argumentation** $n$ = 28 |
| Number of message content - topic - related thoughts | $M$ = 2.11 ($SD$ = .82) | $M$ = 2.25 ($SD$ = .75) | $M$ = 1.76 ($SD$ = .83) | $M$ = 1.25 ($SD$ = .70) |
| Score of memorization | $M$ = 2.19 ($SD$ = .85) | $M$ = 2.11 ($SD$ = .96) | $M$ = 1.68 ($SD$ = .90) | $M$ = 1.03 ($SD$ = .69) |

*Note.* The lower the mean, the lower the number of thoughts, and the lower the score of memorization.

for closure x scalar argumentation interaction effect on *the* number of message content – topic – relevant cognitions ($F$[1, 103) = 4.63, $p$ = .034, $\eta^2$ = 0.04). As illustrated by Figure 1, a detailed analysis revealed that *the* number of cognitions was lower in the scalar argumentation condition than in the non-scalar argumentation condition for participants with high need for cognitive closure ($M_{scalar}$ = 1.25 vs. $M_{non\text{-}scalar}$ = 1.76, $F$[1, 103] = 5.73, $p$ = .018, $\eta^2$ = 0.05), but not for participants with low need for cognitive closure ($M_{scalar}$ = 2.25 vs. $M_{non\text{-}scalar}$ = 2.11, $F$ < 1). The same need for closure x scalar argumentation interaction effect on the score of memorization was scrutinized. Even though it failed to reach conventional significance ($F$[1, 103] = 2.86, $p$ = .094, $\eta^2$ = 0.027), planned comparisons revealed that the score was significantly lower in the scalar argumentation condition than in the non-scalar argumentation condition for participants with high need for closure ($M_{scalar}$ = 1.03 vs. $M_{non\text{-}scalar}$ = 1.68, $F$[1, 103] = 7.52, $p$ = .007, $\eta^2$ = 0.068), but not for their low need for closure counterparts ($M_{scalar}$ = 2.11 vs. $M_{non\text{-}scalar}$ = 2.19, $F$ < 1), (see Figure 2).

**The Perceived Quality of the Message** (see Table 3)

The second hypothesis stated that the presence of scalar adverbs would have the effect of leading to a better appreciation of the message, especially for people with higher need for cognitive closure. The hypothesis was sustained by a need for closure x scalar argumentation interaction effects on perceived clarity ($F$[1, 103] = 4.45, $p$ = .037, $\eta^2$ = 0.041). As illus-

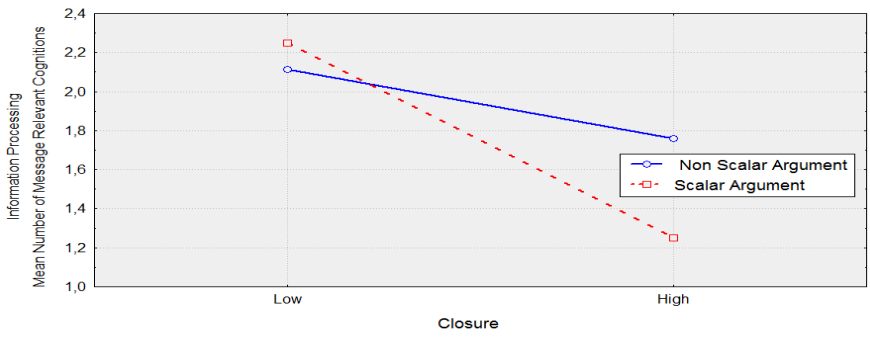


*Figure 1* Need for closure x scalar argumentation interaction on information processing

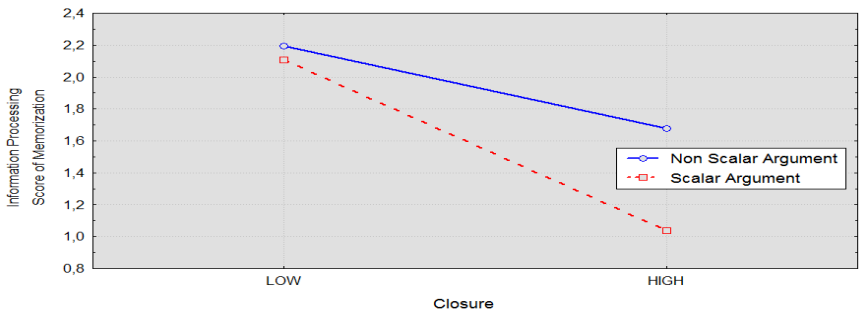


*Figure 2* Need for closure x scalar argumentation interaction on memorization

trated by Figure 3, the version with scalar adverbs was considered clearer than the version without scalar adverbs for participants high in need for closure ($M_{scalar}$ = 5.12 vs. $M_{non\text{-}scalar}$ = 4.45, $F$[1, 103] = 6.70, $p$ = .011, $\eta^2$ = 0.06), but not for participants low in dispositional need for closure ($M_{scalar}$ = 4.61 vs. $M_{non\text{-}scalar}$ = 4.70, $F$ < 1). A same interaction effect emerged with regard to how the message was appealing ($F$[1, 103] = 17.34, $p$ < .0001, $\eta^2$ = 0.144). The version with scalar adverbs was judged as more appealing than the version without scalar adverbs by participants high in need for closure ($M_{scalar}$ = 4.85 vs. $M_{non\text{-}scalar}$ = 4.08, $F$[1, 103] = 8.06, $p$ = .005, $\eta^2$ = 0.072), but less appealing by participants with low need for closure ($M_{scalar}$ = 3.57 vs. $M_{non\ scalar}$ = 4.40, $F$[1, 103] = 9.31, $p$ = .003, $\eta^2$ = 0.083), (see Figure 4). The same pattern of results emerged with regard to the perceived relevance of the message. As shown by Figure 5, a significant interaction effect emerged ($F$[1, 103] = 13.83, $p$ < .0003, $\eta^2$ = 0.118) and revealed that the scalar version was considered more relevant than the version without scalar adverbs for participants with high need for closure ($M_{scalar}$ =

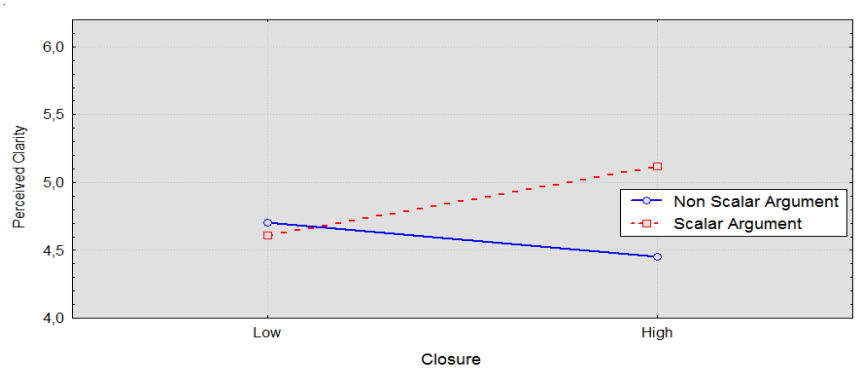


*Figure 3* Need for closure x scalar argumentation interaction on perceived clarity

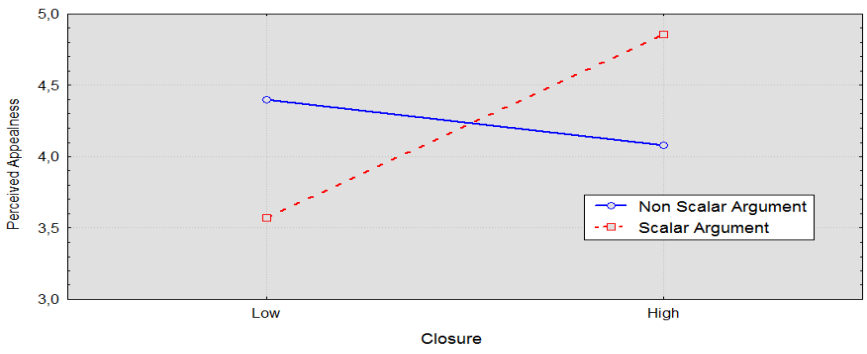


*Figure 4* Need for closure x scalar argumentation interaction on perceived appealness

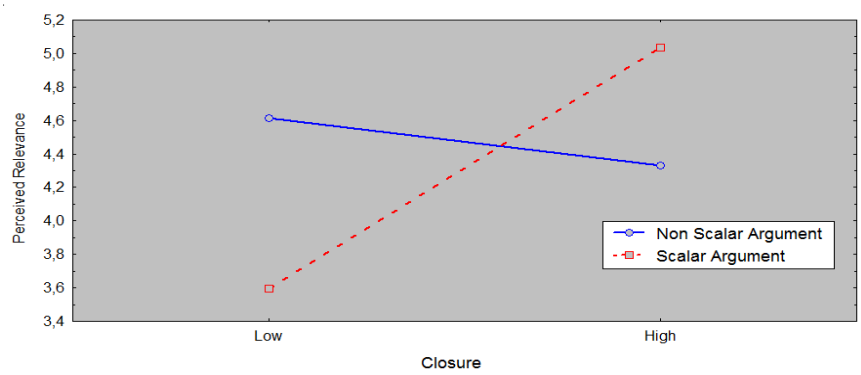


*Figure 5* Need for closure x scalar argumentation interaction on perceived relevance

Table 3 *Means (M) and Standard Deviation (SD) for the perceived quality and the persuasiveness of the message as a function of the scalar argumentation and the dispositional need for closure*

| | ***Low* Need for Closure** | | ***High* Need for Closure** | |
|---|---|---|---|---|
| | ***Non Scalar* Argumentation** *n* = 26 | ***Scalar* Argumentation** *n* = 28 | ***Non Scalar* Argumentation** *n* = 25 | ***Scalar* Argumentation** *n* = 28 |
| Clarity dimension | *M* = 4.70 (*SD* = .92) | *M* = 4.61 (*SD* = .69) | *M* = 4.45 (*SD* = .88) | *M* = 5.12 (*SD* = 1.17) |
| Cognitive challenge dimension | *M* = 4.40 (*SD* = .95) | *M* = 3.57 (*SD* = .74) | *M* = 4.08 (*SD* = 1.02) | *M* = 4.85 (*SD* = 1.21) |
| Relevance dimension | *M* = 4.61 (*SD* = 1.18) | *M* = 3.59 (*SD* = 1.07) | *M* = 4.33 (*SD* = 1.29) | *M* = 5.03 (*SD* = 1.24) |
| Persuasiveness | *M* = 3.98 (*SD* = .98) | *M* = 2.91 (*SD* = .90) | *M* = 3.50 (*SD* = 1.10) | *M* = 3.98 (*SD* = 1.05) |

*Note*. The higher the mean, the more the message is perceived as clear, intellectually appealing, and relevant and the higher the persuasiveness of the message.

5.03 vs. $M_{\text{non-scalar}}$ = 4.33, $F[1, 103] = 4.55$, $p < .04$, $\eta^2 = 0.042$), but the contrary was revealed for participants with low need for closure ($M_{\text{scalar}}$ = 3.59 vs. $M_{\text{non-scalar}}$ = 4.61, $F[1, 103] = 9.80$, $p < .001$, $\eta^2 = 0.087$).

**The Persuasiveness of the Message** (see Table 3)

The third hypothesis stated that the presence of scalar adverbs would have the effect of enhancing the persuasiveness of the message, especially for people with higher need for cognitive closure. As in the case of the previous hypotheses, this prediction was sustained by an interaction effect ($F[1, 103] = 15.37$, $p = .00016$, $\eta^2 = 0.13$). The likelihood of safer sex practices in response to the fact sheet was higher in the scalar argumentation condition than in the non-scalar argumentation condition for participants with high cognitive closure ($M_{\text{scalar}}$ = 3.98 vs. $M_{\text{non-scalar}}$ = 3.50, $F[1, 103] = 2.79$, $p = .09$, $\eta^2 = 0.026$), but lower for participants with low need for closure ($M_{\text{scalar}}$ = 2.92 vs. $M_{\text{non-scalar}}$ = 3.98, $F[1, 103] = 15.11$, $p = .001$, $\eta^2 = 0.128$), (see Figure 6).

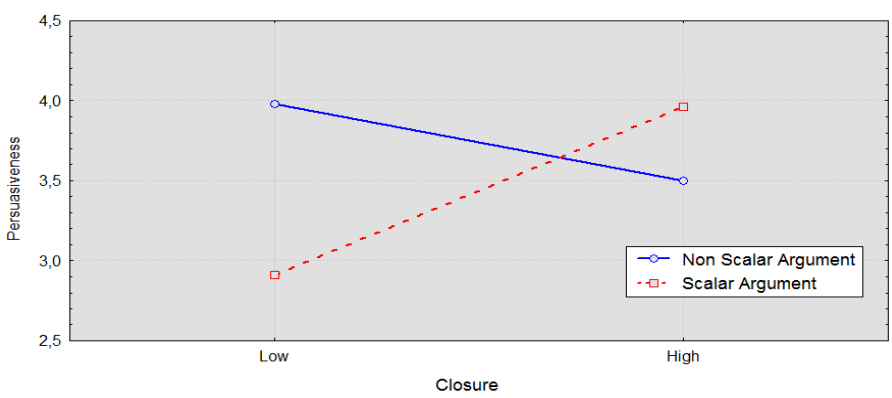


*Figure 6* Need for closure x scalar argumentation interaction on persuasiveness

## Discussion

### Matching Health Messages to the Information-processing Style

The three hypotheses outlined in the introduction were sustained by the results. With regard to the information processing, the number of relevant cognitions as well as the score of memorization associated with the message content was lower in the scalar argumentation condition than in the non-scalar argumentation condition for participants with high cognitive closure, but not for participants with low cognitive closure. Regarding the judgments on the message, the content was perceived as clearer in the scalar argumentation condition than in the non-scalar argumentation condition, only for participants with high cognitive closure. The message content was perceived as more intellectually stimulating in the scalar argumentation condition than in the non-scalar argumentation condition for participants high in need for closure, whereas it was the contrary for the participants with low cognitive closure. The same pattern of results emerged with regard to the judgments on the relevance of the message. In regards to message effectiveness, behavioral intentions reported by participants with high cognitive closure were higher in the scalar argumentation condition compared to the non-scalar argumentation version, but for participants with low cognitive closure, the reverse effect was observed.

In line with the theoretical framework outlined in the introduction of the study, a matching versus mismatching perspective was privileged for explaining interaction effects that emerged from the analyses. It was reasoned that the accentuation of the argumentative orientation by means of scalar adverbs matched the cognitive style of people with high need for closure, but mismatched that of people with low need for closure. Furthermore, it was assumed that participants would be able to perceive the extent to which the message was congruent with their need for closure, and as a result, would evaluate the latter in accordance with this perceived congruency. In the area of health communication, it has been largely evidenced that matching the message to the individuals' needs and information-processing styles is a relevant technique to enhance persuasion and behavioral intentions (Williams-Piehota, Schneider, Pizzaro, Mowad, & Salovey,

2003)[4]. In addition, it has been showed that this matching effect in persuasion was mediated by subjective perceptions of the message quality (Lavine & Snyder, 1996; Quintiliani & Carbone, 2005).

**Future Directions of Research**

Another process could be advanced for explaining these interaction effects, in particular, why for participants with low cognitive closure, the introduction of scalar adverbs produced reverse effects on judgments about the appeal and relevance of the message as well as its persuasiveness. It could also be reasoned that, by stressing the argumentative orientation of the message, such an adverbial marking could be perceived as constraining the judgment and decision, and thus, violating the desire to avoid cognitive closure. As a result, this sense of violation could trigger an aversive reaction whose underlying process has to do with psychological reactance. In contrast, such an aversive response would not occur in participants with high need for cognitive closure because the adverbial marking would be a relevant means of attaining quick closure and satisfying their cognitive impatience. This new assumption could be elucidated in future research in which reactance proneness would be assessed as an additional factor (Dillard & Shen, 2005; Quick & Stephenson, 2008; Ungar, Sieverding, Schweizer, & Stadnitski, 2015).

Given that the current study was conducted with an *emerging* infectious disease (STI) as covert topic, it also raises the question of whether the pattern of results with regard to information processing would be the same if the health topic referred to in the message was a disease for which they have pre-existing and well-established knowledge. It could be assumed that by enhancing the recipient's familiarity with the topic, his or her initial confidence with regard to his or her judgements would be increased, and this sense of confidence could act as a moderating factor. For instance, in the Kruglanski, Peri, and Zakai's (1991) study, the typical finding that under a high need for closure, people exhibit a weaker information seeking tendency than under a low need for closure, was replicated *only* in a high confidence condition, but eliminated in a low confidence condition. Similarly, in the Strojny, Kossowska, and Strojny's (2016) study, participants high in need for closure tended less to seek information than those low in need for closure, but *only* when they were supplied with complete information needed to form the required judgments and supposed to enhance their degree of confidence. In the area of consumer decision, it has also been shown that people with a high need for closure were looking for less information, provided that they were familiar with the product and had a preconceived opinion about it (Houghton & Grewald, 2000; Veirmer, Van Kenhove, & Hendrickx, 2002). So, supposing that the more familiar the disease, the more the receiver's confidence, one can ask whether the effects outlined in this study regarding the information processing could be magnified if the disease referred to in the message was more familiar to the participants[5].

[4] This "congruency hypothesis" or "matching effect" has been largely evidenced for a set of individual dispositional needs and/or information-processing styles, such as need for cognition (William-Piehota, Schneider, Pizzaro, Mowad, & Salovey, 2003), sensation seeking (Donohew, Pugzles Lorch, & Palmgreen, 1998; Hull & Hong, 2016), approach/avoidance orientation (Mann, Sherman, & Updegraff, 2004; Updegraff, Sherman, Luyster, & Mann, 2007), need for affect vs. cognition (Quintiliani & Carbone, 2005), regulatory focus (Latimer, William-Piehota, Katulak, Cox, Mowad, Higgins, & Salovey, 2008), and coping style (William-Piehota, Pizzaro, Schneider, Mowad, & Salovey, 2005).

[5] Maybe the operationalization of this new factor could consist in a "*Paramyxoviridae* versus *HIV/AIDS*" variation, supposing that HIV/AIDS infection is a much more familiar disease of which participants have relevant prior knowledge. Another way to operationalize this factor could consist in asking the participants to answer a questionnaire supposed to assess their knowledge about a given disease (for instance HIV/AIDS) and supplying them with a fictitious score (low vs. high), supposed to reflect their global performance.

Whether the outcomes with regard to the information processing are due to the choice of a particular topic also arises in light of research on the *ability to achieve closure* (Bar-Tal, Kishon-Rabin, & Tabak, 1997; Kossowska & Bar-Tall, 2013). Scholars have developed the idea that, even when people feel the need to finalize their decision and achieve cognitive closure, they may not feel that they are capable of doing so, particularly when the topic in question is highly complex (Roets & Van Hiel, 2007). It could be assumed that the extent of the receiver's relevant prior knowledge about the ongoing topic regulates his or her perceived ability to make judgments and decisions with confidence and certainty. So, once again, supposing that the more extensive such a knowledge, the more the sense of being able to make up one's mind, it could be investigated whether for people high in dispositional need for closure, the decreased information processing encouraged by the adverbial high marking would be magnified if the referred topic in the message was a disease for which prior knowledge is available.

Another interesting thread in the discussion rests on the idea that the linguistic items investigated in this study could have played a role precisely in *the participants' ability to achieve closure*. Considering that participants were faced with a health topic that they were unfamiliar with, it could be supposed that they initially perceived themselves as unable to achieve a cognitive closure. From here, it could also be supposed that, because they stress the argumentative orientation of the message, these linguistic items could enhance the ability to achieve cognitive closure, especially for people high in dispositional need for closure, increasing in them the feeling that they are able to form a confident and certain judgment. This could explain why the typical reduction of information processing within participants high in need for closure, compared to their low need for closure counterparts, was further accentuated by the adverbial high marking in the message. Future research should investigate the role of these linguistic items in the recipient's ability to achieve cognitive closure, especially when he or she is faced with complex topics. Furthermore, such research could take physicians as the experimental population, since "premature closure" has been recognized as one among the most common causes of diagnostic error in medicine (Croskerry, 2003; Dhaliwal, 2016; Graber, Franklin, & Gordon, 2005; Trowbridge, 2008).

**Practical Implications of the Study**

Given its implementation in the context of a health promotion intervention, this study could be used by prevention planners as a useful tool to ensure that messages contain linguistic features that appeal to target audiences high vs. low in dispositional need for closure, especially when the message refers to an emergent and unfamiliar sexually transmitted infection. However, the practical implications for health communication require that the matching effect evidenced for the persuasive outcomes be also registered for the behavioral aspects. Although the use of scalar adverbs seems to be a relevant strategy, when the message is directed towards people high in dispositional need for closure, the fact remains that the most important in the matter is to make sure that these intentions and attitudes be expressed in actual and concrete behaviors. According to the ELM of persuasion, the more effortful the processing of the relevant information contained in the message, the more stable, resistant and predictive for action the attitude which results from it (Petty & Cacioppo, 1986; Petty, Haugtvedt, & Smith, 1995). Now, it should be reminded that the extent of processing (i.e., cognitive elaboration) was impaired by the adverbial high marking for participants high in need for closure. In consequence, one can wonder to what extent the effect on preventive intentions yielded by this linguistic manipulation may lead to effective and lasting behavior, especially for individuals high in need for closure. In a current epidemiological context characterized by the advent of sexually transmitted infections and antimicrobial resistance considered as an "emerging global threat" (Cazanave, Manhart, & Bébéar, 2012;

Unemo & Jensen, 2017; Ramalho da Costa-Lourenço; Barros dos Santos, Meurer Moreira, Longo Fracalanzza, & Bonelli, 2017), this last question is of a critical importance.

## References


Anscombre, J. C., & Ducrot, O. (1976). L'argumentation dans la langue [The argumentation in the language]. *Langages, 42*, 5–27. https://doi.org/10.3406/lgge.1976.2306

Anscombre, J. C., & Ducrot, O. (1983). *L'argumentation dans la langue* [The argumentation in the language]. Brussels, Belgium: Mardaga.

Bar-Tal, Y., Kishon-Rabin, L., & Tabak, N. (1997). The effect of need and ability to achieve cognitive structuring on cognitive structuring. *Journal of Personality and Social Psychology, 73*, 1158–1176. https://doi.org/10.1037/0022-3514.73.6.1158

Bassano, D. (1991). Opérateurs et connecteurs argumentatifs: Une approche psycholinguistique [Operators and argumentatives connectors: A psycholinguistic approach]. *Intellectica, 11*, 149–191. https://doi.org/10.3406/intel.1991.1381

Cacioppo, J. T., Petty, R. E., & Morris, K. (1983). Effects of need for cognition on message evaluation, recall, and persuasion. *Journal of Personality and Social Psychology, 45*, 805–818. https://doi.org/10.1037/0022-3514.45.4.805

Cazanave, C., Manhart, L. E., & Bébéar, C. (2012). Mycoplasma genitalium, an emerging sexually transmitted pathogen. *Médecine et Maladies Infectieuses, 42*, 381–392. https://doi.org/10.1016/j.medmal.2012.05.006

Champaud, C., & Bassano, D. (1987). Argumentative and informative functions of French intensity modifiers "presque", "à peine", and "à peu près": An experimental study on children and adults. *Cahiers de Psychologie Cognitive, 7*, 605–631.

Cronley, M. L., Posavac, S. S., Meyer, T., Kardes, F. R., Kellaris, J. J. (2005). A selective hypothesis testing perspective on price-quality inference and inference-based choice. *Journal of Consumer Psychology, 15*, 159–169. https://doi.org/10.1207/s15327663jcp1502_8

Croskerry, P. (2003). The importance of cognitive errors in diagnosis and strategies to minimize them. *Academic Medicine, 78*, 775–780. https://doi.org/10.1097/00001888-200308000-00003

Dhaliwal, G. (2016). Premature closure? Not so fast. *BMJ Quality & Safety, 26*, 87–89. http://dx.doi.org/10.1136/bmjqs-2016-005267

Defrise, C., & Nirenburg, S. (1990). Meaning representation and text planning. In *COLING-90: Proceedings of the 13th International Conference on Computational Linguistics* (Vol. 3, pp. 219–224). Helsinki, Finland: Association for Computational Linguistics.

Dillard, J. P., & Shen, L. (2005). On the nature of reactance and its role in persuasive health communication. *Communication Monographs, 72*, 144–168. https://doi.org/10.1080/03637750500111815

Donohew, L., Pugzles Lorch, E., & Palmgreen, P. (1998). Applications of a theoretic model of information exposure to health interventions. *Human Communication Research, 24*, 454–468. https://doi.org/10.1111/j.1468-2958.1998.tb00425.x

Ducrot, O. (1993). Pour une description non-veritative du langage [For a no veritative description of language]. *Actes du congrès de linguistique de Séoul*, 86–98.

Graber, M. L., Franklin, N., & Gordon, R. (2005). Diagnostic error in internal medicine. *Archives of Internal Medicine, 165*, 1493–1499. https://doi.org/10.1001/archinte.165.13.1493

Henning, N. (1982). Problems in the semantic-pragmatic description of French adverbials like *même*, *aussi*, *surtout* and *seulement*. *Acta Hafniensia, 17*, 59–71. https://doi.org/10.1080/03740463.1982.10416045

Houghton, D. C., & Grewald, R. (2000). Please, let's get an answer – any answer: Need for consumer cognitive closure. *Psychology & Marketing, 17*, 911–934. https://doi.org/10.1002/1520-6793(200011)17:11<911::AID-MAR1>3.0.CO;2-4

Hull, S. J., & Hong, Y. (2016). Sensation seeking as a moderator of gain and loss framed HIV-test promotion message effects. *Journal of Health Communication, 21*, 46–55. https://www.tandfonline.com/doi/abs/10.1080/10810730.2015.1033113

Iten, C. (2000). The relevance of argumentation theory. *Lingua, 110*, 665–699. https://doi.org/10.1016/S0024-3841(00)00008-5

Kay, P. (1990). Even. *Linguistics and Philosophy, 13*, 59–111. https://doi.org/10.1007/BF00630517

Klein, C. T. F., & Webster, D. M. (2000). Individual differences in argument scrutiny as motivated by need for cognitive closure. *Basic and Applied Social Psychology, 22*, 119–129. https://doi.org/10.1207/15324830051036207

Kossowska, M., & Bar-Tal, Y. (2013). Need for closure and heuristic information processing: The moderating role of the ability to achieve the need for closure. *British Journal of Psychology, 104*, 457–480. https://doi.org/10.1111/bjop.12001

Kruglanski, A. W. (1989). *Lay epistemics and human knowledge: Cognitive and motivational bases*. New York: Plenum.

Kruglanski, A. W. (1990). Motivations for judging and knowing: Implications for causal attribution. In E. T. Higgins & R. M. Sorrentino (Eds.), *Handbook of motivation and cognition: Foundations of social behavior* (Vol. 2, pp. 333–368). New York: Guilford Press.

Kruglanski, A. W. (2004). *The psychology of closed-mindedness*. New York: Psychology Press.

Kruglanski, A. W., & Ajzen, I. (1983). Bias and error in human judgment. *European Journal of Social Psychology, 13*, 1–44. https://doi.org/10.1002/ejsp.2420130102

Kruglanski, A. W., & Chun, W. Y. (2008). Motivated closed-mindedness and its social consequences. In J. Y. Shah & W. L. Gardner (Eds.), *Handbook of motivation science* (pp. 84–99). New York: The Guilford press.

Kruglanski, A. W., & Fishman, S. (2009). The need for cognitive closure. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 343–353). New York: Guilford Press.

Kruglanski, A. W., & Freund, T. (1983). The freezing and unfreezing of lay-inferences: Effects on impressional primacy, ethnic stereotyping, and numerical anchoring. *Journal of Experimental Social Psychology, 19*, 448–468. https://doi.org/10.1016/0022-1031(83)90022-7

Kruglanski, A. W., Orehek, E., Dechesne, M., & Pierro, A. (2010). Lay epistemic theory: The motivational, cognitive, and social aspects of knowledge formation. *Social and Personality Psychology Compass, 4*, 939–950. https://doi.org/10.1111/j.1751-9004.2010.00308.x

Kruglanski, A. W., Peri, N., & Zakai, D. (1991). Interactive effects of need for closure and initial confidence on social information seeking. *Social Cognition, 9*, 127–148. https://doi.org/10.1521/soco.1991.9.2.127

Kruglanski, A. W., & Webster, D. (1996). Motivated closing of the mind: "Seizing" and "freezing". *Psychological Review, 103*, 263–283. https://doi.org/10.1037/0033-295X.103.2.263

Kruglanski, A. W., Webster, D. M., & Klem, A. (1993). Motivated resistance and openness to persuasion in the presence or absence of prior information. *Journal of Personality and Social Psychology, 65*, 861–876. https://doi.org/10.1037/0022-3514.65.5.861

Kunda, Z. (1980). The case for motivated reasoning. *Psychological Bulletin, 108*, 480–498. https://doi.org/10.1037/0033-2909.108.3.480

Kunda, Z. (1999). *Social cognition. Making sense of people*. Massachusetts: MIT Press.

Lane, D. D., Harrington, N. G., Donohew, L. & Zimmerman, R. S. (2006). Dimensions and validation of a Perceived Message Cognition Value Scale. *Communication Research Reports, 23*, 149–161. https://doi.org/10.1080/08824090600796369

Latimer, A. E., William-Piehota, P., Katulak, N. A., Cox, A., Mowad, L., Higgins, E. T., & Salovey, P. (2008). Promoting fruit and vegetables intake through messages tailored to individual differences in regulatory focus. *Annals of Behavioral Medicine, 35*, 363–369. https://doi.org/10.1007/s12160-008-9039-6

Lavine, H., & Snyder, M. (1996). Cognitive processing and the functional matching effect in persuasion: The mediating role of subjective perceptions of message quality. *Journal of Experimental Social Psychology, 32*, 580–604. https://doi.org/10.1006/jesp.1996.0026

Malrieu, J. P. (1999). *Evaluative semantics. Cognition, language and ideology*. London: Routledge.

Mann, T. L., Sherman, D. K., & Updegraff, J. A. (2004). Dispositional motivations and message framing: A test of the congruency hypothesis in college students. *Health Psychology, 23,* 330–334. https://doi.org/10.1037/0278-6133.23.3.330

McKeown, K. R., & Elhadad, M. (1991). A contrastive evaluation of functional unification grammar for surface language generation: A case study in choice of connectives. In C. L. Paris, W. R. Swartout, & W. C. Mann (Eds.), *Natural language generation in artificial intelligence and computational linguistics* (pp. 351–396). Boston, MA: Springer. https://doi.org/10.1007/978-1-4757-5945-7_14

Moeschler, J. (2016). Argumentation and connectives. How do discourse connectives constrain argumentation and utterance interpretations. In A. Capone & J. Mey (Eds.), *Interdisciplinary studies in pragmatics, culture, and society* (pp. 653–675). Heidelberg: Springer Cham. https://doi.org/10.1007/978-3-319-12616-6_26

Molden, D. C., & Higgins, E. T. (2012). Motivated thinking. In K. J. Holyoak & R. G. Morisson (Eds.), *The Oxford handbook of thinking and reasoning* (pp. 390–412). Oxford: Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199734689.013.0020

Peltier, J. W., & Schibrowsky, J. A. (1994). Need for cognition, advertisement viewing time and memory for advertising stimuli. *Advances in Consumer Research, 21*, 244–250.

Petty, R. E., & Cacioppo, J. T. (1977). Forewarning, cognitive responding, and resistance to persuasion. *Journal of Personality and Social Psychol-*

*ogy, 35*, 645–655. https://psycnet.apa.org/doi/10.1037/0022-3514.35.9.645

Petty, R. E., & Cacioppo, J. T. (1979). Effects of forewarning of persuasive intent and involvement on cognitive responses and persuasion. *Personality and Social Psychological Bulletin, 5*, 173–176. https://doi.org/10.1177/014616727900500209

Petty, R. E., & Cacioppo, J. T. (1986). The Elaboration Likelihood Model of Persuasion. In L. Berkowitz (Ed), *Advances in experimental social psychology* (pp. 123–205). Orlando, FL: Academic Press. https://doi.org/10.1016/S0065-2601(08)60214-2

Petty, R. E., Haugtvedt, C. P., & Smith, S. M. (1995). Elaboration as determinant of attitude strength: Creating attitudes that are persistent, resistant and predictive of behavior. In R. E. Petty & J. A. Krosnick (Eds.), *Attitude strength: Antecedents and consequences* (pp. 93–130). Hillsdale, NJ: Erlbaum.

Pierro, A., Mannetti, L., Erb, H. P., Spiegel, S., & Kruglanski, A. W. (2005). Informational length and order of presentation as determinants of persuasion. *Journal of Experimental Social Psychology, 41*, 458–469. https://doi.org/10.1016/j.jesp.2004.09.003

Portolés, J., & Yates, J. (2014). The theory of argumentation within language and its application to discourse analysis. In M. Casado Velarde (Ed.), *Language use in public sphere. Methodological perspectives and empirical applications* (pp. 201–224). Frankfurt am Main: Peter Lang.

Quick, B. L., & Stephenson, M. T. (2008). Examining the role of trait reactance and sensation seeking on perceived threat, state reactance, and reactance restoration. *Human Communication Research, 34*, 448–476. https://doi.org/10.1111/j.1468-2958.2008.00328.x

Quintiliani, L. M., & Carbone, E. T. (2005). Impact of diet-related cancer prevention messages written with cognitive and affective arguments on message characteristics, stage of change and self-efficacy. *Journal of Nutrition Education and Behavior, 37*, 12–19. https://doi.org/10.1016/S1499-4046(06)60254-6

Ramalho da Costa-Lourenço, A. P., Barros dos Santos, K. T., Meurer Moreira, B., Longo Fracalanzza, S. E., & Bonelli, R. R. (2017). Antimicrobial resistance in Neisseria gonorrhoeae: History, molecular mechanisms and epidemiological aspects of an emerging global threat. *Brazilian Journal of Microbiology, 48*, 617–628. https://doi.org/10.1016/j.bjm.2017.06.001

Rocci, A. (2017). *Modality in argumentation*. Dordrecht, The Netherlands: Springer.

Roets, A., & Van Hiel, A. (2006). Need for closure relations with authoritarianism, conservative beliefs and racism: The impact of urgency and permanence tendencies. *Psychologica Belgica, 46*, 235–252. https://doi.org/10.5334/pb-46-3-235

Roets, A., & Van Hiel, A. (2007). Separating ability from need: Clarifying the dimensional structure of the need for closure scale. *Personality and Social Psychology Bulletin, 33*, 266–280. https://doi.org/10.1177/0146167206294744

Roets, A., & Van Hiel, A. (2011a). An integrative process approach on judgment and decision making: The impact of arousal, affect, motivation, and cognitive ability. *The Psychological Record, 61*, 497–520. https://doi.org/10.1007/BF03395773

Roets, A., & Van Hiel, A. (2011b). Item selection and validation of a brief 15-item version of the need for closure scale. *Personality and Individual Differences, 50*, 90–94. https://doi.org/10.1016/j.paid.2010.09.004

Roets, A., Van Hiel, A., & Cornelis, I. (2006). The dimensional structure of the need for cognitive closure scale: Relationships with "seizing" and "freezing" processes. *Social Cognition, 24*, 22–45. https://doi.org/10.1521/soco.2006.24.1.22

Sadock, J. M. (1981). Almost. In P. Cole (Ed.), *Radical pragmatics* (pp. 257–271). New York: Academic press.

Sankaran, S., Szumowska, E., & Kossowska, M. (2017). "When the going gets tough, the tough get going": Motivation towards closure and effort investment in the performance of cognitive tasks. *Motivation and Emotion, 41*, 308–321. https://doi.org/10.1007/s11031-017-9613-y

Strojny, P., Kossowska, M., & Strojny, A. (2016). When the need for closure promotes complex cognition. *Annals of Psychology, 19*, 27–42. http://dx.doi.org/10.18290/rpsych.2016.19.1-1en

Trowbridge, R. L. (2008). Twelve tips for teaching avoidance of diagnostic errors. *Medical Teacher, 30*, 496–500. https://doi.org/10.1080/01421590801965137

Unemo, M., & Jensen, J. S. (2017). Antimicrobial-resistant sexually transmitted infections: Gonorrhea and mycoplasma genitalium. *Nature Reviews Urology, 14*, 139–152. https://doi.org/10.1038/nrurol.2016.268

Ungar, N., Sieverding, M., Schweizer, F., & Stadnitski, T. (2015). Intervention-elicited reactance and its implication. Let me eat what I want. *Zeitschrift für Psychologie, 223*, 247–256. https://doi.org/10.1027/2151-2604/a000226

Updegraff, J. A., Sherman, D. K., Luyster, F. S., & Mann, T. L. (2007). The effects of message quality and congruency on perceptions of tailored

health communications. *Journal of Experimental Social Psychology, 43*, 249–257. https://doi.org/10.1016/j.jesp.2006.01.007

Van Eemeren, F. H. (2001). *Crucial concepts in argumentation theory*. Amsterdam: Amsterdam University Press.

Van Eemeren, F. H., Grootendorst, R., & Snoeck Henkemans, F. (1996). *Fundamentals of argumentation theory. A handbook of historical backgrounds and contemporary developments*. Mahwah, New Jersey: Lawrence Erlbaum Associates.

Vermeir, I., & Van Kehnove, P. V. (2005). The influence of need for closure and perceived time pressure on search effort for price and promotional information in a grocery shopping context. *Psychology & Marketing, 22*, 71–95. https://doi.org/10.1002/mar.20047

Vermeir I., Van Kehnove, P. V., & Hendrickx, H. (2002). The influence of need for closure on consumers' choice behavior. *Journal of Economic Psychology, 23*, 703–727. https://doi.org/10.1016/S0167-4870(02)00135-6

Webster, D. M., & Kruglanski, A. W. (1994). Individual differences in need for cognitive closure. *Personality Processes and Individual Differences, 67*, 1049–1062. https://doi.org/10.1037/0022-3514.67.6.1049

Webster, D. M., & Kruglanski, A. W. (1998). Cognitive and social consequences of the need for cognitive closure. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (vol. 8, pp. 133–141). London, UK: John Wiley & Sons. https://doi.org/10.1080/14792779643000100

Wesson, C. J., & Pulford, B. (2005). Individuals differences in the influence of confidence: The effects of need for closure and need for cognition [abstract]. *Proceedings of the British Psychological Society, 13*, 163.

William-Piehota, P., Pizzaro, J., Schneider, T. R., Mowad, L., & Salovey, P. (2005). Matching health messages to monitor-blunter coping styles to motivate screening mammography. *Health Psychology, 24*, 58–67. https://doi.org/10.1037/0278-6133.24.1.58

William-Piehota, P., Schneider, T. R., Pizzaro, J., Mowad, L., & Salovey, P. (2003). Matching health messages to information-processing styles: Need for cognition and mammography utilization. *Health Communication, 15*, 375–392. https://doi.org/10.1207/S15327027HC1504_01

Wilson, D. (2011). The conceptual - procedural distinction: Past, present and future. In V. Escandell-Vidal, M. Leonetti, & A. Ahern (Eds.), *Procedural meaning: Problems and perspectives* (pp. 3–31). Bingley, UK: Emerald Group Publishing.

Studia Psychologica, Vol. 62, No. 1, 2020, 23-43
https://doi.org/10.31577/sp.2020.01.789

# Cross-Cultural Differences in Cognitive Style, Individualism/Collectivism and Map Reading between Central European and East Asian University Students

David Lacko[1, 2], Čeněk Šašinka[2], Jiří Čeněk[2, 3], Zdeněk Stachoň[2], Wei-lun Lu[2]
[1] Department of Psychology, Faculty of Arts, Masaryk University, Arna Nováka 1/1, 602 00 Brno, Czech Republic
[2] The Division of Information and Library Studies, Faculty of Arts, Masaryk University, Arna Nováka 1/1, 602 00 Brno, Czech Republic
[3] Department of Social Development, Faculty of Regional Development and International Studies, Mendel University, třída Generála Píky 2005/7, 613 00 Brno, Czech Republic

The article examines cross-cultural differences encountered in the cognitive processing of specific cartographic stimuli. We conducted a comparative experimental study on 98 participants from two different cultures, the first group comprising Czechs (*N* = 53) and the second group comprising Chinese (*N* = 22) and Taiwanese (*N* = 23). The findings suggested that the Central European participants were less collectivistic, used similar cognitive style and categorized multivariate point symbols on a map more analytically than the Asian participants. The findings indicated that culture indeed influenced human perception and cognition of spatial information. The entire research model was also verified at an individual level through structural equation modelling (SEM). Path analysis suggested that individualism and collectivism was a weak predictor of the analytic/holistic cognitive style. Path analysis also showed that cognitive style considerably predicted categorization in map point symbols.

*Key words:* cognitive style, cross-cultural differences, categorization, individualism/collectivism, analytic/holistic

## Introduction

The objectives of the study were 1) to explore the cross-cultural differences between Central European and East Asian populations at three distinct levels and 2) to examine how these levels were connected. The presented research examined whether the selected populations differed in the degree of individualism/collectivism and the cognitive style measured by the Compound Figure Test (CFT), and whether cultural differences manifested during cartographic task solving, specifically in the categorization of multivariate point symbols.

The theory of analytic and holistic (A/H) cognition postulates the existence of distinct cognitive and perceptual styles – relatively stable ways of cognitive processing (for review, see Masuda, 2017; Nisbett & Masuda, 2003; Nisbett & Miyamoto, 2005; Nisbett, Peng, Choi, & Norenzayan, 2001). The majority of research in this field focuses on comparing the charac-

Correspondence concerning this article should be addressed to David Lacko, Department of Psychology, Faculty of Arts, Masaryk University, Arna Nováka 1/1, 602 00 Brno, Czech Republic. E-mail: david.lacko@mail.muni.cz
ORCID https://orcid.org/0000-0002-2904-8118
Received March 21, 2019

teristics of cognitive processes in two world regions: the "West" (e.g., North America, Western Europe) and the "East" (mainly the countries of East and Southeast Asia such as China, Japan, South Korea, etc.; Nisbett, 2003). The theory of A/H cognitive style assumes that Westerners adopt relatively more analytic cognitive style and East Asians the holistic one. A/H cognitive style is defined as *"the tendency for individuals to process information either as an integrated whole or in discrete parts of that whole"* (Graff, 2003, p. 21). Although the primary focus of the theory is the comparison of cognitive processes among cultures, it does not rule out the existence of within-culture individual differences in these processes. In other words, if we compare two people from a certain cultural background, one can perceive relatively more analytically, while the other perceives more holistically.

The A/H model is based on the classic Witkin's model of field dependent/independent cognition (Witkin, Moore, Goodenough, & Cox, 1977) and the Gestalt principles of perceptual grouping and figure-ground organization (Wagemans et al., 2012). Recent findings suggest that many differences exist among people in higher cognitive processes, such as categorization, classification, decision-making, reasoning and causal attribution, and the lower perceptual processes related to attention, such as detection of change and field dependence (for review, see Nisbett et al., 2001; Nisbett & Masuda, 2003; Nisbett & Miyamoto, 2005). More precisely, people perceiving relatively more analytically tend to focus more on perceptually salient (focal) objects and less on background and contextual information, and on the relationships between objects in the perceptual field (Chua, Boland, & Nisbett, 2005; Masuda & Nisbett, 2001; Nisbet & Masuda, 2003). Furthermore, people perceiving relatively more analytically are also less dependent on external reference frameworks than their holistic counterparts (Ji, Peng, & Nisbett, 2000; Kitayama, Duffy, Kawamura, & Larsen, 2003), and are less sensitive to contextual changes while being more sensitive to changes in focal objects (Masuda & Nisbett, 2006). Researchers believe that cognitive style also affects the processes of categorization and classification. Whereas analytic individuals categorize objects by applying formal rules of reasoning, holistic individuals categorize objects by their overall (or holistic) qualities, similarity and mutual relationships (Chiu, 1972; Ji, Zhang, & Nisbett, 2004; Norenzayan, Smith, Kim, & Nisbett, 2002).

The value dimension of individualism and collectivism (I/C) in cross-cultural research is commonly related to A/H cognitive style and often used as a predictor of cognitive style and other psychological phenomena (for review, see Oyserman, Coon, & Kemmelmeier, 2002). Some research suggested that collectivistic individuals are field dependent and holistic, whereas people from predominantly individualistic societies are field independent and analytic (Ji et al., 2000; Nisbett, 2003; Nisbett et al., 2001; Triandis & Gelfand, 1998). However, the relationship between I/C and A/H cognitive styles is rarely measured at the individual level, and many authors have only assumed the aforementioned relationships. Other research has failed to find any empirical evidence at all of relationships at the individual level between I/C and A/H cognitive styles (e.g., Davidoff, Fonteneau, & Fagot, 2008; McKone et al., 2010).

In the current literature though, theoretical considerations (e.g., Hermans & Kempen, 1998; Matsumoto, 1999) and empirical evidence (e.g., Levine et al., 2003; Oyserman et al., 2002; Takano & Osaka, 1999; Takano & Osaka, 2018) can be found, criticizing this dichotomous approach as overly simplifying and reductionist. Post-communist European countries are significantly more holistic and collectivistic than Western Europe (Varnum, Grossmann, Katunar, Nisbett, & Kitayama, 2008). Other findings suggest the existence of significant cultural differences not only across national borders (e.g., Federici, Stella, Dennis, & Hündsfelt, 2011; Kitayama, Park, Sevincer, Karasawa, & Uskul, 2009; Varnum et al., 2008) but also between people from different regions in a single country (e.g., Kitayama, Ishii, Imada, Takemura, & Ramaswamy, 2006; Knight &

Nisbett, 2007; Uskul, Kitayama, & Nisbett, 2008).

These critical findings suggest that the dichotomous model of cognitive styles might be overly reductionist. An alternative model was proposed by Kozhevnikov, Evans, and Kosslyn (2014). Their model is based on an older model by Nosal (1990). It emphasizes the ecological nature of cognitive style that is viewed as a pattern of cognitive adaptation to the environment. Cognitive style is in this model environmentally dependent, flexible and task specific. This model is hierarchical in the form of a cognitive-style matrix organizing cognitive styles on two axes: a) levels of information processing (perception, concept formation, higher-order processing, metacognitive processing), and b) cognitive style families (context dependence and independence, rule-based and intuitive processing, internal and external locus, integration and compartmentalization). According to this model, various components of cognitive style would not have to be inevitably (cor)related – a specific environment could, for example, elicit development of local processing (analytic characteristic) and focus on holistic regions of the map (holistic characteristic). This theoretical model might explain the absence of correlations between various facets of cognitive style reported in some studies (e.g., Hakim, Simons, Zhao, & Wan, 2017; Kster, Castel, Gruber, & Kärtner, 2017).

It should be noted that the number of empirical studies that extend beyond the East-West dichotomy and explore the nature of cognitive style and related factors in other cultural regions, such as Central Europe, is rather limited (with the exception of, for example, Cieślikowska, 2006; Čeněk, 2015; Kolman, Noorderhaven, Hofstede, & Dienes, 2003; Stachoň et al., 2018; Varnum et al., 2008). The current research suggests that the people of Central Europe are rather moderately analytical in cognitive style and relatively, although not extremely, individualistic.

As mentioned above, the study employed cartographic tasks and stimuli in order to explore the manifestation of cognitive style. This follows research that has evaluated cartographic visualization methods that began with the publication *The Look of Maps* (Robinson, 1952). These methods gradually developed into the complex field of cognitive cartography. Subsequent to cognitive cartography, map-psychology research was later introduced by Montello (2002). This approach uses maps as stimuli in order to understand human perception and cognition. Examples of map-psychology research include studies on the influence of alignment and rotation on memory (Tversky, 1981) and the influence of cognitive style while working with bivariate risk maps (Šašinka et al., 2018). Categorization in cartographic stimuli was part of the work of Lewandowski et al. (1993), and research conducted around the same time anticipated cross-cultural differences in map reading (e.g., MacEachren, 1995; Wood, 1984) that was ultimately observed (e.g., Angsüsser, 2014; Stachoň et al., 2018; Stachoň et al., 2019). From the cross-cultural perspective, especially in A/H theory, a most interesting study was conducted by McCleary (1975), who examined the categorization of map point symbols. The author found differences in the clustering of dot symbols and identified two user groups from these findings: atomists and generalists, who analogously correspond to the concept of A/H cognitive style. Nevertheless, another study (Sadahiro, 1997) did not confirm this grouping, even though the author also discovered individual differences in the clustering of dot symbols in maps (cf. Sadahiro, 1997).

Consequently, the objective of this research was to further investigate the nature and manifestation of cognitive style in relation to variables such as individualism/collectivism in the culture of Central Europe (Czechia), compared to typical Eastern Asian cultures (China and Taiwan) – specifically, 1) to analyze cross-cultural differences between these two samples in I/C, visual perception (global versus local distribution of attention) and categorization (clustering) in map stimuli, and 2) to verify the entire theoretical model of relationships between I/C and A/H cognitive styles at an individual level and estimate the relationship be-

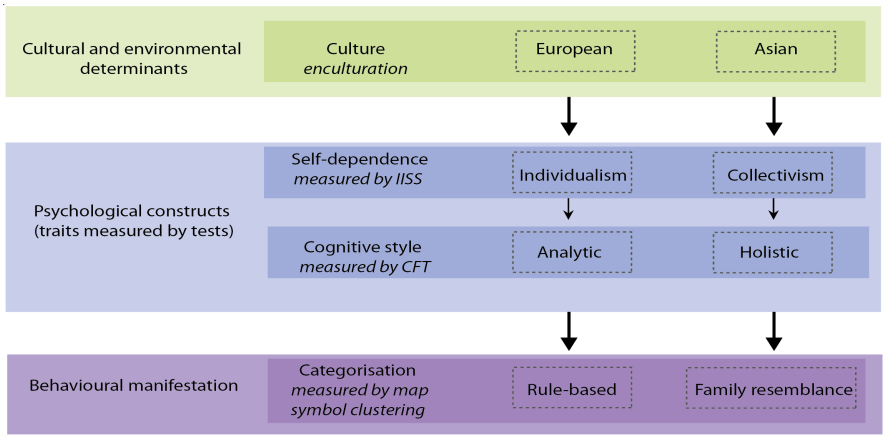


*Figure 1* Research model

tween I/C and selected manifestations of A/H cognitive style (global/local attention) and map reading (categorization; see Figure 1).

## Methods and Procedures

To achieve the above-mentioned objectives, we applied several methods (described in detail below) using Hypothesis online testing platform (see Procedure section). We also collected sociodemographic information such as age, gender, socioeconomic status (SES), cartography skills, eye defects, number of siblings, etc.

### Independent and Interdependent Self Scale

To measure the individual-level I/C, we administered the *IISS – Independent and Interdependent Self Scale* (Lu & Gilmour, 2007). The IISS is derived from the CSC – Self-Construal Scale (Singelis, 1994), the Individualism-Collectivism Scale (Triandis & Gelfand, 1998) and the concept of independent/interdependent self-construal (Markus & Kitayama, 1991). The IISS comprises 42 (21 for the Independent and 21 for Interdependent Self-Construal Scale) seven-point Likert-type numerical items (1 = strongly disagree, 7 = strongly agree). The original version of the questionnaire was administered in simplified Chinese (Lu & Gilmour, 2007). It contains items such as "*I believe that people should try hard to satisfy their interests.*" (independent subscale) or "*I believe that family is the source of our self.*" (interdependent subscale). The Czech version of the questionnaire was translated from English in parallel by three independent translators. Europeans should have higher independent self-construal (individualistic), and East Asians should be more interdependent (collectivistic; Markus & Kitayama, 1991).

### Compound Figure Test

The perceptual factors of cognitive style, more specifically the global and local distribution of attention, were measured using the *CFT – Compound Figure Test*, which is a modified version of the Navon method (Navon, 1977) and has been previously used in several studies (e.g., Kukaňová, 2017; Opach et al., 2018; Šašinka et al., 2018). The CFT comprises six practice trials and 32 test trials (blocked design, same 16 trials for both local and global processing). Number of trials was considered satisfactory based on previous research (Davidoff et al., 2008; von Mühlenen, Bellaera,

Singh, & Srinivasa, 2018). Each trial involves presenting one "Navon figure" – a large number composed of copies of a smaller different number (Figure 2). In the local trial, participants were asked to identify the small numbers as quickly as possible. In the global trial, they were required to identify the large number. Participants used computer mouse to respond. Reaction time and correct identification were measured in each trial. The average reaction time and average success rate was calculated separately for the local (local reaction time, indicating analytic processing) and global (global reaction time, indicating holistic processing) trials.

The main output of the CFT is the global precedence score, which is computed as the difference between the absolute global and local reaction times (e.g., Gerlach & Poirel, 2018; McKone et al., 2010). High values of the global precedence score indicate a holistic cognitive style (global precedence), low or even negative values indicate an analytic cognitive style (local precedence). According to previous research, people should generally perceive global features more quickly than local features (Navon, 1977). Furthermore, analytic perceivers should be relatively quicker in local and relatively slower in global tasks than holistic perceivers (Peterson & Deary, 2006).

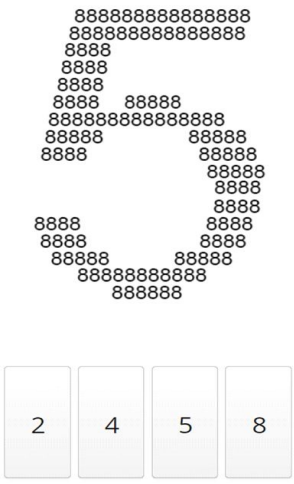


*Figure 2* Example of the Navon figure used in the CFT

**Categorization of Multivariate Map Symbols**

Map reading and understanding is considered as a part of visual literacy (Peña, 2017). In addition, the maps represent the complex stimuli, which enable the user not only to understand the presented information but also to derive the additional information (Morita, 2004), therefore we used the cartographic stimuli. The cartographic visualization of multiple phenomena is known as multivariate mapping. Multivariate point symbols are one possible multivariate mapping method (Slocum, McMaster, Kessler, & Howard, 2005). We created specific cartographic tasks for purposes of our experiment. Categorization was measured with *CMMS – Categorization of Multivariate Map Symbols*, which is based on previous research in categorization (Chiu, 1972; Ji et al., 2004; Norenzayan et al., 2002) and on the relationship between cognitive style and map reading (e.g., Herman et al., 2019; Kubíček et al., 2016; Opach, Popelka, Doležalová, & Rod, 2018; Stachoň et al., 2018; Šašinka et al., 2018). The CMMS measures a specific component of categorization, namely clustering (cf. McCleary, 1975; Sadahiro, 1997).

The method comprised three practice trials and twenty test trials. The administration took between 15 and 30 minutes. In each trial, a fictional map comprising multiple territorial units was presented. Each territorial unit contained one map symbol (Figure 3).

The map symbols contained information about the four attributes of a particular spatial unit, namely food costs (originally blue color, top left position), housing costs (originally red color, top right position), transport costs (originally yellow color, bottom left position) and costs of leisure activities (originally green color, bottom right position), which were indicated by the color and size of the map symbol components (Figure 4). The position and color of the abovementioned attributes were kept constant, only their size was manipulated.

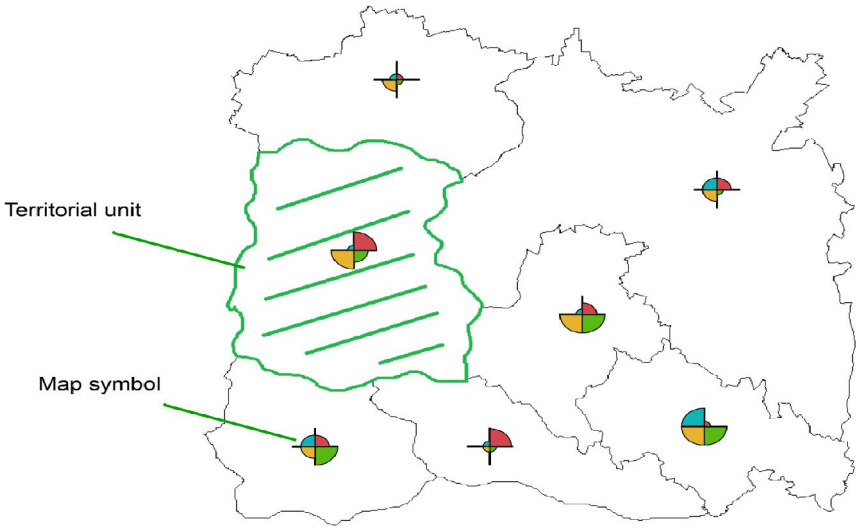


*Figure 3* Territorial unit and map symbol in CMMS

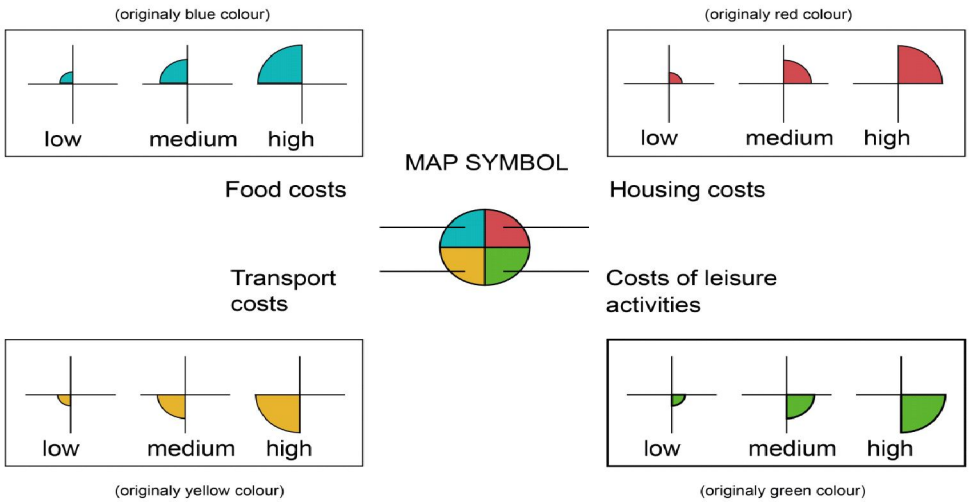


*Figure 4* Multivariate map symbol (descriptions were in Czech and traditional/simplified Chinese languages)

Each map was intentionally created to contain one "holistic" and one "analytic" region comprising several territorial units defined by a specific combination of map symbol characteristics (Figure 6). In the analytic region, one of the map symbol components was kept constant and the rest were random (one-dimensional rule); in the holistic region, all map symbols had globally similar components, but none of them were constant (overall-similarity rule, see Figure 5). The remaining map symbol components were completely random to avoid any categorization rule. The analytic and holistic areas were balanced with respect to reading direction.

In group A) the maximum value of the blue parameter (food costs, upper left) was a common attribute in all symbols. In group B), no

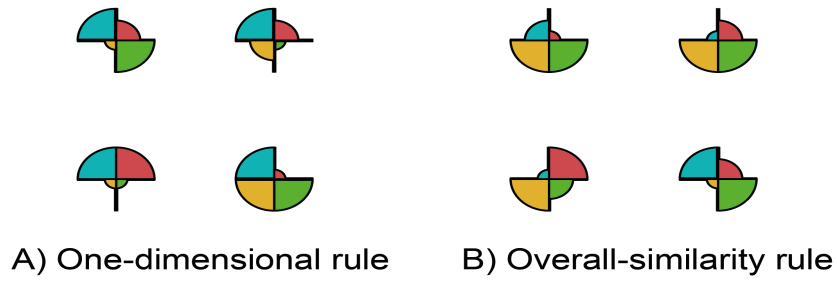


*Figure 5* Example of the used analytic A) – left, and holistic B) – right, categorization rules

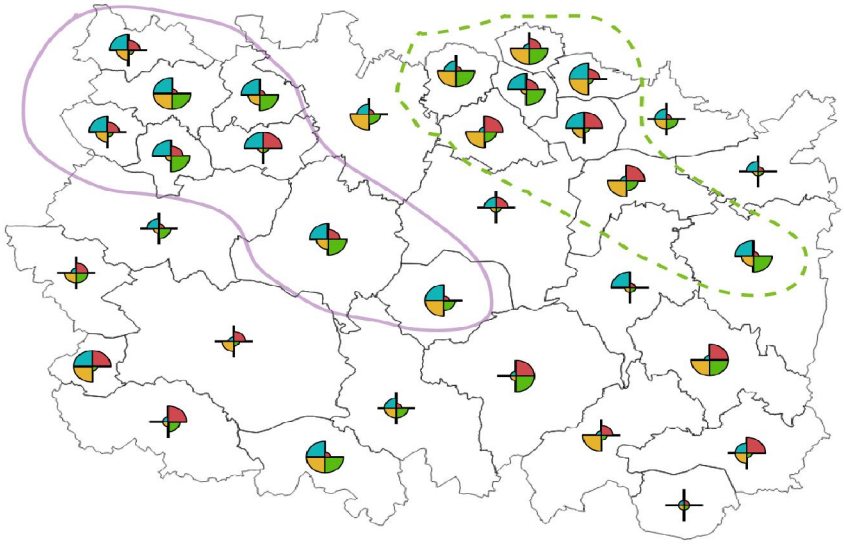

*Figure 6* Example of constructed analytic (left solid line) and holistic (right dashed line) map regions

specific attribute was common to any symbol; they shared overall similarity and equal distribution of values in different parameters (2x maximum, 1x medium, and 1x minimum). Alternative map symbols were created according to principles published by Norenzayan et al. (2002).

Participants were asked to identify and mark a continuous map region comprising at least four territorial units that, according to their judgment, belonged together. The CMMS reported each trial result as a value between -1 and 1, where a negative value is defined as a holistic categorization and a positive value is defined as an analytic categorization. This value represented the agreement between the predetermined holistic and analytic regions and the real marked areas. A value of ±1 represented total agreement, while 0 did not represent any agreement. A control value, calculated as the ratio of marked territorial units within the predetermined areas to the sum of all marked territorial units, was also reported to exclude participants who had incorrectly marked only a negligible number of predetermined areas. A value of .60 and higher was considered a valid response, and therefore 40% or less marked territorial units beyond predetermined areas. For example, if a trial consists of 10 analytic, 10 holistic and 30 random areas and a participant marks out 11 areas (7 analytic and 4 random), his/her control value is valid (analytic marked areas/all marked areas = 7/11 = .636) and his/her score is .70 (analytic marked areas/all analytic areas = 7/10 = .70).

From the research mentioned above, we hypothesized that people with a holistic cognitive style will show a tendency to mark out holistic regions and people with an analytic cognitive style will mark out analytic regions. Analogously, we also assumed that East Asians will mark out the holistic area more often (and the analytic area less often) than Czechs.

**Research Sample**

Before data were collected, a power analysis in *G*Power* (v. 3.1.9.2) was conducted. Setting power at .80 and effect size *f* at .280 was sufficient to test at least 104 participants (52 from each culture).[1]

We gathered data from 103 participants. Five participants were excluded from further data analysis because of missing data. Out of the remaining 98 participants, 53 participants were Central Europeans (Czech), and 45 participants were East Asians (22 Chinese, 23 Taiwanese). All participants were university students, the majority (57.1%) were women and most of them studied psychology (69.4%). The age range was 16–55 years ($M$ = 25.4, $SD$ = 5.52). From previous studies it seems that several demographic variables are relevant to cognitive style, therefore, we gathered information about cartographic skills and experience (Ooms et al., 2016), SES (Grossmann & Varnum, 2011), marital status (Bartoš, 2010), size of residence (Jha & Singh, 2011), number of siblings (based on the number of family members in residence, see Grossmann & Varnum, 2011) or field of study (Choi, Koo & Choi, 2007). The detailed descriptive characteristics of the sample are shown in Table 1.

Our research sample was consequently adequate for testing the hypotheses in the first section of results (Cross-Cultural Differences). In the second section (Relationship between Sociocultural, Perception and Cognitive Factors), however, with respect to the sample size, more demanding methods of statistical analysis were used, such as SEM, specifically path analysis. The sample size was relatively inadequate in this case (according to Ding, Velicer, & Harlow, 1995, the minimum sample size for conducting SEM is about 100–150). The results of SEM therefore needed to be interpreted cautiously. Normality tests were performed for all subscales of the methods used. Non-parametric statistics were used, where the data were not normally distributed.

[1] The value of *f* was selected from previous cross-cultural research using the Navon method, in which the effect sizes were .229–.886 ($M$ = .410, $SD$ = .216; e.g., Fu, Dienes, Shang, & Fu, 2013; McKone et al., 2010; Tan, 2016). We selected the middle effect size value *f* = .280.

Table 1 *Demographic characteristics of the participants*

| | | *Western Culture* | *Eastern Culture* | | |
|---|---|---|---|---|---|
| | | **Czechia** | **China** | **Taiwan** | **East Asia Total** |
| *Gender* | **Male** | 25 (47.2%) | 7 (31.8%) | 10 (43.5%) | 17 (37.8%) |
| | **Female** | 28 (52.8%) | 15 (68.2%) | 13(56.5%) | 28 (62.2%) |
| *Marital status* | **Single** | 31 (58.5%) | 16 (72.7%) | 13 (56.5%) | 29 (64.4%) |
| | **Married** | - | 2 (9.1%) | 2 (8.7%) | 4 (8.9%) |
| | **In a relationship** | 22 (41.5%) | 4 (18.2%) | 8 (34.8%) | 12 (26.7%) |
| *Socioeconomic status* | **Poor** | 1 (1.9%) | - | 1 (4.3%) | 1 (2.2%) |
| | **Low income** | 6 (11.3%) | 4 (18.2%) | 1 (4.3%) | 5 (11.1%) |
| | **Middle income** | 24 (45.3%) | 6 (27.3%) | 13 (56.5%) | 19 (42.2%) |
| | **Upper-middle income** | 19 (35.8%) | 7 (31.8%) | 6 (26.1%) | 13 (28.9%) |
| | **High income** | 3 (5.7%) | 4 (18.2%) | 2 (8.7%) | 6 (13.3%) |
| *Residence (population)* | **< 1K** | 6 (11.3%) | 2 (9.1%) | - | 2 (4.4%) |
| | **1–10K** | 11 (20.8%) | 1 (4.5%) | 4 (17.4%) | 5 (11.1%) |
| | **10–50K** | 8 (15.1%) | 1 (4.5%) | 6 (26.1%) | 7 (15.6%) |
| | **50–100K** | 14 (26.4%) | 2 (9.1%) | 1 (4.3%) | 3 (6.7%) |
| | **100–500K** | 12 (22.6%) | 4 (18.2%) | 5 (21.7%) | 9 (20%) |
| | **500K–1.5M** | 2 (3.8%) | 4 (18.2%) | 1 (4.3%) | 5 (11.1%) |
| | **1.5M–3M** | - | 3 (13.6%) | 4 (17.4%) | 7 (15.6%) |
| | **3M >** | - | 4 (28.2%) | 2 (8.7%) | 6 (13.3%) |
| *Field of study* | **Psychology** | 39 (73.6%) | 12 (54.5%) | 17 (73.9%) | 29 (64.4%) |
| | **Other** | 14 (26.4%) | 10 (45.5%) | 6 (16.1%) | 16 (33.6%) |
| *Number of siblings* | **0** | 6 (11.3%) | 3 (13.6%) | - | 3 (6.7%) |
| | **1** | 31 (58.5%) | 14 (63.6%) | 12 (52.2%) | 26 (57.8%) |
| | **2** | 11 (20.8%) | 2 (9.1%) | 10 (43.5%) | 12 (26.7%) |
| | **3** | 4 (7.5%) | 1 (4.5%) | - | 1 (2.2%) |
| | **4 or more** | 1 (1.9%) | 1 (4.5%) | 1 (4.3%) | 2 (4.4%) |
| *Age range (mean, SD)* | | 20–33 (*M* 23.6, *SD* 2.32) | 18–46 (*M* 27.5, *SD* 7.43) | 16–55 (*M* 27.5, *SD* 7.24) | 16–55 (*M* 27.5, *SD* 7.25) |

**Procedure**

Participants were volunteers contacted through university websites and social networks Facebook (Czech and Taiwanese) and WeChat (Chinese). The aforementioned methods were administered in either simplified/traditional Chinese or Czech on PCs using the Hypothesis online testing platform (Popelka, Stachoň, Šašinka, & Doležalová, 2016; Šašinka, Morong, & Stachoň, 2017) in the presence of an instructor. For their participation the participants got a small reward (USB flash disc) or course credits. The sequence of the tests was 1) CFT, 2) CMMS, 3) IISS, 4) sociodemographic questionnaire. The length of the entire procedure was approx. 35–55 minutes.

## Results

The data were processed with *IBM SPSS Statistics* (v. 25), *IBM SPSS Amos* (v. 25) and *R* (v. 3.4.4, *Lavaan* and *SemTools* packages). The results are presented in two sections: *Cross-Cultural Differences* and *Relationship between Sociocultural, Perceptual and Cognitive Factors*. Analysis of the differences between Taiwanese and Chinese participants and also the individual differences between relevant sociocultural variables (e.g., SES, gender, number of siblings, age) were also performed, with no significant differences found in any of the variables. Because of these results, we combined Taiwanese and Chinese participants into a single "Chinese/Taiwanese" group for any subsequent statistical analysis.

### Cross-Cultural Differences

The IISS Questionnaire had a satisfactory reliability in both the independent $\alpha$ = .895 (Czech version $\alpha$ = .815, Chinese version $\alpha$ = .929) and interdependent $\alpha$ = .872 (Czech version $\alpha$ = .795, Chinese version $\alpha$ = .906) subscales. Furthermore, the subscales did not correlate with each other (Spearman partial $r_s$ = .155, $p$ = .177, culture was a control variable).

The Chinese/Taiwanese were relatively more collectivistic (interdependent subscale) and less individualistic (independent subscale) than the Czechs. The Chinese/Taiwanese scored an average of 5.17 (*SD* = .761) in the collectivistic subscale and 5.18 (*SD* = .911) in the individualistic subscale, whereas the mean scores of the Czechs were 4.66 (*SD* = .564) in the collectivistic subscale and 5.35 (*SD* = .502) in the individualistic subscale (Figure 7). The statistical significance of these differences was tested with one-way ANOVA. The differences were significant only in the case of collectivism: $F(1, 96) = 14.456$, $p < .001$, with medium effect size ($\eta^2$ = .131). No significant differences were found between the groups in the individualism subscale (Mann-Whitney $U$ = 1105.5, $p$ = .535, $r$ = .063). The data were also analyzed with respect to sociodemographic variables. No other significant relationships were observed (for the complete list of collected variables, see Table 1).

A medium correlation was found between both local and global CFT tasks (Spearman partial $r_s$ = .564, $p < .001$, culture was a control variable). Two participants were removed from

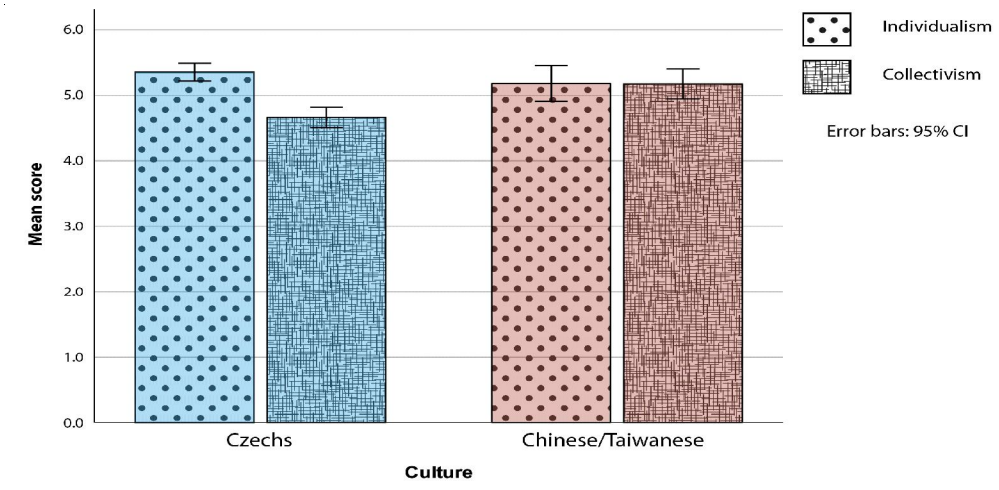


*Figure 7* IISS – mean scores

further analysis because of their high error rates (more than four errors in each task).

The results suggest that all participants had significantly quicker reaction times in the global task than in the local task (Wilcoxon signed-rank test $Z = -6.634$, $p < .001$, $r = -.677$). The findings also show that Czechs were quicker than Chinese/Taiwanese in both local and global tasks. The average reaction time of the Czech participants in the global task was 0.99 sec. ($SD = .209$) compared to the Chinese/Taiwanese participants with an average reaction time of 1.66 sec. ($SD = .466$). A similar pattern was observed in the local task, where the average reaction time of the trial solution was 1.13 sec. ($SD = .144$) for the Czechs and 1.77 s ($SD = .387$) for the Chinese/Taiwanese participants (Figure 8). Czechs were significantly quicker in both the global ($U = 204$, $p < .001$, $r = -.711$) and local ($F(1, 95) = 121.960$, $p < .001$, $\eta^2 = .562$) tasks, with large effect sizes.

These differences in reaction times, however, cannot be interpreted in the A/H paradigm as any difference in cognitive style but rather as differences in the emphasis that both groups placed on the speed of the CFT solution (Kukaňová, 2017; Yates et al., 2010). We also calculated the global precedence score using the aforementioned procedure of difference, specifically by subtracting the local reaction times from global reaction times. Although the Czech participants had a relatively higher global precedence score ($M = .139$, $SD = .210$) than the Chinese/Taiwanese participants ($M = .108$, $SD = .574$), this difference was not significant ($U = 949$, $p = .083$, $r = -.175$) (Figure 9).

The final method applied was CMMS. Four participants were removed from further analysis because of their high error rate (participants that marked less than three territorial units into one continuous map region). The results on a scale between -1 (holistic) to 1 (analytic) show that Czechs categorized in maps more analytically ($M = .044$, $SD = .360$) and East Asians categorized in maps more holistically ($M = -.063$, $SD = .172$) (Figure 10). This cultural difference was statistically significant ($U = 795$, $p = .021$), with a small effect size ($r = -.235$). However, the results show that both groups used a similar cognitive style to categorize map symbols and only small differences in cognitive strategies were found. Moreover, both groups scored relatively close to zero, which is probably caused by using various categorization strategies across different trials,

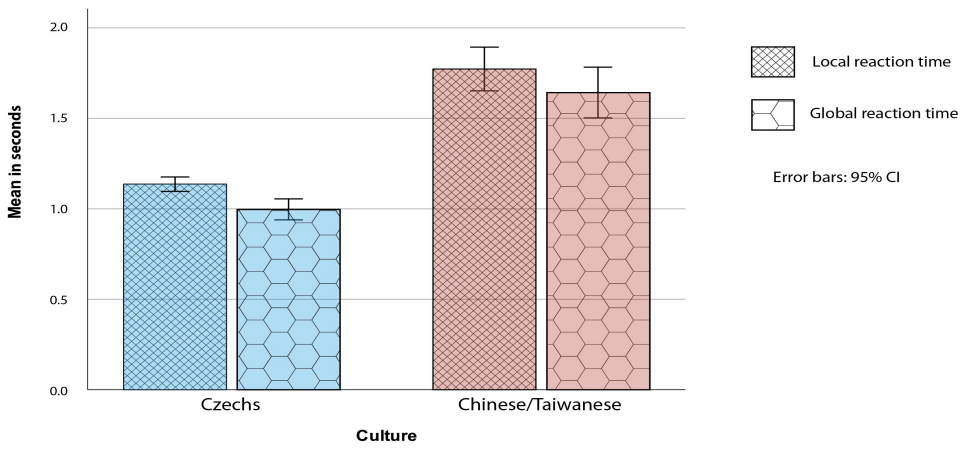


*Figure 8* CFT – mean reaction times

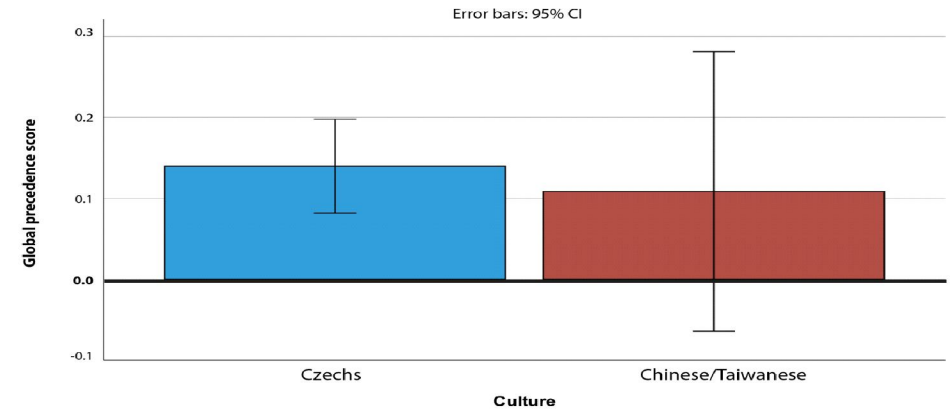


*Figure 9* CFT – Mean global precedence scores (higher values mean higher global precedence)

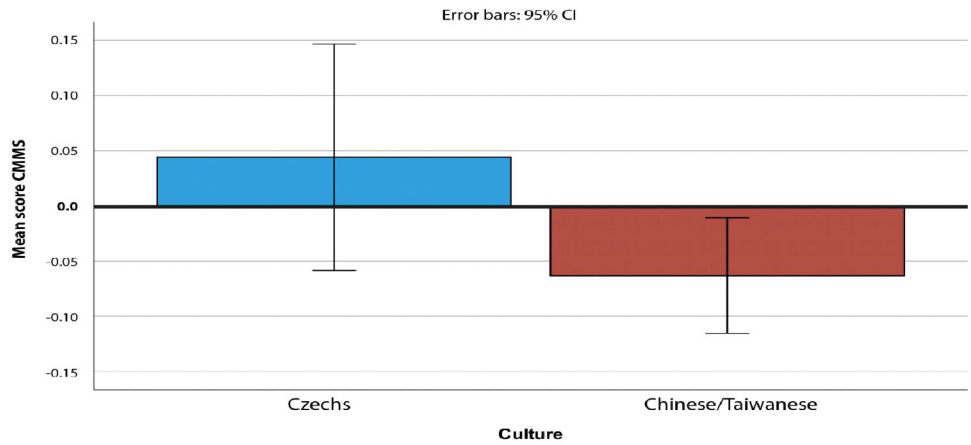


*Figure 10* CMMS – Cross-cultural differences in map categorization (High value = analytic, low value = holistic).

because absolute scores were higher for both Czechs ($M$ = .461, $SD$ = .183) and Asians ($M$ = .247, $SD$ = .148).

**Relationship between Sociocultural, Perceptual and Cognitive Factors**

We performed a Spearman partial correlation and a path analysis (type of SEM) to verify the research model at individual level in order to obtain an improved and deeper understanding of the phenomena under scrutiny and their mutual relationships.

Using a non-parametric Spearman partial correlation with culture as control variable, only weak correlations were found between the CMMS scores and the CFT global reaction times ($r_s$ = .222, $p$ = .035) and between the

CMMS scores and the CFT global precedence scores ($r_s$ = -.216, $p$ = .040). The whole correlation matrix is shown in Table 2:

A path analysis was also performed using the expectation–maximization (EM) method to estimate missing values and an asymptotically distribution-free (ADF) method, which is adequate for non-parametric data. Since both cultures were analyzed together, culture was used as a "control variable". Two models were analyzed: Model 1 comprised CFT reaction times, and Model 2 was computed with the calculated CFT global precedence score (Figure 11). Both models showed a very good fit (Table 3).

Path analysis for Model 1 revealed a weak direct effect of individualism (IISS independent self-construal scale) on CFT local reaction times ($\beta$ = -.250, $B$ = -.167, $p$ = .003) and a weak direct effect of collectivism (IISS interdependent self-construal scale) on CFT global reaction times ($\beta$ = -.196, $B$ = -.135, $p$ = .047). The higher score in individualism therefore indicated a quicker reaction time in the local

Table 2 *Spearman partial correlation matrix*

| | *1.* | *2.* | *3.* | *4.* | *5.* | *6.* |
|---|---|---|---|---|---|---|
| *1. Individualism* | – | | | | | |
| *2. Collectivism* | .155 | – | | | | |
| *3. CFT local RT* | .002 | .073 | – | | | |
| *4. CFT global RT* | -.026 | -.140 | .564** | – | | |
| *5. Global precedence score* | .125 | .183 | .176 | -.546** | – | |
| *6. CMMS* | .066 | .147 | -.063 | .222* | -.216* | – |

*Note.* * p < .05, ** p < .001

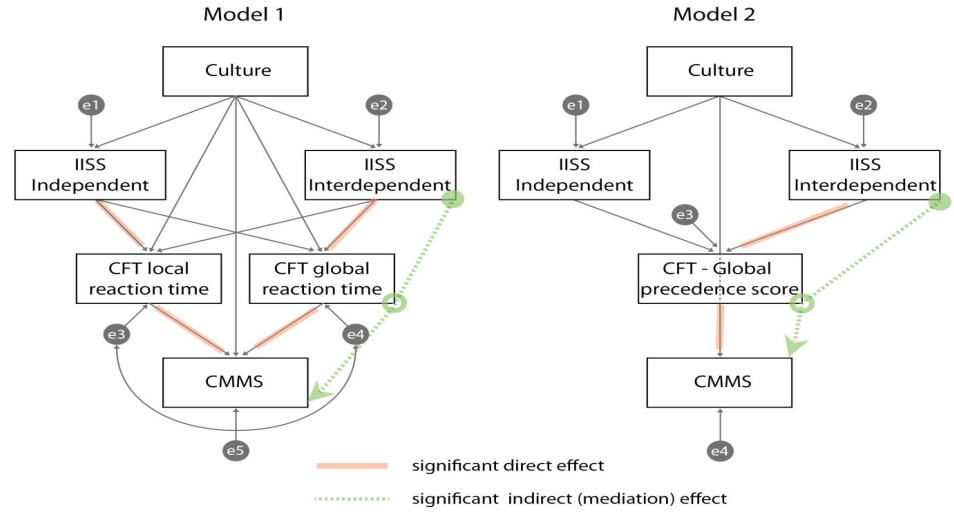


*Figure 11* Path analysis models – Model 1 (left), Model 2 (right)

Table 3 *Models fits*

| *Model* | *Chi-square* | *p-value* | *CFI* | *RMSEA* | *AIC* | *BIC* | *ECVI* |
|---|---|---|---|---|---|---|---|
| *Model 1* | $\chi^2(3) = 3.897$ | .273 | .995 | .057 | 39.897 | 85.289 | .438 |
| *Model 2* | $\chi^2(3) = 4.435$ | .218 | .960 | .073 | 28.435 | 58.697 | .312 |

task, and the higher score in collectivism indicated a quicker reaction time in the global task, i.e., I/C scores weakly predicted the performance in CFT tasks. Moderate direct effects of the CFT global reaction times ($\beta$ = .713, $B$ = .450, $p$ < .001) and the CFT local reaction times ($\beta$ = -.776, $B$ = -.521, $p$ < .001) on the CMMS scores were also found. These results suggest that the analytic perceivers (persons with a quicker CFT local reaction time) tended to use an analytic manner of categorizing point multivariate map symbols, and that the holistic perceivers (persons with quicker CFT global reaction time) used a rather holistic manner of categorizing point multivariate map symbols. In other words, the CFT reaction times satisfactorily predicted the map categorization style. In order to estimate the indirect effects of I/C on point multivariate map symbol categorization, bootstrapping ($N$ = 2000, CI = 95%) was performed, and a very weak indirect (mediation) effect of collectivism (IISS interdependent self-construal scale) on the CMMS score ($\beta$ = -.175, $B$ = -.077, $p$ = .028) was detected.

Path analysis performed on Model 2 showed a weak direct effect of collectivism (IISS interdependent self-construal scale) on the CFT global precedence score ($\beta$ = .357, $B$ = .156, $p$ = .017). This finding suggests that collectivistic people tended to use a more global distribution of attention that is characteristic of the holistic cognitive style. A moderate direct effect of the CFT global precedence score on map categorization ($\beta$ = -.502, $B$ = -.502, $p$ < .001) was also observed, i.e., participants who showed a relatively more global distribution of attention, categorized symbols in maps according to relatively more holistic rules, and vice versa, participants who showed a relatively more local distribution of attention, were prone to use relatively more analytic rules of categorization. A very weak significant indirect (mediation) effect of collectivism (ISS interdependent self-construal scale) on map categorization ($\beta$ = -.179, $B$ = -.078, $p$ = .026) was also found after bootstrapping ($N$ = 2000, CI = 95%).

It should be noted that we reported only significant relationships. However, as shown in Figure 11, we included all plotted relations in the models (i.e., IIISS independent on CFT global RT and IISS interdependent on CFT local RT in Model 1 and IISS independent on CFT global precedence score in Model 2). Moreover, we also performed indirect (meditation) effect of individualism (IISS independent self-construal scale) on map categorization with no significant results in both models. The exogenous control variable “culture” had statistically significant and large regression coefficients on all endogenous variables in the models. Nevertheless, we did not report these results because we added it to our models only in order to weaken the influence of other variables. Moreover, the apparent dissension between insignificant correlation coefficients and significant regression coefficients of path analysis could be explained by suppression effect and Simpson’s paradox (see MacKinnon, Krull, & Lockwood, 2000; Tu, Gunnell, & Gilthorpe, 2008), which postulates that a more complex statistical model can reduce, reverse or even enhance the relationships between variables.

## Discussion

The aims of the presented study were: 1) to compare I/C and A/H cognitive styles and map categorization in Czech and East Asian (Chinese/Taiwanese) university students, and 2)

to investigate and verify the theoretical model of relationships between I/C and A/H cognitive styles and between A/H cognitive styles and their behavioral manifestation in the process of map categorization.

The results suggest that the Czech participants showed a significantly lower level of collectivism (interdependent self-construal scale) than did the Chinese/Taiwanese participants and a similar level of individualism (independent self-construal scale). Our results partly support the current theory that describes the West as relatively less collectivistic than the East (Hofstede, 1983; Markus & Kitayama, 1991; Nisbett et al., 2001; Triandis & Gelfand, 1998). Furthermore, a similar level of individualism corresponds to the empirical research in I/C in post-communist countries (Kolman et al., 2003; Varnum et al., 2008) and even with previous research in I/C in Czechia (Bartoš, 2010; Čeněk 2015). This finding also supports the claims of rapid individualization in the young East Asian populations (e.g., Moore, 2005; Steele & Lynch, 2013).

The results of the CFT show that all of the participants performed the global tasks more quickly than the local tasks, which is consistent with previous findings (Navon, 1977). However, our participants were generally slower compared to the original study (Navon, 1977). This fact was most probably caused by the way of responding (mouse click instead of keyboard buttons) because mouse response process has in contrast with keyboard response process one extra step (i.e., moving the mouse cursor above the response option). Our results also indicate cross-cultural differences in the general reaction times of CFT stimuli processing. The Czech participants were significantly quicker in both the global and local tasks. However, as mentioned above, these differences in reaction times demonstrated rather differences in the emphasis that both groups placed on the speed than differences in cognitive style (Kukaňová, 2017; Yates et al., 2010). The comparison of the global precedence scores (calculated from CFT global and local reaction times) showed no differences in global/local processing between the Czechs and Chinese/Taiwanese, which was contrary to our expectations. The results of the CFT could be seen as a contradiction to the notion of the "analytic West" and "holistic East" (Nisbett et al., 2001; Nisbett & Masuda, 2003; Nisbett & Miyamoto, 2005). However, it is still not clear whether Central Europeans count as the "analytic West". For example, Varnum et al. (2008) showed that Central European post-communist countries are relatively more holistic in their patterns of attention than Western Europe. Other empirical research, comparing the sensitivity to the context of Czech vs. Czech Vietnamese (Čeněk, 2015), and Czech vs. Chinese (Stachoň et al., 2018, Stachoň et al., 2019), reported mixed or contradictory results in terms of the expected differences in cognitive style.

The results of the CMMS show that the Czech participants categorized more analytically in maps, whereas the Chinese/Taiwanese categorized more holistically. This result agrees with the theory that Westerners use slightly more analytic categorization patterns and Easterners use more holistic categorization (Chiu, 1972; Ji et al., 2004; Norenzayan et al., 2002). However, the effect size of this significant difference was relatively small.

Path analysis was used to test the validity of two structural models of relationships between the variables of interest. Both evaluated models (CFT local and global reaction times and the global precedence score) showed a satisfactory good fit. The results of the path analysis show that I/C is a weak predictor of the level of global/local distribution of attention, i.e., collectivist persons tended to use a holistic cognitive style, and individualistic persons tended to use a rather analytic cognitive style. These findings partly support the theory of holistic and analytic cognitive styles (Nisbett, 2003; Nisbett et al., 2001; Triandis & Gelfand, 1998), although the values of the path coefficients were relatively small. The path analysis also did not find all of the expected direct and indirect effects of I/C on the scores of the CFT and the CMMS. The aforementioned findings were, therefore not a conclusive argument to support the A/H cognitive style theory in cross-

cultural context (cf. Nisbet et al., 2001). As with several other studies that did not find any relationship between I/C and A/H cognitive style (e.g., Davidoff et al., 2008; McKone et al., 2010; Takano & Osaka, 1999), it may be possible that this relationship could be different from what researchers expect, or perhaps even non-existent. Our findings of unconvincing yet significant relationships could also be explained in theoretical arguments, which maintain that the I/C and A/H cognitive styles only manifest at a cultural (i.e., cross-cultural comparison) not individual level (i.e., SEM and path analysis; cf. Na et al., 2010). Nevertheless, we would like to emphasize that the sample size was, in this case, relatively inadequate for SEM, therefore its results should be understood as only exploratory.

The concept of I/C and its measurement with self-report scales have recently been subject to disagreement from many scholars. This criticism mainly cites the lack of concurrent, discriminant and construct validity, insufficient conceptualization, a reductionist and dichotomous approach and insufficient psychometric characteristics in questionnaires (for review, see Levine et al., 2003; Matsumoto, 1999; Oyserman et al., 2002; Vignoles et al., 2016). For example, if the individual level of I/C can be significantly influenced by priming, then it means that I/C is not as stable in time as it is generally assumed (Gardner, Gabriel, & Lee, 1999; Oyserman & Lee, 2008). Moreover, according to the results of meta-analytical studies and systematic reviews, the West should not be described as strictly individualistic nor the East as purely collectivistic (Levine et al., 2003; Oyserman et al., 2002; Takano & Osaka, 1999; Takano & Osaka, 2018). Most recently, for example, Hakim et al. (2017) compared the levels of individualism and collectivism of American and Asian international students and found, contrary to expectations, that Americans were significantly more collectivistic, whereas the Asian students were significantly more individualistic.

Path analysis also found that global/local distribution of attention had a moderate predictive power on categorization in both of the tested models, i.e., analytic perceivers (defined by the CFT global precedence score) used analytic categorization in maps, whereas holistic perceivers used holistic categorization. This finding is consistent with the research theory (Chiu, 1972; Ji et al., 2004; Norenzayan et al., 2002) and the empirical research (Kubíček et al., 2016; Šašinka et al., 2018; Stachoň et al., 2019). Consequently, the cognitive style that is characterized as a perceptual process is presumably manifested in higher cognitive processes, such as map reading and categorization.

## Conclusions

The article describes cross-cultural differences in western and eastern cultures, between Czech and Chinese/Taiwanese university students, respectively. The theoretical background of the research was based on the theory of analytic and holistic cognitive styles and the dimensions of individualism and collectivism. Two main objectives were defined: first, to identify the possible cross-cultural differences and similarities between Czechs and Chinese/Taiwanese, and second, to verify the entire research model and the relationships between A/H cognitive style and I/C at individual levels. For this purpose, we also developed a new method (CMMS) in order to study how A/H cognitive style was manifested during categorization in map reading. The results suggest that cross-cultural differences exist between both cultures, especially at the level of collectivism (Czechs were less collectivist than the Chinese/Taiwanese) and categorization in map reading (Czechs used more analytic and less holistic categorization). Neither individual differences (e.g., SES, gender, age) nor differences in cognitive style measured by the CFT between Czech and East Asians were found. The findings also indicate that I/C is a weak predictor of A/H cognitive style and that A/H cognitive style moderately predicts categorization in map reading.

These results contradict the East-West dichotomy and suggest that the culture of Central Europe (specifically Czechia) is much more

similar to the East than expected from the literature. However, more cross-cultural research of typically Western, typically Eastern and Central European cultures is needed for an improved understanding of the real influence of culture on human perception and cognition in regions outside the East-West dichotomy. Based on the presented results, future research should focus on verification of Nisbett's (2001) vs. Kozhevnikov's (2014) models of cognitive styles. Above all, specify the number of cognitive style families, investigate the stability/flexibility of cognitive styles, and inspect the developmental aspects (e.g., children of different age) of cognitive style and its adaptive nature (e.g., research on expatriates during the process of cultural adaptation) is also suggested.

**Acknowledgement**

This publication was supported by the Czech Science Foundation (GC19-09265J: The influence of socio-cultural factors and writing system on perception and cognition of complex visual stimuli).

## References

Angsüsser, S. (2014). Possible reasons for size differences between point symbols in German and Chinese city maps. In T. Bandrova & M. Konecny (Eds.), *Proceedings of the 5th International Conference on Cartography & GIS* (pp. 268–277), Sofia: Bulgarian Cartographic Association. https://cartography495gis.com/docsbca/5ICCandGIS_Proceedings.pdf

Bartoš, F. (2010). Individualismus a kolektivismus v české populaci a jejich souvislost s narcismem. *Sociólogia, 42*(2), 134–160.

Čeněk, J. (2015). Cultural dimension of individualism and collectivism and its perceptual and cognitive correlates in cross-cultural research. *The Journal of Education, Culture and Society, 6*(2), 210–225. https://doi.org/10.15503/jecs20152.210.225

Chiu, L. H. (1972). A Cross-cultural comparison of cognitive styles in Chinese and American children. *International Journal of Psychology, 7*(4), 235–242. https://doi.org/10.1080/00207597208246604

Choi, I., Koo, M., & Choi, J. (2007). Individual differences in analytic versus holistic thinking. *Personality and Social Psychology Bulletin, 33*(5), 691–705. https://doi.org/10.1177/0146167206298568

Choi, I., & Nisbett, R. (1998). Situational salience and cultural differences in the correspondence bias and actor-observer bias. *Personality and Social Psychology Bulletin, 24*(9), 949–960. https://doi.org/10.1177/0146167298249003

Choi, I., Nisbett, R., & Norenzayan, A. (1999). Causal attribution across cultures: Variation and universality. *Psychological Bulletin, 125*(1), 47–63. https://doi.org/10.1037/0033-2909.125.1.47

Chua, H., Boland, J., & Nisbett, R. (2005). Cultural variation in eye movements during scene perception. *Proceedings of the National Academy of Sciences of the United States of America, 102*(35), 12629–12633. https://doi.org/10.1073/pnas.0506162102

Cieślikowska, D. (2006). Object and context in perception and memory: Polish-Chinese research on analytic and holistic cognitive styles. *Studia Psychologiczne (Psychological Studies), 44*(1), 80–99.

Cohen, N., & Ariely, T. (2011). Field research in conflict environments: Methodological challenges and snowball sampling. *Journal of Peace Research, 48*(4), 423–435. https://doi.org/10.1177/0022343311405698

Davidoff, J., Fonteneau, E, & Fagot, J. (2008). Local and global processing: Observations from a remote culture. *Cognition, 108*(3), 702–709. https://doi.org/10.1016/j.cognition.2008.06.004

Ding, L., Velicer, W., & Harlow, L. (1995). Effect of estimation methods, number of indicators per factor and improper solutions on structural equation modeling fit indices. *Structural Equation Modeling, 2*(2), 119–143. https://doi.org/10.1080/10705519509540000

Federici, S., Stella, A., Dennis, J., & Hündsfelt, T. (2011). West vs. West like East vs. West? A comparison between Italian and US American context sensitivity and fear of isolation. *Cognitive Processing, 12*(2), 203–208. https://doi.org/10.1007/s10339-010-0374-8

Fu, Q., Dienes, Z., Shang, J., & Fu, X. (2013). Who learns more? Cultural differences in implicit sequence learning. *PLoS ONE, 8*(8), e71625. https://doi.org/10.1371/journal.pone.0071625

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

Gerlach, Ch., & Poirel, N. (2018). Navon's classical paradigm concerning local and global processing relates systematically to visual object classifica-

tion performance. *Scientific Reports, 8*(1), 324. https://doi.org/10.1038/s41598-017-18664-5

Graff, M. (2003). Learning from web-based instructional systems and cognitive style. *British Journal of Educational Technology, 34*(4), 407–418. https://doi.org/10.1111/1467-8535.00338

Grossmann, I., & Varnum, M. (2011). Social class, culture, and cognition. *Social Psychological and Personality Science, 2*(1), 81–89. https://doi.org/10.1177/1948550610377119

Hakim, N., Simons, D., Zhao, H., & Wan, X. (2017). Do Easterners and Westerners differ in visual cognition? A preregistered examination of three visual cognition tasks. *Social Psychological and Personality Science, 8*(2), 1–11. https://doi.org/10.1177/1948550616667613

Herman, L., Juřík, V., Stachoň, Z., Vrbík, D., Russnák, J., & Řezník, T. (2018). Evaluation of user performance in interactive and static 3D maps. *ISPRS International Journal of Geo-Information, 7*(11), 1–25. https://doi.org/10.3390/ijgi7110415

Hermans, H., & Kempen, H. (1998). Moving cultures: The perilous problems of cultural dichotomies in a globalizing world. *American Psychologist, 53*(10), 1111–1120. https://doi.org/10.1037/0003-066X.53.10.1111

Hofstede, G. (1983). The cultural relativity of organizational practices and theories. *Journal of International Business Studies, 14*(2), 75–89. https://doi.org/10.1057/palgrave.jibs.8490867

Jha, S. D., & Singh, K. (2011). An analysis of individualism-collectivism across Northern India. *Journal of the Indian Academy of Applied Psychology, 37*(1), 149–156.

Ji, L., Peng, K., & Nisbett, R. (2000). Culture, control, and perception of relationships in the environment. *Journal of Personality and Social Psychology. 78*(5), 943–955. https://doi.org/10.1037//0022-3514.78.5.943

Ji, L., Zhang, Z., & Nisbett, R. (2004). Is it culture or is it language? Examination of language effects in cross-cultural research on categorization. *Journal of Personality and Social Psychology, 87*(2), 57–65. https://doi.org/10.1037/0022-3514.87.1.57

Kitayama, S., Duffy, S., Kawamura, T., & Larsen, J. T. (2003). Perceiving an object and its context in different cultures: A cultural look at new look. *Psychological Science, 14*(3), 201–206. https://doi.org/10.1111/1467-9280.02432

Kitayama, S., Ishii, K., Imada, T., Takemura, K., & Ramaswamy, J. (2006). Voluntary settlement and the spirit of independence: Evidence from Japan's "Northern frontier." *Journal of Personality and Social Psychology, 91*(3), 369–384. https://doi.org/10.1037/0022-3514.91.3.369

Kitayama, S., Park, H., Sevincer, A., Karasawa, M., & Uskul, A. (2009). A cultural task analysis of implicit independence: Comparing North America, Western Europe, and East Asia. *Journal of Personality and Social Psychology, 97*(2), 236–255. https://doi.org/10.1037/a0015999

Knight, K., & Nisbett, R. (2007). Culture, class, and cognition: Evidence from Italy. *Journal of Cognition and Culture, 7*(3), 283–291. https://doi.org/10.1163/156853707X208512

Kolman, L., Noorderhaven, N., Hofstede, G., Dienes, E. (2003). Crosscultural differences in Central Europe. *Journal of Managerial Psychology, 18*(1), 76–88. https://doi.org/10.1108/02683940310459600

Köster, M., Castel, J., Gruber, T., & Kärtner, J. (2017). Visual cortical networks align with behavioral measures of context-sensitivity in early childhood. *NeuroImage, 163*(2017), 413–418. https://doi.org/10.1016/j.neuroimage.2017.08.008

Kozhevnikov, M., Evans, C., & Kosslyn, S. M. (2014). Cognitive style as environmentally sensitive individual differences in cognition: A modern synthesis and applications in education, business, and management. *Psychological Science in the Public Interest, 15*(1), 3–33. https://doi.org/10.1177/1529100614525555

Kubíček, P., Šašinka, Č., Stachoň, Z., Štěrba, Z., Apeltauer, J., & Urbánek, T. (2016). Cartographic design and usability of visual variables for linear features. *The Cartographic Journal, 54*(1), 91–102. https://doi.org/10.1080/00087041.2016.1168141

Kukaňová, M. (2017). *Porovnání dvou typů vizualizací z hlediska percepční a kognitivní zátěže a kognitivních schopností jedince.* [Comparison of the two types of visualization in terms of perceptual and cognitive load, and personal cognitive abilities]. [Doctoral Dissertation]. Brno: Masaryk University. https://is.muni.cz/auth/th/djk1o/

Levine, T., Bresnahan, M., Park, H., Lapinski, M., Wittenbaum, G., Shearman, S., … & Ohashi, R. (2003). Self-construal scales lack validity. *Human Communication Research, 29*(2), 210–252. https://doi.org/10.1111/j.1468-2958.2003.tb00837.x

Lewandowsky, S., Herrmann, D. J., Behrens, J. T., Li, S., Pickle, L., & Jobe, J. B. (1993). Perception of clusters in statistical maps. *Applied Cognitive Psychology, 7*(6), 533–551. https://doi.org/10.1002/acp.2350070606

Lu, L., & Gilmour, R. (2007). Developing a new measure of independent and interdependent views of the self. *Journal of Research in Personality, 41*(1), 249–257. https://doi.org/10.1016/j.jrp.2006.09.005

MacEachren, A. (1995). *How maps work: Representation, visualization, and design*. New York: Guilford Press.

MacKinnon, D. P., Krull, J. L., & Lockwood, C. M. (2000). Equivalence of the mediation, confounding and suppression effect. *Prevention Science: The Official Journal of the Society for Prevention Research, 1*(4), 173–181. https://doi.org/10.1023/A:1026595011371

Markus, H., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*(2), 224–253. https://doi.org/10.1037/0033-295X.98.2.224

Masuda, T. (2017). Culture and attention: Recent empirical findings and new directions in cultural psychology. *Social and Personality Psychology Compass, 11*(12), e12363. https://doi.org/10.1111/spc3.12363

Masuda, T., & Kitayama, S. (2004). Perceived-induced constraint and attitude attribution in Japan and in the US: A case for cultural dependence of the correspondence bias. *Journal of Experimental Social Psychology, 40*(3), 409–416. https://doi.org/10.1016/j.jesp.2003.08.004

Masuda, T., & Nisbett, R. (2001). Attending holistically versus analytically: Comparing the context sensitivity of Japanese and Americans. *Journal of Personality and Social Psychology, 81*(5), 922–934. https://doi.org/10.1037//0022-3514.81.5.922

Masuda, T., & Nisbett, R. (2006). Culture and change blindness. *Cognitive Science, 30*(2), 381–399. http://dx.doi.org/10.1207/s15516709cog0000_63

Matsumoto, D. (1999). Culture and self: An empirical assessment of Markus and Kitayama's theory of independent and interdependent self-construals. *Asian Journal of Social Psychology, 2*(3), 289–310. https://doi.org/10.1111/1467-839X.00042

McCleary, G. (1975). In pursuit of the map user. In J. Kavaliunas (Ed.), *Proceedings of the International Symposium on Computer-Assisted Cartography: Auto Carto II* (pp. 238–250), Washington: U.S. Department of Commerce, Bureau of the Census. http://cartogis.org/docs/proceedings/archive/auto-carto-2/pdf/auto-carto-2.pdf

McKone, E., Davies, A., Fernando, F., Aalders, R. Leung, H., Wickramariyaratne, T., & Platow, M. (2010). Asia has the global advantage: Race and visual attention. *Vision Research, 50*(16), 1540–1549. https://doi.org/10.1016/j.visres.2010.05.010

Miyamoto, Y., & Kitayama, S. (2002). Cultural variation in correspondence bias: The critical role of attitude diagnosticity of socially constrained behavior. *Journal of Personality and Social Psychology, 83*(5), 1239–1248. https://doi.org/10.1037/0022-3514.83.5.1239

Montello, D. R., (2002). Cognitive map-design research in the twentieth century: Theoretical and empirical approaches. *Cartography and Geographic Information Science, 29*(3), 283–304. https://doi.org/10.1559/152304002782008503

Morita, T. (2004). *Ubiquitous mapping in Tokyo*. International joint workshop on ubiquitous, pervasive and Internet mapping (UPIMap2004), Tokyo, Japan. https://www.geospatialweb.com/www.ubimap.net/upimap2004/html/papers/UPIMap04-A-01-Morita.pdf

Moore, R. (2005). Generation Ku: Individualism and China's millennial youth. *Ethnology, 44*(4), 357–376. http://doi.org/10.2307/3774095

Morris, M., & Peng, K. (1994). Culture and cause: American and Chinese attributions for social and physical events. *Journal of Personality and Social Psychology, 67*(6), 949–971. https://doi.org/10.1037/0022-3514.67.6.949

Na, J., Grossmann, I., Varnum, M., Kitayama, S., Gonzalez, R., & Nisbett, R. (2010). Cultural differences are not always reducible to individual differences. *Proceedings of the National Academy of Sciences of the United States of America, 107*(14), 6192–6197. https://doi.org/10.1073/pnas.1001911107

Navon, D. (1977). Forest before trees: The precedence of global features in visual perception. *Cognitive Psychology, 9*(3), 353–383. https://doi.org/10.1016/0010-0285(77)90012-3

Nelson, E., Dow, D., Lukinbeal, C., & Farley, R. (1997). Visual search processes and the multivariate point symbol. *Cartographica, 34*(4), 19–33. http://doi.org/10.3138/15T3-3222-X25H-35JU

Nisbett, R. (2003). *The Geography of thought: How Asians and Westerners think differently… and why*. New York: The Free Press.

Nisbett, R., & Masuda, T. (2003). Culture and point of view. *Proceedings of the National Academy of Sciences, 100*(19), 11163–11170. https://doi.org/10.1073/pnas.1934527100

Nisbett, R., & Miyamoto, Y. (2005). The Influence of culture: Holistic versus analytic perception. *Trends in Cognitive Sciences, 9*(10), 467–473. https://doi.org/10.1016/j.tics.2005.08.004

Nisbett, R., Peng, K., Choi, I., & Norenzayan, A. (2001). Culture and systems of thought: Holistic versus analytic cognition. *Psychological Review, 108*(2), 291–310. https://doi.org/10.1037/0033-295x.108.2.291

Norenzayan, A., Smith, E., Kim, B. & Nisbett, R. (2002). Cultural preferences for formal versus intuitive

reasoning. *Cognitive Science, 26*(5), 653–684. https://doi.org/10.1207/s15516709cog2605_4

Nosal, C. S. (1990). *Psychologiczne modele umysłu*. [Psychological models of the mind]. Warsaw: PWN.

Ooms, K., De Maeyer, P., Dupont, L., Van der Veken, N., Van de Weghe, N., & Verplaetse, S. (2016). Education in cartography: What is the status of young people's map-reading skills? *Cartography and Geographic Information Science, 43*(2), 134–153. https://doi.org/10.1080/15230406.2015.1021713

Opach, T., Popelka, S., Doležalová, J., & Rød, J. K. (2018). Star and polyline glyphs in a grid plot and on a map display: Which perform better? *Cartography and Geographic Information Science, 45*(5), 400–419. https://doi.org/10.1080/15230406.2017.1364169

Oyserman, D., & Lee, S. (2008). Does culture influence what and how we think? Effects of priming individualism and collectivism. *Psychological Bulletin, 134*(2), 311–342. https://doi.org/10.1037/0033-2909.134.2.311

Oyserman, D., Coon, H., & Kemmelmeier, M. (2002). Rethinking individualism and collectivism: Evaluation of theoretical assumptions and meta-analyses. *Psychological Bulletin, 128*(1), 3–72. https://doi.org/10.1037/0033-2909.128.1.3

Peña, E. (2017). *Mapping visual literacy* [Doctoral Dissertation]. Vancouver: The University of British Columbia. http://doi.org/10.14288/1.0368982

Peterson, E., & Deary, I. (2006). Examining the wholistic-analytic style using preferences in early information processing. *Personality and Individual Differences, 41*(1), 3–14. https://doi.org/10.1016/j.paid.2005.12.010

Popelka, S., Stachoň, Z., Šašinka, Č., & Doležalová, J. (2016). EyeTribe tracker data accuracy evaluation and its interconnection with Hypothesis software for cartographic purposes. *Computational Intelligence and Neuroscience, 2016*, 1–14. https://doi.org/10.1155/2016/9172506

Robinson, A. (1952). *The look of maps: An examination of cartographic design*. Madison: University of Wisconsin Press.

Sadahiro, Y. (1997). Cluster perception in the distribution of point objects. *Cartographica, 34*(1), 49–62. https://doi.org/10.3138/Y308-2422-8615-1233

Šašinka, Č., Morong, K., & Stachoň, Z. (2017). The Hypothesis platform: An online tool for experimental research into work with maps and behavior in electronic environments. *ISPRS International Journal of Geo-Information, 6*(12), 1–22. https://doi.org/10.3390/ijgi6120407

Šašinka, Č., Stachoň, Z., Kubíček, P., Tamm, S., Matas, A., & Kukaňová, M. (2018). The Impact of global/local bias on task-solving in map-related tasks employing extrinsic and intrinsic visualization of risk uncertainty maps. *The Cartographic Journal, 55*(4), 1–17. https://doi.org/10.1080/00087041.2017.1414018

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

Slocum, T. A., McMaster, R. B., Kessler, F. C., & Howard, H. H. (2005). *Thematic cartography and geographic visualization.* New Jersey: Pearson Prentice Hall.

Stachoň, Z., Šašinka, Č., Čeněk, J., Štěrba, Z., Angsuesser, S., Fabrikant, S., ... & Morong, K. (2019). Cross-cultural differences in figure-ground perception of cartographic stimuli. *Cartography and Geographic Information Science*, *46*(1), 82–94. https://doi.org/10.1080/15230406.2018.1470575

Stachoň, Z., Šašinka, Č., Čeněk, J., Angsüsser, S., Kubíček, P., Štěrba, Z., & Bilíková. M., (2018). Effect of size, shape and map background in cartographic visualization: Experimental study on Czech and Chinese populations. *ISPRS International Journal of Geo-Information, 7*(427), 1–15. https://doi.org/10.3390/ijgi7110427

Steele, L., & Lynch, S. (2013). The pursuit of happiness in China: Individualism, collectivism, and subjective well-being during China's economic and social transformation. *Social Indicators Research, 114*(2), 441–451. https://doi.org/10.1007/s11205-012-0154-1

Takano, Y., & Osaka, E. (1999). An unsupported common view: Comparing Japan and the US on individualism/collectivism. *Asian Journal of Social Psychology, 2*(3), 311–341. https://doi.org/10.1111/1467-839X.00043

Takano, Y., & Osaka, E. (2018). Comparing Japan and the United States on individualism/collectivism: A follow-up review. *Asian Journal of Social Psychology, 21*(4), 301–3016. https://doi.org/10.1111/ajsp.12322

Tan, Y. (2016). *East-West cultural differencies in Visual Attention Tasks: Identifying multiple mechanism and developing a predictive model* [Doctoral dissertation]. Michigan: Michigan Technological University. https://digitalcommons.mtu.edu/etdr/141

Triandis, H., & Gelfand, M. (1998). Converging measurement of horizontal and vertical individualism and collectivism. *Journal of Personality and Social Psychology, 74*(1), 118–128. https://doi.org/10.1037/0022-3514.74.1.118

Tu, Y. K., Gunnell, D., & Gilthorpe, M. S. (2008). Simpson's Paradox, Lord's Paradox, and Suppres-

sion effects are the same phenomenon – the reversal paradox. *Emerging Themes in Epidemiology, 5*(2), 1–9. https://doi.org/10.1186/1742-7622-5-2

Tversky, B. (1981). Distortions in memory for maps. *Cognitive Psychology, 13*(3), 407–433. https://doi.org/10.1016/0010-0285(81)90016-5

Uskul, A., Kitayama, S., & Nisbett, R. (2008). Ecocultural basis of cognition: Farmers and fishermen are more holistic than herders. *Proceedings of the National Academy of Sciences of the United States of America, 105*(25), 8552–8556. https://doi.org/10.1073/pnas.0803874105

Varnum, M., Grossmann, I., Katunar, D., Nisbett, R., & Kitayama, S. (2008). Holism in a European cultural context: Differences in cognitive style between Central and East Europeans and Westerners. *Journal of Cognition and Culture, 8*(3), 321–333. https://doi.org/10.1163/156853708X358209

Vignoles, V., Owe, E., Becker, M., Smith, P., Easterbrook, M., Brown, R., … & Bond, M. (2016). Beyond the 'east-west' dichotomy: Global variation in cultural models of selfhood. *Journal of Experimental Psychology: General, 145*(8), 966–1000. https://doi.org/10.1037/xge0000175

von Mühlenen, A., Bellaera, L., Singh, A., & Srinivasa, N. (2018). The effect of sadness on global-local processing. *Attention, Perception, & Psychophysics, 80*(5), 1072–1082. https://doi.org/10.3758/s13414-018-1534-7

Wagemans, J., Elder, J., Kubovy, M., Pamer, M., Peterson, M., Sing, M., & von der Heydt (2012). A Century of Gestalt psychology in visual perception: I. Perceptual grouping and figure-ground organization. *Psychological Bulletin, 138*(6), 1172–1217. https://doi.org/10.1037/a0029333

Witkin, H., Moore, C., Goodenough, D., & Cox, P. (1977). Field dependent and field independent cognitive styles and their educational implications. *Review of Educational Research, 47*(1), 1–64. https://doi.org/10.3102/00346543047001001

Wood, D. (1984). Cultured symbols: Thoughts on the cultural context of cartographic symbols. *Cartographica, 21*(4), 9–37. https://doi.org/10.3138/B88T-68X3-L0J1-0226

Yates, J., Ji, L-J., Oka, T., Lee, J-W., Shinotsuka, H., & Sieck, W. (2010). Indecisiveness and culture: Incidence, values, and thoroughness. *Journal of Cross-cultural Psychology, 41*(3), 428–444. https://doi.org/10.1177/0022022109359692

Studia Psychologica, Vol. 62, No. 1, 2020, 44-57
https://doi.org/10.31577/sp.2020.01.790

# The Role of Teacher Support, Students' Need Satisfaction, and Their Psychological Capital in Enhancing Students' Self-regulated Learning

Simona Lidia Sava[1], Delia Vîrgă[2], Ramona Palos[2]
[1] Department of Educational Sciences, West University of Timisoara, Romania
[2] Department of Psychology, West University of Timisoara, Romania

Because self-regulated learners do better in university and tend to be successful students, many authors consider that the development of self-regulatory learning skills in students has to become a priority for higher education. The present study aimed to investigate the explanatory role of psychological capital, as a personal resource, over and above teacher support and needs satisfaction, in relation to students' preference for self-regulating their learning (i.e., using cognitive strategies and self-regulation in academic learning). Data were collected from a convenience sample made up of 236 Romanian first-year students of psychology. Hierarchical multiple regressions indicated that psychological capital has an important role, over teacher support and the need for competence satisfaction, in the explanation of the students' preference for self-regulating their learning. From the practical perspective, research findings support educational practice interventions in enhancing self-regulation learning, because all three explored variables are changeable or malleable and can be fulfilled or improved through training.

*Key words*: teacher support, need satisfaction, psychological capital, self-regulated learning

## Introduction

Self-regulation can be defined as self-generated thoughts, feelings, and actions in attaining important goals in life (Zimmerman, 1998, p. 73). In an academic environment, self-regulated students are seen as proactive learners who pursue their personal goals, use different learning strategies, and continually monitor their progress (Zimmerman, 1990). Because they do better at university (Bakracevic-Vukman & Licardo, 2010), and tend to be successful students (Andrzejewski, Davis, Bruening, & Poirier, 2016; Zusho, 2017), the development of their skills to self-regulate learning has to become a priority for higher education (Cassidy, 2011). Instruction teachers' behavior or learning environment can have a great impact on the way students self-regulate their learning (Boekarts & Cascallar, 2006; Dignath & Werf, 2012). On the other hand, students' commitment to engage in self-regulated learning is a voluntary act (Andrzejewski et al., 2016; Cleary & Zimmerman, 2004). It is not enough for students to have self-regulated skills or an "enabling environment", they need to be motivated to involve themselves in self-

Correspondence concerning this article should be addressed to Ramona Palos, Department of Psychology, West University of Timisoara, 4 Vasile Pârvan Blvd., room 233, 300223 Timisoara, Romania. E-mail: ramona.palos@e-uvt.ro
ORCID https://orcid.org/0000-0002-4426-8178
Supplemental information for this article can be accessed at https://www.studiapsychologica.com/index.php/view-articles/
Received April 16, 2019

regulated learning (Cassidy, 2011; Pintrich & de Groot, 1990). Therefore, we should consider at least the following two mutually dependent resources involved in fostering students' self-directed learning: social or contextual variables and personal variables (Pintrich, 2000).

In our study, the social or contextual variables with an impact on students' self-regulated learning refer to *teacher support* (e.g., help, guidance, feedback). The personal variables refer to *students' psychological needs* (i.e., autonomy, competence, and relatedness), which can be satisfied in relation to other contextual variables (e.g., teacher support or learning environment), and to *students' psychological capital*. As a newly proposed construct, students' psychological capital represents a set of malleable personal resources consisting of self-efficacy, hope, optimism, and resilience (Carmona-Halty, Schaufeli, & Salanova, 2019). It is considered a valuable individual resource for the effectiveness of learning, influencing students' readiness and desire to learn and to transfer learning (Combs, Luthans, & Griffith, 2009).

Instructors can teach students how to regulate their learning by increasing the complexity of the study and learning strategies (Cleary & Zimmerman, 2004), by encouraging them to control their learning process, or by adjusting their cognition and effort to the demands of the learning tasks (Pintrich & de Groot, 1990). If teachers provide students with support, guidance or feedback, they will create an educational environment that can satisfy the students' psychological needs and increase their study engagement (Rahmadani, Schaufeli, Ivanova, & Osin, 2019). Moreover, building high-quality relationships with their students (i.e., satisfying their need for relatedness), teachers can help students to develop their psychological capital (i.e., a source of motivational energy, which may help students to strive for and achieve their goals – You, 2016), which, in turn, would develop their necessary skills and attitudes to meet academic requirements (Carmona-Halty et al., 2019). Psychological capital increases positive emotions (Probst, Gailey, Jiang, & Bohle, 2017), and positive emotions enhance students' motivation and their use of learning strategies (You, 2016). Also, the development of students' psychological capital is significant for psychological needs satisfaction (Luthans & Youssef, 2007; Verleysen, Lambrechts, & Acker, 2015) which, in turn, can promote students' self-regulated learning (Liu et al., 2014).

There is some research emphasizing the influence of teacher support (Dignath, 2016; Zhu & Mok, 2018), students' need satisfaction (Liu et al., 2014; Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009) or psychological capital (You, Kim, & Kang, 2014) on students' self-regulated learning separately, but little is known about these three variables taken together, especially how psychological capital can increase their impact. Consequently, the present study aimed to fill this gap by investigating *the explanatory role of psychological capital, as a personal resource, over and above teacher support and needs satisfaction, in relation to students' preference for self-regulating their learning (i.e., using cognitive strategies and self-regulation in academic learning).* Specifically, this research could provide valuable insights for practice by developing interventions focus on teachers and students training, because these three investigated variables are changeable or malleable, and can be improved (teachers support), satisfied/fulfilled (basic needs), or increased and developed (psychological capital).

## Self-Regulated Learning and Teacher Support

Self-regulated learning is considered to be an active process through which learners systematically use metacognitive, motivational, and behavioral strategies (Zimmerman, 1990; Zusho, 2017). From the classroom performance perspective, three components are considered essential: the cognitive strategies used in the learning process, the metacognitive strategies applied for planning, monitoring or changing learning, and effort management strategies practiced to work diligently and deal with difficult tasks (Pintrich, 2004).

Metacognitive and effort management strategies were labeled as self-regulation, and along with cognitive strategies, are related to the cognitive component of self-regulated learning (Pintrich & de Groot, 1990).

Because self-regulated learning is linked to or directly involved in academic performance (Rotgans & Schmidt, 2009; Schloemer & Brenan, 2006; Schunk, 2005), assisting students to become self-regulated learners is crucial. Teachers can foster self-regulated learning directly, by instructing students on how to learn and use learning strategies, and indirectly, by creating those learning environments which enable self-regulation (Dignath & Werf, 2012; Dignath, 2016). They can provide students with explicit information about efficient practices and offer formative feedback on learning (Brown, Peterson, & Yao, 2016; Zhu & Mok, 2018). Received feedback is a valuable facilitator of self-regulated learning, especially when it is specific and formative, and students perceive it as being useful for their learning (Zhu & Mok, 2018). Creating multiple curriculum opportunities and structuring the learning environment to allow students to practice and generalize cognitive and metacognitive strategies are also tactics to encourage students' self-regulated learning (Lopez-Agudo & Marcenaro-Gutierrez, 2017). It is not sufficient for teachers to develop a constructivist learning environment that enhances students' autonomy, they also need to teach them how to handle this autonomy in the learning process (Dignath & Werf, 2012), and provide them with structure. Autonomy sustains students' engagement in self-regulated learning, while structure teaches them how to use self-regulatory strategies (Sierens et al., 2009). Active teaching methods that increase student-teacher and student-student interactions, as well as specific assessment practices, might influence students' self-regulated learning as well (Lopez-Agudo & Marcenaro-Gutierrez, 2017; Rotgans & Schmidt, 2009).

Based on the above arguments, we formulated the first hypothesis:

*Hypothesis 1.* Teacher support positively relates to students' cognitive strategies used in the learning process (H1a), and positively to students' self-regulation (use of metacognitive and effort management strategies) (H1b).

**Self-Regulated Learning and Need Satisfaction**

According to the Self-Determination Theory, autonomy, competence, and relatedness are the three psychological needs linked directly to a person's efficient functioning and well-being (Deci & Ryan, 2000). The *need for autonomy* refers to students' desire to control their choices and to have psychological freedom when carrying out a learning task or an activity (van den Broeck, Vansteenkiste, De Witte, Soenens, & Lens, 2010; DeHaan, Hirai, & Ryan, 2016; Orkibi & Ronen, 2017). The *need for competence* indicates the person's desire to experience efficacy and mastery in different educational situations (González-Cutre, Sicilia, Sierra, Ferriz, & Hagger, 2016; Orkibi & Ronen, 2017). The *need for relatedness* describes the students' desire to be connected with significant others and to be accepted as members of a group (van den Broeck et al., 2010; Orkibi & Ronen, 2017).

When students' psychological needs are satisfied, they become highly intrinsically motivated and self-regulate more their learning (Sierens et al., 2009). When the learning environment supports autonomy by giving them freedom of control (Liu et al., 2014), supports competence by offering structure, and supports involvement through relatedness, engagement in self-regulated learning is highly probable (Grolnick & Raftery-Helmer, 2015). Emphasizing educational activities based on interactions between students, which foster social relatedness, may influence their use of learning strategies and intrinsic motivation. Such contexts can facilitate students' engagement, deeper processing and learning, and enhance personal adjustment in classrooms and beyond (Deci, Ryan, & Williams, 1996). Students' fulfillment of psychological needs shapes their academic performance, engagement, persistence, and effort invested in study activities (Gillet et al., 2019; Sulea, van Beek, Sârbescu,

Vîrga, & Schaufeli, 2015). This leads to the following hypothesis:

*Hypothesis 2*. Needs satisfaction positively relates to students' cognitive strategies used in the learning process (H2a), and positively to students' self-regulation (use of metacognitive and effort management strategies) (H2b).

**Self-Regulated Learning and Psychological Capital**

Psychological capital (PsyCap) represents "one's positive appraisal of circumstances and probability for success based on motivated effort and perseverance" (Luthans, Avolio, Avey, & Norman, 2007, p. 550). Four psychological resources are included in this construct: self-efficacy, hope, optimism, and resilience (Luthans, Avolio, et al., 2007). "*Self-efficacy* is linked to one's confidence to take on and put in the necessary effort to succeed in challenging tasks; *hope* refers to the perseverance towards goals or the redirection path to goals in order to succeed; *optimism* consists of making a positive attribution about succeeding now and in the future; and *resilience* relates to ones' ability, when faced with adversity, to sustain one's efforts to attain success" (Luthans, Youssef, & Avolio, 2007, p. 3). Psychological capital is viewed as a core construct because the four psychological resources together have an impact more significant than the sum of their individual effects (Luthans, Avolio, et al., 2007; Luthans & Avolio, 2014; Wernsing, 2014). Also, essential for practice is the idea that psychological capital can be developed and improved through training interventions (Dello Russo & Stoykova, 2015; Luthans, Avolio, et al., 2007; Lupsa, Vîrgă, Maricutoiu, & Rusu, 2019).

There are only a few studies carried out in the academic settings that explored the relationships of psychological capital with different variables, and most of them are linked to academic performance. For example, Ortega-Maldonado and Salanova (2017) investigated the relationships between undergraduate students' psychological capital, their coping strategies, satisfaction with university life, and academic performance. Siu, Bakker, and Jiang (2014) tested the relationship between psychological capital and study engagement, and how intrinsic motivation mediates these relationships. Other research emphasized the role of psychological capital on students' academic performance and showed how training increased the participants' level of psychological capital (Jafri, 2013; Luthans, Luthans, & Jensen, 2012).

To our best knowledge, little attention has been paid to the impact of psychological capital on self-regulated learning and students' need satisfaction. Previous research found that students' psychological capital is significantly related to self-regulated learning and study engagement (You et al., 2014), and might influence learning motivation and learning transfer (Combs et al., 2009). You (2016) showed positive associations between psychological capital of college students and their learning empowerment (i.e., the feeling of competence to perform a task), and how this indirectly enhanced engagement. Also, previous investigations have shown that the satisfaction of needs for autonomy, competence, and relatedness could contribute to the development of psychological capital (Luthans & Youssef, 2007). Carmona-Halty et al. (2019) emphasized that students' psychological capital can be enhanced if they have high-quality relationships with their teachers (i.e., their need for relatedness is satisfied). Teacher and peer support can increase academic engagement and students' hope (one of the psychological capital resources) as well (Orkibi & Ronen, 2017). Conversely, Verleysen, Lambrechts, and Acker (2015) found that satisfying the need for competence influences all four psychological capital dimensions, while there was no direct impact on psychological capital by satisfying the needs for autonomy and relatedness. Based on the scarcity of information in this area, the aim of our study was to evaluate the added value that psychological capital has over teacher support and needs satisfaction in explaining students' cognitive strategies and their self-regulation used in the learning pro-

cess. Consequently, we formulate the third hypothesis:

*Hypothesis 3*. Psychological capital positively relates to students' cognitive strategies used in the learning process (H3a), and positively to students' self-regulation (H3b), after controlling for the effect of teacher support and needs satisfaction.

## Methods

### Participants and Procedures

Data were obtained from a convenience sample made up of 236 Romanian first-year students of Psychology enrolled in Educational Psychology courses. The participants included 58 men (24.6%) and 178 women (75.4%), with an age range from 19 to 53 years ($M$ = 21.18, $SD$ = 3.95). All the freshmen students were informed about the research (e.g., the aim, the conditions of the study, confidentiality of their responses), and anyone who wanted to participate in the research received a link to fill in four questionnaires online. The link was posted on the course communication group, and students needed about 30 minutes to fill in the questionnaires. From 324 students, only 236 replied (72.83% response rate). The questionnaires were posted online in the last week of the first semester.

### Measures

Three of the questionnaires were already validated on Romanian samples (i.e., PsyCap, needs satisfaction, and MSLQ), and the other one (i.e., teacher support) was used in previous studies. All the items and instructions were adapted to be relevant to the academic environment.

*Self-regulated learning* was assessed by using the second section of the Motivated Strategies for Learning Questionnaire (MSLQ – Pintrich & de Groot, 1990), considered the most commonly used instrument in self-regulated learning measurement (Panadero, 2017; Kokkinos & Voulgaridou, 2018). This section consisted of two cognitive scales and measured students' use of cognitive strategies and their self-regulation. Cazan (2011) investigated the convergent and predictive validity of the scales, after their translation into Romanian, and the findings showed that they are able to measure students' learning strategies in a reliable and valid manner. The use of cognitive strategies sub-scale was made up of 13 items, which focus on rehearsal (e.g., "When I study for a test I practice saying the important facts over and over to myself."), elaboration (e.g., "When I study for a test, I try to put together the information from class and the book.") and organizational strategies (e.g., "I outline the chapters in my book to help me study."). Cronbach's alpha for the sub-scale was .84. The self-regulation sub-scale was made up of 9 metacognitive strategy items (e.g., "I ask myself questions to make sure I know the material I have been studying.") and effort management strategy items (e.g., "I work hard to get a good grade even when I don't like a class."). Cronbach's alpha for the sub-scale was .67, a value that can be considered acceptable (Sierens et al., 2009). All items were scored on a 7-point Likert scale (1 – not at all true of me, 7 – very true of me).

*Teacher support* was measured by using a scale from the Questionnaire on the Experience and Evaluation of Work (QEEW – van Veldhoven & Meijman, 1994), which assesses support by direct supervisors. It is a 5-items scale used in another Romanian research (Vîrgă, De Witte, & Cifre, 2017) that had been adapted for educational context to assess teacher support. The extent to which an answer applies to students was scored on a 5-point Likert scale (1 – never, 5 – always) (e.g., "Can you count on your teachers' support when you encounter difficulties?"). The internal consistency for the scale was .88.

*Students' need satisfaction* was assessed with the Need Satisfaction at Work Scale (van den Broeck et al., 2010), adapted to the Romanian context by Tânculescu and Iliescu (2014) and showed good psychometric characteristics. Three subscales are included in the instrument: autonomy satisfaction (6 items; e.g., "I feel free to express my ideas and opin-

ions at university."), competence satisfaction (6 items; e.g. "I feel competent as a student."), and relatedness satisfaction (6 items; e.g., "At university, I can talk to people about things that really matter to me."). Participants responded by using a 5-point Likert scale (1 – totally disagree, 5 – totally agree). The Cronbach's alpha coefficient values range from .72 to .91. The questionnaire has been used previously in another study on Romanian students (Sulea et al., 2015).

*Students' psychological capital* was measured with a 24-item PsyCap Questionnaire (Luthans et al., 2007). The instrument was validated on the Romanian population with good psychometric characteristics (Lupsa & Vîrgă, 2018). The questionnaire assesses four psychological resources: self-efficacy (6 items; e.g., "I feel confident analyzing a long-term problem to find a solution"), hope (6 items; e.g., "At present, I am energetically pursuing my study goals"), optimism (6 items; e.g., "I always look on the bright side of things regarding my studies") and resilience (6 items; e.g., "I usually manage difficulties one way or another at university"). Items were assessed using a 7-point Likert scale (1 – strongly disagree, 7 – strongly agree). Because empirical results have shown that overall psychological capital is a core construct (Luthans & Avolio, 2014; Wernsing, 2014), the composite score was used. The internal consistency of the entire questionnaire in our sample was $\alpha = .91$.

**Data Analysis**

The means, standard deviations, internal consistency alphas, and Pearson correlation between all the study variables are presented in Table 1. All variables had normal distributions (Skewness and Kurtosis < 1). Thus, a general guideline for skewness and kurtosis is that numbers should be in between interval ±1 (Hair, Hult, Ringle, & Sarstedt, 2017). Based on this guideline, the values of skewness and kurtosis for our variable are included in this range. Thus, the distributions are considered normal. The analyses were performed using IBM SPSS Statistics 23.0.

The study's hypotheses were tested by conducting two separately hierarchical regression analyses. The first considered the cognitive strategies component of self-regulated learning, and the second focused on the self-regulation component (metacognitive and effort management strategies) as criterion variables (Table 2). Teacher support, students' need satisfaction, and psychological capital were the predictor variables. *Teacher support* was included in the first step because it is considered a valuable social/contextual resource with an impact on the self-regulated learning process. Teachers can provide students with explicit information about efficient practices, can create multiple curriculum opportunities that encourage self-regulated learning, and can structure the learning environment to allow students to practice and generalize strategies (Paris & Paris, 2001). Also, students' use of learning strategies might be influenced by the teaching methods and the assessment practices (Rotgans & Schmidt, 2009). The other two variables (i.e., students' need satisfaction and psychological capital) included in the second and the third steps of the analysis are considered personal resources. Students' needs can be satisfied in relation to the learning environment. If this environment supports their autonomy, provides opportunities to acquire skills and fosters social relatedness there is an excellent chance for students to engage in self-regulated learning in the classroom (Liu et al., 2014). Psychological capital, as a source of motivational energy, was included in the third step of the regression to investigate the explanatory role of this malleable resource, over and above teacher support and needs satisfaction, in relation to cognitive strategies and self-regulation in academic learning.

## Results

Table 1 presents the correlation matrix between study variables. All predictors (i.e., teacher support, students' need satisfaction, and psychological capital) showed positive and significant correlations with each of the dependent variables, respectively, the stu-

dents' cognitive strategies and their self-regulation.

The first hypothesis of the study – Teacher support positively relates to students' cognitive strategies used in the learning process (H1a), and positively to students' self-regulation (use of metacognitive and effort management strategies) (H1b) – received statistical support as follows (Table 1). Significant positive associations were found between teacher support and the use of cognitive strategies ($r$ = .34, $p$ < .001; H1a), and between teacher support and students' self-regulation ($r$ = .40, $p$ < .001; H1b).

The second hypothesis – Needs satisfaction positively relates to students' cognitive strategies used in the learning process (need for autonomy: $r$ = .16, $p$ < .01; need for competence: $r$ = .34, $p$ < .001; need for relatedness: $r$ = .14, $p$ < .05; H2a), and positively to students' self-regulation (use of metacognitive and effort management strategies) (need for autonomy: $r$ = .28, $p$ < .001; need for competence: $r$ = .46, $p$ < .001; need for relatedness: $r$ = .20, $p$ < .001; H2b) - also received statistical support (Table 1). Thus, all three psychological needs (i.e., autonomy, competence, and relatedness) correlated positively and significantly with students' cognitive strategies (H2a), and self-regulation (H2b).

Psychological capital correlated positively and significantly with cognitive strategies ($r$ = .61, $p$ < .001) and with self-regulation ($r$ = .51, p < .001).

The results of hierarchical regression analysis with the two dependent variables (i.e., cognitive strategies and self-regulation) are presented in Table 2. Regarding the use of cognitive strategies as the criterion measure, in the first step, teacher support accounted for 11.4% of the variance ($R^2$ = .114), and the model of regression was significant [$F$(1, 234) = 30.23, $p$ < 0.001]. By adding in the second step of the regression model, the need for autonomy, competence and relatedness, and controlling the influence of teacher support, the predictive value of the second model (also significant [$F$(3, 231) = 4.54, $p$ < 0.001],) increased to 16.4% ($\Delta R^2$ = .049); specifically, the need for competence added significant variance ($\beta$ = .26, $p$ < 0.001). In the third step, the psychological capital was related to the use of cognitive strategies ($\beta$ = .63; $p$ < 0.001) and explained 23.5% of additional variance [$\Delta R^2$ = .235; $F$(1, 230) = 89.96, $p$ < 0.001], after controlling the influence of the students' need and teacher support. The final model, which includes all five predictors, explained students' use of cognitive strategies in the learning process at a rate of 39.9% ($R^2$ = .399).

Also, Table 2 shows that for students' preference for engaging in self-regulation as the criterion measure, teacher support at Step 1 accounted for 15.7% of the variance ($\beta$ = .39; $p$ < 0.001), and the first model of the regression was significant [$F$(1, 234) = 43.45, $p$ < 0.001]. In Step 2, students' needs accounted for an additional 10.3% of the variance ($\Delta R^2$ =103), after controlling the influence of teacher support, the second model being also significant [$F$(3, 231) = 10.72, $p$ < 0.001]; specifically, the need for competence added sig-

Table 1 *Correlation matrix between study variables*

| Variables | *M* | *SD* | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|---|
| 1. Cognitive Strategies | 66.72 | 11.88 | *(.84)* | | | | | | |
| 2. Self-regulation | 41.69 | 7.34 | .66** | *(.67)* | | | | | |
| 3. Teacher support | 18.96 | 4.13 | .34** | .40** | *(.88)* | | | | |
| 4. Need for Autonomy | 20.11 | 4.52 | .16* | .28* | .48** | *(.72)* | | | |
| 5. Need for Competence | 23.94 | 5.36 | .34** | .46** | .44** | .45** | *(.91)* | | |
| 6. Need for Relatedness | 21.30 | 5.65 | .14* | .20** | .39** | .38** | .28** | *(.86)* | |
| 7. PsyCap | 4.59 | .95 | .61** | .51** | .45** | .43** | .61** | .24** | *(.91)* |

*Note*. $N$ = 236; ** $p$ < 0.01; * $p$ < 0.05; Self-regulated learning: cognitive strategies and self-regulation dimensions; Students' need satisfaction: need for autonomy satisfaction, need for competence satisfaction, need for relatedness satisfaction; Students' psychological capital = PsyCap; Values of the internal consistency alphas are displayed in italic in the diagonal.

Table 2 *Hierarchical regression analysis predicting the two components of self-regulated learning (i.e., cognitive strategies and self-regulation components)*

| *Variables* | *Self-regulated learning* | | | | | |
|---|---|---|---|---|---|---|
| | *Cognitive strategies* | | | *Self-regulation* | | |
| | $R^2$ | $\Delta R^2$ | $\beta$ | $R^2$ | $\Delta R^2$ | $\beta$ |
| *Step 1* | .114 | .114** | | .157 | .157** | |
| Teacher support | | | .33** | | | .39** |
| *Step 2* | .164 | .049** | | .260** | .103** | |
| Teacher support | | | .26** | | | .23** |
| Need for autonomy | | | -.08 | | | .00 |
| Need for competence | | | .26** | | | .35** |
| Need for relatedness | | | -.01 | | | .00 |
| *Step 3* | .399 | .235** | | .319** | .059** | |
| Teacher support | | | .15* | | | .17** |
| Need for autonomy | | | -.16** | | | -.04 |
| Need for competence | | | -.04 | | | .20** |
| Need for relatedness | | | -.00 | | | .01 |
| PsyCap | | | .63** | | | .31** |

*Note*. $N$ = 236; ** $p < 0.01$; * $p < 0.05$; Self-regulated learning: cognitive strategies dimension and self-regulation dimension; Students' need satisfaction: need for autonomy, competence and relatedness satisfaction; Students' psychological capital = PsyCap.

nificant variance ($\beta$ = .35, $p < 0.001$). In the third step, students' psychological capital was related to self-regulation ($\beta$ = .31; $p < 0.001$) and explained 5.9% of additional variance [$\Delta R^2$ = .059; $F(1, 230) = 19.86$, $p < 0.001$], after controlling the influence of students' needs and teacher support. The final model that includes all five predictors explained students' self-regulation of the learning process at a rate of 31.9% ($R^2$ = .319).

Altogether, the results of all the regression analyses supported Hypothesis 3, which stated that psychological capital positively relates to students' cognitive strategies used in the learning process (H3a), and positively to students' self-regulation (H3b), after controlling for the effect of teacher support and needs satisfaction.

## Discussion

The current study aimed to investigate the explanatory role of psychological capital, as a personal resource, over and above teacher support and needs satisfaction, in relation to students' preference for self-regulating their learning (i.e., using cognitive strategies and self-regulation in academic learning). The results indicated that psychological capital, as a personal resource, plays an essential role, after controlling for teacher support and needs satisfaction, in the explanation of the students' preference for using cognitive strategies and self-regulation in academic learning. In other words, students who got more support from their teachers in the learning process, who felt that their need for competence was satisfied during instruction, and who had a high level of psychological capital, reported a higher preference for the use of cognitive and metacognitive strategies, and self-regulating their effort.

The results of the study confirmed the first hypothesis. Teacher support was positively related to students' use of cognitive, metacognitive, and effort management strategies, and it was identified as a predictor of students' self-regulated learning. This is following other studies that emphasized the influence of teacher support (Dignath, 2016; Paris & Paris, 2001). Students who ask for, receive and use teachers' support about how to link learning strate-

gies with desired outcomes, or about relationships between cues and successive states of achievement, are more successful in self-regulating their learning (Brown et al., 2016).

The results of the study confirmed the second hypothesis as well. Needs satisfaction positively related to students' cognitive strategies and their self-regulation in the learning process. Despite these relationships, only the need for competence, the satisfaction of which is considered to stimulate people functioning and well-being on a more general level (van den Broeck, Vansteenkiste, de Witte, & Lens, 2008), was found as a significant predictor for self-regulated learning. Surprisingly, the need for autonomy negatively predicted the use of cognitive strategies, which is slightly different from other research. For example, Young (2005) pointed out that students who perceive themselves as being autonomous and competent tend to be intrinsically motivated. They know how to adjust their learning strategies to the content and requirements of the tasks, what kind of cognitive and metacognitive strategies they need to solve them, and how to manage their effort strategies. Also, that feeling of competence needs to be accompanied by feelings of autonomy for individuals to be self-regulated (Deci et al., 1996; Valero-Valenzuela & Manzano-Sánchez, 2019). The need for competence is reflected in students' understanding of how to self-regulate their learning, whereas the need for autonomy is reflected in the students' willingness to get involved in study activities (Grolnick & Raftery-Helmer, 2015). A possible explanation for our result could be linked to the reduced academic experience of the students. They were in the first year, and many of them did not know how to study, what to learn, or how to organize their work. Maybe, at this stage, they needed more structure and rules, with clear expectations regarding their behavior, and more help in engaging in learning tasks. Autonomy is linked to students' independence and their opportunity to make choices (e.g., learning strategies, effort, and persistence in academic tasks), but they might also experience autonomy satisfaction when they follow teachers' requests, rules or suggestions, and can act of their own free will if teachers give them rational motives why it is better to do so (van den Broeck et al., 2010). Teacher support (e.g., guidance, constructive feedback), can help students to increase confidence in monitoring their study behavior, and nurture their need for competence, namely the "know-how" of self-regulated learning. When the students become confident, they can develop the willingness (autonomy) to initiate self-regulated learning (Sierens et al., 2009).

Another meaningful result that confirmed the third hypothesis is the significant value added by psychological capital in explaining students' preference for cognitive, metacognitive, and use of effort management strategies. It has already been shown that psychological capital is a valuable resource for learning motivation (Combs et al., 2009) or learning empowerment (You, 2016), but few studies have approached psychological capital as a core construct in relation to self-regulated learning in educational settings (You, 2016). The level of psychological capital influences students' preferences for or engagement in self-regulated learning (You, 2016). Specifically, if students are generally more positive, confident, and flexible in the change process, they are willing to expend additional energy and effort to pursue their learning goals by using cognitive and metacognitive strategies (You, 2016). In the current study, students' psychological capital was positively related to their use of cognitive, metacognitive and effort management strategies, and it was also a predictor for both dimensions of self-regulated learning (i.e., cognitive strategies use and self-regulation). This means that students' psychological capital can have an essential role in cognitive strategies use and students' self-regulation of learning, if they get teacher support and have an environment that assures the satisfaction of their competence needs. What could be interesting about our results is that psychological capital had a higher impact on students' use of cognitive strategies than it had on their use of metacognitive and effort management strategies (the explained variance was more signifi-

cant in the first case, $\Delta R^2$ = .253). Cognitive strategies can be taught and learned through training, and then can be applied in learning situations (Dignath & van der Werf, 2012). However, self-regulation is more complex, and its quality depends on motivation (whether or how much to study), method (how to study), and time (how much time is spent studying and how effectively this time is spent) and is viewed as "a context-specific process that is selectively used to succeed in school" (Zimmerman, 1998, p. 73). In other words, it is not enough for students to have strategies, they need to be motivated to use the strategies in the learning process. The limited academic experience of our students in dealing with different courses and teachers, diverse styles and demands, and their insufficient time to adapt to the academic context and requirements (e.g., to know how to learn or how to manage tasks) (Gillet et al., 2019) could explain this result. Accordingly, further studies are necessary to determine if and how these variables are reflected in self-regulated learning. For example, based on these findings, a model could be tested, which would explore if psychological capital (as a core construct, but also with each of its resources – self-efficacy, hope, optimism, resilience) mediates the relationships between social or contextual variables (i.e., teacher support) and each learning strategy that students can use in their academic learning. Knowing this, training interventions could be designed for both teachers and students.

Some limitations of this research need to be acknowledged. First of all, the results were based on self-report questionnaires, and students' answers can have a high level of social desirability. Second, the sample could be considered not well balanced regarding the number of men and women. In this case, further investigation is needed to see if there are differences in the way that students regulate their learning and use their personal and contextual resources. Also, the findings should be considered with caution because our participants were only from the Psychology specialization. Thus, more research would be useful to analyze whether and how learning behavior could be shaped by the students' specialty. Another limit is given by the Breusch-Pagan test, which was significant for cognitive strategies. This violation of homoscedasticity could lead to bias in the error terms and distortion of significance for the model which predicts cognitive strategies of students. In future research, it would be useful to test a new model with other predictors, like academic engagement or study demands and resources (Klein, Gerhard, Büchner, Diestel, & Schermelleh-Engel, 2016). Despite the limitations, these findings may well be significant for educational practice.

Helping students to become self-regulated learners means assisting them in acquiring necessary skills and structuring the environment to facilitate practice and engagement in self-regulated learning (Cleary & Zimmerman, 2004; Paris & Paris, 2001). That is, students need "skill" and "will" to self-regulate learning (Liu et al., 2014). The results of the present study showed that psychological capital, as a personal resource of motivational energy (support for "will"), has an incremental value over and above teacher support (support for "skill"), and need for competence satisfaction (support for "will") in explaining students' preference to self-regulate their learning. From the theoretical perspective, our findings help to enrich the understanding of the impact of psychological capital on self-regulated learning, a construct that has not been explored enough in the educational context. From a practical perspective, these results are essential because all three variables are malleable and can be enhanced through appropriate training. Thus, educational institutions (e.g., schools, universities) could find ways to make teachers more aware of the difference they can make to their students by helping them to self-regulate learning. They can design formal training for teachers of how to aid students to regulate their learning, and also how to find successful ways of integrating practices of self-regulated learning into their teaching (Dignath & Werf, 2012). For students, they may also run formal training to explain the conceptual mean-

ing of self-regulated learning, its relationship with academic achievement (Zusho, 2017), and those personal and contextual factors which can help them to achieve highly efficient self-regulated learning (Zhu & Mok, 2018). Also, institutions can organize intervention programs for both teachers and students to develop their psychological capital (Carmona-Halty et al., 2019; Luthans et al., 2012). Previous research showed improvement in psychological capital after specific training and emphasized its visible, long-term effects (Dello Russo & Stoykova, 2015). Beyond the organizational level, namely what institutions can do to improve students' self-regulated learning, at the individual level teachers can structure the learning environment to facilitate the satisfaction of students' psychological needs by encouraging self-initiative, by offering feedback or by creating opportunities for social interactions (Deci et al., 1996; DeHaan et al., 2016; Orkibi & Ronen, 2017). Any improvement in each of these three variables can influence students' engagement in self-regulated learning.

In conclusion, the most critical finding of our research is related to the role of psychological capital in explaining the students' preference for self-regulated learning after they get teacher support and their needs for competence are satisfied. Therefore, it may be suggested that motivational variables, such as psychological capital and needs satisfaction, could act as the "will" which may determine students to use their "skills" (i.e., cognitive, metacognitive and effort management strategies) in the learning process.

## References


Andrzejewski, C. E., Davis, H. A., Bruening, P. S., & Poirier, R. R. (2016). Can a self-regulated strategy intervention close the achievement gap? Exploring a classroom-based intervention in 9th-grade earth science. *Learning and Individual Differences, 49*, 85–99. doi.org/10.1016/j.lindif.2016.05.013

Bakracevic-Vukman, K., & Licardo, M. (2010). How cognitive, metacognitive, motivational, and emotional self-regulation influence school performance in adolescence and early adulthood. *Educational Studies*, *36*(3), 259–268. doi: 10.1080/03055690903180376

Boekaerts, M., & Cascallar, E. (2006). How far have we moved toward the integration of theory and practice in self-regulation? *Educational Psychology Review*, *18*, 199–210. doi: 10.1007/s10648-006-9013-4

Breslin, R. W. (1970). Back-translation for cross-cultural research. *Journal of Cross-Cultural Psychology*, *1*, 185–216.

Brown, G. T. L., Peterson, E. R. P., & Yao, E. S. (2016). Student conceptions of feedback: Impact on self-regulation, self-efficacy, and academic achievement. *British Journal of Educational Psychology, 86*, 606–629. doi: 10.1111/bjep.12126

Carmona-Halty, M., Schaufeli, W. B., & Salanova, M. (2019). Good relationships, good performance: The mediating role of Psychological Capital – a three-wave study among students. *Frontiers in Psychology*, *10*(306), 1–5. doi: 10.3389/fpsyg.2019.00306

Cassidy, S. (2011). Self-regulated learning in higher education: Identifying key component processes. *Studies in Higher Education*, *36*, 989–1000. doi: 10.1080/03075079.2010.503269

Cazan, A-M. (2011). Psychometric properties of cognitive self-regulation MSLQ scales. *Romanian Journal of Experimental Applied Psychology*, *2*(1), 49–57.

Cleary, T., & Zimmerman, B. J. (2004). Self-regulation empowerment program: A school-based program to enhance self-regulated and self-motivated cycles of student learning. *Psychology in the Schools*, *41*(5), 537–550. doi: 10.1002/pits.10177

Combs, G., Luthans, F., & Griffith, J. (2009). Learning motivation and transfer of human capital development: Implications from psychological capital. In R. J. Burke & C. L. Cooper (Eds.), *The Peak Performing Organization* (pp. 73–91). London & New York: Routledge/Taylor & Francis.

Deci, E. L., Ryan, R. M., & Williams, G. C. (1996). Need satisfaction and the self-regulation of learning. *Learning and Individual Differences*, *8*, 165–183.

Deci, E. L., & Ryan, R. M. (2000). The "What" and "Why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*(4), 227–268.

DeHaan, C. R., Hirai, T., & Ryan, R. M. (2016). Nussbaum's capabilities and self-determination theory's basic psychological needs: Relating some fundamentals of human wellness. *Journal of Happiness Studies*, *17*, 2037–2049. doi: 10.1007/s10902-015-9684-y

Dello Russo, S., & Stoykova, P. (2015). Psychological Capital Intervention (PCI): A replication and extension. *Human Resource Development Quarterly*, *26*(3), 329–347. doi: 10.1002/hrdq.21212

Dignath-van Ewijk, C., & van der Werf, G. (2012). What teachers think about self-regulated learning: Investigating teacher beliefs and teacher behavior of enhancing students' self-regulation. *Education Research International*, 1–10. Hindawi Publishing Corporation. doi: 10.1155/2012/741713

Dignath-van Ewijk, C. (2016). Which components of teacher competence determine whether teachers enhance self-regulated learning? Predicting teachers' self-reported promotion of self-regulated learning by means of teacher beliefs, knowledge, and self-efficacy. *Frontline Learning Research*, *4*(5), 83–105. doi.org/10.14786/flr.v4i5.247

Gillet, N., Morin, A. J. S., Huyghebaert, T., Burger, L., Maillot, A., Poulin, A., & Tricard, E. (2019). University students' need satisfaction trajectories: A growth mixture analysis. *Learning and Instruction*, *60*, 275–285. doi: 10.1016/j.learninstruc.2017.11.003

González-Cutre, D., Sicilia, A., Sierra, A. C., Ferriz, R., & Hagger, M. S. (2016). Understanding the need for novelty from the perspective of self-determination theory. *Personality and Individual Differences*, *102*, 159–169. doi: 10.1016/j.paid.2016.06.036

Grolnick, W. S., & Raftery-Helmer, J. N. (2015). Context supporting self-regulated learning at school transitions. In T. J. Cleary (Ed.), *Self-regulated learning interventions with at-risk youth: Enhancing adaptability, performance, and well-being* (pp. 251–276). American Psychological Association: Washington D.C. doi: 10.1037/14641-012

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2017). *A Primer on Partial Least Squares Structural Equation Modeling* (PLS-SEM). 2nd Ed. Thousand Oaks, CA: Sage

Jafri, H. (2013). A study of the relationship of psychological capital and students' performance. *Business Perspectives and Research, 1*(2), 9–16. doi: 10.1177/2278533720130202

Kim, H-Y. (2013). Statistical notes for clinical researchers: Assessing normal distribution (2) using skewness and kurtosis. *Restorative Dentistry and Endodontics, 38*, 52–54. doi.org/10.5395/rde.2013.38.1.52

Klein, A. G., Gerhard, C., Büchner, R. D., Diestel, S., & Schermelleh-Engel, K. (2016). The detection of heteroscedasticity in regression models for psychological data. *Psychological Test and Assessment Modeling*, *58*, 542–567.

Kokkinos, C. M., & Voulgaridou, I. (2018). Motivational beliefs as mediators in the association between perceived scholastic competence, self-esteem and learning strategies among Greek secondary school students. *Educational Psychology*, 1–10. doi: 10.1080/01443410.2018.1456651

Liu, W. C., Wang, C. K. J., Kee, Y. H., Koh, C., San, B., Lim, C., & Chua, L. (2014). College students' motivation and learning strategies profiles and academic achievement: A self-determination theory approach. *Educational Psychology*, *34*(3), 338–353. doi: 10.1080/01443410.2013.785067

Lopez-Agudo, L. A., & Marcenaro-Gutierrez, O. D. (2017). Engaging children in lessons: The role of efficient and effective teachers. *School Effectiveness and School Improvement*, *28*(4), 650–669. doi: 10.1080/09243453.2017.1364272

Lupsa, D., & Vîrgă, D., (2018). Psychological Capital Questionnaire (PCQ): Analysis of the Romanian adaptation and validation. *Psihologia Resurselor Umane [Psychology of Human Resources]*, *16*, 27–39. doi.org/10.24837/pru.2018.1.484

Lupsa, D., Vîrgă, D., Maricutoiu, L. P., & Rusu, A. (2019). Increasing Psychological Capital: A preregistered meta-analysis of controlled interventions. *Applied Psychology*. https://doi.org/10.1111/apps.12219

Luthans, F., Youssef, C. M., & Avolio, B. J. (2007). *Psychological Capital. Developing the Human Competitive Edge*. New York, Oxford University Press.

Luthans, F., Avolio, B. J., Avey, J. B., & Norman, S. M. (2007). Positive psychological capital: Measurement and relationship with performance and satisfaction. *Personnel Psychology, 60*, 541–572. doi: 10.1111/j.1744-6570.2007.00083.x

Luthans, F., & Youssef, C. M. (2007). Emerging positive organizational behavior. *Journal of Management*, *33*, 321–349. doi: 10.1177/0149206307300814

Luthans, B. C., Luthans, K. W., & Jensen, S. M. (2012). The impact of business school students' psychological capital on academic performance. *Journal of Education for Business*, *87*, 253–259. doi: 10.1080/08832323.2011.609844

Luthans, F., & Avolio, B. J. (2014). Brief summary of psychological capital and introduction to the special issue. *Journal of Leadership & Organizational Studies*, *21*(2), 125–129. doi: 10.1177/1548051813518073

Moors, J. J. A. (1986). The meaning of kurtosis: Darlington reexamined. *The American Statistician, 40,* 283–284. doi:10.2307/2684603

Orkibi, H., & Ronen, T. (2017). Basic psychological needs satisfaction mediates the association be-

tween self-control skills and subjective well-being. *Frontiers in Psychology*, *8*(936), 1–10. doi: 10.3389/fpsyg.2017.00936

Ortega-Maldonado, A., & Salanova, M. (2017). Psychological capital and performance among undergraduate students: The role of meaning-focused coping and satisfaction. *Teaching in Higher Education*, *23*(3), 390–402. doi: 10.1080/13562517.2017.1391199

Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, *8*(422), 1–28. doi: 10.3389/fpsyg.2017.00422.

Paris, S. J., & Paris, A. H. (2001). Classroom applications of research on self-regulated learning. *Educational Psychologist*, *36*, 89–101.

Pintrich, P. R., & de Groot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology*, *82*(1), 33–40.

Pintrich, P. R. (2000). The role of goal orientation in self-regulated learning. In M. Boekaerts, P. Pintrich, & M. Zeidner (Eds.), *The handbook of self-regulation: Theory, research, and applications* (pp. 451–502). San Diego: Academic Press.

Pintrich, P. R. (2004). A conceptual framework for assessing motivation and self-regulated learning in college students. *Educational Psychology Review, 16*(4), 385–407. doi: 10.1007/s10648-004-0006-x

Probst, T. M., Gailey, N. J., Jiang, L., & Bohle, S. L. (2017). Psychological capital: Buffering the longitudinal curvilinear effects of job insecurity on performance. *Safety Science*, *100*, 74–82. doi: 10.1016/j.ssci.2017.02.002

Rahmadani, V. G., Schaufeli, W. B., Ivanova, T. Y., & Osin, E. N. (2019). Basic psychological need satisfaction mediates the relationship between engaging leadership and work engagement: A cross-national study. *Human Resource Development Quarterly,*1–19. doi: 10.1002/hrdq.21366

Rotgans, J. & Schmidt, H. (2009). Examination of the context-specific nature of self-regulated learning. *Educational Studies*, *35*, 239–253. doi: 10.1080/03055690802648051

Schloemer, P., & Brenan, K. (2006). From students to learners: Developing self-regulated learning. *Journal of Education for Business*, *82*, 81–87. doi: 10.3200/JOEB.82.2.81-87

Schunk, D. H. (2005). Self-regulated learning: The educational legacy of Paul R. Pintrich. *Educational Psychologist*, *40*(2), 85–94. doi: 10.1207/s15326985ep4002_3

Sierens, E., Vansteenkiste, M., Goossens, L., Soenens, B., & Dochy, F. (2009). The synergistic relationship of perceived autonomy support and structure in the prediction of self-regulated learning. *British Journal of Educational Psychology*, *79*, 57–68. doi: 10.1348/000709908X304398

Siu, O. L., Bakker, A. B., & Jiang, X. (2014). Psychological capital among university students: Relationships with study engagement and intrinsic motivation. *Journal of Happiness Studies*, *15*, 979–994. doi: 10.1007/s10902-013-9459-2

Sulea, C., van Beek, I., Sârbescu, P., Vîrga, D., & Schaufeli, W. B. (2015). Engagement, boredom, and burnout among students: Basic need satisfaction matters more than personality traits. *Learning and Individual Differences*, *42*, 132–138. doi: 10.1016/j.lindif.2015.08.018

Tânculescu, L., & Iliescu, D. (2014). Adaptarea culturală a scalei Satisfacerea nevoilor psihologice la locul de muncă în context românesc [Cultural adaptation of the Work-related Basic Need Satisfaction against the Romanian background]. *Psihologia Resurselor Umane [Psychology of Human Resources], 12*, 130–146.

Valero-Valenzuela, A., & Manzano-Sánchez, D. (2019). Interpersonal style of coaching, motivational profiles and the intention to be physically active in young athletes. *Studia Psychologica*, *61*(2), 110–119. doi: 10.21909/sp.2019.02.776

van den Broeck, A., Vansteenkiste, M., De Witte, H., & Lens, W. (2008). Explaining the relationships between job characteristics, burnout, and engagement: The role of basic psychological need satisfaction. *Work & Stress: An International Journal of Work, Health & Organizations*, *22*(3), 277–294. doi: 10.1080/02678370802393672

van den Broeck, A., Vansteenkiste, M., De Witte, H., Soenens, B., & Lens, W. (2010). Capturing autonomy, competence, and relatedness at work: Construction and initial validation of the work-related basic need satisfaction scale. *Journal of Occupational and Organizational Psychology*, *83*, 981–1002. doi: 10.1348/096317909X481382

van Veldhoven, M., & Meijman, T. F. (1994). *Het meten van psychosociale arbeidsbelasting met een vragenlijst: De vragenlijst beleving en beoordeling van de arbeid (VBBA)*. [The measurement of psychosocial job demands with a questionnaire: The questionnaire on the experience and evaluation of work (QEEW)]. Amsterdam: NIA

Verleysen, B., Lambrechts, F., & Acker, F. V. (2015). Building psychological capital with appreciative inquiry: Investigating the mediating role of basic psychological need satisfaction. *The Journal of Applied Behavioral Science*, *51*(1), 10–35. doi: 10.1177/0021886314540209

Vîrga, D., De Witte, H., & Cifre, E. (2017). The role of perceived employability, core self-evaluations, and job resources on health and turnover intentions. *The Journal of Psychology*, *151*(7), 632–645. doi: 10.1080/00223980.2017.1372346

Wernsing, T. (2014). Psychological capital: A test of measurement invariance across 12 national cultures. *Journal of Leadership & Organizational Studies*, *21*(2), 179–190. doi: 10.1177/1548051813515924

Zimmerman, B. J. (1990). Self-regulated learning and academic achievement: An overview. *Educational Psychologist*, *25*(1), 3–17.

Zimmerman, B. J. (1998). Academic studying and the development of personal skill: A self-regulatory perspective. *Educational Psychologist*, *33*(2-3), 73–86.

Zhu, J., & Mok, M. M. C. (2018): Predicting primary students' self-regulated learning by their prior achievement, interest, personal best goal orientation and teacher feedback. *Educational Psychology*, *38*(9), 1106–1128. doi: 10.1080/01443410.2018.1497775

Zusho, A. (2017). Toward an integrated model of student learning in the college classroom. *Educational Psychology Review*, *29*, 301–324. doi: 10.1007/s10648-017-9408-4

You, J. W., Kim, B., & Kang, M. (2014). The effects of psychological capital on self-directed learning and learning engagement for college students. *Journal of Learner-Centered Curriculum and Instruction*, *14*(3), 45–70.

You, J. W. (2016). The relationship among college students' psychological capital, learning empowerment, and engagement. *Learning and Individual Differences*, *49*, 17–24. doi: 10.1016/j.lindif.2016.05.001

Young, M. R. (2005). The motivational effects of the classroom environment in facilitating self-regulated learning. *Journal of Marketing Education, 27*(1), 25–40. doi: 10.1177/0273475304273346

Studia Psychologica, Vol. 62, No. 1, 2020, 74-87
https://doi.org/10.31577/sp.2020.01.792

# Slovak Adaptation of the Big Five Inventory (BFI-2): Psychometric Properties and Initial Validation

Peter Halama[1], Michal Kohút[1], Christopher J. Soto[2], Oliver P. John[3]
[1] Department of Psychology, Faculty of Arts, University of Trnava, Hornopotočná 23, 918 43 Trnava, Slovak Republic
[2] Department of Psychology, Colby College, 5550 Mayflower Hill, Waterville, ME 04901, USA
[3] Institute of Personality & Social Research, University of California, Berkeley, 4140 Tolman Hall #5050, Berkeley, CA 94720, USA

The article describes the process of adaptation of the Big Five Inventory – 2 into the Slovak language and cultural context. The translation process of the Slovak BFI-2 was based on three data samples using item analysis and basic psychometric properties. The present study estimates the psychometric properties of the Slovak BFI-2 and its hierarchical structure using exploratory and confirmatory factor analysis in an independent sample of 526 participants recruited through an online research panel. It also provides data on convergent-discriminant validity in relation to alternative Big Five measures (NEO-FFI, TIPI) and to standard well-being measures. The results showed good internal consistency on the domain level, and somewhat lower on the facet level. Both exploratory and confirmatory factor analyses successfully recovered the conceptual structure of the Slovak BFI-2. The BFI-2 domains and facets showed adequate convergent-discriminant validity, based on the meaningful pattern of correlations with the other Big Five measures and well-being scales. These findings suggest that the Slovak version of the BFI-2 is a reliable and valid measure of the Big Five personality traits, and is appropriate for use in Slovak and cross-cultural research.

*Key words*: BFI-2, Big Five personality traits, psychometric adaptation

## Introduction

In the past decades, the Big Five approach has become a widely accepted and well-validated model for the description and assessment of personality (Goldberg, 1990; John, Naumann, & Soto, 2008; McCrae & Costa, 2008). This approach identified five robust personality traits, which include neuroticism, extraversion, agreeableness, conscientiousness and openness to experience. The traits do not represent a particular theoretical perspective, rather, they were derived from analyses of the natural-language terms people use to describe themselves and others (John, Naumann, & Soto, 2008). They are generally found to be cross-culturally generalizable (McCrae, Terracciano et al., 2005), and show strong predictive validity for different areas of human behavior such as work (Brandstätter, 2011), romantic relationships (Malouff et al., 2010) and health (Vollrath, Knoch, & Cassano, 1999).

Correspondence concerning this article should be addressed to Peter Halama, Hornopotočná 23, 918 43 Trnava, Slovak Republic. E-mail: peter.halama@truni.sk
ORCID https://orcid.org/0000-0002-6938-4845
Supplementary information for this article can be accessed at https://www.studiapsychologica.com/index.php/view-articles/
Received June 5, 2019

Many psychometric measures of the Big Five personality traits have been developed, having different complexity or length, such as the NEO Inventories (Costa & McCrae, 2010) or Ten Item Personality Inventory (Gosling, Rentfrow, & Swann, 2003). Some of these measures, such as the NEO PI-R and NEO-PI-3, use domain and facet approaches based on the assumption that personality traits are structured hierarchically (Goldberg, 1999; Soto et al., 2011). In this approach the Big Five domains are conceptualized as broad and general traits located at the top of the hierarchy. Each Big Five domain subsumes more-specific lower-level traits, referred to as facets. One of the most frequently used Big Five measure is the Big Five Inventory (BFI), which was originally developed as a brief, 44-item inventory that would allow efficient and flexible assessment of the Big Five, when there is no need for more differentiated measurement of facet traits within each trait domain (John, Donihue, & Kentle, 1991; John & Srivastava, 1999). The BFI does not use pairs of single adjectives, which are answered less consistently; instead, it uses short phrases based on trait adjectives known to be prototypical markers of the Big Five (John, Naumann, & Soto, 2008). The BFI has become widely used and psychometrically analyzed in many languages such as Spanish (Benet-Martinez & John, 1998), Dutch (Denissen et al., 2008), Czech (Hřebíčková et al., 2016), and others. Cross-cultural research in 56 nations (Schmidt et al., 2007) found that the five-dimensional structure of the BFI was highly replicable across all the major cultural regions of the world, and that the scales possessed high levels of internal reliability across all cultures. Although the BFI did not originally aim to measure traits at the facet level, Soto and John (2009) found that it could assess 10 facets that converge with facets assessed by the NEO PI-R.

Recently, Soto and John (2017a) introduced a new version of the Big Five Inventory, named BFI-2. It is designed to integrate new advances in personality structure and psychological assessment into the BFI, while still retaining three key strengths of the original measure: conceptual focus, ease of understanding, and brevity of assessment time. The BFI-2 tries to ensure an appropriate balance between bandwidth and fidelity (John, Hampson, & Goldberg, 1991) by adopting a hierarchical approach using domains and facets level scales. While domain scales are construed with greater breadth (i.e., high bandwidth), facet scales provide more-detailed personality description (i.e., high fidelity). The BFI-2 is also designed to minimize the influence of acquiescent response style (Rammstedt, Danner, & Bosnjak, 2017), which can threaten the validity of questionnaire-based data (e.g., Rammstedt, Kemper, & Borg, 2013; Soto et al., 2008), by balancing the number of true-keyed and false-keyed items. This allows researchers to easily control for acquiescence at the item level by centering each individual's set of item responses around their within-person mean (see Soto & John, 2017a; Soto et al., 2008). The BFI-2 also adopts new labels for two domains: Neuroticism is replaced by the label Negative Emotionality, which better represents the focus of this domain on negative emotional experiences and more clearly distinguishes it from psychiatric illness, and Openness, which was replaced by the label Open-Mindedness due to possible misinterpretation in terms of openness to social experiences.

The resulting 60-item scale has a hierarchical structure with five domains and three facets nested within each domain. For Extraversion, the facets are Sociability (i.e., the extent to which someone is outgoing, sociable, talkative), Assertiveness (assertive, dominant, leader-like), and Energy Level (active, energetic, enthusiastic). For Agreeableness, the facets are Compassion (compassionate, helpful, sympathetic), Respectfulness (respectful, polite, courteous) and Trust (trustful, forgiving, assuming the best about people). For Conscientiousness, the facets are Organization (systematic, organized, orderly). Productiveness (efficient, persistent) and Responsibility (dependable, reliable, responsible). For Negative Emotionality, the facets are Anxiety (anxious, tense, worried), Depression (sad, depressed, pessimistic) and Emotional Volatility

(moody, emotionally unstable, disinhibited). Finally, Open-Mindedness includes the facets of Intellectual Curiosity (curious, intellectual, complex thinker), Aesthetic Sensitivity (with artistic interests) and Creative Imagination (inventive, creative, original). Every domain is represented by 12 items and every facet by 4 items (Soto & John, 2017a).

Psychometric evaluation of the English-language version of the BFI-2 showed that it has good reliability at both the domain and facet levels and a robust factor structure. The BFI-2 also predicts conceptually relevant behavioral and psychological criteria in a meaningful way, with greater predictive power than the original BFI (Soto & John, 2017a). Analysis of gender differences showed that, similar to previous research with other measures (e.g., Costa, Terracciano, & McCrae, 2001), women tended to describe themselves as somewhat more extraverted, agreeable, conscientious, and emotional than men did (Soto & John, 2017a). The BFI-2 has been translated and psychometrically analyzed in German and Dutch languages (Danner et al., 2019; Denissen et al., in press). Both studies confirmed that the structure found in the English version was replicated in the local adaptations. Moreover, both versions showed good reliability at the domain level and sufficient reliability at the facet level and good validity as examined by correlations with other personality inventories and external criteria related to different life domains. To sum up, the main advantages of the BFI-2 over other Big Five measure are that it a) provides personality assessment at both the domain and facet levels with relative brevity of assessment time and b) balances the number of true-keyed and false-keyed items in order to minimize the influence of acquiescent response style.

With this background in mind, the present research has two key goals. The first is to develop a Slovak version of the BFI-2 and to examine its psychometric properties such as internal consistency and hierarchical structure. The second is to extend the knowledge of the construct validity of the BFI-2 by examining its associations with two additional Big Five measures and selected well-being criteria. Well-being measures have been chosen as a validity criterion because previous research has found robust and consistent relationships of the Big Five traits with different aspects of well-being (e.g., Hayes & Joseph, 2003; Gutierrez, 2005). As well-being is considered a complex construct with different aspects, we decided to include several variables related to positive or negative psychological functioning, namely satisfaction with life, happiness, self-esteem, meaning in life and perceived stress. This strategy can provide more complex insight into validity of the BFI-2, and can extend our knowledge of the BFI-2's validity by examining select well-being criteria that have not been previously investigated. Our validity hypotheses, based on previous research, were that extraversion, agreeableness, and conscientiousness will have a positive relationship with well-being, whereas negative emotionality will have a negative relationship.

These aims are important for two audience types. The first are Slovak researchers, who use personality trait measures in their research and who can get information about this new Big Five measure with strong conceptual clarity and robust hierarchical structure. The second are cross-cultural personality researchers, especially those who are interested in cross-cultural data related to the Big Five traits and their relations with other variables across cultures. The study presents data from an Eastern European country that is frequently underrepresented in large cross-cultural studies using the Big Five approach (e.g., Costa, Terracciano, & McCrae, 2001; Rammstedt, Kemper, & Borg et al., 2013). The results could help to fill this gap and contribute to knowledge related to cross-cultural applicability of the BFI-2 and the Big Five model in general.

## Method

### Development of the Slovak BFI-2

The Slovak BFI-2 was developed through a translation and back-translation process led by the first two authors of this paper and supervised by the original BFI-2 authors. After

developing a preliminary pool of item translations, the final selections were made based on item analyses and basic psychometric properties in three independent scale-development samples. The final version of the Slovak BFI-2 was found to have satisfactory psychometric properties and factor structure in these samples. A full description of the translation procedure, samples and descriptive characteristics, and results of exploratory and confirmatory factor analysis for these pilot studies are presented in Supplementary online material A. Building on these preliminary results, the present study aims to examine the reliability, structural validity, and external validity of the Slovak BFI-2 in an independent, general adult sample.

## Sample

The sample in the present study consisted of 542 participants, 268 males (49.5%), 274 females, who completed an online version of the Slovak BFI-2 and other measures of Big Five personality traits and well-being. The data collection was performed in October and November of 2017. Participants were recruited through an online research panel, and were compensated for their participation by small credits that could be exchanged for different products. Age of the participants ranged from 18 to 86 years, with a mean of 41.79 (*SD* = 14.57). Nine participants (1.7 %) had primary level of education, 307 (56.6 %) had secondary level of education, and 226 (41.7%) had a university degree. All participants were informed about the goals of the study and they provided informed consent prior to the data collection.

## Measures

***Big Five measures.*** All participants answered demographic questions and completed the Slovak BFI-2. For validation of the BFI-2, two other Big Five questionnaires available in the Slovak language were used. The 60-item *NEO-Five Factor Inventory* (NEO-FFI, Costa & McCrae, 2010; Slovak version Ruisel & Halama, 2007) is a shorter version of the 240-item NEO PI-R, aimed to be used in situations in which general information on the domain level of personality is sufficient. It assesses each Big Five domain using a 12-item scale, with items rated on a 5-point Likert-type scale. Alpha reliabilities in the present sample were .83 for Neuroticism, .80 for Extraversion, .67 for Openness, .76 for Agreeableness and .88 for Conscientiousness

The *Ten Item Personality Inventory* (TIPI) was constructed by Gosling, Rentfrow, and Swann (2003; Slovak translation Halama & Gurňáková, 2014) as a very short self-report measure through a selection of adjectives from previous Big Five measures. The inventory contains 10 unipolar items with two adjective markers for each item and with two items for each Big Five trait. The items are rated on a 7-point scale (from *Disagree strongly* to *Agree strongly*). Alphas in the present sample were generally low due to the small number of items: .27 for Extraversion, .41 for Agreeableness, .66 for Conscientiousness, .64 for Emotional Stability, and .28 for Openness.

***Well-being scales.*** The *Oxford Happiness Questionnaire* (OHQ) was developed from its longer version (Oxford Happiness Inventory) as a brief but well validated measure for assessing happiness in its broad sense (Hills & Argyle, 2002; Slovak translation Babinčák & Pipasová Karolová, 2014). It contains 8 items focusing on different aspects of happiness and well-being, with a 6-point Likert scale provided for response. Psychometric analysis (Hills & Argyle, 2002) showed that OHQ has good reliability and validity when correlated with its longer version, and with personality scales usually associated with well-being. The scale's alpha reliability in the present sample was .74.

The *Satisfaction with life scale* (SWLS) was created by Diener et al. (1985) to assess satisfaction with the respondent's life as a whole. It is a short, 5-item scale and respondents indicate the extent to which they agree with each item on a seven-point Likert scale, ranging from *strongly agree* to *strongly disagree*. The SLWS is a very frequently used scale to as-

sess the cognitive aspect of well-being in many languages, and it has good convergent validity as well as temporal stability (Pavot & Diener, 2009). It was translated into Slovak by Halama and Dědová (2007). Its alpha reliability in the present sample was .90.

The *Meaning in Life Questionnaire* (MLQ) was constructed as a measure of meaning consisting of two subscales (Steger et al., 2006). The Presence subscale assesses cognitive appraisals of whether life is meaningful, and the Search subscale assesses general tendencies to actively seek meaning and purpose in life. The questionnaire has 10 items (5 for each subscale) with a 7-point Likert-type response format. The authors (Steger et al., 2006) showed its good discriminant validity and stable factor structure. The Slovak translation used in the study comes from the scale author's official webpage, which does not provide authorship information for the Slovak translation. The alphas in the current sample were .89 for Presence and .80 for Search.

The *Rosenberg Self-Esteem Scale* (RSES) is a 10-item scale that measures global self-esteem (Rosenberg, 1965; Slovak translation Ficková, 1999). It has been widely used in research on self-esteem in different contexts and countries (e.g., Schmidt & Allik, 2005). It uses a 4-point rating scale format (ranging from *absolutely disagree* to *absolutely agree*) with five positively worded items and five negatively worded items. Many studies have shown it to have good reliability and validity (e.g., Pullman & Allik, 2000; Halama, 2008). The scale showed internal consistency of .87 for our sample.

Finally, the *Perceived Stress Scale* (PSS; Cohen, Kamarck, & Mermelstein, 1983; Slovak translation, Halama & Bakošová, 2009) is a measure of an individual's appraisal of his or her life as stressful. The scale is available in different lengths, and the version used in this study contained 10 items rated by the participant on a 5-point Likert-type scale. The questions focus on the global perception of stress experienced during the previous month. The authors claimed that the PSS-10 showed adequate reliability and showed its validity through correlations with life event scores, depressive and physical symptomatology, and other external criteria (Cohen, Kamarck, & Mermelstein, 1983). For this measure, alpha was .86 in the current sample.

## Results

The results of descriptive and reliability analysis (Table 1) showed that domain alpha reliabilities for the Slovak BFI-2 ranged from .79 to .83 ($M$ = .82). For facets, alphas ranged from .43 to .73 with a mean of .63, which is somewhat lower than in the original English study ($M$ = .77). A similar decrease in internal consistency was also observed for the German BFI-2 (Danner et al., 2019), and is fairly typical when adapting psychological measures across cultural contexts. However, lower internal consistency could also reflect the data quality of the sample used. To investigate this possibility, we compared the corrected item-total correlations for the BFI-2 domains and facets with those for the NEO-FFI domains. Overall corrected item-total correlations means were similar, .47, .42 and .45 for the BFI-2 domains, facets and NEO-FFI domains respectively, suggesting that the lower alphas of the BFI-2 facets reflect their brevity and the overall data quality of this sample, rather than a problem specific to the Slovak BFI-2.

An analysis of gender differences showed that females scored significantly higher than males in Agreeableness and its facets, Extraversion and its facets Sociability and Energy Level, Open-Mindedness and its facet Aesthetic Sensitivity, as well as the facets of Responsibility and Anxiety. These gender differences were small to medium in size, ranging from .01 in Depression to .54 in Compassion ($M$ = .30). Column-vector correlations comparing the overall pattern of gender differences obtained here with those in the original validation study for the English-language BFI-2 (Soto & John, 2017a) was .42 for the English online sample and .52 for English student sample. This indicates a moderately similar pattern across studies.

Table 1 *Descriptive characteristics and alphas for domains and facets of the Slovak BFI-2*

| | Full sample | | Male | Female | Gender | |
|---|---|---|---|---|---|---|
| BFI-2 | *M* (*SD*) | Alpha | *M* (*SD*) | *M* (*SD*) | *d* | Age |
| Extraversion | 3.30 (.60) | .80 | 3.21 (.58) | 3.39 (0.60) | -.31 | .09 |
| Sociability | 3.26 (.81) | .69 | 3.10 (.78) | 3.41 (0.82) | -.38 | .10 |
| Assertiveness | 3.14 (.71) | .56 | 3.11 (.68) | 3.16 (0.74) | -.07 | .10 |
| Energy Level | 3.51 (.71) | .65 | 3.41 (.70) | 3.61 (0.70) | -.28 | .02 |
| Agreeableness | 3.76 (.59) | .83 | 3.63 (.55) | 3.89 (0.59) | -.46 | .20 |
| Compassion | 3.89 (.70) | .65 | 3.70 (.66) | 4.07 (0.70) | -.54 | .18 |
| Respectfulness | 4.07 (.69) | .70 | 3.92 (.67) | 4.22 (0.67) | -.44 | .17 |
| Trust | 3.31 (.69) | .57 | 3.25 (.65) | 3.38 (0.73) | -.18 | .16 |
| Conscientiousness | 3.66 (.59) | .83 | 3.53 (.56) | 3.79 (0.60) | -.45 | .15 |
| Organization | 3.71 (.73) | .65 | 3.64 (.68) | 3.79 (0.77) | -.21 | .12 |
| Productiveness | 3.64 (.70) | .64 | 3.49 (.68) | 3.80 (0.69) | -.45 | .14 |
| Responsibility | 3.63 (.65) | .60 | 3.47 (.63) | 3.79 (0.62) | -.50 | .12 |
| Negative Emotionality | 2.83 (.65) | .83 | 2.78 (.63) | 2.88 (0.66) | -.15 | -.12 |
| Anxiety | 2.98 (.72) | .59 | 2.88 (.70) | 3.08 (0.72) | -.28 | -.07 |
| Depression | 2.71 (.83) | .73 | 2.71 (.80) | 2.70 (0.86) | .01 | -.09 |
| Emotional Volatility | 2.81 (.74) | .63 | 2.76 (.76) | 2.85 (0.73) | -.12 | -.14 |
| Open-Mindedness | 3.55 (.59) | .79 | 3.45 (.57) | 3.66 (0.59) | -.36 | .12 |
| Intellectual Curiosity | 3.61 (.62) | .43 | 3.56 (.61) | 3.66 (0.62) | -.15 | .04 |
| Aesthetic Sensitivity | 3.42 (.87) | .73 | 3.21 (.87) | 3.62 (0.82) | -.50 | .18 |
| Creative Imagination | 3.63 (.72) | .68 | 3.57 (.70) | 3.69 (0.74) | -.16 | .04 |

*Note*. Gender d – Cohen's *d* for the mean-level difference between males and females, with negative values indicating higher scores for females; differences of .18 or larger are significant at $p < .05$. Age – absolute correlations of .09 or stronger are significant at $p < .05$.

Correlations with age revealed positive age trends for Agreeableness, Conscientiousness, and their facets, as well as a positive age trend for the Aesthetic Sensitivity facet and a negative trend for the Emotional Volatility facet. All of these age trends had effect sizes of .10 to .20, and were consistent with previous research on adult personality development (e.g., Soto et al., 2011).

The Big Five factor structure of the BFI-2 items was assessed using random intercept exploratory factor analysis (Aichholzer, 2014), which includes a method factor to model individual differences in acquiescent responding (cf. Soto & John, 2017b). This analysis was conducted using Mplus 7.4; because a Mardia test suggested violations of the multivariate normality assumption, robust maximum likelihood was chosen as the method of estimation. Fifty-five items (90%) had their primary loading on the intended domain, with loadings ranging between .21 and .68 ($M$ = .48). In contrast, absolute secondary loadings ranged from .00 to .47 ($M$ = .12). Similarly, a PCA of the 15 facets showed that all facets loaded primarily on their intended domain. Primary loadings ranged from .60 to .88 ($M$ = 0.77), while absolute secondary loadings ranged between .01 and .46 ($M$ = .16), which suggests a very clear domain-level factor structure. Tables with results of these analyses are presented in Supplementary online material B.

A series of confirmatory factor analyses was used to verify the hierarchical structure of the Slovak BFI-2, with three facets nested within each Big Five domain. This analysis was carried out in the R statistical software environment, using the Lavaan package and robust maximum likelihood estimation. In the s*ingle domain* model, every item loads on a single factor representing the Big Five domain. In the *single domain plus acquiescence* model, every item was additionally constrained to load 1 on an acquiescence method factor. Facets

were modeled in the *three facets* model, in which each item loaded on its corresponding facet factor and, lastly, the acquiescence method factor was added in the *three facets plus acquiescence* model. As expected, the *three facets plus acquiescence* model had the best fit for each Big Five domain, with a CFI value of at least .923, TLI of at least .898, and RMSEA of no more than .068 for each domain (see Table 2). These results confirm the facet-level structure of the Slovak BFI-2 and the need to account for acquiescence when modeling item responses.

Correlational analysis of the BFI-2 domains and facets (see Table 3) showed that absolute correlations between BFI-2 domains ranged from .28 to .49 ($M$ = .40). These correlations are higher than in the original English version (Soto & John, 2017a), and may reflect the fact that discriminant correlations tend to be higher in paid research panels than in student and self-selected volunteer samples. This interpretation was supported by similarly inflated intercorrelations for the NEO-FFI in the present sample (range = .11 to .47, $M$ = .30), as compared with those previously obtained in Slovak NEO-FFI standardization samples (range = .06 to .27, $M$ = .14) based on students and self-selected volunteers (Ruisel & Halama, 2007). At the facet level, the Slovak BFI-2's mean within-domain facet correlation ranged between .42 and .67 ($M$ = .54), while

Table 2 *Fit statistics for confirmatory factor analyses of the BFI-2 items*

| Model | $\chi^2$ | *df* | BIC | CFI | TLI | RMSEA |
|---|---|---|---|---|---|---|
| *Extraversion* | | | | | | |
| Single domain | 253.16 | 54 | 18409 | 0.808 | 0.765 | 0.093 |
| Single domain plus acquiescence | 185.76 | 53 | 18323 | 0.874 | 0.843 | **0.076** |
| Three facets | 204.80 | 51 | 18355 | 0.853 | 0.810 | 0.084 |
| Three facets plus acquiescence | 101.65 | 50 | 18227 | **0.951** | **0.936** | **0.049** |
| *Agreeableness* | | | | | | |
| Single domain | 303.95 | 54 | 17033 | 0.809 | 0.766 | 0.104 |
| Single domain plus acquiescence | 174.74 | 53 | 16871 | **0.907** | 0.885 | **0.073** |
| Three facets | 289.72 | 51 | 17020 | 0.820 | 0.767 | 0.104 |
| Three facets plus acquiescence | 148.70 | 50 | 16845 | **0.926** | **0.902** | **0.068** |
| *Conscientiousness* | | | | | | |
| Single domain | 401.70 | 54 | 17037 | 0.769 | 0.718 | 0.121 |
| Single domain plus acquiescence | 226.32 | 53 | 16827 | 0.884 | 0.856 | 0.086 |
| Three facets | 343.63 | 51 | 16950 | 0.817 | 0.763 | 0.111 |
| Three facets plus acquiescence | 144.32 | 50 | 16728 | **0.940** | **0.920** | **0.064** |
| *Negative Emotionality* | | | | | | |
| Single domain | 393.73 | 54 | 18237 | 0.769 | 0.717 | 0.120 |
| Single domain plus acquiescence | 171.68 | 53 | 17962 | **0.920** | **0.900** | **0.071** |
| Three facets | 359.40 | 51 | 18194 | 0.795 | 0.734 | 0.117 |
| Three facets plus acquiescence | 100.02 | 50 | 17880 | **0.967** | **0.956** | **0.047** |
| *Open-Mindedness* | | | | | | |
| Single domain | 422.31 | 54 | 18239 | 0.696 | 0.629 | 0.125 |
| Single domain plus acquiescence | 347.25 | 53 | 18144 | 0.761 | 0.703 | 0.111 |
| Three facets | 254.45 | 51 | 18037 | 0.835 | 0.787 | 0.094 |
| Three facets plus acquiescence | 146.09 | 50 | 17908 | **0.923** | 0.898 | **0.065** |

*Note.* BIC – Bayesian information criterion; CFI – Comparative fit index; TLI – Tucker-Lewis index; RMSEA – Root mean square error of approximation. CFI and TLI values ≥ .90, and RMSEA values ≤ .080, are bolded.

Table 3 *Intercorrelations of the BFI-2 domains and facets*

| BFI-2 domains | Extraversion | | | | Agreeableness | | | Conscientiousness | | | | Negative Emotionality | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Extraversion | | | | | | | | | | | | | | | |
| Agreeableness | .28 | | | | | | | | | | | | | | |
| Conscientiousness | .44 | | | | .49 | | | | | | | | | | |
| Negative Emotionality | -.47 | | | | -.38 | | | -.38 | | | | | | | |
| Open-Mindedness | .45 | | | | .37 | | | .41 | | | | -.28 | | | |
| BFI-2 facets | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 1. Sociability | - | | | | | | | | | | | | | | |
| 2. Assertiveness | **.47** | - | | | | | | | | | | | | | |
| 3. Energy Level | **.52** | **.44** | - | | | | | | | | | | | | |
| 4. Compassion | .24 | .12 | .33 | - | | | | | | | | | | | |
| 5. Respectfulness | .18 | .05 | .31 | **.67** | - | | | | | | | | | | |
| 6. Trust | .19 | .03 | .30 | **.49** | **.56** | - | | | | | | | | | |
| 7. Organization | .16 | .28 | .37 | .37 | .37 | .24 | - | | | | | | | | |
| 8. Productiveness | .28 | .30 | .55 | .37 | .41 | .29 | **.61** | - | | | | | | | |
| 9. Responsibility | .21 | .27 | .38 | .47 | .44 | .23 | **.57** | **.62** | - | | | | | | |
| 10. Anxiety | -.30 | -.28 | -.35 | -.13 | -.16 | -.27 | -.20 | -.23 | -.21 | - | | | | | |
| 11. Depression | -.46 | -.41 | -.53 | -.24 | -.23 | -.37 | -.31 | -.34 | -.27 | **.63** | - | | | | |
| 12. Emotional Volatility | -.16 | -.13 | -.26 | -.25 | -.36 | -.41 | -.27 | -.27 | -.32 | **.58** | **.51** | - | | | |
| 13. Intellectual Curiosity | .22 | .42 | .40 | .29 | .24 | .16 | .20 | .28 | .29 | -.13 | -.27 | -.15 | - | | |
| 14. Aesthetic Sensitivity | .10 | .19 | .31 | .28 | .27 | .25 | .20 | .24 | .24 | -.04 | -.15 | -.11 | **.43** | - | |
| 15. Creative Imagination | .21 | .40 | .51 | .28 | .25 | .19 | .31 | .43 | .35 | -.24 | -.37 | -.25 | **.51** | **.42** | - |

*Note*. Absolute correlations of .10 or stronger are significant at $p < .05$. Within-domain correlations are bolded.

absolute between-domain facet correlations were lower, ranging from .03 to .55 ($M$ = .27).

Convergent validity was assessed through correlations of the BFI-2 with the NEO-FFI and TIPI (Table 4). Same-trait different-method correlations show good convergence between BFI-2 and NEO-FFI, ranging from .63 to .77 ($M$ = .72). As expected, correlations between BFI-2 facets and convergent NEO-FFI domains were somewhat lower on average ($M$ = .60, ranging between .36 and .69), reflecting the distinctions between same-domain facets. Mean convergent correlations with the TIPI were .63 (ranging from .49 to .76) for the BFI-2 domain scales and .52 (ranging from .32 to .68) for same-domain facet scales. As expected, discriminant correlations between different domains were lower, averaging .32 (between .09 and .51) in size with the NEO-FFI and .28 (between .07 and .53) with the TIPI. Discriminant correlations of the facet scales averaged .27 (between .04 and .60) with the NEO-FFI and .23 (between .01 and .52) with the TIPI. The strongest of these correlations are conceptually meaningful, such as the negative correlations between Extraversion and Neuroticism/Negative Emotionality.

Table 5 presents external validity correlations and predictive power of the BFI-2 for well-being measures. Generally, all domains except Negative Emotionality showed positive correlations with positive indicators of psychological well-being and negative correlations with the Perceived Stress Scale. On average, the strongest absolute correlations of these well-being measures were found with the Negative Emotionality ($M$ = .46) and Extraversion ($M$ = .43) domains, and with the Depression ($M$ = .50) and Energy Level ($M$ = .42) facets. We also compared the predictive power of the BFI-2 domains vs. facets for well-being measures using multiple regression analysis and $R^2$ val-

Table 4 *BFI-2 and multitrait-multimethod correlation matrices of the Big Five measures*

| | NEO-FFI | | | | | TIPI | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| BFI-2 | E | A | C | N | O | E | A | C | N | O |
| *Extraversion* | **.75** | .15 | .50 | -.48 | .21 | **.56** | .15 | .39 | -.42 | .42 |
| Sociability | *.66* | .17 | .30 | -.35 | .06 | *.54* | .12 | .24 | -.32 | .25 |
| Assertiveness | *.46* | -.06 | .39 | -.35 | .23 | *.38* | -.01 | .28 | -.31 | .37 |
| Energy Level | *.68* | .26 | .55 | -.46 | .23 | *.43* | .25 | .44 | -.40 | .41 |
| *Agreeableness* | .30 | **.72** | .49 | -.35 | .18 | .07 | **.61** | .53 | -.39 | .11 |
| Compassion | .24 | *.63* | .47 | -.30 | .15 | .11 | *.52* | .50 | -.26 | .09 |
| Respectfulness | .22 | *.63* | .48 | -.29 | .15 | -.01 | *.55* | .52 | -.33 | .10 |
| Trust | .29 | *.58* | .29 | -.31 | .16 | .06 | *.49* | .32 | -.41 | .10 |
| *Conscientiousness* | .32 | .34 | **.77** | -.41 | .13 | .14 | .34 | **.71** | -.34 | .18 |
| Organization | .24 | .25 | *.66* | -.34 | .05 | .10 | .26 | *.62* | -.31 | .12 |
| Productiveness | .35 | .29 | *.68* | -.38 | .13 | .17 | .29 | *.58* | -.29 | .19 |
| Responsibility | .23 | .34 | *.63* | -.34 | .15 | .08 | .33 | *.62* | -.27 | .15 |
| *Negative Emotionality* | -.51 | -.31 | -.35 | **.73** | -.09 | -.22 | -.33 | -.38 | **.76** | -.18 |
| Anxiety | -.43 | -.19 | -.21 | *.62* | -.04 | -.19 | -.20 | -.24 | *.61* | -.18 |
| Depression | -.60 | -.26 | -.38 | *.69* | -.10 | -.34 | -.27 | -.36 | *.63* | -.25 |
| Emotional Volatility | -.25 | -.34 | -.28 | *.54* | -.07 | -.02 | -.37 | -.36 | *.68* | -.02 |
| *Open-Mindedness* | .35 | .25 | .46 | -.30 | **.63** | .26 | .17 | .35 | -.28 | **.49** |
| Intellectual Curiosity | .27 | .19 | .38 | -.23 | *.54* | .20 | .10 | .28 | -.22 | *.44* |
| Aesthetic Sensitivity | .20 | .23 | .27 | -.16 | *.59* | .19 | .15 | .23 | -.14 | *.31* |
| Creative Imagination | .37 | .19 | .48 | -.33 | *.36* | .24 | .16 | .34 | -.32 | *.46* |

*Note.* Absolute correlations of .09 or stronger are significant at $p < .05$. Same trait domain correlations are bolded, same trait facet correlations are in italics.

ues as criteria. These analyses showed that the BFI-2 domains had somewhat lower predictive power than the facets, with mean determination coefficients of .35 for domains vs. .38 for facets. These results suggest a rather modest, 10% relative increase in predictive power for the BFI-2 facets over the domains.

## Discussion

The main goals of the present research were to develop the Slovak version of the BFI-2 questionnaire, and to report its psychometric characteristics and associations with other Big Five questionnaires and selected well-being measures. Concerning reliability, the Slovak BFI-2 shows very good internal consistency at the domain level. At the facet level, the alpha coefficients were generally good, although some facets were more internally consistent than others. Similar results obtained in other language adaptations of the BFI-2, such as German and Dutch (Danner et al., 2019; Denissen et al., in press), as well as comparisons with the Slovak NEO-FFI in the present research, suggest that some of the lower facet alpha reliabilities obtained here likely reflect the general difficulty of adapting psychological measures across cultures, as well as the overall data quality of paid online samples, rather than an issue specific to the Slovak BFI-2. These considerations may also explain our finding of moderate-to-large discriminant correlations between some BFI-2 domain scales. In their validation study of the Dutch BFI-2, Denissen et al. (in press) noted substantially poorer discriminant correlations in a paid online sample than in a student sample, and our paid sample showed similarly higher-than-normal discriminant correlations for both the BFI-2 and the NEO-FFI. However, additional research using different samples and measures is needed to

Table 5 *Correlations and predictive power of the BFI-2 domains and facets for well-being measures*

| | | | | | MLQ | |
|---|---|---|---|---|---|---|
| BFI-2 | OHQ | SWLS | RSES | PSS | Presence | Search |
| *Correlations* | | | | | | |
| *Extraversion* | .56 | .38 | .59 | -.40 | .48 | .14 |
| Sociability | .44 | .33 | .39 | -.28 | .35 | .05 |
| Assertiveness | .37 | .22 | .47 | -.33 | .33 | .13 |
| Energy Level | .56 | .37 | .57 | -.37 | .50 | .16 |
| *Agreeableness* | .43 | .24 | .41 | -.30 | .36 | .16 |
| Compassion | .34 | .17 | .38 | -.23 | .32 | .15 |
| Respectfulness | .36 | .20 | .38 | -.27 | .31 | .16 |
| Trust | .41 | .23 | .27 | -.26 | .29 | .09 |
| *Conscientiousness* | .40 | .23 | .49 | -.35 | .41 | .17 |
| Organization | .30 | .17 | .40 | -.28 | .33 | .12 |
| Productiveness | .41 | .22 | .46 | -.32 | .37 | .14 |
| Responsibility | .31 | .19 | .41 | -.30 | .36 | .18 |
| *Negative Emotionality* | -.60 | -.47 | -.56 | .61 | -.52 | -.01 |
| Anxiety | -.43 | -.34 | -.37 | .50 | -.39 | .02 |
| Depression | -.67 | -.53 | -.64 | .59 | -.54 | -.04 |
| Emotional Volatility | -.40 | -.31 | -.39 | .44 | -.36 | .01 |
| *Open-Mindedness* | .41 | .21 | .42 | -.27 | .34 | .22 |
| Intellectual Curiosity | .33 | .14 | .35 | -.20 | .22 | .21 |
| Aesthetic Sensitivity | .29 | .12 | .24 | -.13 | .24 | .16 |
| Creative Imagination | .38 | .24 | .44 | -.32 | .35 | .16 |
| *Predictive power ($R^2$ values)* | | | | | | |
| BFI-2 domains | .50 | .25 | .50 | .39 | .37 | .06 |
| BFI-2 facets | .54 | .29 | .57 | .41 | .39 | .06 |

*Note.* OHQ – Oxford Happiness Questionnaire; SWLS – Satisfaction with Life Scale; RSES – Rosenberg Self-Esteem Scale; PSS – Perceived Stress Scale; MLQ – Meaning in Life Questionnaire. Absolute correlations of .09 or stronger are significant at $p < .05$.

confirm or refute these interpretations. Until then, we recommend caution in interpreting the Slovak BFI-2 facets with lower internal consistency, and we recommend that researchers keep discriminant correlations in mind when interpreting the Slovak BFI-2 domains.

Factor and principal components analyses suggested that the Slovak BFI-2 retains the measure's intended structure at both the domain and facet levels. The vast majority of items loaded primarily on their intended component with primary loadings substantially higher than secondary loadings. Principal component analysis of facets clearly recovered the intended BFI-2 structure, with three facets loading on each Big Five domain. Moreover, CFAs successfully replicated the results of the original BFI-2 validation study, in which the items within each Big Five domain could be adequately fit by a measurement model that included three substantive facet factors plus an acquiescence method factor (cf. Soto & John, 2017a). The results not only showed that the Slovak BFI-2 has the same robust hierarchical structure as the original English version, but also confirmed that acquiescence should be taken into account when studying questionnaire factor structure (Rammstedt et al., 2013; Soto et al., 2008). The BFI-2 minimizes the effect of the acquiescence through balancing of the true-keyed and false-keyed items for each facet and domain scale, and PCAs of the 15 facets suggested that this effectively controls for acquiescence. However, the CFA re-

sults clearly suggest that acquiescence should be accounted for as a method factor when modeling BFI-2 structure at the item level. As suggested by Soto and John (2017a), the BFI-2 is not only an example of effective control for acquiescence, but also a promising tool for future research examining the phenomenon of acquiescent responding itself through indexing or modeling individual differences in acquiescence across the content-balanced BFI-2 item set.

Validity of the BFI-2 was further examined through associations with three types of variables. First were the demographic variables of gender and age. Our results revealed patterns of age and gender differences similar to those obtained in previous Big Five research, as well as in the original BFI-2 study (Costa, Terracciano, & McCrae, 2001; Soto & John, 2017a; Soto et al., 2011). Second, correlations of the Slovak BFI-2 with the NEO-FFI and TIPI also confirmed that the BFI-2 domains showed good convergence with both of these alternative measures. Third, correlations with selected well-being measures revealed a meaningful pattern of associations at both the domain and facet levels, as well as distinctive profiles of personality correlates for some well-being indicators (e.g., perceived stress, search for meaning in life). These results support the construct validity of the Slovak BFI-2, and suggest that it can be recommended as a reliable measure of Big Five domains and facets in the Slovak environment and cross-cultural research.

### Limitations and Further Research

As mentioned above, the main limitation of our research is the specific sample characteristics. In this study, we used respondents recruited from a paid online research panel, which may have affected data quality. Although early research using paid online samples such as Amazon Mechanical Turk did not observe a substantial effect of reasonable compensation on general data quality (Buhrmester, Kwang, & Gosling, 2011), more recent research has observed differences in data quality between paid online panels and student or volunteer samples (e.g., Denissen et al., in press). However, further research that administers the BFI-2 and other psychological measures to Slovak samples drawn from alternative sources could help clarify this issue.

Another limitation is that our study did not include peer-reported data for either the BFI-2 or the validity criteria. Therefore, future research could examine self-peer agreement, and also test the validity with peer-reported criteria. A third notable limitation is the rather narrow range of validity criteria, which focused specifically on well-being. Big Five personality traits have been shown to predict a broad range of cognitive, emotional and behavioral variables (e.g., Ozer & Benet-Martínez, 2006; Soto, in press). Our focus on selected well-being measures allowed us to examine this criterion domain in greater detail; however, many other variables remain unexamined. Further research including other criteria could provide more information about how the Slovak BFI-2 relates with a broad range of psychological variables, and how useful it can be for predicting consequential outcomes.

### Conclusions

The present paper reports the development of the Slovak version of the BFI-2, its psychometric properties, and its capacity to predict selected well-being criteria. Based on descriptive and correlational analysis, alpha coefficients, and exploratory and confirmatory factor analysis, we can conclude that in general, the Slovak BFI-2 shows satisfactory psychometric properties, as well as a robust hierarchical factor structure. Moreover, the Slovak BFI-2 displays associations with gender, age and other Big Five measures that are generally consistent with previous research and theoretical assumptions. Finally, we found a meaningful pattern of validity correlations between the Slovak BFI-2 and well-being measures at both the domain and facet levels. We therefore recommend the Slovak BFI-2 for use in both Slovak and international personality research. We expect it will be a particularly valuable tool for

researchers who wish to efficiently measure personality traits at both the Big Five domain and facet levels. Future research can replicate the findings using different samples, estimate additional psychometric properties of the Slovak BFI-2, and establish its predictive validity in greater detail.

**Acknowledgement**

This work was supported by the Scientific Grant Agency VEGA [grant number 1/0363/18].

## References

Aichholzer, J. (2014). Random intercept EFA of personality scales. *Journal of Research in Personality*, *53*, 1–4. https://doi.org/10.1016/j.jrp.2014.07.001

Babinčák, P., & Pipasová Karolová, V. (2014). Osobnostné vlastnosti ako prediktory subjektívne vnímaného šťastia. In M. Blatný, M. Jelínek, P. Květon, V. Nielsen, & D. Vobořil (Eds.), *Sociální procesy a osobnost 2013. Sborník příspěvků* (pp. 14–19). Brno: Psychologický ústav AV ČR.

Benet-Martinez, V., & John, O. P. (1998). Los Cinco Grandes across cultures and ethnic groups: Multitrait-multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology*, *75*(3), 729. http://dx.doi.org/10.1037/0022-3514.75.3.729

Brandstätter, H. (2011). Personality aspects of entrepreneurship: A look at five meta-analyses. *Personality and Individual Differences*, *51*(3), 222–230. https://doi.org/10.1016/j.paid.2010.07.007

Buhrmester, M., Kwang, T., & Gosling, S. D. (2011). Amazon's Mechanical Turk: A new source of inexpensive, yet high-quality, data?. *Perspectives on Psychological Science*, *6*(1), 3–5. https://doi.org/10.1177/1745691610393980

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24,* 385–396. http://dx.doi.org/10.2307/2136404

Costa, P. T., & McCrae, R. R. (2010). *NEO inventories: Professional manual*. Odessa, FL: Psychological Assessment Resources.

Costa Jr., P. T., Terracciano, A., & McCrae, R. R. (2001). Gender differences in personality traits across cultures: Robust and surprising findings. *Journal of Personality and Social Psychology*, *81*(2), 322–331. https://doi.org/10.1037/0022-3514.81.2.322

Danner, D., Rammstedt, B., Bluemke, M., Lechner, C., Berres, S., Knopf, T., Soto, C. J., & John, O. P. (2019). Das Big-Five Inventar 2: Validierung eines Persönlichkeitsinventars zur Erfassung von 5 Persönlichkeitsdomänen und 15 Facetten [The Big Five Inventory–2: Validating a personality inventory to capture 5 personality domains and 15 facets]. *Diagnostica*, *65*, 121–132 https://doi.org/10.1026/0012-1924/a000218

Denissen, J. J. A., Geenen, R., Soto, C. J., John, O. P., & van Aken, M. A. G. (in press). The Big Five Inventory–2 (BFI-2): Replication of psychometric properties of the Dutch adaptation and first evidence for the discriminant predictive validity of the facet scales. *Journal of Personality Assessment*. https://doi.org/10.1080/00223891.2018.1539004

Denissen, J. J., Geenen, R., Van Aken, M. A., Gosling, S. D., & Potter, J. (2008). Development and validation of a Dutch translation of the Big Five Inventory (BFI). *Journal of Personality Assessment*, *90*(2), 152–157. https://doi.org/10.1080/00223890701845229

Diener, E. D., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction with Life Scale. *Journal of Personality Assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901_13

Ficková, E. (1999). Personality dimensions and self-esteem indicators relationships. *Studia Psychologica*, *41*(4), 323–328.

Goldberg, L. R. (1990). An alternative "description of personality": The Big-Five factor structure. *Journal of Personality and Social Psychology, 59*, 1216–1229. http://dx.doi.org/10.1037/0022-3514.59.6.1216

Goldberg, L. R. (1999). A broad-bandwidth, public-domain, personality inventory measuring the lower-level facets of several five-factor models. In I. Mervielde, I. J. Deary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7–28). Tilburg, the Netherlands: Tilburg University Press.

Gosling, S. D., Rentfrow, P. J., & Swann Jr., W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality*, *37*(6), 504–528. https://doi.org/10.1016/S0092-6566(03)00046-1

Gutierrez, J. L. G., Jimenez, B. M., Hernandez, E. G., & Puente, C. P. (2005). Personality and subjective well-being: Big five correlates and demographic variables. *Personality and Individual Differences,* 38, 1561–1569. https://doi.org/10.1016/j.paid.2004.09.015

Halama, P. (2008). Confirmatory factor analysis of Rosenberg Self-Esteem Scale in a sample of Slo-

vak high school and university students. *Studia Psychologica*, *50*(3), 255–266.

Halama, P., & Bakošová, K. (2009). Meaning in life as a moderator of the relationship between perceived stress and coping. *Studia Psychologica*, *51*(2/3), 143–148.

Halama, P., & Dědová, M. (2007). Meaning in life and hope as predictors of positive mental health: Do they explain residual variance not predicted by personality traits? *Studia Psychologica*, *49*(3), 191–200.

Halama, P., & Gurňáková, J. (2014). Need for structure and Big Five personality traits as predictors of decision making styles in health professionals. *Studia Psychologica*, *56*(3), 171–180. doi: 10.21909/sp.2014.03.658

Hayes, N., & Joseph, S. (2003). Big 5 correlates of three measures of subjective well-being. *Personality and Individual Differences*, *34*(4), 723–727. https://doi.org/10.1016/S0191-8869(02)00057-0

Hills, P., & Argyle, M. (2002) The Oxford Happiness Questionnaire: A compact scale for the measurement of psychological well-being. *Personality and Individual Differences*, 33, 1073–1082. https://doi.org/10.1016/S0191-8869(01)00213-6

Hřebičková, M., Jelínek, M., Blatný, M., Brom, C., Burešová, I., Graf, S., Mejzlíková, T., Vazsonyi, A. T., & Zábrodská, K. (2016). Big Five Inventory: Základní psychometrické charakteristiky české verze BFI-44 a BFI-10. *Československá Psychologie, 60*(6), 567–583.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five Inventory—Versions 4a and 54.* Berkeley: University of California at Berkeley, Institute of Personality and Social Research.

John, O. P., Hampson, S. E., & Goldberg, L. R. (1991). The basic level in personality-trait hierarchies: Studies of trait use and accessibility in different contexts. *Journal of Personality and Social Psychology, 60,* 348–361. http://dx.doi.org/10.1037/0022-3514.60.3.348

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative Big Five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). New York: Guilford.

John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–138). New York: Guilford Press.

Malouff, J. M., Thorsteinsson, E. B., Schutte, N. S., Bhullar, N., & Rooke, S. E. (2010). The five-factor model of personality and relationship satisfaction of intimate partners: A meta-analysis. *Journal of Research in Personality*, *44*(1), 124–127. https://doi.org/10.1016/j.jrp.2009.09.004

McCrae, R. R., & Costa, P. T. J. (2008). Empirical and theoretical status of the five-factor model of personality traits. In G. Boyle, G. Matthews, & D. Saklofske (Eds.), *Sage handbook of personality theory and assessment* (Vol. 1, pp. 273–294). Los Angeles: Sage. http://dx.doi.org/10.4135/9781849200462.n13.

McCrae, R. R., & Terracciano, A. et al. (2005). Universal features of personality traits from the observer's perspective: Data from 50 cultures. *Journal of Personality and Social Psychology*, *88*(3), 547–561. https://doi.org/10.1037/0022-3514.88.3.547

Ozer, D. J., & Benet-Martínez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology, 57*, 401–421.

Pavot, W., & Diener, E. (2009) Review of the Satisfaction With Life Scale. In E. Diener (Ed.), *Assessing well-being. Social indicators research series, Vol. 39*. Springer, Dordrecht. https://doi.org/10.1007/978-90-481-2354-4_5

Pullmann, H., & Allik, J. (2000). The Rosenberg Self-Esteem Scale: Its dimensionality, stability and personality correlates in Estonian. *Personality and Individual Differences*, *28*(4), 701–715. https://doi.org/10.1016/S0191-8869(99)00132-4

Rammstedt, B., Danner, D., & Bosnjak, M. (2017). Acquiescence response styles: A multilevel model explaining individual-level and country-level differences. *Personality and Individual Differences*, *107*, 190–194. https://doi.org/10.1016/j.paid.2016.11.038

Rammstedt, B., Kemper, C. J., & Borg, I. (2013). Correcting Big Five personality measurements for acquiescence: An 18-country cross-cultural study. *European Journal of Personality*, *27*(1), 71–81. https://doi.org/10.1002/per.1894

Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.

Ruisel, I., & Halama, P. (2007). *NEO-FFI. NEO päťfaktorový osobnostný inventár*. Praha: Testcentrum-Hogrefe.

Schmitt, D. P., & Allik, J. (2005). Simultaneous administration of the Rosenberg Self-Esteem Scale in 53 nations: Exploring the universal and culture-specific features of global self-esteem. *Journal of Personality and Social Psychology*, *89*(4), 623–642. http://dx.doi.org/10.1037/0022-3514.89.4.623

Schmitt, D. P., Allik, J., McCrae, R. R., & Benet-Martínez, V. et al. (2007). The geographic distribu-

tion of Big Five personality traits: Patterns and profiles of human self-description across 56 nations. *Journal of Cross-Cultural Psychology*, *38*(2), 173–212. https://doi.org/10.1177/2F0022022106297299

Soto, C. J. (in press). How replicable are links between personality traits and consequential life outcomes? The Life Outcomes of Personality Replication Project. *Psychological Science*. https://doi.org/10.1177/0956797619831612

Soto, C. J., & John, O. P. (2009). Ten facet scales for the Big Five Inventory: Convergence with NEO PI-R facets, self-peer agreement, and discriminant validity. *Journal of Research in Personality*, *43*(1), 84–90. https://doi.org/10.1016/j.jrp.2008.10.002

Soto, C. J., & John, O. P. (2017a). The next Big Five Inventory (BFI-2): Developing and assessing a hierarchical model with 15 facets to enhance bandwidth, fidelity, and predictive power. *Journal of Personality and Social Psychology*, *113*(1), 117–143. http://dx.doi.org/10.1037/pspp0000096

Soto, C. J., & John, O. P. (2017b). Short and extra-short forms of the Big Five Inventory–2: The BFI-2-S and BFI-2-XS. *Journal of Research in Personality*, *68*, 69–81. https://doi.org/10.1016/j.jrp.2017.02.004

Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2008). The developmental psychometrics of Big Five self-reports: Acquiescence, factor structure, coherence, and differentiation from ages 10 to 20. *Journal of Personality and Social Psychology, 94,* 718–737. http://dx.doi.org/10.1037/0022-3514.94.4.718

Soto, C. J., John, O. P., Gosling, S. D., & Potter, J. (2011). Age differences in personality traits from 10 to 65: Big Five domains and facets in a large cross-sectional sample. *Journal of Personality and Social Psychology*, *100*(2), 330–348. http://dx.doi.org/10.1037/a0021717

Steger, M. F., Frazier, P., Oishi S. & Kaler, M. (2006). The Meaning in Life Questionnaire: Assessing the presence of and search for meaning in life. *Journal of Counseling Psychology, 53*, 80–93. http://dx.doi.org/10.1037/0022-0167.53.1.80

Vollrath, M., Knoch, D., & Cassano, L. (1999). Personality, risky health behaviour, and perceived susceptibility to health risks. *European Journal of Personality*, *13*(1), 39–50. https://doi.org/10.1002/(SICI)1099-0984(199901/02)13:1%3C39::AID-PER328%3E3.0.CO;2-J

Studia Psychologica, Vol. 62, No. 1, 2020, 58-73
https://doi.org/10.31577/sp.2020.01.791

# The Effect of Self-Regulation of Shame on Teenagers' Aggression

Liusheng Wang[1], Biao Sang[2]
[1] Department of Psychology, Nantong University, 9 Seyuan Road, Nantong, Jiangsu, People's Republic of China
[2] School of Psychology and Cognitive Science, East China Normal University, 3663 N. Zhongshan Road, Shanghai, People's Republic of China

Studies have found that shame and aggression are closely connected, and self-blaming and re-planning strategies can regulate an individual's shame. This study conducted two experiments to investigate the effects of self-regulation of shame on explicit and implicit aggressiveness of adolescents. Shame was induced in both experiments by audio recordings describing different shameful situations that adolescents may experience in daily life. The participants of 7th grade were required to self-regulate their shame by self-blaming strategy, re-planning strategy, or non-regulation, and rated their explicit aggressiveness in Study 1 and did implicit association test (IAT) in Study 2, respectively. The current studies found that the regulation of shame with self-blaming strategy enhanced explicit aggression, but did not affect the bias of implicit aggression.

*Key words:* shame, aggression, emotional regulation, implicit association tests

## Introduction

Shame is a painful experience that involves a negative evaluation of one's entire self. This evaluation and self-censorship changes an individual's self-perception, and is accompanied by feelings of fright, and a sense of insignificance, powerlessness, and worthlessness, as well as public exposure (Lewis, 1971). As a negative self-consciousness emotion, shame has a detrimental effect on an individual's psychology and behavior, such as enhanced aggression.

### Shame and Aggression

There have been theories and empirical studies that focused on the relationship between shame and aggression (Elison, Garofalo, & Velotti, 2014). The Compass of Shame proposed by Nathanson focuses on the role of individual shame in the self (Nathanson, 1992). Attacking others is one of the four typical ways that individuals deal with shame. Individuals are often unwilling to accept shame when they experience it, so they externalize shame by directing anger at others or the external environment, which in some way enables selves to feel the diminished shame.

Sinha's shame-anger theory proposed that shame is accompanied by intense hostility and anger (Sinha, 2017). Similarly, Harper and Arias proposed that shame may lead to anger and hostility, and finally to aggression and other defensive behaviors (Harper & Arias, 2004). Shame has a protective motive. When shame activates protective motivation and the indi-

Correspondence concerning this article should be addressed to Liusheng Wang, Department of Psychology, Nantong University, 9 Seyuan Road, Nantong, Jiangsu, P. R. China. E-mail: willow76@ntu.edu.cn
ORCID https://orcid.org/0000-0001-7899-0081
The data that support the findings of this study are available from the corresponding author, upon reasonable request.
Received May 8, 2019

vidual protects him/herself, this leads to aggression (de Hooge, Breugelmans, Wagemans, & Zeelenberg, 2018; de Hooge, Zeelenberg, & Breugelmans, 2010), and demonstrates the destruction function of shame. Experiencing shame early in life can increase the risk of psychological problems (Heaven, Ciarrochi, & Leeson, 2009; Tangney, 1992). Individuals faced with rejection and humiliation continually seek to condemn the scapegoat who caused them pain. The shame-anger spiral theory explains the interactive, spiraling relationship between shame and anger (Scheff, 2012). This theory proposes that when an individual perceives his or her own shame, this induces anger, which further induces stronger shame in a cycle of "shame-anger-shame". Some clinical psychological disorders, such as post-traumatic stress disorder and social phobia, are thought to reflect the effects of this cycle (Dai, Wang, & Qian, 2012). Unbearable shame eventually may lead to extreme violence and even war at the societal level (Scheff, 2014). The spiral theory can be described in a popular way as follows. As emotions grow and gather strength with the passage of time, individuals are ashamed because they have already experienced shame; they are angry because they are ashamed; and they are ashamed because of their anger. The cycle continues back and forth, accumulating more and more power over time until anger, depression, attack or self-inflicted harm is triggered.

According to the "social pain and threat" model proposed by Elison and his colleagues (Elison, Garofalo, & Velotti, 2014), shame is considered to be social pain. The relationship between shame and aggressiveness is similar to the relationship between physiological pain and aggressiveness. Shame is an adaptation to threats, similar to the way bodily pain is a defense against general physical threats of injury. The model's basic path is that threats to personal reputation, social rank, or relationships generate shame, then physical pain, and finally anger and aggression. Rage and aggression may be viewed as an evolutionary adaptive coping mechanism, a psychological defense, or emotional regulation. Two arguments support the model's postulated path. First, social exclusion causes physical pain (Eisenberger, 2011). An fMRI study by Eisenberger et al. showed that activity in the anterior cingulate cortex exhibits similar patterns in response to social rejection and bodily pain (Eisenberger, Lieberman, & Williams, 2003). Second, physical pain can produce anger and attack (Berkowitz, 2012).

Many empirical studies support the relationship between shame and aggressiveness from different perspectives. Shame is positively correlated with juvenile delinquency (Gold, Sullivan, & Lewis, 2011), aggressive behavior (Stuewig & Tangney, 2007; Stuewig et al., 2015), and hostility (Elison et al., 2014; Velottin, Garofalo, Bottazzi, & Caretti, 2016). An eight-year longitudinal study found that early shame-prone children in Grade 5 experienced more destructive behaviors, such as drug abuse, detention, imprisonment, and suicide in later life (Tangney, 1992). A short-term longitudinal study found that shame and hostility were highly stable during a one-year period, and that high levels of shame among 9th grade students was a good predictor of increased hostility in the 10th grade (Heaven et al., 2009). Moreover, one study found juvenile offenders, who were less empathetic, experienced less shame (Schalkwijk, Stams, Stegge, Dekker, & Peen, 2016).

The relationship between shame and aggression may be influenced by other factors. Event awareness moderates the effect of shame on anger at others, and shame can even decrease an individual's anger about the unfairness of others, when the others are aware of the individual's experience of shameful events (Zhu et al., 2019). An adolescent's social status can affect the risk of aggressive behavior when experiencing shame; for instance, moderate social status has a protective function on the relationship between shame and aggression (Åslund, Leppert, Starrin, & Nilsson, 2009). Blame is another factor that influences the relationship between shame and aggression. For example, Stuewig et al. found that externalization of blame medi-

ated the association between shame and aggression in college students, adolescents, and adult prisoners (Stuewig, Tangney, Heigel, Harty, & McCloskey, 2010). Shame can also affect aggression indirectly through coping strategies, such as self-blaming, blaming others, and escaping (Zhang, Zhang, & Huang, 2013). In addition, the mechanism underlying the association between shame and aggression differs by gender (Scheff & Retzinger, 1997), with females having a shame-shame feedback mechanism and males having a shame-anger feedback loop.

**Shame Regulation**

As one of the self-conscious emotions, shame can be regulated by different strategies, some of which are as effective as well-established techniques for regulating the basic emotions. The shame-resilience theory attempts to explain how individuals recover from shameful events by using certain strategies (Van Vliet, 2008). For example, research has shown that self-compassion and cognitive reappraisal can significantly reduce shame-proneness, and that symptoms of social anxiety can also be significantly reduced by self-compassion (Cándea & Szentágotai-Tătar, 2018). Other studies have found that shame among middle-school students is positively correlated with self-blaming (Fan & Yu, 2008), and that self-blaming, blaming-others, and evading strategies mediate the relationship between shame and aggression (Zhang et al., 2013). Gao conducted a series of survey studies of the shame regulation of college students. The studies found that negative cognitive assessments of college students mainly entailed shame (Gao, Zhao, Wang, Dai, & Qian, 2012). The regulation strategies of shame can be classified into four sub-categories, including a repair strategy (e.g., self-change strategy and re-evaluation strategy), and a defensive strategy (e.g., denial-attack strategy and avoidance-retreat strategy) (Gao et al., 2012). Compared to the regulatory strategies of general negative emotions, the undergraduate students were more likely to use a catastrophic strategy in which they focused on the catastrophic consequences, and they were less likely to regulate shame by such strategies as acceptance, "putting things in perspective", rumination, positive reappraisal, and positive refocusing (Gao, Qian, & Wang, 2011).

The re-planning and "putting into perspective" strategies are relatively effective for regulating shame, whereas the self-blaming and blaming-others strategies are relatively ineffective. The re-planning strategy can help individuals to engage in constructive and compensatory behavior (Gao, 2016). Wang and Sang found that re-planning and self-blaming strategies enhanced adolescent's intensity of shame, with medium effect sizes of regulation (Wang & Sang, 2019).

**Situations of Shame**

Being different from children whose life is mainly inside of family, teenagers stay longer hours in schools, and interact with peers and teachers. Their life situations mainly involve activities on campus, such as learning activities or playing. Autonomy becomes an important theme of teenagers' development, including behavior, emotion and value autonomy (Steinberg, 2017). Teenagers begin to have more opportunities to govern their own behavior, and spend more time outside of direct supervision by their parents. The social domain theory based domain specificity model proposes that individuals have different types of social interactions and that their varied interactions lead to the development of different types, or domains, of social knowledge (Smetana, 2002; Smetana, Crean, & Campione-Barr, 2005). Greater domain specificity will add precision to the assessment of the development and contribute to the understanding of shame emotion. Social domains for teenagers mean different situations. Schools, as social institutions, have a responsibility to nurture and guide teenagers; however, schools often perpetuate the cycle of shame (Monroe, 2008). Or, schools could carry on the intervention of shame (Hunger & Böhlke, 2018). Therefore, teenagers have autonomy

to deal with different negative life events, involving the inside or outside of school situations, and to regulate negative emotion, such as shame. It is necessary to focus on teenagers' shame in two different social domains, which are divided into situations inside and outside of schools.

**The Current Study**

As shame can affect aggression and individuals can regulate shame using various strategies, one issue of importance arises about how specific types of self-regulation of shame affect an individual's aggression.

Incidents involving shame are closely related to an individual's situation, and the major life events of adolescents revolve around school and learning. Thus, incidents of shame among adolescents are likely to occur in the unique context of school, namely, being called as domain specificity, such as splash and squelch eating in the school dining hall, examination cheating, poor learning performance, and other shameful events that can happen on campus; we call these unique situations. Other shameful events can occur that are not related to school, such as littering in public places, unpleasant body odor, and family conflicts; we call these general situations. This study examined the effect of shameful events on adolescents in these two types of situations.

There are many types of emotional regulation strategies. Re-planning and self-blaming are common strategies in the daily life of a teenager (Wang, 2017), and they can independently affect the intensity of an individual's shame (Wang & Sang, 2019). Based on Gross' process model of emotion regulation (Gross, 2015; Gross & Thompson, 2007), emotion regulation is divided into antecedent-focused and response-focused regulation (Gross, 1998). Specifically, more attention is paid to two strategies named cognitive reappraisal and expressive suppression. Generally, increased use of cognitive reappraisal predicts increased levels of positive well-being outcomes (Haga, Kraft, & Corby, 2009). Cognitive reappraisal can be serviced for different emotion goals, with different tactics (McRae, Ciesielski, & Gross, 2012). The re-planning strategy is an antecedent-focused, and it is a cognitive reappraisal strategy that emphasizes regulation before an emotional response occurs and ways individuals can regulate emotions by avoiding shameful events. The re-planning strategy is a repair-type strategy that involves active measures to repair self-injury, which is a relatively positive cognitive-regulation strategy, similar to the refocusing strategy of the shame-resilience theory. In the current research, re-planning is a re-imagination of the presented hypothetical scenario. These scenarios were designed to select from a pool of scenarios and rated by teenagers in the pilot study. So, these scenarios often happen in teenagers' life, are not far removed from teenagers' life. They are common life events for teenagers, and easy to understand by them. These scenarios are not strange to them. Additionally, there is research that has provided some support for re-planning strategy use to regulate emotion. Originally, emotional regulation primarily aims to regulate the negative emotions, using different strategies. In the Cognitive Emotion Regulation Questionnaire (CERQ), developed by Garnefski and his colleagues, re-planning is one of the cognitive reappraisal strategies in emotion regulation, and is theoretically more adaptive (Garnefski & Kraaij, 2007). Cognitive reappraisal can be serviced for different emotion goals, using different tactics (McRae et al., 2012). Generally, increased use of cognitive reappraisal could predict increased levels of positive well-being outcomes (Haga et al., 2009). Regarding shame regulation, Gao (2016) found that the re-planning strategy is relatively effective for regulating shame. Wang and Sang (2019) found that the re-planning strategy could affect adolescent's intensity of shame. Therefore, re-planning is a relevant strategy in hypothetical situations, and often taken as a strategy in shame and other negative emotions regulation.

The self-blaming strategy, on the other hand, is a response-focused emotion regulation, and

it is repressive coping rather than expressive suppressing. Expressive suppressing refers to the process of consciously inhibiting emotional expressions while emotionally aroused (Gross, 2002; Gross & Levenson, 1993). The term repressive orientation is synonymous with the term defensive. Repressive coping is a strategy of self-protection that involves dismissing or ignoring emotions one feels. In situating negative context, individuals with repressive coping often report little distress, while simultaneously presenting threat reactivity through other response channels, ultimately protecting themselves, or preserving a self-image. In nature, repressive coping may serve a protective function (Coifman, Bonanno, Ray, & Gross, 2007). The self-blaming strategy addresses the self-attributions about shameful events to achieve shame regulation. It is a relatively passive regulation strategy that is essentially defensive and corresponds to the attack-self script in the "compass of shame" model (Elison, Lennon, & Pulos, 2006). Taking into account the significance and operation of different strategies, this study used the re-planning strategy and the self-blaming strategy as individual self-regulation strategies in Experiment 1.

Not only are individuals directly or explicitly aware of their own aggressive experiences, they may have an implicit experience of aggression (Dai, Yang, & Wu, 2005). And, inducing shame could affect an individual's implicit moral self (Zhou, 2015). Therefore, this study conducted two experiments to examine the effect of shame regulation on subsequent explicit aggression towards others and the bias of implicit aggression. The purpose of Experiment 1 was to examine the effect of shame regulation on explicit aggression using a repeated-measures experimental design. Considering the role of regulation strategies and the motives of shame, the experimental hypothesis was that there would be a significant difference in explicit aggression between the self-regulation conditions and the non-regulation condition; that is, a self-regulation strategy should strengthen the explicit aggressiveness towards others. Experiment 2 examined whether shame regulation using the self-blaming strategy would affect the bias of implicit aggression.

## Study 1

Study 1 was designed to examine the effect of shame after regulation by different strategies on explicit aggression. As the intensity of the induced shame in the study was medium level, and the immediate self-assessments can enhance the influence of the current emotional experience on subsequent behavior, the study used a repeated-measures experimental design.

The regulatory strategies used in the experimental procedure were expressed in specific and clear instructions to ensure the adolescents participating in the experiment understood them (Wang & Sang, 2019): 1) Self-blaming was expressed as, "I blame myself". For example, "I should be blamed"; "I should take responsibility for what happened"; "In this case, I was wrong"; and "I was the main reason for this fault"; 2) Re-planning was expressed as, "I managed to do it better". For example, "I think about how to do it better"; "I think how best to deal with these situations"; "I think how to change this situation"; and "I want a better plan to do it". 3) Non-regulation means the participants did not do anything; they just looked at the computer screen. The participants were instructed to imagine or meditate on the specific method when the computer prompted the use of a strategy. The non-regulation condition was used as a baseline in the repeated-measures design, which facilitated the comparison of the self-blaming and re-planning strategies.

### Methods

#### *Participants*

Ninety-one students in Grade 7 participated in the experiment. The data of 87 students were included after data screening. Mean age = 13.52 years, *SD* = 0.80, 42 students were male.

*Materials*

Stories were used to induce shame. The materials were adopted from studies by Wang (2017) and Wang and Sang (2019). The stories about shame were created based on interviews and open-ended survey questions. Six stories were chosen for use in this study based on shame ratings made by 500 students from Grades 7 to 11. These stories included unique situations, such as chewing loudly in the school dining-hall, cheating on an examination, and poor school performance, and general situations, such as littering, having body odor, and family conflict. Three similar stories were created to meet the requirements of the repeated-measures design.

Thirty-eight postgraduate students (28 females; Mean age = 20.50 years, *SD* = 1.41) were asked to rate the similarity of the three stories on a 7-point scale. Higher ratings indicated greater similarity. The results showed that the similarity ratings of the three stories were above 5 points. The results of one-sample *t*-test, using point 4 (the midpoint of the Likert 7-point scale) as the reference value, revealed the mean was significantly different from 4, chewing noise, $t(37) = 5.99$, Cohen's $d = 0.98$; cheating on exam, $t(37) = 10.30$, Cohen's $d = 1.67$; poor performance, $t(37) = 7.69$, Cohen's $d = 1.24$; littering, $t(37) = 11.13$, Cohen's $d = 1.81$; body odor, $t(37) = 9.56$, Cohen's $d = 1.54$; family conflict, $t(37) = 9.52$, Cohen's $d = 1.53$; $ps < 0.001$. The stories were also rated for the intensity of the shame or guilt experienced by the story's protagonist. Higher ratings indicated that the strength of emotion experienced by the protagonist was greater. A paired-sample *t*-test showed that the shame ratings of all the story situations were significantly higher than the guilt ratings were (see Table 1).

The texts of the stories were read by a radio hostess, and recorded in MP3 format. The mean duration of the audio files was 40.56 (*SD* = 5.93) seconds. A postgraduate student in the art department drew pencil sketches based on the core content and core elements of each story's situation. These sketches were converted to electronic files in the JPG format, with 640 × 470 pixels.

Six neutral images were selected from the *International Affective Picture System* (IAPS) for use during relaxation portions of the experiment. The valence of the neutral images was *M* = 4.97 (*SD* = 0.12); the arousal score was *M* = 2.52 (*SD* = 0.42). Eight college students were asked to rate the degree to which soft music was soothing on a 7-point scale. The mean rating of the piece, which was from "*Dancing with the Neon Light*" (www.ximalaya.com) was 1.38, which indicated portions of the music were soothing.

The measure of explicit aggressiveness was based on Buss's definition. According to Buss's general structure and definition of aggression (Buss & Perry, 1992), aggression generally includes physical attacks, verbal attacks, anger, and hostility, designed to mea-

Table 1 *Ratings of shame and guilt*

| Situations | Stories | Shame | | Guilty | | | |
|---|---|---|---|---|---|---|---|
| | | *M* | *SD* | *M* | *SD* | *t* | *Cohen's d* |
| Unique | chewing noise | 5.37 | 1.13 | 3.08 | 2.31 | 5.64*** | 0.91 |
| | cheating on exam | 5.66 | 1.12 | 3.24 | 2.35 | 5.34*** | 1.01 |
| | poor performance | 5.37 | 1.32 | 3.03 | 2.18 | 5.15*** | 1.33 |
| General | littering | 5.50 | 0.95 | 3.37 | 2.40 | 5.41*** | 0.88 |
| | body odor | 5.71 | 1.29 | 3.11 | 2.20 | 5.81*** | 1.12 |
| | family conflict | 5.26 | 1.01 | 3.29 | 2.37 | 4.75*** | 0.77 |

*** $p < 0.001$

sure the aggression to others. Physical and verbal attacks are forms of behavior, anger is an emotion, and hostility entails cognition (Liu, Zhou, & Gu, 2009). This experiment used descriptions from the revised Chinese version of the "*Buss-Perry Aggression Questionnaire*" for use with adolescents (Buss & Perry, 1992; Liu et al., 2009; Zhou, 2007). Six items from the anger and the hostility sub-scales were selected for use, in accordance with the purpose of the study: for example, "I can't control my temper" (anger); and "I think others always have good luck" (hostility).

*Procedures*

The experiment consisted of two consecutive stages: an inducing-regulation stage and an explicit-aggression measurement stage. Before the experiment, all the participants completed a practice session and indicated they understood the regulation-strategy manipulation. All the stories were presented in three blocks during the experiment by the E-prime software program. The order of the blocks was randomized, and the order of the story situations within the blocks was balanced. Each block used only one kind of regulation strategy. The blocks were separated by an interval of 120 seconds, during which time the participants listened to relaxing music. Subsequently, for 3 minutes the rest of the blocks were presented.

Each trial consisted of the following five steps (Deng, Sang, & Ruan, 2013; Gao et al., 2012). Step 1 – Fixation. The center of the screen displayed an up arrow, a down arrow, or a short horizontal line for 2 s, indicating the participants should regulate their shame with the corresponding regulation strategy. Step 2 – Inducement. The screen presented a picture, while the participants, wearing headsets, listened to the description of the situation corresponding to the picture. The participants were instructed to imagine themselves as the protagonists in the situations in the stories and to experience the shameful emotions fully. After the audio recording ended, the picture disappeared; the average audio duration was about 41 s. Step 3 – Regulation. A symbol was presented on the screen that represented the regulation strategy; only one type of regulation strategy was used in each block. The strategies comprised the re-planning strategy, the self-blaming strategy, and the non-regulation strategy. The screen displayed the following instructions: "↓" stands for "I managed to do better"; "↑" stands for "I blame myself"; and "-" stands for "non-regulation". Participants regulated themselves in accordance with the instructions given before the experiment. The duration of the display was 5 s. Step 4 – Rating explicit aggression. Participants rated themselves according to the description of aggression on the screen by pressing the numbered computer keys on 4-point scale. Step 5 – Relaxation. The screen showed a neutral affective picture, while the participants listened to relaxing music through the headset. There were 18 trials total for every participant.

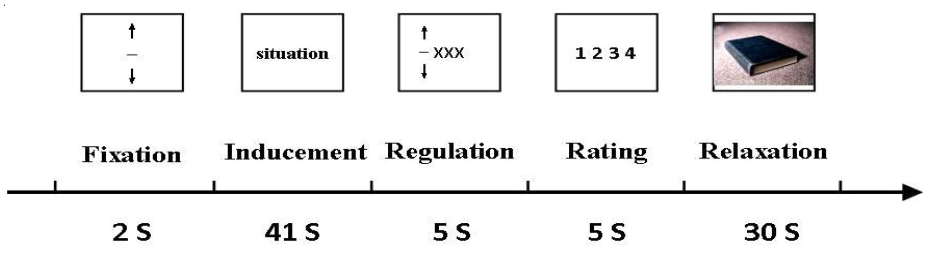


*Figure 1* Procedures for emotional regulation

## Results

The reaction time of the participants was recorded while they rated explicit aggression in Step 4. The reaction time data were retained for analysis based on the following criteria: the reaction time was more than 300 ms and less than 20,000 ms, and the data for all the three regulation strategies were complete (i.e., no missing data in one of the regulation strategies).

A repeated-measures ANOVA was conducted on the ratings of explicit aggression in the unique situations, with regulation strategies and gender as independent variables. The ANOVA found a significant main effect of the regulation strategies, $F(2,464) = 3.54$, $p < 0.05$, $\eta^2 = 0.02$, indicating that the regulation strategies affected the self-ratings of aggression. Post-hoc tests showed that aggression ratings after the self-blaming strategy were significantly higher than the ratings in the re-planning strategy and non-regulation conditions ($p$s < 0.05). The main effect of gender was not significant, and the interaction of regulation strategy with gender was not significant ($p$s > 0.05; see Table 2).

The repeated-measures ANOVA on the aggression ratings in the general situations showed no significant main effect of the regulation strategies, $F(2,235) = 2.63$, $p > 0.05$. The main effect of gender was not significant, and the interaction of regulation strategy and gender was not significant ($p$s > 0.05).

## Discussion

A significant regulation effect of the self-blaming strategy in unique situations was found, whereas no effect of any regulation strategies was present in general situations, indicating an enhanced effect of regulation with self-blaming strategy on explicit aggressiveness in the specific circumstances.

The experimental results are consistent with existing research findings. Previous studies on the relationship between shame and aggression have found that shameful experiences can increase adolescent hostility (Heaven et al., 2009), that shameful experiences are strongly related to aggressive behavior (Åslund et al., 2009), and that shame can lead to more aggressive behavior (Schoenleber, Sippel, Jakupcak, & Tull, 2015). Moreover, self-blaming strategy has been found to be a partial mediator of the association between shame and aggression (Zhang et al., 2013).

Attacking others is one of the typical responses to shame in Nathanson's "Compass of Shame" model (Nathanson, 1992). Attacking others is accompanied by self-loathing and anger, which involves the relationship between the individual self and others. Self-blaming strategy corresponds to aggressive-reaction script in the "Compass of Shame" model (Elison et al., 2006). The self-blaming strategy is similar to self-compassion in the self-direction strategy, which can reduce shame-proneness (Cándea & Szentágotai-Tătar, 2018). However, these two strategies stand in different perspectives concerning the responsibility of the self. Self-blaming strategy places more responsibility on the individual, whereas self-compassion supports the individual with understanding and sympathy. Therefore, self-blaming would produce different outcomes regarding shame than those produced by self-compassion.

Table 2 *Aggression after regulation in the unique and general situations*

| Regulation | Unique situations | | | General situations | | |
|---|---|---|---|---|---|---|
| Strategies | *M* | *SD* | *F* | *M* | *SD* | *F* |
| Non-regulation | 2.03 | 0.95 | 3.54* | 2.13 | 0.96 | 2.63 |
| Re-planning | 2.05 | 1.00 | | 2.24 | 1.00 | |
| Self-blaming | 2.20 | 1.03 | | 2.27 | 1.09 | |

* $p < 0.05$

In the unique context of shame (e.g., examination cheating or poor performance), in which adolescents' experiences are closely related to school, adopting the self-blaming strategy to regulate shame corresponds to aggression in the "Compass of Shame" model. Self-blaming strategy provides clues to the reaction as part of the aggressive dimension of shame. The dual roles of self-blaming and typical responses to shame by "Compass of Shame" model are superimposed, leading to explicit aggressiveness by adolescents. The re-planning strategy focuses on regulation before a shameful incident occurs, so it is merely a hypothetical operation. Individuals who are already in a shameful situation, feel helpless and experience negative feelings, but this is not enough to trigger aggression.

The experiment also found that the effectiveness of strategies changed with the type of situation, and that the regulatory effect in unique situations involving school or learning was more pronounced. Generally, the induction of shame is closely related to the nature of the events. The unique context in this experiment refers to the close relationship between the "personal lives" and the "school lives" of students. Adolescents have more autonomy and can take initiative in unique situations, and they bear more responsibility for the consequences of shameful incidents. Therefore, the regulatory effect of the self-blaming strategy in a unique situation is stronger than that in a general situation.

## Study 2

The results of Experiment 1 showed that the self-blaming strategy can enhance an individual's explicit aggression after regulating shame. However, when a person is not aware of his offensiveness, the person may still be angry at others and become implicitly aggressive. Thus, the research question arises: As there exists the effect of regulation with self-blaming strategy on shame, does this strategy affect an individual's bias of implicit aggression? Study 2 was designed to answer that question. Study 2 used a single-factor repeated-measures design, which was similar to Study 1. However, only the self-blaming strategy and non-regulation conditions were examined, with the latter used as the baseline or control condition. The dependent variable implicit aggression was measured using the implicit association test (IAT) paradigm.

### Methods

#### *Participants*

Ninety-five students in Grade 7 were assigned to the self-blaming strategy group and the non-regulation group. The students were different from the sample in Study 1. The data of 15 students were excluded from the analyses because their correct ratio, which referred to the corrected reaction in IAT experiment, was < 0.8 or because of misconduct during the experiment. The remaining participants were 80 students, 32 males, Mean age = 14.27 (*SD* = 0.63).

#### *Materials*

The story situation "examination cheating" in Study 1 was selected as the shame-inducing situation in Study 2. The emotional regulation materials were the same as those used in the self-blaming strategy condition and non-regulation condition in Study 1.

The IAT materials were adopted directly from the previous implicit aggression studies (Xie, Bi, & Luo, 2010; Yang, 2012). The self-concept dimension included 5 words in self dimension and 5 in the others dimension. The associated attribute dimension of aggression included 5 aggressive adjectives and 5 non-aggressive adjectives (see Table 3).

#### *Procedures*

The experiment consisted of the induction-regulation phase and the IAT phase. Classical music was broadcast by earphones before and after the experiment in order to ease the relaxation of the participants. The induction-regulation phase was the same as that in Study 1.

The IAT phase was conducted with an IAT program that had 7 steps (Greenwald, Nosek, & Banaji, 2003), including 5 practice tasks and 2 test tasks (see Table 4). Step 1 was practice to identify the target concept words as quickly and correctly as possible, classify the words belonging to the concept "self" and press the "D" key to respond, and to classify the words belonging to the concept "others" and press the "K" key to respond. Step 2 was practice to distinguish the attribute concept words as quickly and correctly as possible, classify the words belonging to the concept "attack" and press the "D" key to respond, and to classify the words belonging to the concept "non-attack" and press the "K" key to respond. Step 3 was practice to jointly identify all the stimulus words presented in the first two steps, categorize the words belonging to the concepts "self" and "attack" and press the "D" key to respond, and to identify the words belonging to the concepts of "others" and "non-attack" and press the "K" key to respond. Step 4 was the same as Step 3, but the fourth step was the formal test phase, and the reaction times and correct rates were recorded. Step 5 was the opposite of the target-concept discrimination exercise. Contrary to Step 1, the participants identified words belonging to the concept "others" and press the "D" key to respond, and identified words belonging to the concept "self" and press the "K" key to respond. Step 6 was practice on the incompatibility joint-task identification. The "others" and "attack" words had to be classified and the "D" key used to respond, and the "self" and "non-attack" words had to be classified and the "K" key used to respond. Step 7 was the same as Step 6. Step 7 formally tested reaction times and correct rates.

**Results**

The data underwent a preliminary analysis in accordance with Greenwald's rules (2003). Participants were eliminated if their correct ratio was below 0.8. The reaction times were re-

Table 3 *IAT materials*

| Type | Words |
|---|---|
| Self | I(Wo), Myself(ZiJi), Me(BenRen), Me(An), We(WoMen) |
| Others | Him (Ta), They(TaMen), Outers(WaiRen), Others(TaRen), Another(BieRen) |
| Aggressive | Attack(Gongji), Fight(Fankang), War(ZhanZheng), Confront(DuiKang), Beat(XieJi) |
| Non-aggressive | Peace(HePing), Mild(WenHe),Trust(XinRen), Coorperation(HeZuo), Friendly(YouShan) |

*Note*. The words in brackets refer to the pronunciation of Pinyin in Chinese language

Table 4 *Steps and procedures in the IAT phase*

| Step | Description | Response Key D | Response Key K | Trials |
|---|---|---|---|---|
| 1 | Target concept words (Practice) | Self | others | 20 |
| 2 | Attribute concept words (Practice) | Attack | non-attack | 20 |
| 3 | Compatibility joint task (Practice) | self+attack | others+non-attack | 20 |
| 4 | Compatibility joint task (Test) | self+attack | others+non-attack | 40 |
| 5 | Opposite target word discrimination (Practice) | Others | Self | 20 |
| 6 | Incompatibility joint task (Practice) | others+attack | self+non-attack | 20 |
| 7 | Incompatibility joint task (Test) | others+attack | self+non-attack | 40 |

corded as 300 ms when they were below 300 ms, and recorded as 3000 ms when they were above 3000 ms. All the reaction times were included regardless of whether they were correct or incorrect responses. The reaction times of the compatibility and incompatibility tasks were transformed into natural logarithms. The IAT effect index and its logarithm were calculated as the mean reaction time of the incompatibility task minus the mean of the compatibility task.

An independent-sample *t*-test showed no significant difference between the IAT effect of reaction times on the regulation group and the non-regulation group, $t(78) = -0.29$, $p > 0.05$, and no significant difference on the IAT effect of logarithm, $t(78) = 0.06$, $p > 0.05$ (see Table 5).

**Discussion**

The results of Study 2 showed that the implicit bias toward aggression did not vary after the regulation of shame. After regulation using the self-blaming strategy, the IAT effect, representing the association between self and aggression, had a similar tendency as between the regulation and non-regulation conditions, indicating no regulation effect of shame on implicit aggression. The bias of self to aggressiveness was not affected by the regulation of shame.

The association between self and aggression in the IAT experiment refers to the implicit bias of self toward aggressiveness. In the process of socialization, individuals establish a psychological structure related to aggressive behavior, potentially affecting the individual's interpretation of environmental cues. The connection between the concept of self and the concept of aggression becomes a part of the connected network in the individual mind. Once the connection is stimulated, the self automatically activates and spreads, so that the individual's aggressive traits and behaviors can be automatically triggered, manifested as the individual's implicit aggression. Generally, implicit measures are thought to be more accurate, at least in the sense that they are less susceptible to socially desirable responding, faking, etc. Therefore, the implicit aggression is stable. Although implicit aggression could be influenced under some conditions (Dai et al., 2005; Xie et al., 2010; Yang, 2012), and one's implicit moral self is also affected by shame (Zhou, 2015), it is necessary to have a trigger to push the process and implement this change. The protective motive is one motivation of shame (de Hooge et al., 2010; de Hooge et al., 2018), and self-blaming strategy can possibly be a trigger. However, the effect size of self-blaming strategy may be small. Based on the content of the compatible and incompatible tasks in this experiment, the impact of self-blaming strategy is not enough to change the stable connection between the original self-concept and the aggressive concept. The IAT effect was similar between the two groups,

Table 5 *Reaction times (ms) and the IAT effect in different conditions*

| Conditions | Index | Tasks | *M* | *SD* | IAT effect | *t* |
|---|---|---|---|---|---|---|
| Non-regulation | Reaction times | Compatibility | 1077.33 | 227.47 | -78.44 | -0.29 |
| | | Incompatibility | 998.89 | 277.07 | | |
| Regulation | Reaction times | Compatibility | 1125.39 | 324.25 | -96.27 | |
| | | Incompatibility | 1029.12 | 304.97 | | |
| Non-regulation | Logarithm | Compatibility | 6.9605 | 0.2121 | -0.0938 | 0.06 |
| | | Incompatibility | 6.8667 | 0.2981 | | |
| Regulation | Logarithm | Compatibility | 6.9893 | 0.2682 | -0.0902 | |
| | | Incompatibility | 6.8991 | 0.2704 | | |

indicating that the regulation using the self-blaming strategy could not change the association between "self" and "attack".

## General Discussion

The findings of the two experiments in the current study showed the different effects of shame regulation on aggression, in which the self-regulation of shame through the self-blaming strategy enhanced adolescents' explicit aggression, but no effects existed involving implicit bias toward aggressiveness. This difference is related to the individual's perception of aggression.

Shame is closely related to aggression and it can induce aggression (Åslund et al., 2009; Heaven et al., 2009; Schoenleber et al., 2015). Anger and aggression are considered to be coping strategies to deal with shame (Elison et al., 2014). There exist restore and protective motivations following shame (de Hooge et al., 2010; de Hooge et al., 2018), corresponding to the confirmation or protection of self, respectively, depending on the triggers to motivation. Regarding self-regulation of shame, repressive coping serves as a protective function (Coifman et al., 2007), which is an effective response to a threat. Individuals experiencing repressive coping might not express it to the outside world, they maybe commit it to the internal ego, such as self-blaming. Specifically, self-blaming functions are a clue or trigger to activate protective motive of shame, leading to protective behavior, such as aggression. The results from Study 1 also confirmed indirectly some findings about the role of self-blaming. Self-blaming has a role in the relationship of shame and aggression (Zhang et al., 2013), and could affect individual's shame (Gao, 2016; Wang & Sang, 2019). The self-blaming strategy is a defensive strategy (Sznycer et al., 2016) that can exacerbate injury to self-identity and self-worth of adolescents. Chinese traditional culture advocates the spirit of "*cultivating self, family-discipline, governing the country and maintaining the world peace*" (In Chinese, 修身，齐家，治国，平天下) (Wang & Sang, 2019), which describes the theory, principles and methods of moral cultivation by a number of Confucian and Neo-Confucian scholars. Chinese people pay more attention to self-cultivation and their own responsibilities for their behaviors, and they often regulate and manage their own affect and behavior using self-blaming strategy. If adolescents superimpose the extra effect of the self-blaming strategy on the original relationship between shame and aggression, they begin to do self-defense and resistance, and then subjective aggression becomes a major channel for venting; therefore, the immediate effect of shame leads to the increased explicit aggression among adolescents who have experienced shameful situations.

However, adolescents do not clearly perceive their own aggressiveness when they process some concepts on the IAT test. Individuals are accustomed to the cognitive attribution of shameful events under their own attribution styles. Based on the cognitive attribution theory of self-conscious emotions (Lewis, 2008), when the self-blaming strategy is used to deal with a shameful event, adolescents attribute the individual's feelings of shame to themselves. But, the relationship between shame and implicit aggression is steady and becomes one part of personality traits. And, as far as implicit cognitive and social behavior is concerned, the protective motive in self-blaming strategy is not enough to affect the implicit aggression. Therefore, the association between shame and implicit aggressiveness is hard to change by self-blaming strategy.

There are some issues to address. The first involves the measurement of aggression. The tool developed by Buss and Perry (1992) is designed mainly to evaluate a trait aggression rather than state hostility or aggressive behavior. There exists a strong relationship between trait and state sociality. And the responses to these items of questionnaire could also reflect the attitudes in the moment. It would be better to measure directly the acute tendency towards aggressive behavior in future research. IAT is often applied to measure strength of association between aggressive tendencies and outwards expression (Richetin

& Richardson, 2008; Xie et al., 2010; Yang, 2012). One study found priming shame could negatively affect an individual's implicit moral self (Zhou, 2015). According to IAT procedure (Greenwald et al., 2003), there are practice tasks taken before test tasks. The time for practice tasks potentially diminishes the emotional response during test tasks, even though it is very short. Therefore, future studies should use a method more accurate than IAT, in order to evaluate implicit aggression. The second issue is about individual dispositions in the design. Some researchers have found that different kinds of narcissism, such as over/covert, grandiose/vulnerable, are related to different behaviors (Derry, Ohan, & Bayliss, 2019; Fossati, Borroni, Eisenberg, & Maffei, 2010; Martinez, Zeichner, Reidy, & Miller, 2008). Besides gender, other individual traits, such as narcissism, could be taken into consideration in future research.

## Ethics Statement

This study was carried out in accordance with the recommendations of Nantong University Committee with written informed consent from all subjects. All subjects gave written informed consent in accordance with the Declaration of Helsinki. The protocol was approved by Nantong University Committee.

## Acknowledgement

This study was funded by The Key Project of Philosophy and Social Science Research in Colleges and Universities in Jiangsu Province (No. 2017ZDIXM134) and National Natural Science Foundation of China (No. 31371043).

## References

Åslund, C., Leppert, J., Starrin, B., & Nilsson, K. W. (2009). Subjective social status and shaming experiences in relation to adolescent depression. *Archives of Pediatrics & Adolescent Medicine, 163*(1), 55–60. doi: 10.1001/archpedi.163.1.55

Berkowitz, L. (2012). A different view of anger: The cognitive-neoassociation conception of the relation of anger to aggression. *Aggressive Behavior, 38*(4), 322–333. doi: 10.1002/ab.21432

Buss, A. H., & Perry, M. (1992). The aggression questionnaire. *Journal of Personality and Social Psychology, 63*(3), 452–459.

Cándea, D.-M., & Szentágotai-Tătar, A. (2018). The impact of self-compassion on shame-proneness in social anxiety. *Mindfulness, 9*(6), 1816–1824. doi: 10.1007/s12671-018-0924-1

Coifman, K. G., Bonanno, G. A., Ray, R. D., & Gross, J. J. (2007). Does repressive coping promote resilience? Affective-autonomic response discrepancy during bereavement. *Journal of Personality and Social Psychology, 92*(4), 745–758. doi: 10.1037/0022-3514.92.4.745

Dai, Y., Wang, M., & Qian, M. (2012). Research and theory about shame and PTSD (in Chinese). *Chinese Journal of Clinical Psychology, 20*(2), 190–193. http://clinicalpsychojournal.yywkt.cn/Magazine/Show.aspx?ID=138982

Dai, C., Yang, Z., & Wu, M. (2005). An experimental research on implicit aggression (in Chinese). *Psychological Science, 28*(1), 96–98. http://www.cqvip.com/Main/Detail.aspx?id=12138401

de Hooge, I. E., Breugelmans, S. M., Wagemans, F. M. A., & Zeelenberg, M. (2018). The social side of shame approach versus withdrawal. *Cognition & Emotion, 32*(8), 1671–1677. doi: 10.1080/02699931.2017.1422696

de Hooge, I. E., Zeelenberg, M., & Breugelmans, S. M. (2010). Restore and protect motivations following shame. *Cognition & Emotion, 24*(1), 111–127. doi: 10.1080/02699930802584466

Deng, X., Sang, B., & Luan, Z. (2013). Up- and down-regulation of daily emotion: An experience sampling study of Chinese adolescents' regulatory tendency and effects. *Psychological Reports, 113*(2), 552–565. doi: 10.2466/09.10.PR0.113x22z4

Derry, K. L., Ohan, J. L., & Bayliss, D. M. (2019). Fearing failure: Grandiose narcissism, vulnerable narcissism, and emotional reactivity in children. *Child Development*. doi: 10.1111/cdev.13264

Eisenberger, N. I. (2011). Why rejection hurts: What social neuroscience has revealed about the brain's response to social rejection. In J. C. J. Decety (Ed.), *The Handbook of Social Neuroscience* (pp. 586–598). New York: Oxford University Press.

Eisenberger, N. I., Lieberman, M. D., & Williams, K. D. (2003). Does rejection hurt? An fMRI study of social exclusion. *Science, 302*(5643), 290–292. doi: 10.1126/science.1089134

Elison, J., Garofalo, C., & Velotti, P. (2014). Shame and aggression: Theoretical considerations. *Ag-*

*gression and Violent Behavior, 19*(4), 447–453. doi: 10.1016/j.avb.2014.05.002

Elison, J., Lennon, R., & Pulos, S. (2006). Investigating the compass of shame: The development of the Compass of Shame Scale. *Social Behavior and Personality, 34*(3), 221–238. doi: 10.2224/sbp.2006.34.3.221

Fan, Z., & Yu, G. (2008). A study on the relationship of self-esteem and attributional style with guilt and shame (in Chinese). *Psychology Exploration, 28*(4), 57–61. http://pe.paperonce.org/oa/DArticle.aspx?type=view&id=200804013

Fossati, A., Borroni, S., Eisenberg, N., & Maffei, C. (2010). Relations of proactive and reactive dimensions of aggression to overt and covert narcissism in nonclinical adolescents. *Aggressive Behavior, 36*(1), 21–27. doi: 10.1002/ab.20332

Gao, J. (2016). *Emotion regulation of shame* (in Chinese). Beijing: Intellectual Property Publishing House.

Gao, J., Qian, M., & Wang, W. (2011). Cognitive emotion regulation of shame and general negative emotions (in Chinese). *Chinese Journal of Clinical Psychology, 19*(6), 807–809. http://clinicalpsychojournal.yywkt.cn/Magazine/Show.aspx?ID=139840

Gao, J., Zhao, Q., Wang, M., Dai, Y., & Qian, M. (2012). Selection of cognitive emotion regulation strategy on shame: Impact of self-appraisals (in Chinese). *Chinese Journal of Clinical Psychology, 20*(4), 469–473. http://clinicalpsychojournal.yywkt.cn/Magazine/Show.aspx?ID=139187

Garnefski, N., & Kraaij, V. (2007). The cognitive emotion regulation questionnaire: Psychometric features and prospective relationships with depression and anxiety in adults. *European Journal of Psychological Assessment, 2007, 23*(3), 141–149. doi: 10.1027/1015-5759.23.3.141

Gold, J., Sullivan, M. W., & Lewis, M. (2011). The relation between abuse and violent delinquency: The conversion of shame to blame in juvenile offenders. *Child Abuse & Neglect, 35*(7), 459–467. doi:10.1016/j.chiabu.2011.02.007

Greenwald, A. G., Nosek, B., & Banaji, M. (2003). Understanding and using the implicit association test: I. An improved scoring algorithm. *Journal of Personality and Social Psychology, 85*(2), 197–216. doi: 10.1037/0022-3514.85.2.197

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology, 74*(1), 224–237.

Gross, J. J. (2002). Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology, 39*, 281–291. doi: 10.1017.S0048577201393198

Gross, J. J. (2015). The Extended Process Model of Emotion Regulation: Elaborations, applications, and future directions. *Psychological Inquiry, 26*(1), 130–137. doi: 10.1080/1047840X.2015.989751

Gross, J. J., & Levenson, R. W. (1993). Emotional suppression: Physiology, self-report, and expressive behavior. *Journal of Personality and Social Psychology, 64*(6), 970–986. doi: 10.1037/0022-3514.64.6.970

Gross, J. J., & Thompson, R. A. (2007). Emotion regulation: Conceptual foundations. In J. J. Gross (Ed.), *Handbook of Emotion Regulation* (pp. 3–24). New York, NY: Guilford.

Haga, S. M., Kraft, P., & Corby, E-K. (2009). Emotion regulation: Antecedents and well-being outcomes of cognitive reappraisal and expressive suppression in cross-cultural samples. *Journal of Happiness Studies, 10*(3), 271–291. doi: 10.1007/s10902-007-9080-3

Harper, F. W. K., & Arias, I. (2004). The role of shame in predicting adult anger and depressive symptoms among victims of child psychological maltreatment. *Journal of Family Violence, 19*(6), 359–367. doi: 10.1007/s10896-004-0681-x

Heaven, P. C. L., Ciarrochi, J., & Leeson, P. (2009). The longitudinal links between shame and increasing hostility during adolescence. *Personality and Individual Differences, 47*(8), 841–844. doi: 10.1016/j.paid.2009.07.002

Hunger, I., & Böhlke, N. (2018). On the boundaries of shame. A qualitative study of situations of overstepping boundaries (of shame) in physical education as seen from the students' perspective. *Forum Qualitative Sozialforschung / Forum: Qualitative Social Research, 18*(2), Art. 2. doi: 10.17169/fqs-18.2.2623

Liu, J., Zhou, Y., & Gu, W. (2009). Reliability and validity of Chinese version of Buss-Perry Aggression Questionnaire in adolescents (in Chinese). *Chinese Journal of Clinical Psychology, 17*(4), 449–451. http://clinicalpsychojournal.yywkt.cn/Magazine/Show.aspx?ID=140074

Lewis, H. B. (1971). *Shame and guilt in neurosis*. New York: International Universities Press.

Lewis, M. (2008). Self-conscious emotions: Embarrassment, pride, shame, and guilt. In M. Lewis, J. M. Haviland-Jones, & L. F. Barrett (Eds.), *Handbook of Emotions* (pp. 742–756). New York: Guilford Press.

Martinez, M. A., Zeichner, A., Reidy, D. E., & Miller, J. D. (2008). Narcissism and displaced aggression: Effects of positive, negative, and delayed feedback. *Personality and Individual Differ-*

*ences, 44*(1), 140–149. doi: 10.1016/j.paid.2007.07.012

McRae, K., Ciesielski, B., & Gross, J. J. (2012). Unpacking cognitive reappraisal: Goals, tactics, and outcomes. *Emotion, 12*(2), 250–255. doi: 10.1037/a0026351

Monroe, A. (2008). Shame solutions: How shame impacts school-aged children and what teachers can do to help. *The Educational Forum, 73*(1), 58–66. doi: 10.1080/00131720802539614

Nathanson, D. L. (1992). *Shame and pride: Affect, sex, and the birth of the self*. New York: W. W. Norton & Company.

Richetin, J., & Richardson, D. S. (2008). Automatic processes and individual differences in aggressive behavior. *Aggression and Violent Behavior, 13*(6), 423–430. doi: 10.1016/j.avb.2008.06.005

Schalkwijk, F., Stams, G. J., Stegge, H., Dekker, J., & Peen, J. (2016). The conscience as a regulatory function: Empathy, shame, pride, guilt, and moral orientation in delinquent adolescents. *International Journal of Offender Therapy and Comparative Criminology, 60*(6), 675–693. doi: 10.1177/0306624X14561830

Scheff, T. (2012). A social/emotional theory of "mental illness". *International Journal of Social Psychiatry, 59*(1), 87–92. doi: 10.1177/0020764012445004

Scheff, T. (2014). The ubiquity of hidden shame in modernity. *Cultural Sociology, 8*(2), 129–141. doi: 10.1177/1749975513507244

Scheff, T., & Retzinger, S. M. (1997). Shame, anger and the social bond: A theory of sexual offenders and treatment. *Electronic Journal of Sociology, 3*(1). https://www.sociology.org/ejs-archives/vol003.001/sheff.html

Schoenleber, M., Sippel, L. M., Jakupcak, M., & Tull, M. T. (2015). Role of trait shame in the association between posttraumatic stress and aggression among men with a history of interpersonal trauma. *Psychological Trauma: Theory, Research, Practice, and Policy, 7*(1), 43–49. doi: 10.1037/a0037434

Sinha, M. (2017). Shame and psychotherapy: Theory, method and practice. In E. Vanderheiden & C.-H. Mayer (Eds.), *The value of shame* (pp. 251–275). Cham, Switzerland: Springer International Publishing.

Smetana, J. G. (2002). Culture, autonomy, and personal jurisdiction in adolescent-parent relationships. In H. W. Reese & R. Kail (Eds.), *Advances in Child Development and Behavior* (Vol. 29). Orlando, Florida: Academic Press.

Smetana, J., Crean, H. F., Campione-Barr, N. (2005). Adolescents' and parents' changing conceptions of parental authority. *New Directions for Child and Adolescent Development, 2005*(108), 31–46. doi: 10.1002/cd.126

Steinberg, L. (2017). *Adolescence*. New York: McGraw-Hill.

Stuewig, J., & Tangney, J. P. (2007). Shame and guilt in antisocial and risky behaviors. In J. L. Tracy, R. W. Robins, & J. P. Tangney (Eds.), *The Self-conscious emotions: Theory and research* (pp. 371–388). New York: Guilford Press.

Stuewig, J., Tangney, J. P., Heigel, C., Harty, L., & McCloskey, L. (2010). Shaming, blaming, and maiming: Functional links among the moral emotions, externalization of blame, and aggression. *Journal of Research in Personality, 44*(1), 91–102. doi: 10.1016/j.jrp.2009.12.005

Stuewig, J., Tangney, J. P., Kendall, S., Folk, J. B., Meyer, C. R., & Dearing, R. L. (2015). Children's proneness to shame and guilt predict risky and illegal behaviors in young adulthood. *Child Psychiatry & Human Development, 46*(2), 217–227. doi: 10.1007/s10578-014-0467-1

Sznycer, D., Tooby, J., Cosmides, L., Porat, R., Shalvi, S., & Halperin, E. (2016). Shame closely tracks the threat of devaluation by others, even across cultures. *Proceedings of the National Academy of Sciences*, *113*(10), 2625–2630. doi:10.1073/pnas.1514699113

Tangney, J. P. (1992). Situational determinants of shame and guilt in young adulthood. *Personality and Social Psychology Bulletin, 18*(2), 199–206. doi:10.1177/0146167292182011

Van Vliet, K. J. (2008). Shame and resilience in adulthood: A grounded theory study. *Journal of Counseling Psychology, 55*(2), 233–245. doi: 10.1037/0022-0167.55.2.233

Velotti, P., Garofalo, C., Bottazzi, F., & Caretti, V. (2016). Faces of shame: Implications for self-esteem, emotion regulation, aggression, and well-being. *The Journal of Psychology, 151*(2), 171–184. doi: 10.1080/00223980.2016.1248809

Wang, L. (2017). *Emotion regulation of shame for adolescents* (in Chinese). Shanghai: East China Normal University.

Wang, L., & Sang, B. (2019). The effect of regulation on shame in adolescence in China. In E. Vanderheiden & C.-H. Mayer (Eds.), *The bright side of shame* (pp. 67–75). Cham, Switzerland: Springer International Publishing. doi: 10.1007/978-3-030-13409-9_5

Xie, X., Bi, Y., & Luo, Y. (2010). Effects of situational positive clues on implicit aggression (in Chinese). *Psychological Science, 33*(1), 44–47.

Yang, W. (2012). *The comparative research of the influence of the scene clues to the athletes' im-*

*plicit offensive* (in Chinese). Changsha: Hunan Normal University.

Zhou, S. (2015). *Implicit assessment of moral self-evaluation in shame-proneness* (in Chinese). Chongqing: Southwest University.

Zhou, Y. (2007). *The influencing factors and its mechanism of implicit aggression* (in Chinese). Shanghai: East China Normal University.

Zhu, R., Xu, Z., Tang, H., Liu, J., Wang, H., An, Y., Mai, X., & Liu, C. (2019). The effect of shame on anger at others: Awareness of the emotion-causing events matters. *Cognition & Emotion, 33*(4), 696–708. doi: 10.1080/02699931.2018.1489782

Zhang, F., Zhang, D., & Huang, X. (2013). The relationship between junior students' shame-proneness and aggression: The mediating role of shame coping (in Chinese). 16th Congress of Psychology of China.