Burnout and work-related well-being differences regarding morningness–eveningness preference of Croatian workers

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Editor's Foreword

Psychology Days in Zadar is an international conference organized biennially by the Department of Psychology of the University of Zadar. It started over 40 years ago, first as a regional meeting, but soon grew to become a reputable international meeting. Its quality was recognized by many participants, whose large responsiveness is an incentive to members of the Department for further improvement in the organization and realization of this event.

The 22nd Psychology Days conference in Zadar was held on October 01-03, 2020. It was organized by an international organizational-scientific committee which faced specific challenges in organizing conference during COVID-19 pandemic. Due to the COVID-19-related safety measures and restrictions, the conference has been transformed into virtual meeting. This resulted in significant challenges caused by differences in time zones and difficulties in engaging and socializing people in an online event. Being aware that networking and professional development opportunities are particularly valuable for conference attendees, it took the organizational-scientific committee an extra work to replicate these experiences online. Despite this, the committee overcame these challenges and organized another successful international conference in Zadar by gathering over 300 active participants from Croatia, USA, Great Britain, Germany, Denmark, Slovenia, Bosnia and Herzegovina, Serbia, and other countries. Over 130 papers were presented through four invited lectures, seven symposia, nineteen oral sessions, and four poster sessions.

Encouraged by authors` interest and positive experiences regarding previous editions of Book of Selected Proceedings, we have decided to invite authors who participated in 22nd Psychology Days, to send their papers for publishing in the Book of Selected Proceedings of 22nd Psychology Days in Zadar. Each paper underwent a double-blind review process by two experts in the field. List of reviewers can be found at the end of the book. After review process, twelve papers were accepted for publication in the Book of Selected Proceedings of 22nd Psychology Days in Zadar. The selected papers present research from various fields in psychology, such as personality, organisational and biological psychology, as well as mental health during the COVID-19 pandemic. We strongly believe that these studies will make an important and high-quality contribution to the existing base of scientific knowledge.

It is also noteworthy that this volume is a result of joint effort of authors, reviewers, and members of the Editorial Board. I would like to use this opportunity to thank the authors for choosing the Book of Selected Proceedings of 22nd Psychology Days in Zadar to publish their work. I would also like to express my gratitude to the reviewers, whose valuable, constructive, and supportive reviews were extremely helpful in reaching timely decisions on the manuscripts. On behalf of the Editorial Board, I thank them for their time and voluntary contribution to the quality of the work that we publish. I would also like to acknowledge the excellent and demanding work of the members of the Editorial Board who made their invaluable contribution through all stages of preparing this volume. Finally, I am thankful to the University of Zadar for sponsoring editing and publishing costs of this edition.

On behalf of the Editorial Board members and all the authors whose works are published in this volume, I wish to express my sincere hope that the Book of Selected Proceedings of 22nd Psychology Days in Zadar will be recognized as a respectable source of information and ideas for a wide range of interested audience.

Irena Pavela Banai
Editor-in-Chief

Original research

1

The relationship between humour styles and theory of mind

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Abstract

Humour is a complex phenomenon defined as a cognitive-affective style of dealing with adverse situations through amusement, which elicits a positive cognitive and affective response in people. In this study, three different theories are described. The two theories that consider Theory of Mind and humour together, the Mind Reading Hypothesis (Howe, 2002) and the Inner Eye Theory (Jung, 2003), give a prominent role to Theory of Mind (ToM) in the development of humour, which can be defined as the ability to infer about mental states of others. The approach used in this study is Martins' 2x2 conceptualization of the everyday functions of humour. He distinguishes between humour used to enhance the self or to enhance relationships with others. Each of these functions is intersected by a distinction between humour that is benign and benevolent and humour that is potentially harmful or hurtful (Martin et al., 2003). The aim of this study is to examine the relationship between humour styles and Theory of Mind. A sample of seventy-five (75) female university students participated in this study (Mage=20.5, SDage=2.04). Participants were presented first with the Humour Styles Questionnaire and then with the Faux Pas Recognition Test - Adult Version. Correlations between scores on the Humour Styles Questionnaire subscales and scores on the Faux Pas Recognition Test were calculated and there was no significant correlation. The highest mean score on the HSQ scales was for the Affiliative Humour subscale, with 91% of participants scoring the highest on this subscale. Interpretations of these results are included in the paper.

Keywords: humour, Theory of Mind, Mind Reading Hypothesis, Inner Eye Theory

Introduction

Humour is a complex phenomenon defined by many theories from different approaches. It can be defined as one of a set of elements that belong to the comic, together with wit, mockery/ridicule, sarcasm, satire, irony, etc. These elements describe a cognitive-affective style of dealing with adverse situations through amusement. In addition, it can be defined as an umbrella term for all comic phenomena (Samson, 2008). Romero and Cruthirds (2006) defined humour as a type of amusing communication that leads to a positive cognitive and emotional response, while Scheel and Gockel (2017) defined it as a communicative process that involves incongruity and evokes a variety of emotions, either in the "producer" of humour, the "receiver" of humour, or both. According to Martin (2007), humour is a "kind of mental game involving a light-hearted, non-serious attitude toward ideas and events that serves a range of serious social, emotional, and cognitive functions", focusing on incongruity, unexpectedness, and playfulness. It can emerge in everyday social interactions and manifest itself in various aspects, such as jokes, spontaneous conversational humour, and accidental or unintentional humour. It comprises four components: social context, cognitive-perceptual process, emotional response, and the vocal-behavioural expression of laughter.

Theories of humour

Although there are many approaches and theories of humour, five of them are the most influential (Martin, 2007): psychoanalytic theory, superiority/inferiority theory, arousal theory, incongruity theory, and reversal theory. According to the psychoanalytic theory, humour occurs in stressful situations and alters the perception of negative affect by observing amusing or incongruent elements in the situation. Superiority/inferiority theory defines humour in terms of aggression, the feeling of one's own victory and triumph, and the weakness of others. Both theories emphasise the emotional component of humour. Arousal theories originated in the nineteenth century, in the work of Herbert Spencer, a British philosopher, and they focus on the role of psychological and physiological arousal in humour. Incongruity theories focus on the perception of incongruity as an essential component of humour, i.e., funny things are incongruous or surprising. According to inversion theory, humour is a type of mental play that presupposes a playful state of mind, the paratelic state (Apter, 1989). The paratelic state is defined as a protective framework or psychological safety zone created to insulate against the seriousness of the world (Martin 2007). In addition to these general theoretical approaches to humour, there are also theories that come from an evolutionary perspective and view humour as an evolutionary adaptive mechanism, such as the Inner Eye Theory of Laughter (Jung, 2003) and the Mind Reading Hypothesis (Howe, 2002).

A contemporary approach to humour research used in this paper is that of Martin et al. (2003). They proposed a theory based on the 2x2 conceptualization of everyday functions of humour. A distinction is made between humour used to enhance the self or to enhance relationships with others. Each of these functions is intersected by a distinction between humour that is benign and benevolent and humour that is potentially harmful or hurtful. Accordingly, humour can be used to improve the self through a benevolent and benign approach (self-improving humour) or to disrupt relationships with others (aggressive humour). Similarly, it can be used to enhance relationships with others in a benevolent and self-accepting manner (affiliative humour) or by impairing the self (self-defeating humour).

Theory of Mind

Social cognition is an area of cognitive processing and is defined as the ability to identify, perceive, and interpret socially relevant information, and it includes facial expressions, prosody in speech, body language, and Theory of Mind (Weightman et al., 2014). The term Theory of Mind (ToM) was first used by Premack and Woodruff (1978, p.515) to describe the ability to infer mental states of others, or as they said, "when we say that an individual has a Theory of Mind, we mean that the individual attributes mental states to himself and to others (either conspecifics or even other species)". The ability to view the world from another person's perspective begins by the end of the first year of life (Remschmidt, 2009). Between the ages of three and five, children are able to perform the basic ToM tasks and develop first-order ToM, that is, they acquire the ability to perceive and understand the existence of false beliefs about events in the world. Second-order false beliefs refer to the ability to perceive and understand false beliefs about other people's beliefs, and it develops between the ages of six and seven (Vera-Estay et al., 2016). ToM has been used in a variety of research, and its definition has expanded with each new finding. For example, Dennis et al. (2013) divided ToM into cognitive ToM, affective ToM, and conative ToM. They described cognitive ToM as cognitive beliefs and "reading" other people's thoughts, affective ToM as understanding other people's emotions, and conative ToM as the forms of social communication in which one person attempts to influence another's mental or emotional state. Tager- Flusberg and Sullivan (2000) distinguished two components of Theory of Mind: the social-cognitive component and the social-perceptual component. The social-cognitive component, which is associated with cognitive abilities, describes what is traditionally considered Theory of Mind. It includes false beliefs, understanding the role of intentionality in interpreting certain non-scriptural utterances, and moral attributions. The social-perceptual component is associated with the affective system and includes the "ability to distinguish between people and objects and to make rapid judgments about people's mental states on the basis of facial and bodily expressions" (p.62).

Humour and Theory of Mind

Several theories of humour mention the role of Theory of Mind in the development and understanding of humour, although only some of them give this theory a prominent role in the development of humour. It may be necessary to understand what other people find humorous to elicit a desired response. Thus, in the Mind Reading Hypothesis, Howe's (2002) Theory of Mind is presented as the basis for the emergence of humour. Humour comes from observing and understanding the other person's perception and how they resolve the gap between the old perception and the new reality. This theory diverts attention from the common explanation that humour arises as a result of the relaxation of the conscious mind and the understanding of the incongruity between the perception of two realities and their resolution. Similarly, the theory of the inner eye (Jung, 2003) embraces the Theory of Mind idea that the human brain makes inferences about the mental states of others, thus facilitating the development of laughter and humour through three criteria, although unlike the Mind Reading Hypothesis it includes laughter. Howe (2002, p.253) defines laughter as a by-product of the "release of tension and is a simple reflex action, similar to the laughter response in tickling". Jung (2003. p.216), on the other hand, states that the "ability to read minds is crucial to the production of laughter and incorporates mind reading into all three components of the proposed laughter trigger mechanism". The three components of the trigger mechanism are: falsification of belief representations, empathy, and sympathetic immediate benefit (Jung, 2003). Falsification of belief representations refers to the falsification of a belief that the subject has about himself or others. In other words, mental states have a mind-to-world fit (Searle, 1983; cited in Jung, 2003), so they are expected to correctly represent states of

the world. When these representations turn out to be false through falsification of the expected, intended, or believed outcome, the first criterion for the emergence of laughter is met. Here, the greater the falsification, the stronger the laughter. The second criterion is empathy, which can be defined as an affective response to various emotional states of others (Eisenberg et al., 2010). It can be defined as a three-dimensional construct consisting of cognitive, motor, and emotional components (Blair, 2005). Cognitive empathy is defined as the ability to differentiate affective signals sent by others and is related to Theory of Mind. Motor empathy describes the ability to form a response to these signals (including facial expressions) and emotional empathy is described as the ability to respond accordingly. Jung (2003, p.218) defines it as "perceiving, feeling, and thinking in the imagination from the perspective of the other". It is involved in the generation of a laughing state by enabling the subject to comprehend the other's perspective and integrate it with the other's other known characteristics that may have caused the observed actions. In other words, cognitive empathy should be associated with understanding the other's perspective, motor empathy with forming a response in accordance with the subject's perspective, and emotional empathy with the response. Overall, Theory of Mind is associated with cognitive, motor, and emotional empathy and is included in Jung's (2003) definition of empathy. The third criterion is sympathetic immediate utility (SIU), which is defined as a momentary positive or negative emotion generated by the discrepancy between the false belief state of the world and the actual or real state of the world. SIU includes the understanding of a person's value system, the sympathy of laughter for the person, and the outcome. These variables define the degree of SIU and the threshold for triggering laughter. Jung (2003) highlights the role of mind reading ability for the SIU criterion as it is required to understand the person's value system and the desirability of the outcome. These three criteria have individual thresholds for laughter and an overall threshold that is sufficient to explain all laughter. Thus, the significance of the Inner Eye Theory is that it highlights the value of the cooperator in enabling others to select and choose compatible individuals through laughter as a "signal that facilitates cooperation by transmitting information about the laugher's empathy with attributed mental states and his or her sympathy values for others" (Jung, 2003, p. 245).

Finally, the previously described 2x2 conceptualization of the everyday functions of humour and their definition of affiliative humour as a type of humour used to enhance relationships with others in a benevolent and self-accepting manner can be defined similarly to Jung's (2003) value of laughter as a signal that facilitates cooperation and allows others to select compatible people through laughter. Additionally, Gessner and Kashdan (2006, as cited in Samson, 2008) found that perspective taking was positively correlated with friendly humour and negatively correlated with hostile humour. Accordingly, the importance of ToM for humour manifests itself in the recognition that the goal of the other is to generate humour, which in turn requires understanding the other's perspective. Finally, in light of the previous findings, the purpose of this study is to examine the relationship between humour styles and Theory of Mind, with the hypothesis that higher levels of humour would be expected among those who have a more developed Theory of Mind, specifically higher levels of affiliative humour.

Material and methods

Participants

A convenience sample of seventy-five (75) female university students from the University of Humanities and Social Sciences in Split participated in this study. The students who participated in this study were enrolled in preschool and teacher education. Female students were selected because they are the majority of students in these courses. Their mean age was 20.5 years (*Mage*=20.5, *SDage*=2.04, *age range*= 18-23).

Measures

The Humour Styles Questionnaire (HSQ, Martin et al., 2003) was used to measure individual differences in humour styles used in everyday situations. As mentioned earlier, this questionnaire is derived from Martin et al.'s (2003) 2x2 conceptualization of the functions of everyday humour. It consists of 32 items in four dimensions, which are reflected in four different subscales:

- Self-enhancing humour (used for self-improvement through benevolent and benign behaviour): even when I am alone, I am often amused by the absurdities of life (item example).
- Aggressive humour (used to enhance self by influencing relationships with others): When someone makes a mistake, I often tease them about it (item example).
- Affiliative humour (used to enhance relationships with others in a benign and self-accepting way): I laugh and joke a lot with my closest friends (item example).
- Self-defeating humour (used to improve relationships with others by detracting from one's self): I allow others to laugh at me or make fun of me more than I should (item example).

Each subscale consists of eight items (presented on a scale of one to seven) and has shown adequate internal consistency in the original study by Martin et al. (2003) with Cronbach Alphas ranging from .77 to .81. The HSQ was translated into Croatian by Zorbas and Tadinac (2014) with internal consistencies of .67 for the aggressive humour scale, .75 for the self-enhancing humour scale, .81 for the self-defeating humour scale, and .82 for the affiliative humour scale. Scores for each subscale are calculated by summing the scores of the items included in each subscale. A higher score on a subscale indicates a more pronounced humour dimension.

Faux Pas Recognition Test - Adult Version (Stone et al., 1998; Gregory et al., 2002) was used as a measure of Theory of Mind. It was originally intended to detect ToM skills that develop between the ages of nine and eleven. It consists of 20 stories, 10 stories containing faux pas (saying something inappropriate/incorrectly), and 10 control stories. Participants were asked to read the stories and then answer the story questions. They were informed that there was no time limit and that participation was voluntary and anonymous. The questions are presented after the story, and the format is the same for each story. The first two questions are related to Faux Pas Detection *(Did someone say something they shouldn't have?, Who said something they shouldn't have?*), the third question is focused on understanding inappropriateness (*Why shouldn't he have said it?*), the fourth on identifying intent *(Why did he say it?* or *Why do you think he said it?*), the fifth on belief (*Did X know that Y?*), and the sixth question on empathy (*How did X feel?*). The seventh and eighth questions are on understanding the story. Scores can be calculated by each aspect of the test (Faux Pas detection, Inappropriateness, Intentions, Belief, and Empathy), or an overall score can be derived. Questions are scored one point for each question answered correctly. The total score is determined by adding the ratios for each aspect of the test and dividing by a perfect score for each ratio, with a higher total score indicating a more developed Theory of Mind. In this study, we used a total score to measure overall Theory of Mind. The test was translated into Croatian and back into English for this study, with two translators proficient in at least C1 level according to the Common European Framework of Reference for Languages (CEFR) involved in the translation. This test can be found on the Autism Research Center website (ARC).

Procedure

This study was a cross-sectional study and participation was anonymous. Participants were recruited from the University of Humanities and Social Sciences in Split as a convenience sample. All of them were enrolled in preschool and teacher education. Participants were presented first with the Humour Styles

Questionnaire and then with the Faux Pas Recognition Test - Adult Version. These questionnaires were administered in a group setting and the results of the study were made available to all participants upon request.

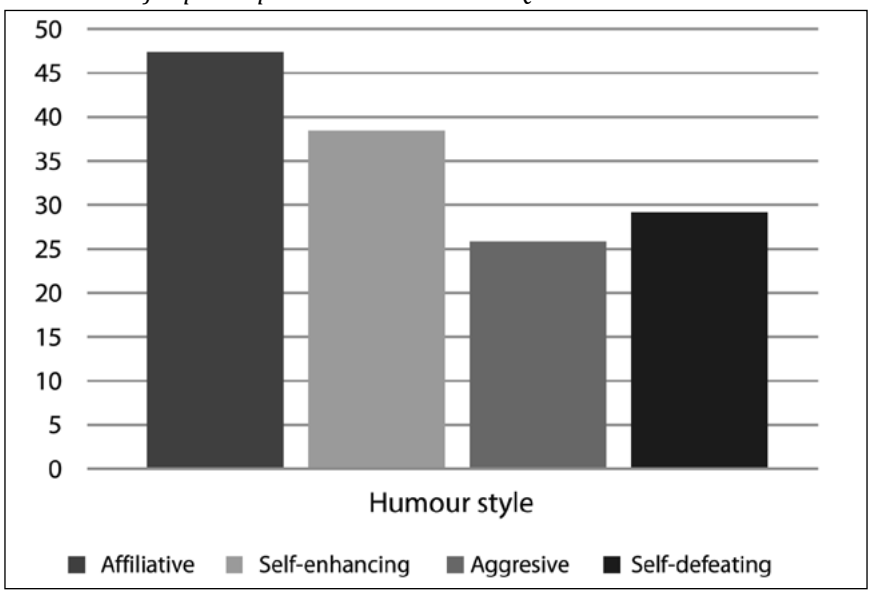
Results

Descriptive parameters for responses to the HSQ and the Faux Pas Recognition Test are presented in Table 1, and the means for participants' scores on the HSQ scales are also presented separately in Figure 1. Scores were tested for normal distribution using the Kolmogorov-Smirnov test (Table 1) before examining correlations. Normal distributions were found for the Faux Pas Recognition Test and all scales of the HSQ except for the subscale Affiliative Humour.

Table 1
Descriptive parameters for the HSQ subscales and the Faux Pas Recognition Test (N= 75)

	NUMBER OF ITEMS	*M*	*SD*	*MIN*	*MAX*	*d*	*p*
Affiliative humour (AFH)	8	47.20	6.01	21	56	.17	< .05
Self- enhancing humour (SEH)	8	38.85	6.81	17	53	.08	> .05
Aggressive humour (AH)	8	25.31	6.24	12	36	.08	> .05
Self- defeating humour (SDH)	8	28.84	7.63	11	48	.09	> .05
Faux Pas Recognition Test	20	0.74	0.15	0.32	0.99	.13	> .05

Figure 1
Mean scores for participants' results on the HSQ scales



Differences between scores on the humour style subscales were calculated using dependent samples t-tests. The results show a significant difference between the scores on the affiliative humour style subscale and all other humour style subscales, indicating that the affiliative humour style is more prominent

than all other styles (Table 2). Additionally, the results show a significant difference between the scores on the self-enhancing humour subscale and aggressive and self- defeating humour subscales, indicating that the self-enhancing humour style is more prominent than these two other styles. Finally, the results show a significant difference between the scores on the aggressive humour subscale and the self-defeating humour subscale, indicating that the aggressive humour style is more prominent than self-defeating humour.

Table 2
Results of t tests for dependent samples between the results on the humour style subscales

HUMOUR STYLEs	*t*	*df*	*p*
Affiliative humour vs. Self- enhancing humour	11.09	74	.000
Affiliative humour vs. Aggressive humour	23.46	74	.000
Affiliative humour vs. Self- defeating humour	17.51	74	.000
Self- enhancing humour vs. Aggressive humour	13.24	74	.000
Self- enhancing humour vs. Self- defeating humour	10.91	74	.000
Aggressive humour vs. Self- defeating humour	-3.89	74	.000

Correlations between scores on the humour style subscales-self-enhancing humour (used to reinforce self through benevolent and benign approach), aggressive humour (used to reinforce self by influencing relationships with others), and self-defeating humour (used to reinforce relationships with others by influencing self) and scores on the Faux Pas Recognition Test (ToM test) were calculated using the Pearson correlation coefficient. The correlation between scores on the affiliative humour subscale (used to reinforce relationships with others in a benign and self-accepting manner) and the Faux Pas Recognition Test were calculated using the Spearman rank order correlation. All correlations were very low and non-significant: ρ=-.07 between affiliative humour and ToM test, r=-.04 between self-enhancing humour and ToM test, r=-.14 between aggressive humour and ToM test, and r=.03 between self-defeating humour and ToM test (p>.05).

Discussion

As shown in Figure 1 and Table 2 the highest mean score on the HSQ scales was obtained for the subscale Affiliative Humour, with 91% of the participants having the highest score on this subscale. Considering the age and life stage that most, if not all, of the participants in this study were in, these results are to be expected. This stage of life describes the need to build and maintain relationships with others, and humour is an important part of this process. According to Ziv (2010), humour can be used to adequately begin and establish an interpersonal relationship, and Martin and Ford (2018, p. 209) state that "our perceptions of other people seem to be influenced by the type of humour they use, others' reactions to their humour, and the social context in which it is used." This statement can be extended with the assertion that similarity creates attraction, and Montoya et al. (2008) found that perceived similarity predicts interpersonal attraction even more strongly than actual similarity.

Furthermore, any individual who wishes to become part of a group undergoes a selection process in which they are evaluated by other members, and humour improves their chances of acceptance. Furthermore, laughter and humour help to demonstrate group acceptance, loyalty, and status hierarchy, define social desirability (Chapman, 1983; Jung, 2003; Martin and Ford, 2018), enhance positive emotions, and improve interpersonal relationships (Shiota et al., 2004), and affiliative humour reinforces cohesion and

a sense of group identity (Lynch, 2010). Similarly, as previously described, Jung (2003) describes humour, and as an extension, laughter, as a signal that enables and facilitates cooperation and selection of compatible people. Well-developed humour that is accepted in turn influences how others view a person. Specifically, above-average humour is associated with higher extraversion and agreeableness, implies less neuroticism, and is associated with social desirability (Cann and Calhoun, 2001).

Finally, affiliative humour style is a combination of humour used to enhance relationships with others by lifting morale, strengthening cohesion and identity, and reinforcing norms (Martineau, 1972; cited in Martin et al., 2003), and humour that is relatively benign and benevolent and used in a self-accepting manner. In relation to the previous research cited, it is possible and likely that the participants in this research, given their age and social environment, emphasized the importance of group acceptance, social desirability, cooperation, and loyalty, all of which are best achieved through the use of affiliative humour. Therefore, the part of this study related to the proportion of participants in each of the HSQ subscales is expected.

On the other hand, the results regarding the correlation between ToM and humour were not expected. Indeed, many theories of humour involve understanding another person's point of view and understanding the social context, or in other words, Theory of Mind. For example, Chan (2016) describes a three-component theory of humour, and the mechanisms included in it are humour comprehension (cognition), humour appraisal (affect), and humour expression (laughter). It includes incongruence as part of humour and its resolution in the humour comprehension phase, the occurrence of positive emotions in the humour appraisal phase, and the physical expression of these positive emotions through laughter. Jung's (2003) Inner Eye theory describes the role of ToM in detail, through the falsification of belief representations, empathy and understanding of emotional signals and perceptions of others, and the sympathetic immediate-usefulness, or a momentary positive or negative emotion generated by the discrepancy between the false belief state of the world and the actual or eventual state of the world. It involves the understanding of a person's value system, the sympathy of an individual laughing for the person they are laughing with, and the outcome. Martin and Ford (2018) refer to these types of theories as incongruity theories of humour. These theories define humour and laughter as a product of resolving incongruence or resolving the discrepancy between perceived and expected reality and the reality that occurs. In order to laugh and understand the humorous situation, a person should be able to understand the incongruity that occurred, which in turn requires a developed theory of mind. These theories and their definition of humour require mentalization, Theory of Mind and the ability to reason about other people.

On the other hand, Martin et al.'s (2003) Humour Styles Questionnaire does not measure any of the previously mentioned aspects of humour, nor is it focused on incongruence, which is required for the development of humour. Thus, this questionnaire is not constructed to describe any of the relevant aspects required to understand humour, but to describe the specific ways in which people use humour in their lives, and as such cannot be expected to correlate with the Theory of Mind tasks. Other measures of humour, perhaps those that tap into the previously mentioned constructs such as mentalization, incongruence, or comprehension, may be better choices in future research. Finally, since ToM is a complex construct that correlates with executive functions, personality traits, language, various disorders (personality disorders, intellectual difficulties, autism spectrum disorders...) and is measured with different instruments, all describing different parts of ToM, it might be advisable to adequately pair the ToM measure and the corresponding humour measure.

Conclusions

The main conclusions of this research suggest that participants in this research who are in a stage of life where it is important to build and maintain relationships with others and become part of a group choose to use affiliative humour to achieve these goals. This statement is consistent with research findings on affiliative humour, which is commonly used in groups to enhance relationships with others in a benign, benevolent, and self-accepting manner. Our other conclusion relates to the use of various ToM and humour tests and questionnaires. Since ToM is a complex construct, with correlations to several other constructs, including humour, care should be taken in the selection of instruments, as the outcome of the research depends on the careful selection of the right measure. Although this is important in any research and has already been mentioned, Theory of Mind can be associated with a large number of constructs and we find it best to deconstruct the relevant constructs into smaller aspects, which in turn provide a better perspective for selecting the appropriate ToM test to conduct a research. For this research, the Faux Pas Task, specifically the parts that examine recognition, understanding inappropriateness, and empathy, individually rather than as an overall measure, might have been more useful. Another good ToM task for this research would have been the Strange Stories Task (Happé, 1994). Additionally, humour tests involving incongruence, mentalizing, faking belief representations, or understanding social cues should be paired with these ToM tests. Finally, this study was only conducted on a sample of female students and its generalizability is limited. However, it may provide useful insights into the relative relevance of developmental constructs such as ToM in comparison to the process of establishing and maintaining social relationships in adolescence.

References

Apter, M. J. (1989). Reversal theory: A new approach to motivation, emotion and personality. *Anuario de Psicologia, 42*(3), 17- 29.

Blair, R. J. R. (2005). Responding to the emotions of others: Dissociating forms of empathy through the study of typical and psychiatric populations. *Consciousness and Cognition, 14*, 698- 718. https://doi.org/10.1016/j.concog.2005.06.004.

Cann, A., & Calhoun, L. G. (2001). Perceived personality associations with differences in sense of humor: Stereotypes of hypothetical others with high or low senses of humor. *Humor, 14*(2), 117- 130. https://doi.org/10.1515/humr.14.2.117.

Chan, Y. C. (2016). Neural correlates of sex/ gender differences in humor processing for different joke types. *Frontiers in Psychology, 7*(536), 1- 18. https://doi.org/10.3389/fpsyg.2016.00536.

Chapman, A. J. (1983). Humor and laughter in social interactions and some implications for humor research. In P. E. McGhee and J. H. Goldstein (Eds.) *Handbook of humor research: Volume 1, Basic Issues* (pp. 135- 159). Springer- Verlag.

Dennis, M., Simic, N., Bigler, E. D., Abildskov, T., Agostino, A., Taylor, H. G., Rubin, K., Vannatta, K., Gerhardt, C. A., Stancin, T., & Yeates, K. O. (2013). Cognitive, affective, and conative thery of mind (ToM) in children with traumatic brain injury. *Developmental Cognitive Neuroscience, 5*, 25 – 39. https://doi.org/10.1016/j.dcn.2012.11.006.

Eisenberg, N., Eggum, N. D., & Di Giunta, L. (2010). Empathy- related responding: Associations with prosocial behavior, aggression, and intergroup relations. *Social Issues Policy Review, 4*(1), 143- 180. https://doi.org/10.1111/j.1751-2409.2010.01020.x.

Gregory, C., Lough, S., Stone, V. E., Erzinclioglu, S., Martin, L., Baron-Cohen, S., & Hodges, J. (2002). Theory of

mind in patients with frontal variant frontotemporal dementia and Alzheimer's disease: Theoretical and practical implications. *Brain*, *125*, 752-64. https://doi.org/10.1093/brain/awf079.

Happé, F. G. E. (1994). An advanced test of theory of mind: Understanding of story characters´ thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. *Journal of Autism and Developmental Disorders, 24*(2), 129 – 154.

Howe, N. E. (2002). The origin of humor. *Medical Hypotheses, 59*(3), 252-254. https://doi.org/10.1016/S0306-9877(02)00209-8.

Jung, W. E. (2003). The Inner Eye Theory of Laughter: Mindreader Signals Cooperator Value. *Evolutionary Psychology, 1,* 214-253. https://doi.org/10.1177/147470490300100118.

Lynch, R. (2010). It`s funny because we think it`s true: laughter is augmented by implicitpreferences. *Evolution and Human Behavior, 31*, 141-148. https://doi.org/10.1016/j.evolhumbehav.2009.07.003.

Martin, R. A. (2007). *The psychology of humor: An integrative approach.* Elsevier.

Martin, R A., & Ford, T. E. (2018). *The psychology of humor: An integrative approach.* Academic Press Elsevier.

Martin, R. A., Puhlik-Doris, P., Larsen, G., Gray, J., & Weir, K. (2003). Individual differences in uses of humor and their relation to psychological well-being: Development of the Humor Styles Questionnaire. *Journal of Research in Personality, 37,* 48-75. https://doi.org/10.1016/S0092-6566(02)00534-2.

Montoya, R. M., Horton, R. S., & Kirchner, J. (2008). Is actual similarity necessary for attraction?: A meta-analysis of actual and perceived similarity. *Journal of Social and Personal Relationships, 25*(5), 879-912. https://doi.org/10.1177/0265407508096700.

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences, 1*(4), 515-526. https://doi.org/10.1017/S0140525X00076512.

Remschmidt, H. (2009). *Autizam: Pojavni oblici, uzroci, pomoć. [Autism: types, causes and help].* Naklada Slap.

Romero, E. J., & Cruthirds, K. W. (2006). The use of humor in the workplace. *Academy of Management Perspectives, 20*, 58-69.

Samson, A. C. (2008). Cognitive and Neural Humor Processing: The influence of structural stimulus properties and Theory of Mind. (Unpublished doctoral dissertation): Faculty of Humanities and Social Studies in Freiburg.

Scheel, T., & Gockel, C. (2017). *Humor at work in teams, leadership, negotiations, learning and health*. Springer International Publishing.

Shiota, M. N., Campos, B., Keltner, D., & Hertenstein, M. J. (2004). Positive emotion and the regulation of interpersonal relationships. In P. Philippot and R. S. Feldman (Eds.) *The regulation of emotion* (pp. 127- 157). Lawrence Erlbaum Associates, Inc.

Stone, V.E., Baron-Cohen, S., & Knight, R.T. (1998). Frontal lobe contributions to theory of mind. *Journal of Cognitive Neuroscience*, 10, 640-656. https://doi.org/10.1162/089892998562942.

Tager- Flusberg, H., & Sullivan, K. (2000). A componential view of theory of mind: evidence from Williams syndrome. *Cognition, 76*(1), 59- 90. https://doi.org/10.1016/S0010-0277(00)00069-X.

Vera- Estay, E., Seni, A. G., Champagne, C., & Beauchamp, M. H. (2016). All for one: contributions of age, socioeconomic factors, executive functioning, and social cognition to moral reasoning in childhood. *Frontiers in Psychology, 8*(7), 227. https://doi.org/10.3389/fpsyg.2016.00227.

Weightman, M. J., Air, M. T., & Baune, B. T. (2014). A review of the role of social cognition in major depressive disorder. *Frontiers in Psychiatry, 11*(5), 179. https://doi.org/10.3389/fpsyt.2014.00179.

Ziv, A. (2010). The social function of humor in interpersonal relationships. *Sociology*, 47, 11-18. https://doi.org/10.1007/s12115-009-9283-9.

Zorbas, H., &Tadinac, M. (2014). Je li humor spolno odabrano svojstvo? (Is Humor a sexually selected trait?) (Unpublished master`s thesis): Department of Psychology, Faculty of Humanities and Social Studies in Zagreb.

Original research

2

Mental health of different groups of non-communicable disease patients and its relation to knowledge about COVID-19 and significant life events

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Abstract

This study examined the relationship between mental health and COVID-19 related knowledge in a sample of patients with different types of non-communicable diseases (respiratory diseases, cardiovascular diseases, diabetes, and other) in Croatia. 171 participants (84% women, 30% respiratory diseases patients, Mage=42.76) completed an online survey that was conducted from March 18 until March 23, 2020. Measures included the Hospital Anxiety and Depression Scale, Optimism-Pessimism Scale and 8 questions about the novel coronavirus. Participants with respiratory disease were as informed, anxious, depressed, optimistic, and pessimistic as participants with other non-communicable diseases. Participants who had experienced a significant life-event in the week preceding the study reported higher levels of anxiety and depression than participants who had not experienced a significant life-event, while these groups of participants did not differ in the levels of optimism and pessimism. Depression and anxiety were predicted by experiencing a significant life-event, higher levels of pessimism, and lower levels of optimism, but anxiety was also predicted by higher knowledge about the COVID-19 symptoms. Optimism was also related to lower knowledge about the efficacy of nose rinsing. The findings of this study have a potential to encourage public health experts in creating tailored messages whilst also taking into consideration the mental health of vulnerable groups of people exposed to other stressful life events.

Keywords: COVID-19 related knowledge, non-communicable disease, anxiety, depression, optimism, pessimism

Introduction

According to the World Health Organization (2018) non-communicable disease appear as the result of a combination of genetic, physiological, environmental, and behavioral factors. These diseases are also known as chronic disease and tend to be long in their duration. 41 million people die annually from chronic disease which accounts for more than 70 percent of all deaths globally. Eighty percent of all deaths from non-communicable diseases are caused by four main types of diseases: cardiovascular disease, diabetes, cancer, and chronic respiratory disease (Isaranuwatchai et al., 2020; World Health Organization, 2018). A lifestyle including excessive use of alcohol, tobacco, physical inactivity, and unhealthy diet contributes to the risk of developing a non-communicable disease (Beaglehole et al., 2011).

A novel coronavirus (SARS-CoV-2) appeared in the Chinese city of Wuhan in December 2019 and has spread all over the world. WHO (2020) declared a pandemic on 11 March 2020. The novel coronavirus causes respiratory disease COVID-19 with a variety of potential outcomes: percentages of asymptomatic cases vary from 17% (Byambasuren et al., 2020) to 81% (Ing et al., 2020) while mortality rate on a world-wide level is 2% (Worldometer, 2021). Currently available data suggests that by June 2021 over three and a half million people died from COVID-19 and more than hundred and seventy million cases of infection have been registered (Worldometer, 2021). Evidence from biomedical studies shows that existing comorbidities increase the risk of being infected (Chen et al., 2020; Yang et al., 2020) and might endanger a patient's life (Wang, D. et al., 2020). Tanner (2020) concludes that the COVID-19 mortality rate among people having a non-communicable disease is higher compared to the general population. The lockdown imposed by governments as well as *stay at home orders* led to additional risks for chronic disease patients: sometimes they were unable to get medical care (Hsiao et al., 2020) and consequently their health condition deteriorated (Awucha et al., 2020); important appointments with medical experts had been delayed to avoid the risk of being infected or due to inability to go (Louvardi et al., 2020; Mauro et al., 2020).

Difficulties regarding physical health were not the only challenge during the COVID-19 pandemic for people with non-communicable disease: sleep disturbances and lower quality of sleep (Xia et al., 2020) as well as higher levels of psychological impact, depression, anxiety, stress (Wang, C., 2020) and somatization (Louvardi et al., 2020) were reported. Alshareef et al. (2020) indicate that healthy lifestyle habits among individuals with diabetes were reduced while Grabowski et al. (2020) found that patients with diabetes experience altered self-observations because society labels them as vulnerable. Ciacci and Siniscalchi (2020) highlight that the main concerns for non-communicable disease patients during the lockdown were different fears: of death, of being infected more easily than the rest of the population and of being alone whereas Korukcu et al. (2021) found that having a chronic disease requiring long-term medication contributed to higher levels of fear of COVID-19. Zhou et al. (2020) showed that optimistic attitudes and thoughts about the development of the pandemic might act as a protection against depression and anxiety, while Du et al. (2020) report that lack of knowledge about the novel coronavirus contributes to elevated anxiety symptoms.

The protective role of knowledge during the COVID-19 pandemic has been highlighted by the recent studies (Wang, C. et al., 2020; Yıldırım & Güler, 2020) and findings by Galić et al. (2020) suggest that different types of information should be given regarding different COVID-19 related knowledge. Having said that, chronic disease patients do not possess adequate knowledge about COVID-19 (Akalu et al., 2020; Huynh et al., 2020) and have distorted risk perceptions about developing severe health problems and might not practice precautionary measures (Tran & Ravaud, 2020). Although according to the available literature the relationship between mental health and knowledge about COVID-19 has not been studied yet, these findings are of huge importance since the COVID-19 pandemic is being followed by an infodemic – among the huge amounts of information people all over the world have been encountering, some are misinformation

(Huaxia, 2020). Moreover, both credible and fake news lead to great uncertainty and fear of the unknown (Cipolletta & Ortu, 2020) and it is argued that confusion and panic state might posit greater danger than the disease itself (Depoux et al., 2020). Besides panic, other negative emotions might be experienced in a significant life-event (Bityutskaya & Bazarov, 2019)

Significant life-events can be defined as distinct events that could cause a significant change in mood or strain routine functioning (Jean-Baptiste et al., 2020). They may be perceived as harmful or threatening (Cohen et al., 2016) or require the individual's adaptation (Holmes & Rahe, 1967). Some argue that the COVID-19 pandemic is a significant life-event (Jean-Baptiste et al., 2020; Lorenzo et al., 2021) that has changed the world radically (Politico Magazine, 2020). The impact of significant life-events on affective regulation has been studied extensively (Cohen et al., 2019) and according to the large body of studies, the pandemic has significantly affected mental health: Sonderskov et al. (2020) report lower psychological well-being compared to pre-COVID period, while Ozdin and Bayrak Ozdin (2020) indicate that having at least one non-communicable disease predicts higher levels of health anxiety. Furthermore, having a history of stressful events was associated with higher levels of anxiety and depression (Mazza et al., 2020) and Grajek et al. (2021) have shown that the sudden appearance of COVID-19 as a large stressor caused a decrease in non-communicable patients' quality of life and an increase in negative feelings associated with chronic disease. According to the aforementioned findings, it can be assumed that the COVID-19 pandemic and the recent significant life events can be viewed as accumulated stressors that might have exacerbated negative feelings of non-communicable disease participants.

To the best of our knowledge, only a study by Camacho-Rivera et al. (2020) compared different preventive behaviors of different types of non-communicable disease patients during the COVID-19 pandemic, especially in the Croatian context. Their findings suggest that individuals with immune conditions were more likely to wear a face mask while individuals with a respiratory disease were more likely to work from home. Considering everything stated above, we wanted to fill in the existing research gap and examine how well Croatian citizens who have at least one non-communicable disease are informed about the novel coronavirus and the relationship between this knowledge and mental health. Respiratory disease patients are more likely to develop a severe type of COVID-19 disease compared to other non-communicable disease patients (Wang, F. et al., 2020) and Laires et al. (2021) indicate that the highest self-perceived risk of developing a severe disease course was among the people with respiratory diseases. Therefore, we hypothesized that participants with respiratory disease, in the aims of protecting themselves from developing the disease or coping with it, would be better informed about the novel coronavirus than participants with other non-communicable disease (H1a). It was also expected that participants with respiratory diseases would have higher levels of anxiety, depression, and pessimism, as well as lower levels of optimism than participants with other non-communicable diseases (H1b). Furthermore, we hypothesized that poorer knowledge about different aspects of the disease in both respiratory and non-respiratory disease participants would be related to higher levels of anxiety, depression and pessimism and lower levels of optimism (H2a). We hypothesized that lower levels of optimism and higher levels of pessimism would be related to higher levels of anxiety and depression (H2b). Finally, we hypothesized that participants who experienced a significant life-event in the week preceding the study would have higher levels of anxiety, depression, and pessimism and lower levels of optimism in comparison with those who had not experienced any significant life-event at this time (H3).

Material and methods

Participants

The snowball method was used to recruit the participants. Participants in this study are a subsample from a larger study about COVID-19 related knowledge and mental health (Galić et al., 2020) and only participants who reported having at least one non-communicable disease (*N*=171) were included in data analysis. 51 participants (30%) had a respiratory disease, 44 participants (26%) reported suffering from a cardiovascular disease, 21 participants (12%) had diabetes, 45 participants (26%) had some other chronic disease and 10 participants (6%) suffered from more than one non-communicable disease. The mean age of the sample was 42.76 years and the majority of participants were women (84%). Most of the participants had finished high school (61%) and 26% of participants had experienced a significant life event the week before the study.

Measures

Participants filled in a socio-demographic questionnaire containing questions on gender, age, education level, infection prevention and control measures. They were also asked if they had experienced a significant life-event in a week prior to study (e.g., death of a close person, breaking up an intimate relationship, residence change, and changes in their work environment). According to the positive or negative answer to this question, participants were divided in two groups: those who experienced a significant life-event (1) and those who did not experience it (0) in the week preceding the study. Other measures included a COVID-19 knowledge test developed for the aim of this study, The Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983; Pokrajac-Bulian et al., 2015) and Optimism-Pessimism Scale (Penezić, 2002).

The COVID-19 knowledge test had eight questions: five of them were multiple choice questions and three questions were true/false questions. Authors used information on the official World Health Organization website dedicated to the novel coronavirus (https://www.who.int/emergencies/diseases/novel-coronavirus-2019/advice-for-public/myth-buster) and translated all the questions from English to Croatian by using the back translation method. Participants were given one point for each correct answer and zero points for incorrect answers. The authors planned to make a linear combination of eight question that would present a general measure of knowledge on the novel coronavirus. However, results of different reliability and factor analyses suggested that a linear combination could not be computed so each question was considered separately and the relationship between response accuracy and other research variables was examined. According to answers given to each of the questions, participants were divided in two groups: e.g., if a participant answered correctly to question five and incorrectly to question seven, he was put in the 'informed' group for question five and 'uninformed' group for question seven.

The Hospital Anxiety and Depression Scale (Zigmond & Snaith, 1983) was validated on a Croatian sample by Pokrajac-Bulian et al. (2015). It has two subscales: Anxiety subscale (e.g., *I get sudden feelings of panic*) and Depression subscale (e.g., I have lost interest in my appearance) and each of them has 7 items. Responses were given on a 4-point scale with the answer 0 meaning not at all and 3 meaning most of the time. Higher scale score represents higher level of anxiety or depression. The internal reliability measured by the Cronbach Alpha coefficient was .83 for Depression subscale and .89 for Anxiety subscale in this study.

The Optimism-Pessimism Scale (OPS; Penezić, 2002) measures positive and negative expectations of future activities outcome. This scale consists of the Optimism subscale (e.g., I expect the best in uncertain times) with six items and the Pessimism subscale (e.g., I rarely expect something good to happen) with eight items. Responses were given on a 5-point Likert scale with the answer 1 meaning strongly disagree and 5 meaning strongly agree. Higher scale score represents higher level of optimism or pessimism. The internal reliability measured by Cronbach Alpha coefficient was .86 for pessimism and .87 for optimism in this study.

Procedure

After being approved by the Ethical Committee of the Department of Psychology at the University of Zadar, data collection started one day before the lockdown in Croatia (18 March 2020) via Google Forms advertised on WhatsApp and Facebook pages. Data collection was planned to last for a week but due to the Zagreb earthquake (22 March 2020), which was a significant life-event not mentioned in the study answers, responses were not accepted after this date. Participants were informed about the aim of the study, and they were asked to provide an informed consent before filling in the prepared questionnaire.

Results

Descriptive statistics of the observed variables are presented in Table 1. The most difficult question in the Knowledge test was the question about the percentage of people who develop serious breathing problems. According to difficulty indexes, questions about the effects of rinsing your nose, the most common COVID-19 symptoms and the ways of transmission were of optimal difficulty while the remaining questions were too easy. The level of pessimism was distributed around the theoretical mean value of the scale, while the average level of optimism was above the theoretical mean value of the scale. The levels of anxiety and depression were distributed below the theoretical mean values of the scale.

Table 1
Descriptive statistics of observed variables (N=171)

	M	*SD*	*Min*	*Max*
q1 Effects of rinsing nose	.57	.50		
q2 Effects of antibiotics in preventing COVID-19	.97	.17		
q3 The most common symptoms of COVID-19	.68	.47		
q4 Handwashing to protect from COVID-19	.94	.24		
q5 COVID-19 ways of transmission	.43	.50		
q6 The percentage of people who develop serious breathing problems	.13	.34		
q7 Persons without symptoms can transmit COVID-19	.96	.18		
q8 Virus time survival on surfaces	.96	.20		
Anxiety	9.01	4.74	1	21
Depression	6.46	4.52	0	21
Pessimism	21.52	7.10	8	40
Optimism	22.55	4.87	6	30

Note. q1-q8 – Questions in COVID-19 knowledge test

To examine whether there were differing levels of COVID-19 related knowledge (H1a), anxiety, depression, optimism, and pessimism (H1b) among respiratory diseases patients and other non-communicable diseases patients phi and point-biserial coefficients of correlation were computed. To examine whether poorer knowledge about different aspects of the disease in both respiratory and non-respiratory disease participants would be related to higher levels of anxiety, depression and pessimism and lower levels of

optimism (H2a) as well as whether there was a difference in anxiety, depression, optimism, and pessimism between participants who experienced a significant life-event and those who have not in a week preceding the study (H3), point-biserial correlation coefficients were computed. Pearson correlation coefficients were computed to test whether lower levels of optimism and higher levels of pessimism would be related to higher levels of anxiety and depression (H2b). The correlations between all the mentioned variables and the participants' age were also computed. All these correlations are shown in Table 2.

Table 2

Pearson, point-biserial and phi correlation coefficients between the observed variables (N=171)

Variable	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1. Age	-.05	-.21**	.06	-.06	.05	-.03	-.21**	-.04	-.07	.10	-.13	-.02	.03	.02
2. Life Events	1	.07	.03	.10	-.04	-.08	-.06	-.00	-.03	.06	.18*	.25**	.01	-.14
3. Respiratory disease		1	.07	.11	.07	.05	.11	.01	.12	.01	-.04	-.01	-.02	.07
4. q1 Rinsing nose			1	.13	-.09	-.06	.08	.03	.03	0.12	-.07	.00	-.05	-.18*
5. q2 Antibiotics				1	.03	-.04	.01	.07	.16*	.14	-.08	-.04	-.05	-.07
6. q3 Symptoms					1	.15	.14	-.10	.00	-.08	.16*	.07	.02	.06
7. q4 Handwashing						1	.06	.03	.09	-.05	.02	.03	.04	.14
8. q5 Transmission							1	-.10	.04	-.12	-.05	-.05	-.05	.13
9. q6 Serious breathing problems								1	.08	-.09	-.04	.05	.05	-.15*
10. q7 Asymptomatic									1	.12	-.05	.01	-.06	.03
11. q8 Survival on surfaces										1	-.04	.01	.04	-.03
12. Anxiety											1	.79**	.39**	-.28**
13. Depression												1	.39**	-.35**
14. Pessimism													1	-.32**
15. Optimism														1

According to the results shown in Table 2, having a non-respiratory chronic disease was positively correlated with age, while age was negatively correlated with knowledge about COVID-19 symptoms. Experiencing a significant life event in the week preceding the study was positively correlated with anxiety and depression. The accuracy of responses to questions about rinsing nose and developing serious breathing problems were negatively correlated with optimism whereas higher levels of knowledge about COVID-19 symptoms were correlated with higher levels of anxiety. Higher levels of anxiety were correlated with higher levels of depression and pessimism and lower levels of optimism. Depression was also correlated to a higher level of pessimism and lower optimism. Other correlations were not significant (Table 2).

To additionally examine the predictive value of the set of variables correlated on a bi-variate level (COVID-19 knowledge and experiencing significant life-event) in explaining dependent variables (anxiety, depression, and optimism) three multiple regression analyses were conducted. The predictive value of optimism and pessimism in predicting anxiety and depression was also examined. The results of the regression analyses are shown in Table 3. Although pessimism was correlated with both mental health indicators and optimism, it was not significantly correlated with neither of the variables that were tested as predictors. Therefore, multiple regression analysis for pessimism as the dependent variable was not conducted.

Table 3

The results of multiple regression analysis of observed variables in predicting anxiety, depression, and optimism among non-communicable disease patients (N=171)

Dependent variable	Predictors	Standardized Coefficients	Std. Error	*R*	Adj. R^2
		ß	*ß*		
Anxiety	q3	.174*	.068	.48**	.21**
	Life Events	.162*	.069		
	Pessimism	.329**	.072		
	Optimism	-.162*	.073		
Depression	Life Events	.214**	.068	.50**	.24**
	Pessimism	.312**	.071		
	Optimism	-.222**	.071		
Optimism	Anxiety	-.016	.116	.47**	.20**
	Depression	-.246*	.115		
	Pessimism	-.226**	.076		
	q1	-.193**	.069		
	q6	-.124	.070		

*Note: *p < .05; **p < .01*

The results in Table 3 show that higher knowledge about the COVID-19 symptoms, experiencing a significant life-event in the week preceding the study, higher levels of pessimism, and lower levels of optimism have a significant contribution in the explanation of anxiety. These four variables account for 21.2% of the variance of anxiety. Experiencing a significant life-event in the week preceding the study, higher levels of pessimism, and lower levels of optimism have a significant contribution in the explanation of depression. These three variables account for 23.9% of the variance of depression. Lower knowledge about the efficacy of rinsing nose, lower levels of depression and pessimism have a significant contribution in the explanation of optimism. These three variables account for 19.5% of the variance of optimism.

Discussion

This study aimed to examine the relationship between COVID-19 related knowledge and mental health in a sample of Croatian citizens with at least one non-communicable disease. Our overall hypotheses were only partially confirmed. According to the difficulty indexes on COVID-19 knowledge questions, our sample of non-communicable diseases patients was well-informed about the novel coronavirus and no differences were found in the accuracy of responses to any of the COVID-19 related knowledge test question between participants with respiratory disease and participants with other types of non-communicable disease. Our finding that participants with non-communicable diseases were well-informed about the novel coronavirus is not in line with the results of previous studies (Akalu et al., 2020; Bailey et al., 2020; Huynh et al., 2020; Wolf et al., 2020). It can be assumed that extensive media coverage about ways to prevent the infection since the first COVID-19 registered case in Croatia on 25 February 2020 has contributed to the high knowledge of our sample regardless of the type of non-communicable disease which is not in line with hypothesis H1a. Having said that, our results indicate that among the Croatian sample of non-communicable diseases patients knowledge about ways of transmission and about developing serious breathing problems was not as good as in other questions. One possible explanation for this is the infodemic participants might have experienced when encountering fake news and misinformation. The findings of Galić et al. (2020) highlight the responsibility public health experts have when addressing the citizens and according to Brooks et al. (2020) accurate information is necessary during the quarantine period because it enables people to understand the situation.

Contrary to the hypothesis H1b, respiratory diseases patients were as anxious, depressive, optimistic and pessimistic as other non-communicable disease patients. The COVID-19 pandemic can be described as a threatening situation for the whole society and it is plausible that having adequate knowledge about the ways to protect yourself from being infected by the novel coronavirus (e.g. regular handwashing) might have equipped our participants with the capability to practice health-related behaviors, such as handwashing (West et al., 2020). This action may have protected them from mental health deterioration. Ahorsu et al. (2020) indicate that participants who practice preventive behaviors have higher levels of mental health. However, further altered research should be conducted to test such an assumption.

The findings of correlation and multiple regression analyses are not completely in line with hypothesis H2a. Pessimism did not correlate with neither of our predictors: experiencing significant life-event nor COVID-19 related knowledge. Higher levels of depression and anxiety were predicted by experiencing a significant life-event in the week preceding the study. Participants might have wondered about what could happen next in the pandemic which could have led to higher levels of anxiety. At the same time ruminating if they could have done anything different to avoid the significant life-event might have started an onset of depressive symptoms (Olatunji et al., 2013). Being informed about the COVID-19 symptoms was another predictor of higher anxiety levels. Since non-communicable disease patients have been at risk of developing severe types of the COVID-19 with uncertain outcomes (Chen et al., 2020; Yang et al., 2020) it is plausible that they were afraid about developing the COVID-19 symptoms or were even, due to their condition, experiencing similar symptoms. The anxiety connected to this fear could have led to being sure to inform themselves well about the symptoms.

The misbelief about nose rinsing as an effective way to protect against the COVID-19 infection predicted higher levels of optimism, which might be an indicator of unrealistic optimism among our participants. Makridakis & Moleskis (2015) report that unrealistic optimism can lead to the underestimation of risk and illness so our finding should be considered with great concern: if especially vulnerable groups underestimated the risk of the COVID-19 infection, possible outcomes might be fatal. Considering that specific communication towards individuals with a high risk of developing severe COVID-19 is mandatory (Tran &

Ravaud, 2020) and that more targeted communication can help people understand different information during the pandemic (Grabowski et al., 2020), it is of greatest importance for public health experts to adjust their communication to different audiences, especially those suffering from non-communicable diseases, by providing tailored messages (e.g., how to practice at home, how to calm yourself using breathing exercises, what (not) to do outside, etc.) in order to handle the current pandemic in the best possible way.

The findings of this study were also partly in line with H2b, since anxiety was not a significant predictor of optimism whereas lower levels of depression and pessimism predicted higher levels of optimism. However, the results could be attributed to the interdependence of the predictors, especially anxiety and depression which are highly correlated. Higher levels of anxiety and depression were, expectedly, predicted by higher levels of pessimism and lower levels of optimism. These results are in line with Zenger et al. (2010) who report that patients with high level of pessimism and low level of optimism are at risk for higher levels of anxiety and depression.

Higher levels of anxiety and depression observed in participants who experienced a significant life-event prior to the study are in line with hypothesis H3 and can be explained by Dohrenwend and Dohrenwend's (1974) theory of stressful life events. According to this theory, every event that affects individual's usual activities is perceived as a stressful event which is bound to require adaptation (Holmes & Rahe, 1967). Therefore, being anxious or depressive is at the same time a reaction to the unexpected events in participants' lives but also to the COVID-19 pandemic which is a significant life-event (Jean-Baptiste et al., 2020; Lorenzo et al., 2020). A possible explanation for comparable levels of optimism and pessimism among participants who experienced a significant life-event prior to the study and those who did not, which is contrary to H3 is that optimism and pessimism are relatively stable and independent personality traits (Scheier & Carver, 1985) which implies they are less prone to change after unpredictable events.

The here presented study has some limitations. The study is cross-sectional, which does not allow conclusions about changes in the mental health of our sample during the lockdown, nor about any causal relations among the variables. Moreover, the sample of non-communicable disease patients is not a representative sample for Croatia – for example, women are overrepresented. Future research should aim at collecting data on a more representative and larger sample of the targeted patients in several time points and include questions on the practice of specific health-related behaviors. Such research could also consider potential moderator and mediator roles among the studied variables.

Conclusions

This study contributes to a growing body of COVID-19 related studies with non-communicable disease patients in Croatia (Buljan-Flander et al., 2020; Lauri-Korajlija & Jokić-Begić, 2020). The main finding of our study is that, at the beginning of the lockdown in Croatia, higher levels of anxiety among non-communicable disease patients can be predicted by a higher knowledge about the COVID-19 symptoms. Moreover, respiratory disease patients were as anxious, depressive, optimistic, and pessimistic as patients with other non-communicable diseases, while those who experienced a significant life-event in the week preceding the study were more depressed and anxious than those who did not. The findings of this study have a potential to encourage public health experts in creating tailored messages which would take into consideration exposure to other stressful life events and the mental health of vulnerable groups of people.

References

Alshareef, R., Al Zahrani, A., Alzahrani, A., & Ghandoura, L. (2020). Impact of the COVID-19 lockdown on diabetes patients in Jeddah, Saudi Arabia. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *14*(5), 1583–1587. https://doi.org/10.1016/j.dsx.2020.07.051

Akalu, Y., Ayelign, B., & Molla, M. D. (2020). Knowledge, Attitude and Practice Towards COVID-19 Among Chronic Disease Patients at Addis Zemen Hospital, Northwest Ethiopia. *Infection and Drug Resistance*, *13*, 1949–1960. https://doi.org/10.2147/idr.s258736

Alshareef, R., Al Zahrani, A., Alzahrani, A., & Ghandoura, L. (2020). Impact of the COVID-19 lockdown on diabetes patients in Jeddah, Saudi Arabia. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *14*(5), 1583–1587. https://doi.org/10.1016/j.dsx.2020.07.051

Awucha, N. E., Janefrances, O. C., Meshach, A. C., Henrietta, J. C., Daniel, A. I., & Chidiebere, N. E. (2020). Impact of the COVID-19 Pandemic on Consumers' Access to Essential Medicines in Nigeria. *The American Journal of Tropical Medicine and Hygiene*, *103*(4), 1630–1634. https://doi.org/10.4269/ajtmh.20-0838

Bailey, S. C., Serper, M., Opsasnick, L., Persell, S. D., O'Conor, R., Curtis, L. M., Benavente, J. Y., Wismer, G., Batio, S., Eifler, M., Zheng, P., Russell, A., Arvanitis, M., Ladner, D. P., Kwasny, M. J., Rowe, T., Linder, J. A., & Wolf, M. S. (2020). Changes in COVID-19 Knowledge, Beliefs, Behaviors, and Preparedness Among High-Risk Adults from the Onset to the Acceleration Phase of the US Outbreak. *Journal of General Internal Medicine*, *35*(11), 3285–3292. https://doi.org/10.1007/s11606-020-05980-2

Beaglehole, R., Bonita, R., Horton, R., Adams, C., Alleyne, G., Asaria, P., Baugh, V., Bekedam, H., Billo, N., Casswell, S., Cecchini, M., Colagiuri, R., Colagiuri, S., Collins, T., Ebrahim, S., Engelgau, M., Galea, G., Gaziano, T., Geneau, R., & Haines, A. (2011). Priority actions for the non-communicable disease crisis. *Lancet, 377*(9775), 1438–1447. https://doi.org/10.1016/S0140-6736(11)60393-0

Bityutskaya, E. V., & Bazarov, T. Y. (2019). Features of perception of life events by people with different preferred styles of response to changes. *Voprosy Psikhologii*, *3*, 94–106.

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet*, *395*(10227), 912–920. https://doi.org/10.1016/S0140-6736(20)30460-8

Buljan Flander, G., Galic, R., Roje Dapic, M., Raguz, A., & Prijatelj, K. (2021). Protective and Risk Factors in Adjusting to the Covid-19 Pandemic in Croatia. *Socijalna psihijatrija*, *48*(3), 285–300. https://doi.org/10.24869/spsih.2020.285

Byambasuren, O., Cardona, M., Bell, K., Clark, J., McLaws, M.-L., & Glasziou, P. (2020). Estimating the extent of asymptomatic COVID-19 and its potential for community transmission: Systematic review and meta-analysis. *Official Journal of the Association of Medical Microbiology and Infectious Disease Canada*, *COVID-19*, *5*(4), 223-234. https://doi.org/10.3138/jammi-2020-0030

Camacho-Rivera, M., Islam, J. Y., & Vidot, D. C. (2020). Associations Between Chronic Health Conditions and COVID-19 Preventive Behaviors Among a Nationally Representative Sample of U.S. Adults: An Analysis of the COVID Impact Survey. *Health Equity*, *4*(1), 336–344. https://doi.org/10.1089/heq.2020.0031

Chen, N., Zhou, M., Dong, X., Qu, J., Gong, F., Han, Y., Qiu, Y., Wang, J., Liu, Y., Wei, Y., Xia, J., Yu, T., Zhang, X., & Zhang, L. (2020). Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *The Lancet*, *395*(10223), 507-513. https://doi.org/10.1016/s0140-6736(20)30211-7

Ciacci, C., & Siniscalchi, M. (2020). Tips from the battlefront: Psychological support of patients with a chronic illness during the COVID-19 lockdown in four steps. *United European Gastroenterology Journal*,

8(6), 741–742. https://doi.org/10.1177/2050640620927564

Cipolletta, S., & Ortu, M. C. (2020). COVID-19: Common Constructions of the Pandemic and Their Implications. *Journal of Constructivist Psychology*, 1-17. https://doi.org/10.1080/10720537.2020.1818653

Cohen, S., Gianaros, P. J., & Manuck, S. B. (2016). A Stage Model of Stress and Disease. *Perspectives on Psychological Science*, *11*(4), 456–463. https://doi.org/10.1177/1745691616646305

Cohen, S., Murphy, M. L. M., & Prather, A. A. (2019). Ten Surprising Facts About Stressful Life Events and Disease Risk. *Annual Review of Psychology*, *70*(1), 577–597. https://doi.org/10.1146/annurev-psych-010418-102857

Depoux, A., Martin, S., Karafillakis, E., Preet, R., Wilder-Smith, A., & Larson, H. (2020). The pandemic of social media panic travels faster than the COVID-19 outbreak. *Journal of Travel Medicine*, *27*(3), taaa031. https://doi.org/10.1093/jtm/taaa031

Dohrenwend, B. S., & Dohrenwend, B. P. (1974). *Stressful life events: their nature and effects*. Wiley.

Du, J., Dong, L., Wang, T., Yuan, C., Fu, R., Zhang, L., Liu, B., Zhang, M., Yin, Y., Qin, J., Bouey, J., Zhao, M., & Li, X. (2020). Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. *General Hospital Psychiatry*, *67*, 144-145. https://doi.org/10.1016/j.genhosppsych.2020.03.011

Galić, M., Mustapić, L., Šimunić, A., Sić, L., & Cipolletta, S. (2020). COVID-19 Related Knowledge and Mental Health: Case of Croatia. *Frontiers in Psychology*, *11,* 567368. https://doi.org/10.3389/fpsyg.2020.567368

Government of Canada (2020). *Health-related concerns and precautions during the COVID-19 pandemic: A comparison of Canadians with and without underlying health conditions*. Www150.Statcan.gc.ca. https://www150.statcan.gc.ca/n1/pub/82-003-x/2020005/article/00001-eng.htm

Grabowski, D., Meldgaard, J., & Hulvej Rod, M. (2020). Altered Self-Observations, Unclear Risk Perceptions and Changes in Relational Everyday Life: A Qualitative Study of Psychosocial Life with Diabetes during the COVID-19 Lockdown. *Societies*, *10*(3), 63. https://doi.org/10.3390/soc10030063

Grajek, M., Działach, E., Buczkowska, M., Górski, M., & Nowara, E. (2021). Feelings Related to the COVID-19 Pandemic Among Patients Treated in the Oncology Clinics (Poland). *Frontiers in Psychology*, *12*. https://doi.org/10.3389/fpsyg.2021.647196

Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research*, *11*(2), 213–218. https://doi.org/10.1016/0022-3999(67)90010-4

Hsiao, S., Chang, H., Kang, Y., & Chen, Y. (2020). Mitigate risks of medication interruption due to COVID-19 for elderly with chronic diseases. *The Kaohsiung Journal of Medical Sciences*, *36*(8), 661–662. https://doi.org/10.1002/kjm2.12263

Hu, Z., Lin, X., Chiwanda Kaminga, A., & Xu, H. (2020). Impact of the COVID-19 epidemic on lifestyle behaviors and their association with subjective wellbeing among the general population in the Mainland China: cross-sectional study. *Journal of Medical Internet Research, 22*(8), e21176. https://doi.org/10.2196/21176

Huaxia. (2020, February 4). *Bat soup, biolab, crazy numbers...Misinformation "infodemic" on novel coronavirus exposed - Xinhua | English.news.cn*. Www.xinhuanet.com. http://www.xinhuanet.com/english/2020-02/04/c_138755586.htm

Huynh, G., Nguyen, M. Q., Tran, T. T., Nguyen, V. T., Nguyen, T. V., Do Thi Hoai, T., Nguyen, P. H. N., Phan, T. H. Y., Vu, T. T., & Nguyen, T. N. H. (2020). Knowledge, Attitude, and Practices Regarding COVID-19 Among Chronic Illness Patients at Outpatient Departments in Ho Chi Minh City, Vietnam. *Risk Management and Healthcare Policy*, *13*, 1571–1578. https://doi.org/10.2147/rmhp.s268876

Ing, A. J., Cocks, C., & Green, J. P. (2020). COVID-19: in the footsteps of Ernest Shackleton. *Thorax*, *75*(8),

693–694. https://doi.org/10.1136/thoraxjnl-2020-215091

Isaranuwatchai, W., Teerawattananon, Y., Archer, R. A., Luz, A., Sharma, M., Rattanavipapong, W., Anothaisintawee, T., Bacon, R. L., Bhatia, T., Bump, J., Chalkidou, K., Elshaug, A. G., Kim, D. D., Reddiar, S. K., Nakamura, R., Neumann, P. J., Shichijo, A., Smith, P. C., & Culyer, A. J. (2020). Prevention of non-communicable disease: best buys, wasted buys, and contestable buys. *BMJ*, *368,* m141. https://doi.org/10.1136/bmj.m141

Jean-Baptiste, C. O., Herring, R. P., Beeson, W. L., Dos Santos, H., & Banta, J. E. (2020). Stressful life events and social capital during the early phase of COVID-19 in the U.S. *Social Sciences & Humanities Open*, *2*(1), 100057. https://doi.org/10.1016/j.ssaho.2020.100057

Korukcu, O., Ozkaya, M., Faruk Boran, O., & Boran, M. (2021). The effect of the COVID-19 pandemic on community mental health: A psychometric and prevalence study in Turkey. *Health & Social Care in the Community, 00,* 1–10. https://doi.org/10.1111/hsc.13270

Laires, P. A., Dias, S., Gama, A., Moniz, M., Pedro, A. R., Soares, P., Aguiar, P., & Nunes, C. (2021). The Association Between Chronic Disease and Serious COVID-19 Outcomes and Its Influence on Risk Perception: Survey Study and Database Analysis. *JMIR Public Health and Surveillance*, *7*(1), e22794. https://doi.org/10.2196/22794

Lauri Korajlija, A., & Jokic-Begic, N. (2020). COVID-19: Concerns and behaviours in Croatia. *British Journal of Health Psychology*, *25*(4), 849–855. https://doi.org/10.1111/bjhp.12425

Lee, S. M., Kang, W. S., Cho, A.-R., Kim, T., & Park, J. K. (2018). Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. *Comprehensive Psychiatry*, *87*, 123–127. https://doi.org/10.1016/j.comppsych.2018.10.003

Lorenzo, N. E., Zeytinoglu, S., Morales, S., Listokin, J., Almas, A. N., Degnan, K. A., Henderson, H., Chronis-Tuscano, A., & Fox, N. A. (2021). Transactional Associations Between Parent and Late Adolescent Internalizing Symptoms During the COVID-19 Pandemic: The Moderating Role of Avoidant Coping. *Journal of Youth and Adolescence, 50*(3), 459–469. https://doi.org/10.1007/s10964-020-01374-z

Louvardi, M., Pelekasis, P., Chrousos, G. P., & Darviri, C. (2020). Mental health in chronic disease patients during the COVID-19 quarantine in Greece. *Palliative and Supportive Care*, *18*(4), 1–6. https://doi.org/10.1017/s1478951520000528

Makridakis, S., & Moleskis, A. (2015). The costs and benefits of positive illusions. *Frontiers in Psychology*, *6,* 859. https://doi.org/10.3389/fpsyg.2015.00859

Mauro, V., Lorenzo, M., Paolo, C., & Sergio, H. (2020). Treat all COVID 19-positive patients, but do not forget those negative with chronic diseases. *Internal and emergency medicine, 15*(5), 787–790. https://doi.org/10.1007/s11739-020-02395-z

Mazza, C., Ricci, E., Biondi, S., Colasanti, M., Ferracuti, S., Napoli, C., & Roma, P. (2020). A Nationwide Survey of Psychological Distress among Italian People during the COVID-19 Pandemic: Immediate Psychological Responses and Associated Factors. *International Journal of Environmental Research and Public Health*, *17*(9), 3165. https://doi.org/10.3390/ijerph17093165

Molarius, A., Berglund, K., Eriksson, C., Eriksson, H. G., Lindén-Boström, M., Nordström, E., Persson, C., Sahlqvist, L., Starrin, B., & Ydreborg, B. (2009). Mental health symptoms in relation to socio-economic conditions and lifestyle factors – a population-based study in Sweden. *BMC Public Health*, *9*(1), 302. https://doi.org/10.1186/1471-2458-9-302

Olatunji, B. O., Naragon-Gainey, K., & Wolitzky-Taylor, K. B. (2013). Specificity of Rumination in Anxiety and Depression: A Multimodal Meta-Analysis. *Clinical Psychology: Science and Practice*, *20*(3), 225–257. https://doi.org/10.1111/cpsp.12037

Ozamiz-Etxebarria, N., Dosil-Santamaria, M., Picaza-Gorrochategui, M., & Idoiaga-Mondragon, N. (2020). Niveles de estrés, ansiedad y depresión en la primera fase del brote del COVID-19 en una muestra

recogida en el norte de España. *Cadernos de Saúde Pública*, *36*(4), e00054020. https://doi.org/10.1590/0102-311x00054020

Özdin, S., & Bayrak Özdin, Ş. (2020). Levels and predictors of anxiety, depression and health anxiety during COVID-19 pandemic in Turkish society: The importance of gender. *International Journal of Social Psychiatry*, *66*(5), 002076402092705. https://doi.org/10.1177/0020764020927051

Penezić, Z. (2002). Skala optimizma - pesimizma (O-P skala). In K. Lacković-Grgin, A. Proroković, V. Ćubela, & Z. Penezić (Eds.), *Zbirka psihologijskih skala i upitnika: svezak 1* (pp. 15–17). Sveučilište u Splitu - Filozofski fakultet Zadar. https://morepress.unizd.hr/books/press/catalog/view/28/24/365-1

Pokrajac-Bulian, A., Kukić, M., & Bašić-Marković, N. (2015). Quality of life as a mediator in the association between body mass index and negative emotionality in overweight and obese non-clinical sample. *Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity*, *20*(4), 473–481. https://doi.org/10.1007/s40519-015-0208-x

Politico Magazine (2020, March 19). *Coronavirus will change the world permanently. Here's how.* POLITICO. https://www.politico.com/news/magazine/2020/03/19/coronavirus-effect-economy-life-society-analysis-covid-135579

Scheier, M. F., & Carver, C. S. (1992). Effects of optimism on psychological and physical well-being: Theoretical overview and empirical update. *Cognitive Therapy and Research*, *16*(2), 201–228. https://doi.org/10.1007/bf01173489

Sønderskov, K. M., Dinesen, P. T., Santini, Z. I., & Østergaard, S. D. (2020). The depressive state of Denmark during the COVID-19 pandemic. *Acta Neuropsychiatrica*, *32*(4), 226-228. https://doi.org/10.1017/neu.2020.15

Tanner, L. (2020). *Coronavirus death rate is higher for those with chronic illnesses*. JEMS. https://www.jems.com/2020/06/16/coronavirus-death-rate-is-higher-for-those-with-chronic-illnesses/

Tran, V.-T., & Ravaud, P. (2020). COVID-19–related perceptions, context and attitudes of adults with chronic conditions: Results from a cross-sectional survey nested in the ComPaRe e-cohort. *PLOS ONE*, *15*(8), e0237296. https://doi.org/10.1371/journal.pone.0237296

Wang, C., Pan, R., Wan, X., Tan, Y., Xu, L., Ho, C. S., & Ho, R. C. (2020). Immediate Psychological Responses and Associated Factors during the Initial Stage of the 2019 Coronavirus Disease (COVID-19) Epidemic among the General Population in China. *International Journal of Environmental Research and Public Health*, *17*(5), 1729–1753. https://doi.org/10.3390/ijerph17051729

Wang, D., Hu, B., Hu, C., Zhu, F., Liu, X., Zhang, J., Wang, B., Xiang, H., Cheng, Z., Xiong, Y., Zhao, Y., Li, Y., Wang, X., & Peng, Z. (2020). Clinical Characteristics of 138 Hospitalized Patients With 2019 Novel Coronavirus–Infected Pneumonia in Wuhan, China. *JAMA, 323*(11),1061–1069. https://doi.org/10.1001/jama.2020.1585

Wang, F., Cao, J., Yu, Y., Ding, J., Eshak, E. S., Liu, K., Mubarik, S., Shi, F., Wen, H., Zeng, Z., Bai, J., & Yu, C. (2020). Epidemiological characteristics of patients with severe COVID-19 infection in Wuhan, China: evidence from a retrospective observational study. *International Journal of Epidemiology*, *49*(6), 1940–1950. https://doi.org/10.1093/ije/dyaa180

West, R., Michie, S., Rubin, G. J., & Amlôt, R. (2020). Applying principles of behaviour change to reduce SARS-CoV-2 transmission. *Nature Human Behaviour, 4,* 451–459. https://doi.org/10.1038/s41562-020-0887-9

WHO (2018). *Noncommunicable diseases*. Who.int; World Health Organization: WHO. https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases

WHO (2020). *WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020*. https://www.who.int/dg/speeches/detail/who-director-general-s-opening-remarks-at-the-media-briefing-on-covid-19---11-march-2020

Wolf, M. S., Serper, M., Opsasnick, L., O'Conor, R. M., Curtis, L., Benavente, J. Y., Wismer, G., Batio, S., Eifler, M., Zheng, P., Russell, A., Arvanitis, M., Ladner, D., Kwasny, M., Persell, S. D., Rowe, T., Linder, J. A., & Bailey, S. C. (2020). Awareness, Attitudes, and Actions Related to COVID-19 Among Adults With Chronic Conditions at the Onset of the U.S. Outbreak. *Annals of Internal Medicine*, *173*(2), 100–109. https://doi.org/10.7326/m20-1239

Worldometer. (2021). *Coronavirus Toll Update: Cases & Deaths by Country of Wuhan, China Virus - Worldometer*. Worldometers.info. https://www.worldometers.info/coronavirus/

Xia, Y., Kou, L., Zhang, G., Han, C., Hu, J., Wan, F., Yin, S., Sun, Y., Wu, J., Li, Y., Zhang, Z., Huang, J., Xiong, N., & Wang, T. (2020). Investigation on sleep and mental health of patients with Parkinson's disease during the Coronavirus disease 2019 pandemic. *Sleep Medicine*, *75*, 428–433. https://doi.org/10.1016/j.sleep.2020.09.011

Yang, J., Zheng, Y., Gou, X., Pu, K., Chen, Z., Guo, Q., Ji, R., Wang, H., Wang, Y., & Zhou, Y. (2020). Prevalence of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. *International Journal of Infectious Diseases*, *94*, 91-95. https://doi.org/10.1016/j.ijid.2020.03.017

Yıldırım, M., & Güler, A. (2020). COVID-19 severity, self-efficacy, knowledge, preventive behaviors, and mental health in Turkey. *Death Studies,* 1-8. https://doi.org/10.1080/07481187.2020.1793434

Zenger, M., Brix, C., Borowski, J., Stolzenburg, J.-U., & Hinz, A. (2010). The impact of optimism on anxiety, depression and quality of life in urogenital cancer patients. *Psycho-Oncology*, *19*(8), 879–886. https://doi.org/10.1002/pon.1635

Zhou, S. J., Zhang, L. G., Wang, L. L., Guo, Z. C., Wang, J. Q., Chen, J. C., Liu, M., Chen, X., & Chen, J. X. (2020). Prevalence and socio-demographic correlates of psychological health problems in Chinese adolescents during the outbreak of COVID-19. *European child & adolescent psychiatry, 29*(6), 749–758. https://doi.org/10.1007/s00787-020-01541-4

Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica*, *67*(6), 361–370. https://doi.org/10.1111/j.1600-0447.1983.tb09716.x

Original research

3

Psychological and physiological correlates of pathogen-induced disgust

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Abstract

The behavioural immune system (BIS) refers to a wide array of affective and cognitive processes that motivate pathogen and disease avoidance. Even though general research in this area is steadily growing, there is only a small number of studies dealing with the physiological aspects of BIS. The goal of this study was to assess the activation of the autonomic nervous system (ANS) during exposition to pathogen-salient stimuli. Participants (N=25) were shown pictures with different levels of pathogen-salience and were asked to rate their (un)pleasantness, while their electrodermal activity and reaction times were being recorded. Participants tended to react faster to the pathogen-salient pictures than to the comparable set of pathogen-free pictures. There was no significant change in magnitudes of skin conductance responses (SCRs) as a function of the type of stimuli. There was, however, a significant effect of pathogen salience on the latency of SCRs, with pathogen-salient pictures having a shorter latency period, which is in line with the notion of fast, automatic responses to pathogen cues. Furthermore, the scores on pathogen disgust subscale of the Three domain disgust scale correlated positively with the magnitude of SCRs and negatively with the reaction times to pathogen-salient stimuli, while having no relation with the same components in pathogen-free context. This indicates domain-specificity, as predicted by the BIS theoretical framework. Our findings provide only partial support for the notion that BIS activation is accompanied by significant ANS activation. Additionally, they underscore the importance of adding physiological measures to the subjective ones in order to further explore the mechanisms underlying BIS functioning.

Keywords: pathogen disgust, electrodermal activity, reaction time, behavioural immune system

Introduction

Coughing, sneezing, vomiting… There are usually two things that come to mind when reading these words: each word can be considered a symptom of a disease, and it will most probably evoke the same reaction among most of the population: "eww". Those two things are not mutually exclusive. In fact, they interact in a way that has served a purpose through our evolution: disgust is an emotion that is described as a strong feeling of revulsion that can sometimes be accompanied by a feeling of nausea and a strong desire to turn away from the stimuli (Oaten et al., 2009), and many disgust elicitors can be classified as "signs of disease" thus motivating an organism towards avoidance of disease cues, consequently preventing the infection from happening. The higher the disgust elicited, the higher motivation to avoid the elicitor. Because of this characteristic, the emotion of disgust has a central role in something that has been named the behavioural immune system (BIS).

This system is composed of affective, cognitive and behavioural processes that act as the first line of defence against potentially harmful parasites and pathogens (Schaller, 2006). It also complements our biological immune system: while the biological system reacts once the pathogens have entered our body, triggering an immune response that consumes a lot of the body's metabolic resources, the BIS tries to prevent coming into contact with those same pathogens, render the activation of biological immune system unnecessary and save valuable energy. Pathogens are rarely visible to the naked eye, so their presence is usually indicated by certain "omens" that betray their presence. Rotten food, worms, flies, foul smell, skin lesions, blood, bodily fluids (to name a few) can all indicate the presence of pathogens and are also common disgust elicitors in multiple cultures (Curtis & Biran, 2001). Interestingly, it has been shown that the differences in the prevalence of these pathogens and infectious diseases across cultures are, in part, a reason for cultural differences in behaviours associated with BIS: cultures that have historically had higher pathogen prevalence exhibit more xenophobic, conservative and conformist behaviours (Fincher et al., 2008; Schaller & Murray, 2010; Skolnick & Dzokoto, 2013; Terrizzi et al., 2013), Furthermore, participants from these cultures show lower levels of extraversion and openness to experience, dispositions that, when pronounced, can lead to behaviours that increase the risk of disease (Oosterhoff et al., 2018).

Additionally, there seems to be some evidence that behavioural immune system reactivity varies as a function of our biological immune system, so as to compensate for its shortcomings. For example, disgust and related avoidance behaviours, can be more pronounced in women during luteal phase of menstrual cycle and during pregnancy (when biological immune system is supressed and women are more vulnerable to pathogens), or after recent illness which would have weakened the biological immune system (Fessler & Navarette, 2003; Fessler et al., 2005; Miller & Maner, 2011). Even though some of the results mentioned here have not been successfully replicated (see Jones et al., 2018; Tybur et al., 2020), the notion of interaction between biological and behavioural immune systems is theoretically plausible.

Recent research has shown that, during the COVID-19 pandemic, disgust sensitivity and perceived vulnerability to disease were increased as compared to the pre-pandemic samples, meaning that disgust sensitivity fluctuated depending on the level of disease threat occurring naturally (Hromatko et al., 2021; Stevenson et al., 2021). The adaptive value of such shifts might be reflected in findings that sometimes the biological immune system is "triggered" by the BIS. There have been instances when exposure to disease cues or exposure to disgusting stimuli (i.e., cockroaches, cadavers, dirty toilets, etc.) has led to a "preparatory" immune response: stimulated production of proinflammatory cytokines IL-6 and TNF-α, and elevated body temperature (Schaller et al., 2010; Stevenson et al., 2011; Stevenson et al., 2012). Since the physiological basis of BIS is still unclear, there is no definite explanation how BIS can modulate immune function. One of the proposed routes follows the same idea as that of basic stress response: stimuli cause the stress response, activating the autonomic nervous system (ANS) and the release of cortisol and noradrenaline, thus

modulating immune response (Schaller et al., 2010). While this seems plausible, the research that would confirm this by examining the physiological aspects of BIS has, so far, been lacking. It is known that disgust, like other affective states, has a certain physiological footprint - it increases skin conductance, lowers blood pressure and slows heartbeat (Ritz et al., 2005; Stark et al., 2005; Vrana, 1993), but it is not known whether the same pattern can be observed during exposure to pathogens, i.e., whether autonomous system activation truly follows BIS activation. For example, on a cognitive level, people estimate stimuli that have higher pathogen salience as more disgusting than disgust-inducing stimuli that have low pathogen-salience or are pathogen-free (Culpepper et al., 2018; Curtis et al., 2004) but whether the same discrimination happens on the physiological level (possibly stimulating immune function after exposure to highly pathogenic stimuli) is unclear.

Therefore, in this study, we aimed to examine the physiological response to stimuli with different levels of pathogen salience. We hypothesised that the exposure to pathogen-salient stimuli, presumably activating the BIS, will also lead to ANS arousal, operationalised here as the increase in electrodermal activity. Furthermore, we opted to explore if physiological arousal elicited by pathogen-salient stimuli can be predicted by some of the often used BIS-related self-report measures, such as disgust sensitivity and perceived vulnerability to disease. More specifically, we hypothesised that perceived vulnerability to disease and pathogen disgust (but not the other two domains of disgust: sexual and moral) should correlate with ANS reactions to pathogen-salient stimuli.

Material and methods

Participants

A total of 29 first-year psychology students, Mage = 19.23, SDage = 2.74, participated in the study in exchange for course points. There were 24 female and five male participants. They were tested individually, after signing an informed consent. All participants declared that they were healthy. Four participants were excluded from further analysis.

Measures

Stimuli

For stimuli, we used images from C-DIS, a tool developed by Culpepper et al. (2018) as a tool for visually activating pathogen disgust. This set is comprised of 20 pathogen-salient paired with 20 control, mostly pathogen-free (or extremely low pathogen salience) pictures. In this study, we randomly chose ten pathogen-salient pictures and their paired counterparts with low (or none) pathogen salience.

Stimuli presentation

Stimuli were presented using the E-Prime 3.0 (Psychology Software Tools, Inc., Pittsburgh, PA, USA). The presentation, during which participants were also asked to rate the pleasantness of the presented stimulus, was as follows: fixation cross was first shown for 1 s, followed by the picture that participants had to rate and was shown on the screen until they gave an answer, followed by the blank screen for 2 s. The order of the presentation was randomized.

During the time the picture (stimulus) was shown, participants had to rate the stimulus by pressing the corresponding button on Chronos device (USB-based collection device for E-prime), with 1 indicating

"Very unpleasant" and 5 indicating "Very pleasant". Participants' responses, as well as their reaction times (time that passed between the stimulus onset and the participant's response), were recorded.

Physiological measurements

Electrodermal activity was monitored using the BIOPAC MP160 system. Skin conductance level was measured on the medial surface of 2nd and 3rd finger on the non-dominant hand. The electrodes used were reusable TSD203 electrodes, filled with isotonic gel. The sampling rate was 2000 Hz.

EDA was recorded and analysed using Acqknowledge 5.0. The acquisition of data was set in a way so that every time a stimulus was presented in E-prime, it was marked in Acqknowledge. There were specific marks for the experimental and control stimuli.

Before statistical analysis, data was cleaned using a high pass filter and median smoothing. For analysis, we used the event-related EDA method (Boucsein et al., 2012). We defined a window of 2-4 seconds after each stimulus presentation, during which an increase in skin conductance of 0.02 μS was defined as an event-related skin response (ER-SCR) evoked by the presented stimuli.

Questionnaires

Perceived vulnerability to disease (PVD) was measured by the scale developed by Duncan et al. (2009). This scale has 15 items that constitute 2 subscales: Perceived infectability subscale (7 items) and Germ aversion subscale (8 items). Participants have to indicate their agreement with the items on a 1 (Strongly disagree) to 7 (Strongly agree) scale. Perceived infectability in this sample had excellent reliability ($\alpha = .90$), while germ aversion had very low reliability ($\alpha = .37$) and was omitted from further analyses.

Disgust proneness was measured using The Three Domains of Disgust Scale (TDDS) developed by Tybur et al. (2009). Each subscale has 7 items which describe situations that are considered disgusting in pathogen, sexual or moral domain, and participants have to rate the items on a scale of 0 (not at all disgusting) to 6 (extremely disgusting) with 3 being neutral value. Moral and sexual disgust subscales had very good reliability ($\alpha = .81$ former, and $\alpha = .85$ latter), while pathogen disgust subscale had poor, albeit almost acceptable, reliability ($\alpha = .68$).

Procedure

The experiment was conducted in a sound-attenuated room. Participants were seated comfortably (in order to minimize muscular artefacts) in front of a computer. Upon arrival, they signed the informed consent and filled questionnaires assessing their basic demographics and health status. They also filled the Perceived Vulnerability to Disease Scale, and Three Domains of the Disgust Scale. Afterwards, EDA electrodes were mounted on two fingers of their non-dominant hand and the recording started. Baseline data while resting was recorded for 3 minutes. Once the baseline was recorded, participants were presented (using E-prime) with a set of disgust-inducing pictures and a set of neutral pictures and they were asked to rate the pictures. After completion of the task, EDA electrodes were removed, and the participants were debriefed. The whole procedure lasted about 15 minutes.

Results

Statistical analysis

All statistical procedures were carried out with the IBM SPSS Statistics v. 26. Separate repeated-measures ANOVAs were used to compare magnitudes of skin conductance responses (SCR), the number of event-related skin conductance responses (ER-SCR), the latency of skin conductance responses, reaction times to stimuli and rating of the pictures depending on the pathogen salience of stimuli. To normalize the magnitudes of SCRs, we used log transformation [log(SCR+1)]. Four participants were identified as non-responders on EDA, so they were excluded from further analysis. We also analysed if EDA variables correlated with any of the subscales of the used questionnaires.

Results

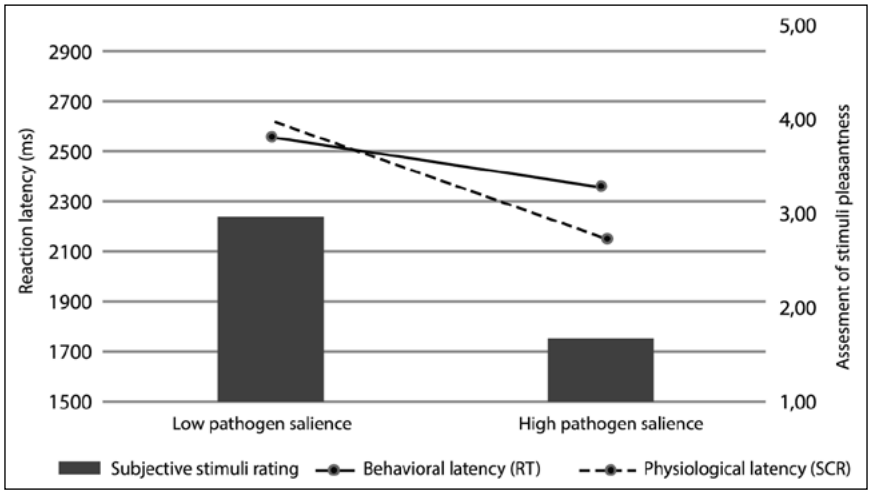
Every independent variable in this research had two levels which means that sphericity assumption was not violated (Petz et al., 2012; Tabachnik & Fidell, 2013). Thus, in the following section the normal, uncorrected F-ratio is shown.

As can be seen in Table 1 and Figure 1, pictures with low pathogen salience were rated as significantly less disgusting than pictures with high pathogen salience (F (1, 24) = 88.06, p < .001). Moreover, although participants tended to react faster to more disgusting stimuli, this difference reached only marginal statistical significance (F (1, 24) = 4.03, p = .056). Effect size was large for the former (ω^2 = .78), while the latter had small effect (ω^2 = .015).

Table 1
Behavioural measures and electrodermal activity depending on the pathogen salience of stimuli

	Low pathogen salience	High pathogen salience	*F (1, 24)*	*p*	ω^2
	M (SD)	*M (SD)*			
Behavioural measures					
Stimuli rating	2.98 (0.82)	1.66 (0.64)	88.06	<.001	.44
Reaction time (ms)	2553.39 (768.86)	2359.63 (570.98)	4.03	.056	.015
Electrodermal activity					
SCR magnitude (μS)	0.013 (.02)	0.011 (.014)	2.04	.166	.002
Number of ER-SCRs	3.32 (1.87)	2.44 (1.56)	9.18	.006	.06
SCR latency (ms)	2618.68 (0.56)	2160.32 (0.72)	5.37	.029	.09

Figure 1
Subjective assessments and behavioural vs. physiological latencies as a function of pathogen saliency of stimuli



As for the electrodermal activity, there was no significant difference in magnitudes of SCRs when exposed to pictures with different levels of pathogen salience (F (1, 24) = 2.04, p > 0.05). However, there was a significant difference in the number of specific skin conductance responses depending on pathogen salience, with stimuli with low pathogen salience evoking more ER-SCRs (F (1, 24) = 9.18, p < .01). Also, the latency period of ER-SCRs was significantly shorter for pictures with higher pathogen salience (F (1, 24) = 5.37, p < .05). This only partially confirmed our hypothesis. Pathogen salience had moderate effect on both dependent variables (ω^2 = .06 and ω^2 = .09, respectively).

Correlations between all the variables used in this study can be seen in Table 2. Regarding self-report measures, there was a significant correlation between perceived infectability of the PVD scale and magnitude of SCRs: infectability was negatively correlated to magnitudes of SCRs both during the exposure to low (r = -.42, p < 0.05) and high (r = -.51, p < .01) pathogen salience pictures. To control for this, we decided to run a repeated measures ANCOVA with perceived infectability as a covariate, but this did not change previous results: magnitudes of SCRs did not significantly differ after exposures to low and high pathogen-salient stimuli (F (1, 24) = 0.26, p > 0.5). Pathogen disgust of TDDS was also significantly correlated to the magnitude of SCRs and to the number of ER-SCRs during exposure to pictures with high pathogen salience (r = .41, p < .05, and r = .43, p < .05) as well as to reaction time for pathogen-salient stimuli (r = -.54, p < .05).

Table 2

Pearson r correlations between all variables used in this study

Variable	Germ aversion	Infecta-bility	Pathogen disgust	Sexual disgust	Moral disgust	Stimuli rating -high pathogen salience	Reaction time – high pathogen salience	Stimuli rating – low pathogen salience	Reaction time – low pathogen salience	SCR magni-tude high pathogen salience	SCR latency high pathogen salience	Number of ER-SCRs high pathogen salience	SCR magni-tude low pathogen salience	SCR la-tency low pathogen salience	Number of ER-SCRs low pathogen salience
Germ aversion	—														
Infectability	0.10	—													
Pathogen disgust	0.00	-0.31	—												
Sexual disgust	0.69***	-0.15	0.30	—											
Moral disgust	-0.02	-0.28	0.45*	0.45*	—										
Stimuli rating -high pathogen salience	-0.36	-0.19	-0.37	-0.44*	-0.23	—									
Reaction time – high pathogen salience	0.05	0.21	-0.541**	-0.33	-0.34	0.04	—								
Stimuli rating – low pathogen salience	-0.538**	-0.30	-0.10	-0.40	-0.09	0.57**	0.02	—							
Reaction time – low pathogen salience	0.32	0.31	-0.35	-0.04	-0.22	-0.28	0.78***	-0.41*	—						
SCR magnitude high pathogen salience	-0.18	-0.510**	0.41*	-0.05	0.17	0.01	-0.28	-0.07	-0.15	—					
SCR latency high pathogen salience	-0.29	0.12	0.09	-0.36	-0.16	-0.01	0.07	-0.06	0.17	0.26	—				
Number of ER-SCRs high pathogen salience	-0.23	-0.21	0.43*	-0.05	0.26	-0.04	-0.23	-0.08	-0.15	0.70***	0.44*	—			
SCR magnitude low pathogen salience	-0.24	-0.42*	0.33	-0.07	0.23	-0.19	0.05	-0.16	0.12	0.90***	0.24	0.65***	—		
SCR latency low pathogen salience	0.32	0.16	-0.18	0.53**	0.27	-0.02	-0.30	-0.08	-0.18	-0.44*	-0.18	-0.44*	-0.40*	—	
Number of ER-SCRs low pathogen salience	-0.04	-0.091	0.35	0.06	0.24	-0.19	-0.17	-0.09	-0.12	0.47*	0.25	0.65***	0.39	-0.43*	—

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

Discussion

The conducted study confirmed that stimuli with higher pathogen salience, meaning they are more disease-relevant, are recognized as more disgusting, which is in line with previous research that established pathogen disgust as a central emotion in disease avoidance mechanism (Curtis et al., 2004; Oaten et al., 2009). Moreover, we found a tendency to estimate the pathogen salient pictures faster than those with low pathogen salience. Since pathogens pose a threat to survival, it seems highly adaptive that stimuli with higher pathogen salience are assessed faster. For example, it is known that stimuli that evoke fear and those that are considered to be threatening (e.g., snakes) are detected and recognized faster due to their importance for survival (Brosch et al., 2010). Pathogens can be considered as "microscopic" predators, so it seems plausible that the same effect is present when faced with stimuli that strongly indicate pathogen presence. Even though some research suggests that more disgusting stimuli can lead to longer viewing time and approach behaviour (Stark et al., 2005), there seems to be agreement on the fact that this might depend on other factors, i.e., the extent of the threat. Ecological validity of inducing disgust via pictures might also be questioned: even though participants perceived these stimuli as disgusting, they probably did not really feel threatened by them. Stepping into a dog's excrement on a pavement unquestionably induces at least some level of disgust in everyone: however, seeing a picture of a dog's excrement on a screen might not have the same effect on everyone.

When it comes to electrodermal activity, our hypothesis that BIS activation will also be observable on the physiological level in terms of increased skin conductance was only partially confirmed. While the latency period of SCRs was shorter for stimuli with higher pathogen salience, there was no significant change in the magnitude of skin conductance after exposure to those pictures compared to pictures with lower salience. Shorter latencies, along with a tendency toward shorter reaction times, indicate faster processing of pathogen-salient stimuli, which is in line with the proposed hypothesis. It has been postulated (Schaller, 2016) that BIS is largely automatically driven, and the fact that we observed shorter SCR latencies for the pathogen salient stimuli might be indicative of BIS activation.

Interestingly, stimuli with lower pathogen salience elicited more specific skin conductance responses. However, we believe this to be a by-product of the way the task was constructed – faster reaction times for more disgusting pictures simultaneously resulted in less exposure to these pictures - when taking into account that latency period was also shorter for pathogen salient pictures, this may also imply that there was not enough time for these stimuli to evoke observable arousal of ANS. Also, Lang et al. (1993) showed that there is a significant correlation between subjective arousal ratings and viewing time (longer viewing time leads to higher subjective arousal), but there is, to our knowledge, no definite answer if the same is true when arousal is measured on the physiological level. This could also mean that wholesome BIS activation, i.e., activation that is also measurable on the biological level, depends on the length of exposure to pathogens. All in all, more research focusing on physiological aspects of BIS is needed in order to draw more precise and more substantial conclusions in this area.

Furthermore, the inclusion of infectability, a commonly used variable in BIS research, did not change the results, meaning that no matter how vulnerable the participants perceived themselves to be, it did not reflect on their ANS arousal. This lack of correlation might be due to the fact that there were no observable differences in skin conductance magnitude as a function of pathogen saliency of the stimuli, and thus the variance of ANS responses was limited. This leads us back to stimuli – at what point would the subjective rating of stimuli as disgusting be accompanied by significant psychological arousal? Does the extent of the threat, as indicated by Stark et al. (2005), have a role in it? Or do the pathogen-salient stimuli indeed have to be perceived as a credible threat to lead to physiological activation of BIS? One of the major arguments for BIS is that it serves as the first line of defence to, among other things, save up valuable metabolic energy,

so it seems maladaptive for it to react to every disease cue that is encountered. Nevertheless, this seems an interesting point to pursue in future research.

Another question our study has opened, is the origin of a negative correlation between perceived vulnerability and SRC magnitude. It has recently been shown in a large sample of participants (N= 990) that those who score high on perceived vulnerability, also score high on measures of anxiety, depression and stress (DASS scales) as well as on specific health worries (Jokić-Begić et al., 2020). This might suggest that these individuals have elevated autonomic system activation at baseline, and thus their variance of SRC magnitude might be reduced. In a manner of speaking, they constantly operate in an "alert mode". The fact that this negative correlation between perceived vulnerability and SRC magnitude was not specific for pathogen salient stimuli only, but remained the same for neutral stimuli as well, is in line with this notion. However, at this point, considering the small sample size in our study, this explanation remains highly speculative, and needs to be tested in future studies.

Finally, we observed an interesting pattern of correlations among subjective, self-reported measures of disgust sensitivity and objective physiological measures of ANS activation. Pathogen-disgust was positively correlated with the magnitude of SCRs during exposure to pathogen-salient stimuli, and negatively correlated with reaction times for pathogen salient stimuli, while having no relation with the same components when participants are exposed to stimuli with low pathogen salience. Additionally, as predicted, there were no correlations with sexual and moral disgust. Even though due to small sample size and a low Cronbach's α, these results can only be regarded as preliminary, this pattern seems to reflect the domain specificity of pathogen-induced autonomic activation (as proposed within the BIS theoretical framework).

While the research in the field of BIS and its psychological correlates has been very proliferative and fruitful, much of it has been conducted using subjective measures exclusively. Our results corroborate the notion (e.g., Clark & Fessler, 2014; Tadinac, 2020) that in order to place a stronger foundation of the BIS theoretical framework, this research should be integrated into broader fields of other, physiologically informed disciplines – psychophysiology being among them.

As for the limitations, this study has a relatively small sample size which is not an oddity in this kind of research and study design, but a larger sample would make the results more generalizable. Furthermore, there were only five men compared to 24 women included in the study, which made the sample quite homogenous, and we were not able to examine gender as a moderating variable. There is some research suggesting that skin conductance responses are gender-dependent (e.g., Rorhmann et al., 2008) so this seems to be an important variable to examine when researching BIS psychophysiology. The second problem is tied to the scale used for the rating of the stimuli. A 1-5 scale might not have been sensitive enough to truly represent the valence of the stimuli, thus making the discrimination of stimuli more difficult (Preston & Colman, 2020). We plan to test this assumption by using a larger scale in the follow-up studies. Furthermore, the stimuli themselves might not have been of sufficient ecological validity. Seeing inflamed oozing wounds in one's near vicinity is not the same as watching them on screen, and this experimental procedure might not have elicited strong enough feelings of disgust. This is the reason why we are currently developing a more diverse stimulation protocol, including olfactory and tactile disgust inducing stimuli in order to compare the potential of various sensory routes to elicit the physiologically observable effects of BIS activation. Finally, our decision to measure the reaction times needed to assess the unpleasantness of the stimuli might have caused additional noise in the data: SCRs can take a few seconds to register, but our participants needed less time to respond and thus shortened the exposure time – in the future, we plan to standardize the exposure, so all stimuli are viewed for the same amount of time.

Conclusions

In conclusion, our results confirm that pathogen-salient stimuli are indeed rated as more disgusting, but lend only partial support to the notion that BIS activation is accompanied by ANS activation: we found shorter latencies of event-related skin conductance responses when the presented stimuli contained pathogen cues, but the magnitude of these responses was not larger than the magnitude of responses to pathogen-free stimuli. Furthermore, self-reported measure of pathogen (but not sexual and moral) disgust predicted the magnitude of SCRs, as well as the reaction times for pathogen salient stimuli, implying a domain-specific pattern of responses. Overall, our findings emphasize the need for further investigation of the physiological aspects of the BIS, as well as the role of risk assessment in its activation.

References

Boucsein, W., Fowles, D. C., Grimnes, S., Ben-Shakhar, G., Roth, W. T., Dawson, M. E., & Filion, D. L. (2012). Publication recommendations for electrodermal measurements. *Psychophysiology, 49*(8), 1017-1034. https://doi.org/10.1111/j.1469-8986.2012.01384.x

Brosch, T., Pourtois, G., & Sander, D. (2010). The perception and categorisation of emotion stimuli: A review. *Cognition & Emotion, 24*(3), 377-400. http://dx.doi.org/10.1080/02699930902975754

Clark, J. A., & Fessler, D. M. T. (2014). Recontextualizing the Behavioral Immune System Within Psychoneuroimmunology. *Evolutionary Behavioral Sciences, 8*(4), 235-243. http://dx.doi.org/10.1037/ebs0000024

Culpepper, P. D., Havliček, J., Leongomez, J. D., & Roberts, S. C. (2018). Visually Activating Pathogen Disgust: A New Instrument for Studying the Behavioral Immune System. *Frontiers in Psychology, 9*:1397. https://doi.org/10.3389/fpsyg.2018.01397

Curtis V., & Biran, A. (2001). Dirt, disgust, and disease. *Perspectives in biology and medicine, 44*(1), 17-31.

Curtis, V., Aunger, R., & Rabie, T. (2004). Evidence that disgust evolved to protect from risk of disease. *Proceedings: Biological Sciences, 271*(4), 131-133.

Duncan, L. A., Schaller, M., & Park, J. H. (2009). Perceived vulnerability to disease: development and validation of a 15-item self-report instrument. *Personality and Individual Differences, 47*, 541–546. https://doi.org/10.1016/j.paid.2009.05.001

Fessler, D. M. T., & Navarette, C. D. (2003). Domain-specific variation in disgust sensitivity across the menstrual cycle. *Evolution and Human Behavior, 24*, 406-417.

Fessler, D. M. T., Eng, S. J., & Navarrete, C. D. (2005). Elevated disgust sensitivity in the first trimester of pregnancy – evidence supporting the compensatory prophylaxis hypothesis. *Evolution and Human Behavior, 26*, 344-351.

Fincher, C. L., Thornhill, R., Murray, D. R., & Schaller, M. (2008). Pathogen prevalence predicts human cross-cultural variability in individualism/collectivism. *Proceedings: Biological Science, 275(*1640*),* 1279-1285. https://doi.org/10.1098/rspb.2008.0094

Hromatko, I., Grus, A., Kolđeraj, G. (2021). Do islanders have a more reactive behavioral immune system? Social cognitions and preferred interpersonal distances during the COVID-19 pandemic. Frontiers in psychology, 12, 647586, 16 doi:10.3389/fpsyg.2021.647586

Jokić Begić, N., Hromatko, I., Jurin, T., Kamenov, Ž., Keresteš, G., Kuterovac Jagodić, G., Lauri Korajlija, A., Maslić Seršić, D., Mehulić, J., Mikac, U., Tadinac, M. et al. (2020). Kako smo svi mi? Rezultati istraživanja psihičkog zdravlja za vrijeme pandemije COVID- 19 u Hrvatskoj. In Bogdan, Andreja (Eds.) Koro-

navirus i mentalno zdravlje: psihološki aspekti, savjeti i preporuke. Hrvatska: Hrvatska psihološka komora i HPD, str. 415-460.

Jones, B. C., Hahn, A. C., Fisher, C. I., Wang, H., Kandrik, M., Lee, A. J., Tybur, J. M., & DeBruine, L. M. (2018). Hormonal correlates of pathogen disgust: testing the compensatory prophylaxis hypothesis. *Evolution and Human Behavior, 39*(2), 166-169.

Lang, P. J., Greenwald, M. K., Bradley, M. M., & Hamm, A. O. (1993). Looking at pictures: affective, facial, visceral, and behavioral reactions. *Psychophysiology, 30*(3), 261-273. https://doi.org/10.1111/j.1469-8986.1993.tb03352.x

Miller, S. L., & Maner, J. K. (2011). Sick Body, Vigilant Mind: The Biological Immune System Activates the Behavioral Immune System. *Psychological Science, 22*(12)*,* 1467-1471.

Oaten, M., Stevenson, R. J., & Case, T. I. (2009). Disgust as a disease-avoidance mechanism. *Psychological Bulletin*, *135*, 303–321. https://doi.org/10.1037/a0014823

Oosterhoff, B., Shook, N. J., & Iyer, R. (2018). Disease Avoidance and Personality: A Meta-Analysis. *Journal of Research in Personality, 77*, 47-56.

Petz, B., Kolesarić, V., & Ivanec, D. (2012). *Petzova statistika: Osnovne statističke metode za nematematičare*. Naklada Slap.

Preston, C. C., & Colman, A. M. (2000). Optimal number of response categories in rating scales: reliability, validity, discriminating power, and respondent preferences. Acta psychologica, 104(1), 1-15. Psychology Software Tools, Inc. [E-Prime 3.0]. (2016). www.pstnet.com

Ritz, T., Thöns, M., Fahrenkrug, S., & Dahme, B. (2005). Airways, Respiration, and Respiratory Sinus Arrhytmia During Picture Viewing. *Psychophysiology, 42*(5), 568-78.

Rohrmann, S., Hopp, H., & Quirin, M. (2008). Gender Differences in Psychophysiological Responses to Disgust. *Journal of Psychophysiology, 22*(2), 65-75. https://doi.org/10.1027/0269-8803.22.2.65

Schaller, M. (2006). Parasites, behavioral defenses, and the social psychological mechanisms through which cultures are evoked. *Psychological Inquiry*, *17*, 96–101.

Schaller, M. (2016). The Behavioral Immune System. In D. M. Buss, (Ed.), *The Handbook of Evolutionary Psychology*, (pp. 206 – 224). John Wiley & Sons, Inc.

Schaller, M., & Murray, D. R. (2010). Infectious diseases and the evolution of cross-cultural differences. In M. Schaller, A. Norenzayan, S. J. Heine, T. Yamagishi, & T. Kameda (Eds.), *Evolution, culture, and the human mind* (pp. 243–256). Psychology Press.

Schaller, M., Miller, G. E., Gervais, W. M., Yager, S., & Chen, E. (2010). Mere Visual Perception of Other People's Disease Symptoms Facilitates a More Aggressive Immune Response. *Psychological Science, 21*(5), 649-652.

Skolnick, J. A., & Dzokoto, V. A. (2013). Disgust and contamination: a cross-national comparison of Ghana and the United States. *Frontiers in Psychology, 4*. https://doi.org/10.3389/fpsyg.2013.00091

Stark, R., Walter, B., Schienle, A., & Vaitl, D. (2005). Psychophysiological Correlates of Disgust and Disgust Sensitivity. *Journal od Psychophysiology, 19*(1), 50-60.

Stevenson, R. J., Hodgson, D., Oaten, M. J., Barouei, J., & Case, T. I. (2011). The effect of disgust on oral immune function. *Psychophysiology, 48*, 900-907.

Stevenson, R. J., Hodgson, D., Oaten, M. J., Moussavi, M., Langberg, R., Case, T. I., & Barouei, J. (2012). Disgust elevates core body temperature and up-regulates certain oral immune markers. *Brain, Behavior, and Immunity, 26,* 1160-1168.

Stevenson, R. J., Saluja, S., & Case, T. I. (2021). The Impact of the Covid-19 Pandemic on Disgust Sensitivity. *Frontiers in Psychology, 11*:600761. https://doi.org/0.3389/fpsyg.2020.600761

Tabachnik, B. G., & Fidell, L. S. (2013). *Using Multivariate Statistics*. Pearson.

Tadinac, M. (2020). There and back again: On the need to put the proximate back into causation. *Evolution-*

ary Behavioral Sciences, 14(4), 379–383. https://doi.org/10.1037/ebs0000208

Terizzi, J. A., Shook, N. J., & McDaniel, M. A. (2013). The Behavioral immune system and social conservatism: a meta-analysis. *Evolution and Human Behavior, 34*, 99-108.

Tybur, J. M., Jones, B. C., DeBruine, L. M., Ackerman, J. M., & Fasolt, V. (2020). Preregistered Direct Replication of "Sick Body, Vigilant Mind: The Biological Immune System Activates the Behavioral Immune System". *Psychological Science, 31*(11), 1461-1469. https://doi.org/10.1177/0956797620955209

Tybur, J. M., Lieberman, D. L., & Griskevicius, V. G. (2009). Microbes, mating, and morality: Individual differences in three functional domains of disgust. *Journal of Personality and Social Psychology*, *29*, 103-122. https://doi.org/10.1037/a0015474

Vrana, S. R. (1993). The psychophysiology of disgust: Differentiating negative emotional contexts with facial EMG. *Psychophysiology, 30*, 279-286.

Original research

4

Factor structure of the Mach-IV in the Croatian sample

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Abstract

The factor structure of the Mach-IV has long been controversial and various models have been proposed in the literature. To assess the factor structure of the Mach-IV in the Croatian sample, a paper-pencil study was conducted with 379 students. The results of the confirmatory factor analyses did not fully confirm any of the previously proposed models. The results of the exploratory factor analysis were mostly consistent with the three-factor model proposed by Beller and Bosse (2017). However, the presence of cross-loadings, zero-loadings, and inconsistent correlation patterns with the criterion variables provide further evidence of the complex factor structure of the Mach-IV.

Key words: Machiavellianism, Mach-IV, validation, Croatian translation

Introduction

The concept of Machiavellianism was defined by Christie and Geis (1970). It is based on the main character from Niccolo Machiavelli's novel "The Prince". The character represents a person who lacks morals, has a cynical worldview, and is manipulative. To measure these personality traits, Christie and Geis (1970) developed the Mach scale. The authors developed several iterations of this scale and the best known is the fourth iteration, the Mach-IV. It consists of 20 items grouped into three factors: Machiavellian views (9 items, e.g. *Barnum was very wrong when he said that a sucker is born every minute*), Machiavellian tactics (9 items, e.g. *Honesty is the best policy in all cases*), and Machiavellian morals (2 items, e.g. *All things considered, it is better to be modest and honest than important and dishonest*). This measure is considered the gold standard for measuring Machiavellianism (Pechorro et al., 2017).

However, the factor structure of the Mach-IV has become a topic of debate since its publication. Christie and his colleagues did not conduct a factor analysis of the Mach-IV items during scale development (Christie & Lehmann, 1970). They combined items from several Machiavellianism measures (e.g., Mach-V) into a single factor analysis, and the conclusions drawn from these analyses are not valid for the structure of the Mach-IV. More informative work on the factor structure of the Mach-IV came later, and research findings generally support a two-factor solution defined by Machiavellian views and tactics (Fehr et al., 1992; Monaghan et al., 2016). The morality factor has been discarded due to its poor psychometric properties (Monaghan et al., 2016). However, the two-factor solution is not without controversy. Items with the same valence often load on the same factor, leading to a three-factor (negative views/tactics, positive views, and positive tactics, Beller & Bosse, 2017) or four-factor solution (positive views, positive tactics, negative views, and negative tactics, Corral & Calvete, 2000). Due to the complexity of the Mach-IV factor structure, some authors questioned the usefulness of the Mach-IV as a measure of Machiavellianism (Panitz, 1989).

Most of the recent journal articles using Mach-IV and conducted on a Croatian sample are from the research group at the University of Rijeka (Rožić et al., 2018; Kardum et al., 2015), which treats Mach-IV as a unidimensional measure, which can lead to better predictive power for specific behaviours than factor scores (Fehr et al., 1992) and is generally the dominant approach in the literature (Monaghan et al., 2018). Although authors (Kardum et al., 2015) have reported theoretically expected relationships between the Mach-IV score and other two traits (psychopathy, narcissism) that together with Machiavellianism form Dark Triad personality (socially aversive personality; Paulhus & Williams, 2002), to our knowledge, no data on the factor structure of the Croatian translation of the Mach-IV have been published by members of this or other research groups (but see Milas et al., 1991 for the general factor structure of Machiavellian traits in the Croatian sample).

Consequently, the aim of the study was to formally test the psychometric properties (factor structure, construct validity, reliability) of the Croatian version of the Mach-IV and to compare the results with previous work. Since the results of previous international studies on the factor structure of the Mach-IV are mixed (Beller & Bosse, 2017; Corral & Calvete, 2000; Monaghan et al., 2016), no specific hypotheses regarding the factor structure of the Mach-IV were made.

Material and methods

Participants

A total of 412 participants filled in the questionnaire. Participants were excluded from the final sample based on the following criteria: a) they did not provide both age and gender, b) they left the questionnaire completely blank, c) they left one of the scales completely blank, d) they did not answer more than half items on one of the scales, e) they provided a pattern of answers on one of the measures (chose the same value for all items). According to these criteria, the final sample consisted of 379 students (M = 21.07, SD = 2.70). A roughly equal number of men and women were included in the sample (*nwomen* = 206; 54%). All participants were students of the authors' affiliation from different departments: Department of Tourism and Communication Studies, Maritime department, Department of Psychology, Department of Health Studies.

Measures

Mach-IV (Christie & Geis, 1970, for Croatian adaptation see Kardum et al., 2015) has 20 items (*It is hard to get ahead without cutting corners here and there*) which participants rate on 6-point Likert-type scale ranging from -3 (strongly disagree) to +3 (strongly agree). The scale has no zero. The strong disagreement was coded as 1, while the strong agreement was coded as 6. Croatian translation is available in Appendix.

NPI-40 (Raskin & Terry, 1988, for Croatian adaptation see Kardum et al., 2015)

The Narcissistic Personality Inventory (NPI-40) (Raskin & Terry, 1988, for Croatian adaptation see Kardum et al., 2015) consists of 40 forced-choice items (*I have a natural talent for influencing people*/*I am not good at influencing people*). For each narcissistic choice, participants get 1 point. The coefficient of internal consistency for the whole scale was α = .82.

The Self-report Psychopathy Scale (Williams et al., 2007, for Croatian adaptation see Kardum et al., 2015) consists of 31 items (e.g. *Rules are made to be broken*). Participants rate each statement on 5 point Likert-type scale ranging from 1 (do not agree at all) to 5 (totally agree). The coefficient of internal consistency for the whole scale was α = .81.

Procedure

Participants took the questionnaire before/after their classes as part of the wider research on the Dark Triad personality in the Croatian sample. They first provided sociodemographic data (age, gender, income, department of studies, and year of studies) and then filled in the scales. The order of scales was fixed: NPI-40, Mach-IV, SRP-III.

Results

Data analysis

Since the multivariate distribution of the scales was not normal (based on the Mardia test computed in the R package "MVN" v. 5.7; Korkmaz et al., 2014), missing data for the continuous variables (Mach-IV, SRP-III) were estimated using the predictive mean matching algorithm implemented in the R package "mice" (v.3.5.0; van Buuren & Groothuis-Oudshoorn, 2011). The amount of missing data at each scale was

small: Mach-IV: 7 values (0.009%); SRP-III: 12 values (0.001%). Missing data on binary variables (NPI-40) were replaced by the median (107 values, 0.007%).

Based on the literature review, the psychometric properties of the one-factor model, the two-factor model (Fehr et al., 1992; Monaghan et al., 2016), the Christie and Geis (1970) three-factor model, the Beller and Bosse (2017) three-factor model, and the four-factor model (Corral & Calvete, 2000) were tested.

Confirmatory factor analyses were computed in Mplus (v.8.3; Muthén & Muthén, 1998-2017) using the weighted least squares mean and variance-adjusted estimator (WLSMV). The WLSMV was chosen as the estimator because it is appropriate for asymmetric ordered-categorical data (Li, 2014).

Model fit was estimated using χ^2/df, comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA). Cut-off values of the fit indices were the smallest value for χ^2/df, CFI > .95, TLI > .95, and RMSEA < .06 (Hu & Bentler, 1999).

Since none of the confirmatory models met the threshold values of the fit indices, the data were further analysed using exploratory factor analysis (EFA) in the software JASP (v.0.13.0.0) under oblimin rotation (Beller & Bosse, 2017) and "minres" procedure. Factors were extracted based on the results of parallel analysis (Horn, 1965).

Results

The results of the confirmatory factor analyses (Table 1) did not support any of the models tested. In terms of model fit indices, the model proposed by Beller and Bosse (2017) had the best fit, but its fit was still poor.

Table 1
Model fit indices

Model	χ^2/df	RMSEA	CFI	TLI
One-factor model	4.05	.09 (.08-.10)	.66	.62
Views & Tactics	4.60	.10 (.09-.11)	.57	.51
Christie and Geis (1970) three-factor model	Latent variable covariance matrix (PSI) is not positive definite because of high correlation between the morality factor and the other two factors.			
Beller and Bosse (2017) three-factor model	2.31	.06 (.05-.07)	.86	.84
Corral & Calvete (2000) four-factor model	Latent variable covariance matrix (PSI) is not positive definite because of high correlation between cynical view of human nature and the other factor(s).			

Based on the results of the parallel analysis, three factors were retained in the exploratory factor analysis (Table 2). The model was largely consistent with the model proposed by Beller and Bosse (2017) and explained 25% of the variance in the items.

Table 2
Factor loadings from the exploratory factor analysis run on all items

Item	Positive interpersonal tactics	Cynical view of human nature/ negative tactics	Positive view of human nature
1. Never tell anyone the real reason you did something unless it is useful to do so.	.20	.34	-.02
2. The best way to handle people is to tell them what they want to hear.	.03	.52	-.11
3. One should take action only when sure it is morally right.	.52	-.09	.06
4. Most people are basically good and kind.	.07	.08	.55
5. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.	-.01	.50	.26
6. Honesty is the best policy in all cases.	.64	.07	.16
7. There is no excuse for lying to someone else.	.50	-.13	.03
8. Generally speaking, men won't work hard unless they're forced to do so.	-.17	.45	-.03
9. All in all, it is better to be humble and honest than important and dishonest.	.79	.01	-.07
10. When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which might carry more weight.	.57	.08	.00
11. Most people who get ahead in the world lead clean, moral lives.	.17	-.09	.48
12. Anyone who completely trusts anyone else is asking for trouble.	.02	.41	.06
13. The biggest difference between most criminals and other people is that criminals are stupid enough to get caught.	.09	.36	-.09
14. Most men are brave.	-.03	.00	.64
15. It is wise to flatter important people.	.22	.30	-.27
16. It is possible to be good in all respects.	.00	.04	.27
17. Barnum was very wrong when he said there's a sucker born every minute.	.14	-.04	.04
18. It is hard to get ahead without cutting corners here and there.	.13	.40	-.08
19. People suffering from incurable diseases should have the choice of being put painlessly to death.	.03	.10	.13
20. Most men forget more easily the death of their father than the loss of their property.	.06	.32	.14

Because two items (*17* and *19*) did not load statically significantly on any factor (r <.30; Field, 2013) and one item (*15*) loaded significantly on two factors, these items were excluded from the analysis and the exploratory factor analysis was rerun using the same procedures and criteria (Table 3).

Table 3
Factor loadings from the exploratory factor analysis run without excluded items

Item	Positive interpersonal tactics	Cynical view of human nature/ negative tactics	Positive view of human nature
1. Never tell anyone the real reason you did something unless it is useful to do so.	.23	**.35**	-.06
2. The best way to handle people is to tell them what they want to hear.	.05	**.49**	-.11
3. One should take action only when sure it is morally right.	**.52**	-.08	.05
4. Most people are basically good and kind.	.06	.09	**.52**
5. It is safest to assume that all people have a vicious streak and it will come out when they are given a chance.	.00	**.50**	.22
6. Honesty is the best policy in all cases.	**.64**	.07	.14
7. There is no excuse for lying to someone else.	**.47**	-.15	.08
8. Generally speaking, men won't work hard unless they're forced to do so.	-.15	**.45**	-.06
9. All in all, it is better to be humble and honest than important and dishonest.	**.79**	.01	-.09
10. When you ask someone to do something for you, it is best to give the real reasons for wanting it rather than giving reasons which might carry more weight.	**.56**	.08	.01
11. Most people who get ahead in the world lead clean, moral lives.	.12	-.10	**.54**
12. Anyone who completely trusts anyone else is asking for trouble.	.04	**.41**	.04
13. The biggest difference between most criminals and other people is that criminals are stupid enough to get caught.	.11	**.35**	-.12
14. Most men are brave.	-.05	.00	**.63**
16. It is possible to be good in all respects.	-.05	.03	**.34**
18. It is hard to get ahead without cutting corners here and there.	.13	**.36**	-.05
20. Most men forget more easily the death of their father than the loss of their property.	.08	**.32**	.10

The results of the exploratory factor analysis confirmed the three-factor model, which explained 28% of the variance in the items. The three factors were: Positive interpersonal tactics (e.g., *Honesty is the best policy in every case*, five items, α = .73), Cynical view of human nature/negative tactics (e.g., *The best way to deal with people is to tell them what they want to hear*, eight items, α = .64), and Positive view of human nature (*Most people are basically good and kind*, four items, α = .57). Descriptive data for each factor are presented in Table 4.

Table 4
Descriptive data

	M	*SD*
Positive interpersonal tactics	4.68	.88
Cynical view of human nature/negative tactics	3.40	.77
Positive view of human nature	3.19	.87

Positive view of human nature was positively correlated with positive interpersonal tactics, while it was uncorrelated with Cynical view of human nature/negative tactics (Table 5). Positive interpersonal tactics and Cynical view of human nature/negative tactics were negatively correlated (Table 5).

Table 5
Factor intercorrelations

	Positive interpersonal tactics	Cynical view of human nature/negative tactics	Positive view of human nature
Positive interpersonal tactics	1.00	-.28**	.27**
Cynical view of human nature/negative tactics		1.00	-.07
Positive view of human nature			1.00

Note. **$p < .01$

In terms of the relation between Machiavellian factors and other two Dark Triad traits, Cynical view of human nature/negative tactics was positively correlated with psychopathy and narcissism, whereas Positive interpersonal tactics were negatively correlated with the same constructs. Positive view of human nature was not correlated with narcissism or psychopathy (Table 6).

Table 6
Correlations between Machiavellian factors, narcissism, and psychopathy

	Positive interpersonal tactics	Cynical view of human nature/negative tactics	Positive view of human nature
Narcissism	-.38**	.23**	-.03
Psychopathy	-.46**	.32**	-.04

Note. **$p < .01$

Discussion

The factor structure of the Mach-IV in the Croatian sample seems to be consistent with the solutions that appeared in the previous international studies. In particular, the proposed model is mostly consistent with the three-factor model proposed by Beller and Bosse (2017). However, the proposed solution is not without controversy. Two items (*17* and *19*) did not load significantly on any factor, one item (*16*) loaded on views but not tactics as proposed by Beller and Bosse's (2017) model, and one item (*15*) had statistically significant loadings on different factors. This supports Miller et al.'s (2019) conclusion that Mach-IV

items generally change factor loadings significantly across studies. In addition, the study results confirm the assumption that the wording of some items is archaic (Miller et al., 2019), as social norms about euthanasia (item *19*) have changed significantly since 1970 and there are no theoretical assumptions for viewing support for euthanasia as Machiavellian behaviour (Corral & Calvete, 2000). Similarly, we are not sure if our students know who Barnum was, which could explain why item *17* did not load significantly on any factor. The proportion of variance in the items explained by the factors is lower than in Beller and Bosse's (2017) study, where the factors explained 38% of the variance. This could be due to the smaller number of items retained. However, even 38% of the variance explained is lower than the target of 50% of the variance explained (Streiner, 1994), indicating the limitations of the proposed three-factor solution.

In terms of construct validity, Cynical view of human nature/negative tactics and Positive interpersonal tactics correlated with other Dark Triad traits, and factor intercorrelations were also mostly in the expected directions (Corral & Calvete, 2000). However, Positive views of human nature were not correlated with Cynical views of human nature/negative tactics, nor with narcissism or psychopathy. This result can be explained by two previous empirical findings. First, views and tactics have a different nomological network and conflating these factors may not be the appropriate solution from a statistical perspective. Specifically, Corral & Calvete (2000) found that Cynical views about human nature, but not Negative interpersonal tactics, were related to Positive view of human nature. In addition, Monaghan et at. (2018) suggest that psychopathy is more closely related to tactics than to views, whereas the opposite is true for narcissism, further demonstrating the importance of distinguishing these two Machiavellian facets. Moreover, another important previous finding in this context is that positive and negative items are not highly correlated (Ray, 1983) and may have different patterns of correlation with the same construct (Steininger & Eisenberg, 1976). Consequently, the proposed solution has two major limitations: It involves dimensions that should be separated from a statistical perspective, and it is potentially sensitive to item wording.

Conclusions

Based on the study results, it is difficult to recommend the use of the Croatian translation of the Mach-IV in the further empirical studies in Croatia. The results of this study point to the limitations of the scale identified in previous international research (Corral & Calvete, 2000; Miller et al., 2019; Panitz, 1989). This recommendation recognises that other scales with better psychometric properties have been developed to assess Machiavellianism, such as Trimmed Mach (Rauthmann, 2012), Two-dimensional Machiavellianism scale (Monaghan et al., 2018), Machiavellianism Personality Scale (Dahling et al., 2009), Five factor Machiavellianism Inventory (Collison et al., 2018). However, we see the use of these scales as an intermediate step between the current and desired state of the art. As Rauthmann (2012) notes, there is no clear theory of Machiavellianism and without agreement on the theory of Machiavellianism, the construct validity of newly developed scales will also be questionable to some extent. In this regard, we refer in particular to the relationship between Machiavellianism and psychopathy, which remains unclear (Rauthmann and Will, 2011; Muris et al., 2017; Rogoza & Cieciuch, 2019). Although in this research magnitude of the correlations between Machiavellian traits and psychopathy was not statistically different than the relation between Machiavellianism and narcissism (all $p > .05$), results of the recent meta-analysis (Muris et al., 2017) suggest that Machiavellianism is more strongly related to psychopathy than narcissism ($r$mp = .58, $r$mn = .38). Multidimensional measures of Machiavellianism that take into account affects, behaviours, cognitions, and desires could address this issue (Rauthmann and Will, 2011). Until that happens, the validity of the aforementioned Mach-IV alternatives should be explored in Croatian samples. Ideally, this would be done with a more diverse sample than was the case in this study in order to capture more variability in the scores and be

able to generalise the results to samples with different socio-demographic characteristics (students, general population). Furthermore, we call authors to consistently follow the recommended format of the Likert-type scale for the particular instrument. Croatian translation of the Mach-IV, as is the case with some other translations (Corral & Calvete, 2000), implements a six-point scale (the neutral point is excluded), while original implementation is based on the five-point scale (Christie & Geis, 1970). This is an important methodological limitation of the existing translation and further reason to explore the validity of the proposed alternative measures. Hopefully, this study will be a small step towards more frequent use of Machiavellian measures other than Mach-IV in Croatian psychological research.

References

Beller, J., & Bosse, S. (2017). Machiavellianism has a dimensional latent structure: Results from taxometric analyses. *Personality and Individual Differences, 113,* 57 – 62. https://doi.org/10.1016/j.paid.2017.03.014

Christie, R., & Geis, F. L. (1970). *Studies in Machiavellianism*. Academic Press.

Christie, R., & Lehmann, S. (1970). The structure of Machiavellian orientations. In R. Christie & F. L. Geis (Eds.), *Studies in Machiavellianism* (pp. 359-387). Academic Press.

Collison, K. L., Vize, C. E., Miller, J. D., & Lynam, D. R. (2018). Development and preliminary validation of a five factor model measure of Machiavellianism. *Psychological Assessment*, *30*, 1401–1407. https://doi.org/10.1037/pas0000637

Corral, S., & Calvete, E. (2000). Machiavellianism: dimensionality of the MACH-IV and its relation to self-monitoring in a Spanish sample. *Spanish Journal of Psychology*, *3*, 3 - 13. https://doi.org/10.1017/s1138741600005497

Dahling, J. J., Whitaker, B. G., & Levy, P. E. (2009). The development and validation of a new Machiavellian scale. *Journal of Management*, *35*, 219–257.

Fehr, B., Samsom, D., & Paulhus, D. L. (1992). The construct of Machiavellianism: Twenty years later. In C. D. Spielberger & J. N. Butcher (Eds.), *Advances in Personality Assessment* (Vol.9, pp.77-116). Hillsdale.

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics: And Sex and Drugs and Rock "N" Roll* (4th Edition). Sage. Horn, J. (1965). A rationale and test for the number of factors in factor analysis. *Psychometrika*, *30*, 179-185.

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

JASP Team (2020). JASP (Version 0.13.0.0.) [Computer software].

Kardum, I., Hudek-Knezevic, J., Schmitt, D. P., & Grundler, P. (2015). "Personality and mate poaching experiences": Corrigendum. *Personality and Individual Differences*, *78*, 103. https://doi.org/10.1016/j.paid.2015.01.039

Korkmaz, S., Goksuluk, D., & Zararsiz, G. (2014). MVN: An R Package for Assessing Multivariate Normality. *The R Journal*, *6*, 151-162.

Li, C.H. (2014). *The performance of MLR, USLMV, and WLSMV estimation in structural regression models with ordinal variables* [doctoral dissertation, Michigan State University]. Msu Libraries.

Milas, G., Rimac, I., & Buzov, Ž. (1991). Društveni status i usvajanje makijavelističkih uvjerenja kod mladih. *Revija za sociologiju*, *22*, 359-366.

Miller, B. K., Nicols, K., & Konopaske, R. (2019). Measurement invariance tests of revisions to archaically

worded items in the Mach IV scale. *PLoS ONE*, *14*: e0223504. https://doi.org/10.1371/journal.pone.0223504

Monaghan, C., Bizumic, B., & Sellbom, M. (2016). The role of Machiavellian views and tactics in psychopathology. *Personality and Individual Differences, 94,* 72–81. https://doi.org/10.1016/j.paid.2016.01.002

Monaghan, C., Bizumic, B., & Sellbom, M. (2018). Nomological network of two dimensional machiavellianism. *Personality and Individual Differences, 130,* 161–173. https://doi.org/10.1016/j.paid.2018.03.047

Muris, P., Merckelbach, H., Otgaar, H., & Meijer, E. (2017). The malevolent side of human nature: A meta-analysis and critical review of the literature on the dark triad (narcissism, Machiavellianism, and psychopathy). *Perspectives on Psychological Science, 12*, 183–204. https://doi.org/10.1177/1745691616666070

Muthén, L. K., & Muthén, B. O. (1998-2017). *Mplus User's Guide* (8th Edition). Muthén & Muthén.

Panitz, E. (1989). Psychometric investigation of the Mach IV scale measuring Machiavellianism. *Psychological Reports*, *64*, 963–968.

Pechorro, P., Caramelo, V., Oliveira, J. P., Nunes, C., Curtis, S. R., & Jones, D. N. (2017). The Short Dark Triad (SD3): Adaptation and Psychometrics among At-Risk Male and Female Youths. *Deviant Behavior, 40*, 273-286. https://doi.org/10.1080/01639625.2017.1421120.

Raskin, R., & Terry, H. (1988). A principal-components analysis of the Narcissistic Personality Inventory and further evidence of its construct validity. *Journal of Personality and Social Psychology*, *54*, 890–902. https://doi.org/10.1037/0022- 3514.54.5.890.

Rauthmann, J. F., & Will, T. (2011). Proposing a multidimensional Machiavellianism conceptualization. *Social Behavior and Personality*: *An International Journal*, *39*, 391-403. https://doi.org/10.2224/sbp.2011.39.3.391

Rauthmann, J. F. (2012). Investigating the MACH–IV With Item Response Theory and Proposing the Trimmed MACH*. *Journal of Personality Assessment*, *95*, 388-397.https://doi.org/10.1080/00223891.2012.742905

Ray, J. J. (1983). Defective validity of the Machiavellianism scale. *Journal of Social Psychology, 119,* 291-292.

Rogoza, R., & Cieciuch, J. (2019). Structural Investigation of the Short Dark Triad Questionnaire in Polish Population. *Current Psychology*, *38*, 756-763. https://doi.org/10.1007/s12144-017-9653-1

Rožić, A., Švegar, D., & Kardum, I. (2018). Efekti crta ličnosti tamne trijade i emocionalne empatije na moralnu prosudbu. *Psihologijske teme*, *27*, 561-583.

Steininger, M., & Eisenberg, E. (1976). On different relationships between dogmatism and Machiavellianism among male and female college students. *Psychological Reports, 38,* 779-782.

Streiner (1994). Figuring out factors: the use and misuse of factor analysis. *Canadian Journal of Psychiatry*, *39*, 135-140.

van Buuren, S., & Groothuis-Oudshoorn, K. (2011). Mice: Multivariate Imputation by Chained Equations in R. *Journal of Statistical Software*, *45*, 1-67.

Williams, K. M., Paulhus, D. L., & Hare, R. D. (2007). Capturing the Four-Factor Structure of Psychopathy in College Students Via Self-Report. *Journal of Personality Assessment*, *88*, 205–219. https://doi.org/10.1080/00223890701268074.

Appendix

Croatian translation of the Mach-IV

Mach IV

Uputa: Niže je navedeno nekoliko tvrdnji. Svaka od njih predstavlja neko uobičajeno mišljenje i nema točnih i netočnih odgovora. S nekim ćete se tvrdnjama vjerojatno složiti, a s drugima nećete. Zanima nas u kojoj se mjeri slažete ili ne slažete s navedenim tvrdnjama.

Pažljivo pročitajte svaku tvrdnju. Zatim odredite u kojoj se mjeri slažete, odnosno ne slažete s tvrdnjom tako da zaokružite broj ispod svake tvrdnje. Brojevi i njihovo značenje su:

Ako se *izrazito slažete*, zaokružite +3	Ako se *pomalo ne slažete*, zaokružite -1
Ako se *donekle slažete*, zaokružite +2	Ako se *donekle ne slažete*, zaokružite -2
Ako se *pomalo slažete,* zaokružite +1	Ako se *izrazito ne slažete,* zaokružite -3

U ovakvim situacijama prvi dojmovi su obično najbolji. Pročitajte svaku tvrdnju, odlučite slažete li se s njom ili ne i u kojoj mjeri i zatim zaokružite odgovarajući broj ispod tvrdnje. Pokušajte dati svoje mišljenje za svaku tvrdnju.

Ukoliko Vam se čini da niti jedan broj ne opisuje točno vaše mišljenje, zaokružite onaj koji približno najbolje odgovara.

1) Nikad ne reci nikome pravi razlog zbog kojeg si nešto učinio, osim ako to nije korisno.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

2) S ljudima je najbolje da im se kaže ono što žele čuti.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

3) Treba učiniti nešto tek kada smo sigurni da je to moralno ispravno.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

4) Većina ljudi u osnovi je dobra i ljubazna.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

5) Najsigurnije je pretpostaviti da su svi ljudi donekle pokvareni, što će izbiti na vidjelo kada im se pruži prilika.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

6) Najbolje je načelo u životu biti uvijek pošten.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

7) Nema opravdanja za laganje.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

8) Općenito govoreći, ljudi neće marljivo raditi osim ako ih se na to ne prisili.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

9) Sve u svemu, bolje je biti skroman i pošten nego važan i nepošten.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

10) Kada tražiš od nekoga uslugu, najbolje je reći pravi razlog zbog čega to tražiš, a ne razloge koji mogu imati veću težinu.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

11) Većina ljudi koja uspije u životu vodi čist i moralan život.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

12) Svatko tko ima potpuno povjerenje u druge izaziva nevolju.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

13) Najveća razlika između većine kriminalaca i drugih ljudi je što su kriminalci dovoljno glupi da budu uhvaćeni.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

14) Većina je ljudi hrabra.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

15) Mudro je laskati važnim ljudima.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

16) Moguće je biti dobar u svakom pogledu.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

17) Barnum je bio u krivu kada je rekao da se svake minute rađa jedan gubitnik.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

18) Teško je napredovati bez da se tu i tamo koriste «prečice».

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

19) Ljudi koji pate od neizlječivih bolesti trebali bi imati pravo na izbor bezbolne smrti.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

20) Većina ljudi lakše zaboravi smrt svoga oca nego gubitak svoje imovine.

+3	+2	+1	-1	-2	-3
izrazito se slažem	donekle se slažem	pomalo se slažem	pomalo se ne slažem	donekle se ne slažem	izrazito se ne slažem

Original research

5

Burnout and work-related well-being differences regarding morningness–eveningness preference of Croatian workers

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Abstract

A person's morning or evening preference is a biologically conditioned individual difference in circadian rhythms. Such a difference might be a problem in professional life due to the nature of the dynamics of most jobs with fixed working hours starting early in the morning. The aim of this study was to verify what role does the morningness or eveningness play in the burnout and work-related well-being of Croatian workers. This online study involved 824 participants, heterogeneous regarding socio-demographic and professional characteristics. Participants were recruited through social networks. Participation was voluntary and anonymous. The measures included a morningness-eveningness scale, a burnout questionnaire, a scale of job-related affective well-being, and questions about the socio-demographic and professional characteristics, including information about work schedule. According to the median of the morningness-eveningness scale, the sample was divided into two subsamples: morning and evening types. ANCOVA showed that there was a significant difference in burnout and job affective well-being between morning and evening types, whilst controlling for the covariate of the level of personal control over working schedule. In conclusion, the findings suggest that employee's eveningness is a significant factor in their tendency to burnout. Given the biological nature of the morningness-eveningness preference, practical interventions should be directed to allowing evening types to adjust their working schedule and to be given the necessary support, with the aim of reducing their exhaustion at work.

Key words: circadian rhythms, morningness-eveningness, burnout, work related well-being, work-related affect, Croatian workers

Introduction

Burnout has become a frequently researched psychological phenomenon, which is not surprising due to its long-term consequences not only on an individual's health (e.g., Burke et al., 1996), but also on work performance, i.e. organizational profit (e. g., Bakker et al, 2008). The severity and difference from other psychological diseases and disorders was also recognized, and burnout syndrome was introduced in the 10th, and further expanded in the 11th version of the ICD (WHO, 2020). It is defined as "a syndrome conceptualized as resulting from chronic workplace stress that has not been successfully managed. It is characterized by three dimensions: feelings of energy depletion or exhaustion; increased mental distance from one's job, or feelings of negativism or cynicism related to one's job; and reduced professional efficacy. Burnout refers specifically to phenomena in the occupational context and should not be applied to describe experiences in other areas of life" (WHO, 2020). Thus, research has focused on discovering the factors that lead to burnout to reduce the prevalence of this syndrome (Bakker et al., 2004). In addition, to identify organizational risk factors that may contribute to burnout, it is necessary first to determine individual factors that, if in conflict with the characteristics of the job or business environment, can lead to the development of burnout syndrome. In praxis, knowing different factors that contribute to burnout serves for earlier recognition and timely intervention. One of the correlates of burnout at work is reduced work wellbeing.

Achieving greater work-related well-being among employees is one of the main goals of industrial/organizational psychology. Primarily, well-being is important for employee health, although there is also a complex relationship between subjective employee well-being and productivity at work, so it benefits the company as well (Cotton and Hart, 2003). Warr (1987) developed a two-dimensional model of affective work well-being that consists of the positive-negative emotions and the level of arousal. Freitas et al (2016) in their study showed that positive and negative affect are very highly associated with both burnout symptoms of depersonalization and exhaustion. By noticing the valence of affect a person has towards work, it is possible to predict and try to prevent burnout at work (Freitas et al., 2016). Therefore, it is important to notice which factors contribute to the positive and which to the negative affect.

Morningness–eveningness

One of the burnout determinants could be an individual preference for morning or evening activity. Morningness or eveningness is an individual preference for performing activities in the morning or in the evening (Smith et al., 1989). Considering these individual differences, and the fact that most people in European countries work during the day (Eurofound, 2015), we can conclude that typical working time is more suitable for those of the morning type. People who are more pronounced evening types, in addition to having a greater problem with early awakening, also have poorer sleep quality (Bakotic et al., 2017), do not have a regular sleep schedule (Philip et al, 2002), and have trouble falling asleep (Zencirci and Arslan, 2011). In addition, even in situations where they do not work exclusively in the morning, but in shifts, evening types have more trouble adjusting to such a schedule than morning types (Willis et al., 2008). Because of this, it is not surprising that some research show that evening types are more prone to burnout, and thus to greater exhaustion and mood swings (Merikanto et al., 2016).

This study examined the differences between morning and evening types in susceptibility to burnout at work and to affective work-related well-being. Based on the literature review, we assumed that, due to the nature of standard working schedule, evening types would have lower affective work well-being and would experience less positive emotions towards work, compared to morning types. In addition, evening types would have higher levels of negative affect towards work, exhaustion and disengagement, as symptoms of burnout at work.

Material and methods

Participants

This study involved total of 850 participants. However, due to the missing values, this number varied regarding of the analysis (763 when analyzing burnout symptoms, and 824 when analyzing job-related affective well-being). The sample consisted of Croatian workers of heterogeneous personal and occupational profiles: 65% were female and 35% male, with an average age of 40 years with a standard deviation of 12.75 years. Most participants worked at jobs with fixed working hours (62.1%), 16.8% of them could choose when they start and finish their work in a fixed interval ("sliding" working hours), 8.7% of them could choose which shifts they will work, while the rest had flexible working hours. Further, 57.9% worked only during the day, 24.2% worked in shifts, but not at night, while 8.2% worked shifts including the night, and 0.5% worked only during the night. Participants reported they worked on average 41,68 hours per week, with a standard deviation of 8.78. 63.9% had finished higher education (baccalaureate degree and higher), and 36.1% had finished maximum high school education.

Participants were recruited for an online survey through social networks in the spring of 2019, with a help from psychology students. Participation in the study was voluntary and anonymous and inclusion criteria were minimum of 30 working hours per week.

Measures

The morningness-eveningness scale (Smith et al., 1989; translated to Croatian by Bakotić et al., 2017) was used in this study. The scale consists of 13 items which represent self-assessment of behavior, habits and preferences more suitable for the morning types, that is the evening ones. Items are answered on a scale of 1 to 4 or 1 to 5, with each item having a unique response scale (e.g., "How do you normally endure getting up in the morning?" to which participants respond on a 4-point scale with 1 indicating "very difficult ", and 4" very easy "). Higher result indicates a higher morningness of the person, while a lower result indicates a higher eveningness of the person. The results range from 13 to 55. In the Croatian sample, the scale has shown very good reliability (Cronbach's alpha=.87) (Bakotić et al., 2017), as well as in this study (Cronbach's alpha=.88). According to the Smith et al. (1989) there should be three distinct chronotypes: evening, intermediate and morning types. We have tried to divide our sample accordingly, but majority of our participants fell under the intermediate type (*N*=630). Since in our sample only 24 were evening types, which was not enough for conducting the appropriate analyses, we divided our sample into two subsamples using the median of the scale. Participants from scores of 13 to 38 were classified as predominantly evening types (*N*=410), and participants from 39 and higher as predominantly morning types (*N*=440). Descriptive statistics for each subsample separately are shown in Table 1.

The Oldenburg burnout inventory (Bakker and Demerouti, 2008; Burić and Slišković, 2018, for Croatian translation) was used in this study to examine participants' burnout levels. The questionnaire consists of 16 items that are equally distributed on two subscales: 8 items fall under the disengagement subscale, and 8 items fall under the exhaustion subscale. Items represent statements (e.g., "I feel more and more involved in my work.") to which participants respond on a 4-point scale, with 1 indicating "completely disagree" and 4 "completely agree". The result is formed separately for each subscale by calculating the mean of the responses and the total result ranges from 1 to 4 for each subscale, with a higher result indicating a higher level of a particular burnout symptom, and vice versa. The Cronbach's alpha for the disengagement subscale in this study was .82 and for the exhaustion subscale .79.

The Job-Related Affective Work-Wellbeing Scale (Van Katwyk et al., 1999; Nezirević et al., 2017) was used in this study to examine work well-being. The scale consists of 20 items, equally divided into two subscales of positive and negative affect, which represent statements that name a particular emotion (e.g. "I felt ANXIOUS because of work."). Participants respond to statements on the scale of 5 degrees denoting the frequency of feelings with 1 meaning "never" and 5 "extremely often". The result is formed so that, after recoding certain items, all responses are summed up, and higher result means higher work well-being of the individual. The results range from 20 to 100. In addition, the result can be calculated for each subscale separately. For the positive affect subscale, a higher score indicates a higher level of job-related positive affect, while for the negative affect subscale, a higher score indicates a higher level of job-related negative affect. Cronbach's alpha in this study is .92 for the whole scale, .88 for the negative affect and .93 for the positive affect, which indicates a very high reliability of the scale.

Level of personal control over working hours was measured with a single item „What kind of working hours do you have (depending on how much you can choose when you will work)?". Participants answered to that item by choosing one of the four answers. The suggested answers were 1 – Fixed working hours, 2 - Sliding working hours, 3 - Flexible working hours in a sense that you can choose your own shifts, 4 – Flexible working hours. This variable was transformed into a pseudo-interval scale of 4 points where 1 represented no personal control over working hours, and 4 represented complete personal control over working hours.

Results

Table 1 shows descriptive results separately for each subsample: morning and evening types. The results of comparison of the two subsamples are consistent with the hypothesis, i.e., evening types, compared to morning types, showed higher levels of both burnout symptoms, higher levels of negative work-related affect, as well as lower levels of positive work-related affect and general work-related affective well-being. Standard deviations show that variability for each scale is the same for both morning and evening types.

Table 1
Descriptive results of participants' answers on the scales in this research divided into morning and evening types

		M	*SD*	*N*
Morning types	Disengagement	2.29	0.50	369
	Exhaustion	2.26	0.42	369
	Job-related affective well-being	68.64	11.06	390
	Positive affect	30.51	7.44	390
	Negative affect	21.87	5.92	390
Evening types	Disengagement	2.45	0.52	394
	Exhaustion	2.45	0.46	394
	Job-related affective well-being	64.97	12.65	413
	Positive affect	29.15	7.61	413
	Negative affect	24.18	6.73	413

Total	Disengagement	2.37	0.52	783
	Exhaustion	2.35	0.45	783
	Morningness	38.00	7.47	850
	Job-related affective well-being	66.9	12.03	824
	Positive affect	29.90	7.53	824
	Negative affect	23.01	6.46	824

Table 2. and Figure 1. show the results of ANCOVA comparing the differences between morning and evening types in the level of exhaustion and disengagement with a significant covariate of the level of control of working time. The homogeneity of the variances was calculated by the Levene's test, and the variances were homogeneous in the comparison for disengagement (F (1,761) = 0.035, p> .05), and heterogeneous in the comparison for exhaustion (F (1,761) = 5.134, p = .024). Due to the robustness of the procedure, this deviation can be accepted, but with a caution when making conclusions. The covariate was significant for both disengagement (F (1,760) = 14.799, p <.001) and exhaustion (F (1,760) = 11.161, p = .001). In addition, both comparisons of differences between groups were significant when covariate was controlled for. Thus, when controlling for the level of individual control over their working schedule, morning and evening types differed statistically significantly in the level of perceived disengagement (F (1,760) = 23.949, p <.001) and exhaustion (F (1,760) = 36.712, p <.001).

Table 2
ANCOVA results for differences between morning and evening types in their level of disengagement and exhaustion while controlling for level of personal control over working schedule

Scale	Source	Sum of squares	*df*	Mean square	*F*	*p*	Partial eta squared	Observed power
Disengagement	Covariate*	3.76	1	3.76	14.80	<.001	.02	0.97
	Between groups**	6.09	1	6.09	23.95	<.001	.03	1.00
	Error	193.15	760	0.25				
	Total	202.25	762					
Exhaustion	Covariate*	2.14	1	2.14	11.16	<.001	.01	0.92
	Between groups**	7.04	1	7.04	36.71	<.001	.05	1.00
	Error	145.70	760	0.19				
	Total	154.28	762					

In Figure 1. we can see the direction of the effect indicating that evening types experience higher levels of exhaustion and disengagement than morning types.

Figure 1

Differences between morning and evening types in their level of disengagement and exhaustion while controlling for level of personal control over working schedule

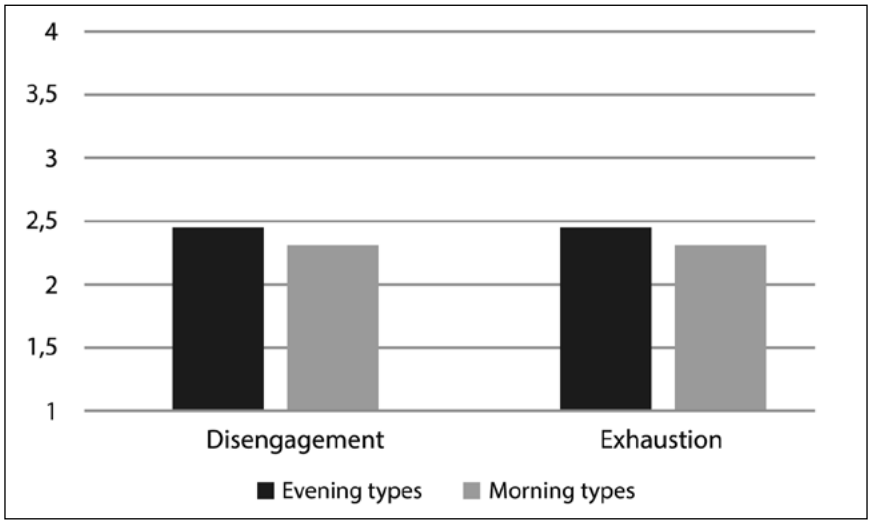


Table 3., Figure 2., and Figure 3. show the results of ANCOVA comparisons of differences between morning and evening types in the level of job-related affective well-being, positive affect, and negative affect. The homogeneity of the variances was calculated by the Levene's test and was satisfied in the case of comparing the level for positive affect (F (1, 801) = 0.017, p = .897), while in the comparisons for negative affect (F (1, 801) = 5.160, p = .023) and job-related affective well-being (F (1, 801) = 4.657, p = .031) it was not satisfied, but again, this deviation can be accepted due to the robustness of the procedure, with due caution when drawing conclusions.

Table 3

ANCOVA results for differences between morning and evening types in their level of positive affect, negative affect and job-related affective well-being while controlling for level of personal control over working schedule

Scale	Source	Sum of squares	*df*	Mean square	*F*	*p*	Partial eta squared	Observed power
Positive affect	Covariate*	1152.56	1	1152.56	20.85	<.001	.03	1.00
	Between groups**	481.69	1	481.69	8.71	<.003	.01	0.84
	Error	44227.59	800	55.28				
	Total	45751.23	802					
Negative affect	Covariate*	346.74	1	346.74	8.68	<.003	.01	0.84
	Between groups**	1163.69	1	1163.69	29.15	<.001	.04	1.00
	Error	31942.23	800	39.93				
	Total	33359.13	802					

Job-related affective well-being	Covariate*	2763.63	1	2763.63	19.59	<.001	.02	0.99
	Between groups**	3142.76	1	3142.75	22.69	<.001	.03	1.00
	Error	110814.98	800	138.52				
	Total	116280.19	802					

Note. *Level of personal control over working hours; **Morning or evening type

In all three cases, there was a statistically significant difference in levels between morning and evening types when the level of personal control over working schedule was controlled for. Compared to evening types, morning types experienced statistically significantly higher levels of positive affect caused by work (F (1, 800) = 8.713, p = .003) and lower levels of negative affect caused by work (F (1, 800) = 29.145, p <.001). In addition, morning types generally experienced statistically significant higher level of job-related affective well-being than evening types (F (1, 800) = 22688, p <.001). The direction and level of the differences can be seen in Figure 2. and Figure 3.

Figure 2

Differences between morning and evening types in their level of positive affect and negative affect while controlling for level of personal control over working schedule

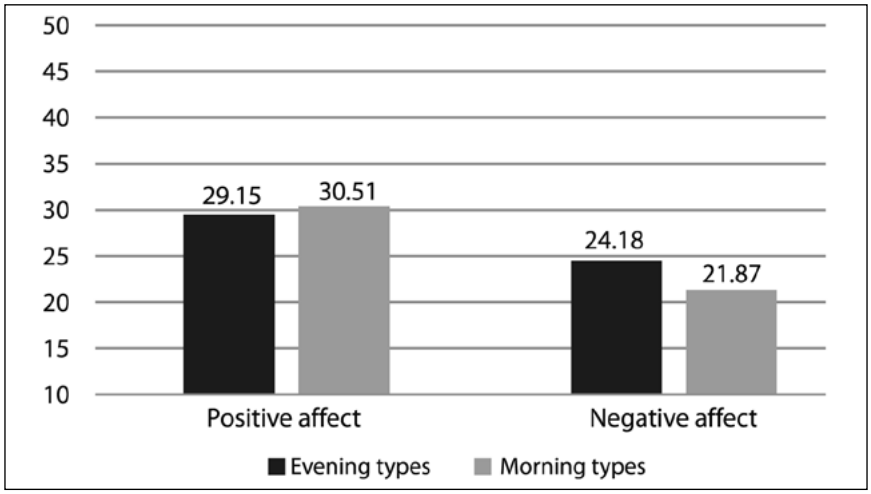
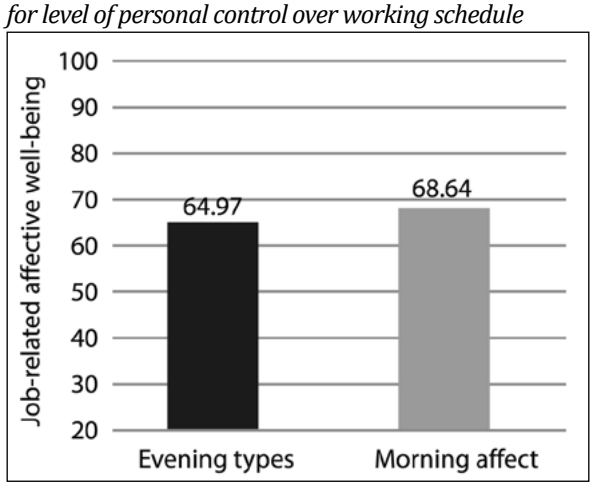


Figure 3

Differences between morning and evening types in their level of job-related affective well-being while controlling for level of personal control over working schedule



Discussion

The results of ANCOVA comparing morning and evening types, are in line with the initial hypothesis that people who prefer the later part of the day for work, due to individual differences in circadian rhythms ("evening types"), are more prone to burnout at work and have lower job-related affective well-being, when controlling for the level of their control over their own working schedule.

The findings are in line with previous research (e.g. Philip et al, 2002; Zencirci and Arslan, 2011) which showed significant correlation between eveningness and various well-being criteria. However, the nature of this connection is still unknown. Since previous studies showed that negative affect towards work is connected to higher rates of burnout (Feritas et al., 2016) there could also be a mediator effect where eveningness of a person relates to negative job-related affect, which in turn is what contributes to higher rates of burnout. Nevertheless, this interpretation of the results should be further empirically investigated.

Although the differences in burnout and well-being measures between these two groups were not large, they have proven to be significant, suggesting that personal morningness-eveningness preference should be a factor to consider when developing organizational interventions to prevent employees` burnout. Given that other studies show the same results of higher burnout prevalence in evening types (Merikanto et al, 2016), data on employee's preference for morning or evening can serve as valuable information when planning working schedule. For example, less shift work (Willis et al., 2008) and focus on increasing job-related affective well-being, i.e. increasing positive affect and reducing negative affect caused by work as they themselves were associated with less burnout at work (Freitas et al, 2016). Even though shiftwork might seem like a solution for the evening types, research in general population show it might be related to many health problems (Slišković, 2010). Also, in another research on Croatian sample (Radosevic-Vidacek & Koscec, 2004), parents' shiftwork had negative effects on their children's sleep quality. Hence, it is very important that working schedule planning takes care not only of the morningness-eveningness preference, but also of the other aspects of employee's well-being.

When interpreting the results of this research, we must take into account its limitations. First, we have to note that dividing the sample into two chronotypes was not in accordance with the original proposition by the authors of the morningness-eveningness scale (Smith et al., 1989). Since our sample comprised too few exclusively evening types, we divided the sample in the chronotypes according to the median of the continuous scale. Thus, we have limited the potential for the generalization of the descriptive statistics to general population. However, we might expect that the effect of eveningness on workers` well-being in general population should be even larger when including more evening types. Thus, future research should test the obtained findings on a larger and more representative sample. Further analysis and research are also needed to examine whether these differences change with consideration of the way employees work, that is whether they work in shifts, only in the morning, only in the evening, et cetera. In this study it was not possible due to the excessive disproportion between those who work only in the morning and all other groups (for example, only 7 participants work exclusively in the evening shift) but initial analyses showed that a difference could exist.

Even though the sample was not representative for the morningness-eveningness preference, it was heterogeneous regarding the jobs, occupations and working sectors of the workers. That provided the possibility to obtain high sensitivity of all variables. Also, data on average working hours and working time arrangements are comparable with findings of Sixth European Conditions Survey (Eurofound, 2015), which supports the representativity of our sample. However, the results might be different if we chose occupations with high rates of burnout (e.g., nurses or firemen). Hence, future research should include and verify results on such high-risk occupations.

Finally, a covariate in this research, the level of workers' control over their own working schedule,

was a single-item measure. Nevertheless, it refers to the feature of the job which is relatively objective, hence we believe its reliability is not questionable. To support its validity, we note that Sixth European Conditions Survey used comparable four options when measuring control over working time arrangements (Eurofound, 2015).

Conclusions

This study confirmed that evening types, compared to morning types, had lower levels of job-related affective well-being and job-related positive affect, as well as higher levels of job-related negative affect, exhaustion, and alienation as symptoms of burnout at work. Despite the limitations, this research provides valuable insights into the problems faced by individuals who work in the morning, but whose biological circadian rhythms predispose them to function better in the later parts of the day.

References

Bakker, A. B., & Demerouti, E. (2008). Towards a model of work engagement. *Career Development International*, *13*(3), 209-223. https://doi.org/10.1108/13620430810870476

Bakker, A. B., Demerouti, E., & Verbeke, W. (2004). Using the job demands-resources model to predict burnout and performance. *Human Resource Management: Published in Cooperation with the School of Business Administration, The University of Michigan and in alliance with the Society of Human Resources Management*, *43*(1), 83-104. https://doi.org/10.1002/hrm.20004

Bakker, A. B., Van Emmerik, H., & Van Riet, P. (2008). How job demands, resources, and burnout predict objective performance: A constructive replication. *Anxiety, Stress, & Coping*, *21*(3), 309-324. https://doi.org/10.1080/10615800801958637

Bakotic, M., Radosevic-Vidacek, B., & Koscec Bjelajac, A. (2017). Morningness–eveningness and daytime functioning in university students: the mediating role of sleep characteristics. *Journal of Sleep Research*, *26*(2), 210-218. https://doi.org/10.1111/jsr.12467

Burić, I., & Slišković, A. (2018). Oldenburški upitnik sagorijevanja [Oldenburg Burnout Inventory]. In A. Slišković, I. Burić, V. Ćubela Adorić, M. Nikolić, & I. Tucak Junaković (Eds.). *Zbirka psihologijskih skala i upitnika*, svezak 9 (13-20). Sveučilište u Zadru.

Burke, R. J., Greenglass, E. R., & Schwarzer, R. (1996). Predicting teacher burnout over time: Effects of work stress, social support, and self-doubts on burnout and its consequences. *Anxiety, Stress, & Coping*, *9*(3), 261-275.

Cotton, P., & Hart, P. M. (2003). Occupational wellbeing and performance: A review of organisational health research. *Australian Psychologist, 38*(2), 118-127.
https://doi.org/10.1080/00050060310001707117

Eurofound. (2015). Sixth European Working Conditions Survey 2015. https://www.eurofound.europa.eu/data/european-working-conditions-survey

Freitas, C. P. P., Silva, C. S. C. D., Damásio, B. F., Koller, S. H., & Teixeira, M. A. P. (2016). Impact of job-related well-being on the relationship of self-efficacy with burnout. *Paidéia* (Ribeirão Preto), *26*(63), 45-52. https://doi.org/10.1590/1982-43272663201606

Merikanto, I., Suvisaari, J., Lahti, T., & Partonen, T. (2016). Eveningness relates to burnout and seasonal sleep and mood problems among young adults. *Nordic Journal of Psychiatry*, *70*(1), 72-80. https://doi.org/10.3109/08039488.2015.1053519

Nezirević, E., Tonković Grabovac, M., & Korajlija, A., L. (2017). Recovery from work-Is it yet another name for work-stress coping strategies? In U. K. Moore & P. Buchwald (Eds.), *Stress and Anxiety - Coping and Resilience* (69-78). Logos Verlag Berlin GmbH.

Philip, P., Taillard, J., Leger, D., Diefenbach, K., Akerstedt, T., Bioulac, B., & Guilleminault, C. (2002). Work and rest sleep schedules of 227 European truck drivers. *Sleep Medicine*, *3*(6), 507-511. https://doi.org/10.1016/S1389-9457(02)00138-7

Radoševic-Vidacek, B., & Košcec, A. (2004). Shiftworking families: parents' working schedule and sleep patterns of adolescents attending school in two shifts. *Revista de Saude Publica*, *38*, 38-47.

Slišković, A. (2010). Problemi rada u smjenama [Shiftwork Problems]. *Arhiv za higijenu rada i toksikologiju*, *61*(4), 477-477. https://doi.org/10.2478/10004-1254-61-2010-2036

Smith, C. S., Reilly, C., & Midkiff, K. (1989). Evaluation of three circadian rhythm questionnaires with suggestions for an improved measure of morningness. *Journal of Applied Psychology*, *74*(5), 728. https://doi.org/10.1037/0021-9010.74.5.728

Van Katwyk, P. T., Fox, S., Spector, P. E., & Kelloway, E. K. (1999). Job-related affective well-being scale (JAWS). https://doi.org/10.1037/1076-8998.5.2.219

Warr, P. (1987). *Work, unemployment, and mental health*. Oxford University Press.

World Health Organization (2020). International statistical classification of diseases and related health problems (11th edition.). https://icd.who.int/

Willis, T. A., O'Connor, D. B., & Smith, L. (2008). Investigating effort–reward imbalance and work–family conflict in relation to morningness–eveningness and shift work. *Work & Stress*, *22*(2), 125-137. https://doi.org/10.1080/02678370802180558

Zencirci, A. D., & Arslan, S. (2011). Morning-evening type and burnout level as factors influencing sleep quality of shift nurses: a questionnaire study. *Croatian Medical Journal*, *52*(4), 527-537. https://doi.org/10.3325/cmj.2011.52.5

Original research

6

The relationship between religiosity, authoritarianism, empathy, and forgiveness among Croatian students

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Abstract

Research on religiosity has discovered its multiple covariates, such as traditional values and the attitudes towards one's own nation and the out-group, which can be viewed as parts of a wider construct of right-wing authoritarianism. This might seem contradictory to covariates we would expect based on church teaching, such as empathy and willingness to forgive. In our research we tried to further explore these relations via detailed correlation analysis including partialization. Data on sociodemographic characteristics, religiosity, right wing authoritarianism, emotional empathy, and willingness to forgive were collected on a quota sample of 452 students from various Croatian faculties. We confirm the earlier findings of high correlations between different measures of self-report religiosity with authoritarianism, as well as with empathy and willingness to forgive. By partialization of sociodemographics, political ideology and consequences of religiosity on social behaviour, a significant part of the covariation between religiosity and authoritarianism is explained, but not with empathy and willingness to forgive. Religiosity is weakly correlated with emotional empathy for women and not for men, and with willingness to forgive for men and not for women. The results require caution about the use and interpretation of these variables in research and stress the need for control of external variables as well as analysis of the actual processes involved in measuring these constructs.

Keywords: religiosity, emotional empathy, Right-Wing Authoritarianism, forgiveness

Introduction

Religiosity is often used in psychological research to predict and explain a variety of behaviour, attitudes, and values. Studies have demonstrated there is a stable association between religiosity and self-esteem, coping with stress, substance abuse, quality of life and various mental health indicators (Hood et al., 2018). Empirical studies have also shown there are stable relations between religiosity and nationalism (Gorski & Türkmen-Dervişoğlu, 2013), negative attitudes against immigrants (McDaniel et al., 2011), and intolerance of homosexuality (Chadee et al., 2013). Some of these findings can be explained by church teachings related to traditional and conservative values. However, all of these findings taken together also point to an unexpected relation of religiosity and various constructs that can be viewed as parts of a wider construct of right-wing authoritarianism, which could explain both the traditional values and the attitudes towards one's own nation as well as the out-group members. These findings are also not in accordance with the hypothesis based on church teaching that religiosity should be related to empathy, willingness to forgive, and prosocial behaviour in general (Altemeyer, 1988). The described relationships have been found for different denominations and in different cultures, which is an indicator of their generality and stability, however an unequivocal theoretical explanation has not been offered (Federico et al., 2021). This is exactly one of the problems psychology of religiosity should address in its attempt to explain the psychological basis of religious behaviour. We feel that more explorative information is needed to further aid the formation of such an explanation. Therefore, we wanted not just to compare the relations of religiosity and authoritarianism on one hand and religiosity and empathy and forgiveness on the other hand, but to explore if these relations can be explained by covariates such as basic sociodemographic characteristics, as well as political views. This is especially relevant considering that recently certain actions of political violence and terrorism have been linked with religious motives, which contradicts some of the fundamental church teachings.

The research of religiosity could be of special relevance in Croatia, where 78% of participants consider themselves religious (Nikodem & Zrinščak, 2019), and therefore religiosity might have a significant impact on life of many citizens. Similar to worldwide research, review of recent research in Croatia has shown diverse religiosity measures were associated with negative attitudes toward euthanasia (Vincelj-Bele, 2014) and homosexuality (Huić et al., 2015; Parmač, 2005), patriarchalism and traditional gender roles (Labus, 2005), but also with a stronger feeling of national identity and uncritical patriotism (Franc et al., 2009), nationalism (Sekulić & Šporer, 2006), stronger perception of immigrants as a bigger cultural threat (Kalebić Maglica et al., 2018) and ethnocentrism (Šram, 2008).

While researching religiosity, we should take into account the complexity of the construct. Stark and Glock (1968) developed one of the better known theoretical models of religiosity. Their two fundamental assumptions are that religiosity is multidimensional, and that dimension of belief is central and most important. Other dimensions are experience, practice (rituals), theology (knowledge), and consequences. The last dimension concerning consequences was later excluded from the model and taken as more of a possible correlate and not a defining part of religiosity per se. On the other hand, Allport (1950) introduced a concept of institutionalized religiosity more related to prejudices, which mostly overlaps with the later introduced concept of external religiosity. He distinguished this from another form of religiosity characterized by internalized and sincere belief in ideals, lack of prejudices and tolerance toward out-group members. While the model of Glock and Stark mostly concerns the level and the structure of one's religiosity, Allport's model is focused on the motivation behind the religious behaviour. However, both models include the assumption that how one interprets religion and beliefs leads to moral and political values not compatible with the initial theological interpretations. This can happen because of specific personal or group interests or erroneous understanding or ignorance of religious truths and norms.

Clark (1958) continued the work of Allport and introduced the concepts of primary and secondary

religious behaviour. Primary religiosity is based on internal religious beliefs and experience being consistent with religious behaviour, while secondary religiosity is more focused on the ritual aspect, i.e., following religious commandments. Later Clark introduced a third dimension centered on respecting authorities of the church and conventional forms of manifesting religiosity. Similar to that, Allen and Spilka (1967) differentiated between committed religiosity, referring to personal, authentic, and internalized form of religiosity, and consensual religiosity, referring to respect for and obedience to authorities and social conformism.

Authoritarianism and religiosity

The concept of authoritarianism was introduced in 1950 by Adorno et al. Authoritarian personality according to them is characterized by unquestioning submission to authorities, a need to wield power and be tough, cynical view of humanity and human weakness, aggression and non-tolerance towards minority groups, ethnocentrism, belief in supernatural and adherence to conventions endorsed by the legal institutions. This personality presumably starts developing in early childhood in the context of forceful parent discipline, strong conformity to social norms, anxiety defense, and displaced aggression (Feather et al., 2001). Altemeyer & Altemeyer (1981), based on the research results that only three of the originally hypothesised aspects of authoritarianism covary, suggested using a narrower construct of right-wing authoritarianism. This construct including authoritarian submission and aggression and conventionalism proved to be a good predictor of prejudice, ethnocentrism, and political behaviour (e.g., Duckitt, 2000; Sidanius & Pratto, 2001; Whitley & Lee, 2000). Most of authoritarian aspects are contrary to fundamental religious teachings. However, the existence of the correlation between religiosity and authoritarianism has been established in multiple research (Adorno, 1950, Altemeyer, 1988; Wylie & Forest, 1992). This relationship has been replicated in Croatia on high-school students (Kalebić Maglica et al., 2018; r = .52) and students (Čorkalo & Stanković, 2000; r = .45, Labus, 2005; group level analysis).

Empathy and religiosity

Empathy consists of cognitive and affective aspects. Cognitive aspects include understanding and accepting the attitudes of another, while emotional empathy encompasses emotional reaction to the emotional state of another and compassion. Since great world religions promote compassion and empathy (Enright et al., 1992) and religious beliefs should affect one's emotions, actions, and goals (Rye et al., 2001), it seems logical to assume empathy, especially emotional empathy, and religion will be related. However, Duriez (2004) does not find such a relation in his research on students. Although being religious was not related to empathy, it was predicted by the way participants process religious contents (literal vs. symbolic). The relationship between religiosity and emotional empathy has been established in some of the other research, although not strongly (Lowicki & Zajenkowski, 2021, Lowicki et al., 2020). Similar results were established in Croatian research as well. In research of Vincelj-Bele (2014) it was .18, and in that of Medak (2002) the correlation of intrinsic religiosity with empathy was .36 and with prosocial behaviour .14. Dragun (2003) cites a correlation of emotional empathy with self-assessed religiosity .21, with intrinsic religiosity .25, and with extrinsic religiosity .07; and of altruism with self-assessed religiosity .21 and with intrinsic religiosity .13.

Willingness to forgive and religiosity

Enright and North (1998) define willingness to forgive as one's readiness to give up the right of resentment, the negative assessments, and ignoring the person who unjustifiably hurt us. The researchers in the field agree this is a complex phenomenon (Enright & Fitzgibbons, 2000) which includes cognitive

(Flanagan, 1992), affective (McCullough et al., 2000), behavioural (Gordon et al., 2000), and motivational aspects (McCullough et al., 1997). Considering that great world religions promote forgiveness (Rye et al., 2001), we would expect having religious beliefs to affect one's emotions, actions and goals in terms of increasing the willingness to forgive. Religious teachings also promote compassion and empathy which can also in turn encourage forgiveness (Enright et al., 1992). While interpreting research in this area, we should take into account that sometimes forgiveness is operationalized in terms of forgiving actual persons that hurt the participants, and sometimes hypothetical scenarios are used. McLernon et al. (2004) describe previous research with inconsistent results on the relation of religiosity and forgiveness, which is not in accord with the general religious teachings (McCullough et al., 1997). Religion was related to attitudes regarding forgiveness and the tendency to forgive to previous and future offenders (Fox & Thomas, 2008), and intrinsic religiosity was positively related to willingness to forgive in hypothetical situations (Stoycheva, 2018; Webb et al., 2005). This indicates that willingness to forgive is more related to religiosity governed by personal reasons, than the one governed by external, social benefits. As theoretically expected and empirically demonstrated, forgiveness is not valued the same in different denominations. Forgiveness was valued most by Protestants and Catholics, and a bit less by Jews and non-religious individuals (Mullet et al., 2003).

Sociodemographic characteristics and religiosity

When researching the relations of the aforementioned constructs with religiosity, it is also important to consider some of the sociodemographic characteristics related to their development and internalization. One of them is gender. Women have a greater affinity for religion than man, in terms of both beliefs and religious rituals (Hood et al., 2018). There are also gender differences in emotional empathy, with women being more empathic (Loffler & Greitmeyer, 2021; Raboteg Šarić, 2001; Rueckert et al., 2011). For forgiveness the results are inconsistent, although the meta-analysis by Fehr et al. (2010) found no gender differences in general. Therefore, it is possible that some of the relations can be partly explained by gender differences. Relationships between empathy and forgiveness have been shown to differ between women and men (Toussaint & Webb, 2005), so it might be possible that gender moderates the relationship of religiosity with these concepts as well. Other sociodemographic and political characteristics may also prove to be important control variables. Life in smaller settlements and lower education levels are often related to higher levels of religiosity and more traditional and conservative values (e.g., Nikkhah et al., 2015). Political ideology, defined by a bipolar dimension conservative-liberal, is related to both authoritarianism and some religious aspects (Adorno, 1950; Altemeyer, 1988). So, inclusion of these variables may help us understand the aforementioned relations with religiosity.

The goal of the research

The goal of this research was to explore the relations of religiosity, authoritarianism, emotional empathy, and willingness to forgive. More specifically, we wanted to compare the relations of religiosity with authoritarianism and religiosity with emotional empathy and willingness to forgive and check if these relations differ between women and men. We wanted to see to what extent these relations can be explained by sociodemographic characteristics and political ideology as covariates. Finally, taking into account that some of the authors consider that the consequences of religiosity should be considered as correlates of religiosity (Stark & Glock, 1968) and not one of its dimensions (Allen & Spilka, 1967), we present what the relations of interest are like if we partial out this aspect to contribute to further debates on theoretical development in the field of religiosity.

Material and methods

Participants

The sample consisted of 425 students (mean age 22.27, *SD* = 3.03) from 24 different bachelor and master studies of 11 faculties of the Universities of Zagreb, Split and Zadar. Most of the sample were women (69.2%), similar to proportion of women in universities of Croatia (60.6%, Croatian Bureau of Statistics, 2020). All of the students included in this sample were of Roman Catholic denomination. In the initial sample, there were additional 127 students of other denominations, but we will not present data on them in this paper. Most of the students were social sciences and humanities majors (52,6%), and the rest were technical (16,6%), teological (16,6%) and biomedical majors (14,2%). Considering the place of residence, 15.5% is from a settlement of less than 1000 residents, 30.6% is from a settlement of 1000 to 10000 residents, 19.1% is from a settlement of 10000 to 50000 residents, 12.2% is from a settlement of 50000 to 100000 residents, and 22.6% is from a settlement of more than 100000 residents. As for level of education of parents, 3.8% finished primary school, 54.1% high school, and 42.1% some form of higher education.

Measures

Regarding sociodemographic characteristics, we collected information on gender and age of the participant, year of study, faculty and area of study, average grade, type of high school finished before studying, the size of place of residence, parents' education level, socioeconomical status, political ideology (liberal - conservative), denomination, and religious community affiliation.

Religiosity Questionnaire (Ljubotina, 2004) was used as an indicator of religiosity. The initial version consisted of 26 items grouped in three subscales, with ratings ranging from 0 (*Completely false*) to 3 (*Completely true*). After exploratory factor analysis (principal axis factoring) with three factors we excluded four items that loaded higher than .3 on multiple factors, lower than .3 on none of them or on a on a theoretically unexpected factor. Based on this we formed three subscales. The first is called *religious beliefs* (*k* = 10) and relates primarily to internalized beliefs and affects, independently of religious behaviour or belonging to a religious community (e.g., "Sometimes I feel the presence of God or a divine creature"). The second is *ritual religiosity* (*k* = 7) and it relates to the extent in which a person participates in religious rituals and ceremonies; this primarily relates to the ceremonial-behavioural aspect of religion (e.g., "I have most of the sacraments stipulated by my religion."). The third reflects the *consequences of religiosity on social behaviour* (*k* = 5). This reflects the extent to which religion determines the person's behaviour (including intolerance or exclusivity towards people of different denominations; e.g. "I am against the marriage of people who belong to different religious traditions"). These subscales correlated between .458 and .653 (Table 2).

Right Wing Authoritarianism (Zakrisson, 2005; Croatian adaptation by Tomić et al., 2013) is a short scale that measures conventionalism, authoritarian aggression and submission and is oriented on the submission to in-group authorities. It consists of 15 declarations (e.g., "Media should be censored so people would not come in contact with destructive and disgusting information") with which respondent agree on scale from 1 (*Don't agree at all*) to 7 (*Agree completely*). Exploratory factor analysis with principal axis factoring and a scree test indicated the existence of two factors, similar to previous research (Manganelli Rattazzi et al., 2007; Mavor et al., 2010), with loadings between .394 and .716. Therefore, we formed two subscales Authoritarian aggression/submission (*k* = 8) and Conventionalism (*k* = 7), which correlated .18.

Emotional Empathy Scale (Raboteg-Šarić, 1993) includes 19 items measuring the tendency to react emotionally to emotional state of others. Response ratings range from 0 (*Does not describe me at all*) to 4 (*Describes me completely*). Exploratory factor analysis with principal axis factoring and a scree test indicated

the existence of a general factor, with loadings ranging from .476 to .672. Range is from 0 to 76, with higher results indicating higher emotional empathy.

Willingness to Forgive Scale is a newly constructed measure consisting of 16 items that include cognitive (e.g., I could understand the reasons of the perpetrator), affective (e.g. feeling of anger) and behavioural aspects (e.g. I would be willing to help the perpetrator if need arises). The respondent was given a description of a traffic accident and the behaviour of the perpetrator, as to avoid asking about willingness to forgive in an unspecified context, and then was required to rate on 1 (*Not at all*) to 5 (*Completely*) the agreement with each of the items concerning the perpetrator of an act described at the beginning of the scale. Exploratory factor analysis with principal axis factoring and a scree test indicated the existence of a general factor that can be interpreted as willingness to forgive, with loadings ranging from .349 to .839. Range is from 16 to 80 with higher results indicating higher willingness to forgive.

Procedure

Quota sampling was used with quotas based on gender, year, and area of study (social sciences and humanities, biomedicine, and (bio)technology). The data were collected anonymously in groups during lectures by educated researchers on different Faculties of different Universities in Zagreb, Split and Zadar with the approvement of the faculty's dean. The responding was made in a classical paper-pencil way, lasted for 15-20 minutes, and no compensation was given. The research was approved by the Ethical Committee of the Department of Psychology of Faculty of Humanities and Social Sciences of University of Zagreb.

Results

First, we calculated descriptive statistics and reliability and tested the normality of the distribution (Table 1). Ranges indicated good discriminativity of the scale, except for empathy where lower ranges were not covered and right-wing authoritarianism for which there were no most extreme values. Reliability was adequate for most of the scales. Kolmogorov-Smirnov was significant for most of the scales, but the skew was mostly in the same direction and not very strong, and therefore we decide to use parametric statistics.

Table 1
Scores for men (N = 131) and women (N = 294)

Scale	Gender	*M (SD)*	Observed min-max	Theoretical min-max	*Skewness/ Kurtosis*[b]	*KS*	alpha	*t*[b]	*p*	Cohen *d*
Religious beliefs	Men	24.16 (5.91)	4-30	0-30	-1.15/ 0.76	0.19***	.92	0.43	.671	0.05
	Women	23.88 (6.5)	0-30		-1.29/ 1.37	0.17 ***	.94			
Ritual religiosity	Men	17.23 (3.59)	7-21	0-21	-0.78/ -0.3	0.16 ***	.74	0.36	.723	0.04
	Women	17.09 (3.85)	3-21		-1.18/ 1.35	0.15 ***	.80			
Consequences of religiosity on social behaviour	Men	8.53 (3.74)	0-15	0-15	-0.51/ -0.49	0.13 ***	.75	2.26	.024	0.24
	Women	7.61 (3.97)	0-15		-0.09/ -0.83	0.1 ***	.80			
Authoritarian agression and submission	Men	37.94 (8.69)	8-53	8-56	-0.45/ -0.03	0.09 *	.77	1.38	.168	0.15
	Women	36.64 (9.09)	8-56		-0.2/ -0.28	0.05	.80			
Conventionalism	Men	26.76 (7.69)	7-49	7-49	0.13/ 0.32	0.08	.71	4.03	.000	0.42
	Women	23.69 (7.04)	7-49		0.1/ 0.16	0.05	.67			
Emotional empathy	Men	57.32 (9.45)	33-76	0-76	-0.14/ -0.41	0.07	.86	-6.58	.000	-0.69
	Women	63.79 (9.3)	29-76		-0.98/ 0.99	0.09 ***	.90			
Willingness to forgive	Men	51.29 (12.55)	21-76	16-80	-0.1/ -0.48	0.04	.90	1.57	.117	0.17
	Women	49.18 (12.86)	16-77		-0.2/ -0.38	0.05	.91			
Political ideology[c]	Men	3.47 (1.15)	1-7	1-7	-0.24/ -0.04	0.2 ***	-	5.90	.000	0.62
	Women	2.79 (1.08)	1-5		-0.01/ -0.51	0.22 ***	-			

Note. KS = Kolmogorov-Smirnov test.
[a] Standard error for skewness indicator is 0.21 for men and 0.14 for women, and for kurtosis .42 and .28, respectively, [b] *df* = 423; [c]1 = liberal, 7 = conservative.
*** $p < .001$. ** $p < .01$. * $p < .05$.

Next, we explored the possible existence of gender differences (Table 1). First, we compared men and women with a t test (Levene's tests showed men and women have equal variances for all tested variables). In accordance with previous research, women had higher scores on empathy. Men had higher scores on Consequences of religiosity on social behaviour, Conventionalism and political ideology, and lower on Emotional empathy, but, surprisingly, there were no gender differences in other dimensions of religiosity nor authoritaraian aggression and submission. Second, we calculated bivariate correlations of all the scores separately for men and for women (Table 2). Some of the correlations are similar, for example between the religiosity subscales. For both genders, religiosity is in most cases more strongly related to authoritarian scales than to empathy and forgiveness. Consequences of religiosity on social behaviour are not at all related to either empathy or forgiveness. The biggest difference are the correlations with willingness to forgive, which are non-significant for women. We did not perform further partialization analyses for correlations established to be non-significant in this step. Because of the established gender differences in the pattern of correlations, we calculated the rest of the analyses separately for men and women.

Table 2
Pearson correlation coefficients between the score for men (N = 131) and women (N = 294)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Religious beliefs	-	.59**	.54**	.47**	.26**	.27**	.28**	.36**	-.10	-.05
2. Ritual religiosity	.68**	-	.50**	.35**	.35**	.13	.20*	.49**	-.08	-.11
3. Consequences of religiosity on social behavior	.57**	.44**	-	.56**	.45**	-.04	.12	.56**	-.03	.04
4. Authoritarian agression and submission	.40**	.42**	.39**	-	.26**	.09	.23**	.42**	-.12	-.08
5. Conventionalism	.32**	.35**	.36**	.12*	-	-.20*	.12	.44**	-.03	.14
6. Emotional empathy	.29**	.16**	.09	.26**	-.07	-	.12	-.13	-.01	-.05
7. Willingness to forgive	.10	.01	-.02	-.08	.06	-.09	-	.18*	-.21*	-.05
8. Political ideology[a]	.44**	.39**	.45**	.34**	.48**	.04	.06	-	-.03	.07
9. Parents' education	-.17**	-.11	-.15**	-.14*	-.01	-.01	-.02	.00	-	.22*
10. Place of residence	-.09	-.12*	-.13*	-.18**	-.07	-.05	-.06	-.07	.21**	-

Note. Data for men are above the main diagonal and for women under the main diagonal.
[a] 1 = liberal, 7 = conservative.
*** $p < .001$. ** $p < .01$. * $p < .05$.

Because our goal was to see if the established relations with religiosity can be explained by other variables, we calculated a series of partial correlation coefficients. In each of the following steps we controlled an additional set of variables to see to what extent can this relation be explained by the additional variables (Table 3). We hypothesised sociodemographic variables might explain part of the relation because they form the context in which both the religiosity and different authoritarianism dimensions are developed, however, partializing out the sociodemographic variables in the first step did not make a big change in the coefficient (differences between correlation coefficients 0. and 1. in Table 3 for authoritarian dimensions transformed to Fisher z were between -.006 and .033). Additionally, partializing political ideology led to the biggest change, similar for all religiosity subscales for both men and women (differences between correlation coefficients 1. and 2. in Table 3 for authoritarian dimensions transformed to Fisher z were between .103 and .195). In the last step we partialized out the consequence of religiosity based on Stark & Glock's

(1968) viewpoint that consequences of religiosity should be considered as correlates of religiosity. This partialization mostly led to a bigger change for men (differences between correlation coefficients 2. and 3. in Table 3 transformed to Fisher z were between .12 and .16 for men) and almost no change for women and for Conventionalism (differences transformed to Fisher z between .05 and .09). Partialization led only to minimal changes in the relationships of religiosity with emotional empathy and willingness to forgive (differences between correlation coefficients in Table 3 for these two scales transformed to Fisher z were between -.077 and .072).

Table 3

Correlations of religiosity with authoritarianism, empathy, and willingness to forgive when control variables are partialized for men (N = 131) and women (N = 294)

Scale	Gender	Controlled variables			
		0 (zero order correlation)	1 Parents' education & Place of residence	2 1 + Political ideology	3 2 + Conse-quences of religiosity
		Authoritarian agression and submission			
Religious beliefs	Men	.47**	.46 ***	.37 ***	.22 *
	Women	.40**	.38 ***	.28 ***	.19 **
Ritual religiosity	Men	.35**	.35 ***	.17	.04
	Women	.42**	.41 ***	.32 ***	.26 ***
Consequences of religiosity on social behaviour	Men	.56**	.56 ***	.43 ***	
	Women	.39**	.37***	.25 ***	
		Conventionalism			
Religious beliefs	Men	.26**	.26 **	.13	.01
	Women	.32**	.32 ***	.13 *	.06
Ritual religiosity	Men	.35**	.37 ***	.20 *	.12
	Women	.35**	.34 ***	.19 **	.15 *
Consequences of religiosity on social behaviour	Men	.45**	.45 ***	.28 **	
	Women	.36**	.36***	.18 **	
		Emotional empathy			
Religious beliefs	Men	.27**	.27 **	.33 ***	.352 ***
	Women	.29**	.29 ***	.30 ***	.303 ***
Ritual religiosity	Women	.16**	.16 **	.15 **	.138 *
		Willingness to forgive			
Religious beliefs	Men	.28**	.26 **	.22 *	.23 **
Ritual religiosity	Men	.20*	.19 *	.12	.11

Note. The partialization was performed only for correlations significant at zero-order level.
*** $p < .001$. ** $p < .01$. * $p < .05$.

Discussion

Based on theory and church teachings we would expect no or maybe a low negative correlation of true religiosity, one based on religious teachings, with right-wing authoritarianism, as well as positive correlations with emotional empathy and willingness to forgive, as well as positive correlation between the two. However, most of these relations were not established in our research.

Authoritarianism

Our results are similar to previous research (Altemeyer, 1998; Wink et al., 2007), indicating there is a surprisingly strong positive correlation of religiosity and authoritarianism in our sample of student population. However, our analyses give some insight into the nature of this relationship. Partialization of sociodemographic variables, level of parents' education and size of place of residence, decreased a bit the correlation of all the religiosity subscales with authoritarianism. The decrease in the second step achieved by successively controlling the part of the variance explained by political ideology represented the biggest change in our analysis. Political ideology is related to authoritarianism and different religiosity aspects, although these relationships are a bit weaker for women. This is in accordance with previous research. For example, Vincelj Bele (2014) found a correlation of -.64 between religiosity and political ideology. The change in the correlations indicates, that although a part of religiosity-authoritarianism relation can be explained by the liberal-conservative dimension and political affiliation, there is an aspect of right-wing authoritarianism unrelated to political ideology, but related to religiosity.

In the last step we partialized out the effect of the dimension of religiosity that represents the way the religion is reflected in social relationships and which is highly related to authoritarianism. This was based on the idea that this way we would get information on a dimension of religiosity similar to Clark's (1958) third dimension or Allen and Spilka's (1967) consensual religiosity which could, like authoritarianism, be partly related to social conformism. This might be of relevance in the discussion on the theoretical status of this construct as a dimension (Allen & Spilka, 1967) vs. as a correlate of religiosity (Stark & Glock, 1968). After this step, the correlations of religious beliefs and ritual religiosity with authoritarianism decreased considerably, mostly being non-significant for men and conventionalism. For men, after the partialization of all these variables the correlation of religiosity and authoritarianism was no longer significant. This can be partly explained by the higher correlation of consequences of religiosity on social behavior with authoritarianism. This gender difference is also interesting, since it seems to indicate that for men all the covariation between religiosity and authoritarianism is explained by used control variables, especially consensual religiosity. In a way this might implicate that social conformism could be one of the main factors for this covariation. However, for women it seems even the more internalized aspects of religiosity are still related to authoritarianism, indicating maybe also an internalization of authoritarianism. We should also keep in mind the conceptual dilemma whether partialization of this religiosity dimension is justified considering it might be considered one of the aspects of religiosity itself, and not so much a covariate of religiosity.

We hope these results will help us understand the relation of religiosity and authoritarianism. The understanding of this relation could prove especially useful in research on religious fundamentalism. Altemeyer and Hunsberger (1992) define religious fundamentalism as the belief that one set of religious teachings is fundamental, and it contains the inerrant truth which must be followed and that those following these teachings have a special relationship with a deity. Although most religious individuals are inclined to observe and protect their religious beliefs and tradition with a certain level of determination and rigidity against "non-believers", in the context of religious fundamentalism this can transform into hostility and

non-tolerance towards the out-group. This aspect of religious fundamentalism partly overlaps with authoritarianism as they both include conventionalism and aggression, and partly with religiosity.

Empathy

Emotional empathy is higher in women, in accordance with previous research (e.g., Loffler & Greitmeyer, 2021). For men, empathy has no correlation with any of religiosity aspects. For women, the correlations with religious beliefs and ritual religiosity were significant, although low, indicating that higher religiosity is related to higher empathy, as expected based on previous research. These gender differences might be explained by different psychological experience of religion by women, which might also explain the greater affinity of women for religion (Hood et al., 2018). The scores on the consequences of religiosity on social behavior subscale were not related to empathy in any of the subsamples. It is also interesting to note that authoritarianism and political ideology were not related to empathy. Thus, future research could test the hypothesis that for religious and authoritarian individuals empathy is restricted to others they consider in-group members with same values. Since the partialization led to almost no change in the relationship of religiosity dimensions with empathy, it seems that other factors could be found to explain this relationship, and might indicate that this relationship is less governed by outer influences such as social context, although it seems gender is relevant.

Forgiveness

There were no gender differences in willingness to forgive, which is in accordance with the meta-analysis by Fehr et al. (2010). Unexpectedly, for women willingness to forgive is not related to religiosity, empathy nor authoritarianism (this correlation is significant, albeit very low). For men religiosity and willingness to forgive had low but significant correlations. We are not sure what is behind this gender difference. One possibility is that men declaratively agree more strongly with formal recommendation of church teachings, which include forgiveness. In light of that, it would be useful to explore if this declarative willingness to forgive would manifest itself in real situations. Another possibility is that this might be a consequence of different gender ratios for different majors, especially in theology where there are more men than women. However, the size of gender groups per majors is inadequate for further analysis. Another unexpected yet interesting finding is the zero correlation of willingness to forgive with emotional empathy which suggests that willingness to forgive in such a hypothetical situation as used in this instrument is based more on cognitive aspect of forgiveness than emotional compassion. Similar to empathy, the partialization of the variables used did not explain much of the correlations of religiosity dimensions with willingness to forgive. This relationship might be unaffected by social context and political orientations due to the religious teachings and their understanding of forgiveness.

When comparing different religious teachings (Cohen et al., 2006), it was determined that Protestants and Jews differ in their understanding of forgiveness. Jews consider some acts unforgivable, while it is usually considered that Christians in general have an imperative of forgiveness. However, forgiveness was not a formal command by Jesus, nor even a moral imperative on which salvation hinges. It is a pastoral incentive with the goal to affirm the reality of forgiveness as a free gift to give, and not one that can be extorted or imposed. The Evangelic teaching is an invitation and an offering, and not a command and an obligation, which makes it more human (Tokić, 2014). On the other side, it is possible for differing religious communities that are a part of a same society to have similar views on forgiveness – among the six most prominent religious communities in Lebanon, the differences in forgiveness between Muslims and Christians were minimal (Mullet et al., 2003). It seems religiosity is more related to forgiveness in general than to

forgiveness in specific real-life situations or to specific individuals. Possible explanations for this, as stated by McCullough et al. (1997), are higher levels of social desirability in religious individuals; higher reliability and consequently high correlation of general level measures; a stronger effect of socio-psychological factors in specific real-life situations; non-differentiation of different form of religiosity like intrinsic and extrinsic. There are other factors that affect the decision to forgive and which help predict the willingness to forgive. One the most important ones are admitting the guilt and remorse on the side of the perpetrator. External factors include perpetrator characteristics, the existence of intent, the gravity of the act, and the repairability of the consequences. Internal factors that affect willingness to forgive are some characteristics of the victim. One of the major methodological problems is the fact that the assessment of willingness to forgive refers to the hypothetical perpetrator and not to the actual person who hurt the respondent. Vučković and Črpić (2007) state that more than 40% of citizens believe that believers are just as willing to forgive as non-believers. The results indicate that religiosity itself is not highly predictive for assessing willingness to forgive but is influenced by various specific factors.

Generally, our results confirm the expected relationships of different religiosity dimensions with both the right-wing authoritarianism on one hand and empathy and willingness to forgive on the other hand. However, the correlations with authoritarianism are in most cases stronger than those with empathy and willingness to forgive (Table 2), and, what is even more interesting, they are explained to a higher degree with political ideology and consequences of religiosity. Although political ideology is a bit of an overlapping construct with authoritarianism, this might indicate that the relationship between authoritarianism and religiosity is at least partly an effect of social context and norms, while empathy and willingness to forgive might be more of a reflection of internalized aspects of religiosity. This is in accordance with the difference in significance of correlations with consequences of religiosity on social behaviour.

Some of the limitations of this research concern the fact the measurements were based on self-report and may not be a realistic reflection of behavior in a real-life situation. In addition, empathy and willingness to forgive were measured as dispositional traits and it is possible that different situational factors influence the actual manifestation of these characteristics in real-life conditions. Although the correlations between religiosity dimensions suggest the existence of a general factor, we presented the analyses with different subdimensions because they sometimes show a different pattern of relationships with other variables, and also because they point to theoretically relevant different contents of religious phenomena. The subscales obviously have a common factor, maybe certain values incorporated in different religiosity aspects, but we were also interested in their specific characteristics. However, when interpreting our results, it is impossible to discern if the repeating patterns of relationships are an indicator of the covariation with more general aspects of religiosity, or the specific ones. Due to explorative nature of our research subject, there was no strong theoretical basis which would suggest which of the explored constructs could be considered predictors, mediators, or criteria. Because of this, we decided for correlational analysis. However, we hope our results will aid in forming a theoretical explanation that will enable future research to use more powerful statitistic techniques such as (hierarchical) regression analysis and (multigroup) path analysis or structural equation modelling. In conclusion, we can say that the results of this research suggest that future researchers should be careful when trying to measure religiosity considering some of the theoretically unexpected relations and to consider the importance of suggested covariates. We hope our research will inspire further examination on the role of these covariates as possible antecedents or mediators in the explored relationships. Religiosity is an important and useful variable, but it is important to consider the different dimensions and operationalizations of this construct, as well as the different ways in which people experience and manifest their religiosity in practice. As early as 1954, Allport stated that "the role of religion is paradoxical. On the one hand, it creates prejudices, and on the other hand, it disables them" (Hood et al., 2018).

Conclusions

Our results confirm some of the earlier findings of high correlations between different measures of self-report religiosity and authoritarianism. By partialization of sociodemographic variables (parents' education & place of residence), political ideology and influence of religiosity on a person's social relations, significant part of the covariation of religiosity with authoritarianism is explained, but not so much with emotional empathy and willingness to forgive. There is a very weak correlation between religiosity and emotional empathy in the subsample of women, while in men there is no correlation. Religiosity is weakly correlated with willingness to forgive in men, while for women there is no association. The results require caution about the use and interpretation of all these variables in psychological research and the need for thorough control of external variables as well as analysis of the actual processes involved in measuring these constructs.

References

Adorno, T. W., Frenkel-Brunswik, E., Levinson, D. J., & Sanford, R. N. (1950). *The authoritarian personality*. Harper and Row.

Allen, R. O., & Spilka, B. (1967). Committed and consensual religion: A specification of religion–prejudice relationships. *Journal for the Scientific Study of Religion, 6*, 191–206. https://doi.org/10.2307/1384046

Allport, G. W. (1950). *The individual and his religion: A psychological interpretation*. Macmillan.

Altemeyer, B. (1988). *Enemies of freedom: Understanding right-wing authoritarianism*. Jossey-Bass.

Altemeyer, B. (1998). The Other "Authoritarian Personality". *Advances in Experimental Social Psychology. 30*, 47-92. https://doi.org/10.1016/s0065-2601(08)60382-2

Altemeyer, B., & Hunsberger, B. (1992). Authoritarianism, religious fundamentalism, quest, and prejudice. *The International Journal for the Psychology of Religion*, *2*(2), 113-133. https://doi.org/10.1207/s15327582ijpr0202_5

Altemeyer, R. A., & Altemeyer, B. (1981). *Right-wing authoritarianism*. University of Manitoba Press.

Chadee, D., Joseph, C., Peters, C., Siew Sankar, V., Nair, N., & Jannel, P. (2013). Religiosity, and Attitudes Towards Homosexuals in a Caribbean Environment. *Social and Economic Studies*, *62*(1-2), 1-28.

Clark, W. H. (1958). The psychology of religion. *Pastoral Psychology, 9*, 49–55. https://doi.org/10.1007/BF01741070

Cohen, A. B., Malka, A., Rozin, P., & Cherfas, L. (2006). Religion and unforgivable offenses. *Journal of Personality*, *74*(1), 85-118. https://doi.org/10.1111/j.1467-6494.2005.00370.x

Croatian Bureau of Statistics (2020). *Students enrolled on professional and university study, Winter semester of 2019/2020 academic year* (Report 8.1.7.). Croatian Bureau of Statistics. https://www.dzs.hr/Hrv_Eng/publication/2020/08-01-07_01_2020.htm

Čorkalo, D., & Stanković, N. (2000). Autoritarnost i percepcija ostvarene demokracije u Hrvatskoj: analiza odnosa na uzorku studenata [Analysis of Relation between Authoritarianism and Perception of Democracy in Students' Population]. *Društvena istraživanja*, *9*(1 (45)), 67-81.

Dragun, A. (2003). Povezanost religiozne orijentacije, seksualnosti i prosocijalnosti [Relationships between Religious Orientation, Sexuality and Prosociality]. *Društvena istraživanja*, *12*(63+ 64), 201-223.

Duckitt, J. (2000). Culture, personality and prejudice. In S. A. Renshon, & J. Duckitt (Eds.), *Political psychology* (pp. 89-107). Palgrave Macmillan. https://doi.org/10.1057/9780230598744_6

Duriez, B., (2004). Are religious people nicer people? Taking a closer look at the religion–empathy relation-

ship. *Mental Health, Religion & Culture, 7*(3), 249–254. https://doi.org/10.1080/13674670310001606450

Enright, R. D., & Fitzgibbons, R. P. (2000). *Helping clients forgive: An empirical guide for resolving anger and restoring hope.* American Psychological Association. https://doi.org/10.1037/10381-000

Enright, R. D., Gassin, E. A., & Wu, C. (1992). Forgiveness: A developmental view. *Journal of Moral Development, 21*(2)*,* 99-114. https://doi.org/10.1080/0305724920210202

Enright, R. D., & North, J. (1998). *Exploring forgiveness.* University of Wisconsin Press.

Feather, N. T., Boeckmann, R. J., & McKee, I. R. (2001). Reactions to an Offence in Relation to Authoritarianism, Knowledge about Risk, and Freedom of Action. *European Journal of Social Psychology, 31*, 109 – 126. https://doi.org/10.1002/ejsp.35

Federico, C. M., Bai, H., & Aguilera, R. (2021), Individual and contextual moderators of the relationship between authoritarianism and religiosity. *British Journal of Social Psychology.* Advance online publication. https://doi.org/10.1111/bjso.12463

Fehr, R., Gelfand, J., & Nag, M. (2010). The Road to Forgiveness: A Meta-Analytic Synthesis of Its Situational and Dispositional Correlates*. Psychological Bulletin, 136 (5)*, 894-914. https://doi.org/10.1037/a0019993

Flanagan, B. (1992). *Forgiving the unforgivable: Overcoming the bitter legacy of intimate wounds*. Macmillan.

Fox, A., & Thomas, T. (2008). Impact of religious affiliation and religiosity on forgiveness. *Australian Psychologist*, *43*(3), 175-185. https://doi.org/10.1080/00050060701687710

Franc, R., Ivičić, I., & Šakić, V. (2009). Patriotism Types and Strength of Croatian National Identity. *Društvena istraživanja*, *18*(3 (101)), 393-415.

Gordon, K. C., Baucom, D. H., & Snyder, D. K. (2000). The use of forgiveness in marital therapy. M. E. McCullough, K. I. Pargament, & C. E. Thoresen (Eds.), *Forgiveness: Theory, research, and practice (p.* 203-227). Guilford Press.

Gorscuh, R.L. (1988). Psychology of Religion. *Annual review of Psychology, 39*, 201-221. https://doi.org/10.1146/annurev.ps.39.020188.001221

Gorski, P. S., & Türkmen-Dervişoğlu, G. (2013). Religion, Nationalism, and Violence: An Integrated Approach. *Annual Review of Sociology, 39*, 193–210. https://doi.org/10.1146/annurev-soc-071312-145641

Hood Jr, R. W., Hill, P. C., & Spilka, B. (2018). *The psychology of religion: An empirical approach*. Guilford Publications. https://doi.org/10.1080/10508619.2019.1638172

Huber, S. (1996). *Dimensionen der Religiosität. Skalen, Messmodelle und Ergebnisse einer empirisch orientierten Religionspsychologie* [Dimensions of religiosity: Scales, measurement models and results fan empirically oriented psychology of religiosity]. Verlag Hans Huber.

Huić, A., Jugović, I., & Kamenov, Ž. (2015). Stavovi studenata o pravima osoba homoseksualne orijentacije [Student attitudes toward the rights of homosexual persons]. *Revija za socijalnu politiku*, *22*(2), 219-245. https://doi.org/10.3935/rsp.v22i2.1224

Kalebić Maglica, B., Švegar, D., & Jovković, M. (2018). The Relationship of Personality, Framing Effect and Attitudes towards Migrants. *Društvena istraživanja*, *27*(3), 495-517. https://doi.org/10.5559/di.27.3.06

Labus, M. (2005). Vrijednosne orijentacije i religioznost [Value orientations and religiosity]. *Sociologija sela*, *43*(2), 383-408.

Liddle, J. R., Shackelford, T.K. (2021). *The Oxford Handbook of Evolutionary Psychology and Religion*. Oxford University Press.

Löffler, C.S., & Greitmeyer, T. (2021). Are women the more empathetic gender? The effects of genderrole expectations. *Current Psychology.* https://doi.org/10.1007/s12144-020-01260-8

Lowicki, P., & Zajenkowski, M. (2021). Religiousness is associated with higher empathic concern—Evidence

from self- and other-ratings. *Psychology of Religion and Spirituality, 13*(2), 127–135. https://doi.org/10.1037/rel0000299

Lowicki, P., Zajenkowski, M., & Van Cappellen P. (2020). It's the heart that matters: The relationships among cognitive mentalizingability, emotional empathy, and religiosity. *Personality and Individual Differences*, 161, 1-9. https://doi.org/10.1016/j.paid.2020.109976

Ljubotina, D. (2004). Razvoj novog instrumenta za mjerenje religioznosti [Development of a new measure of religiosity]. In V. Ćubela Adorić, I. Manenica, & Z. Penezić (Eds.), *XIV. Dani psihologije u Zadru: sažetci radova*. Odjel za psihologiju Sveučilišta u Zadru.

Manganelli Rattazzi, A. M., Bobbio, A., & Canova, L. (2007). A short version of the Right-Wing Authoritarianism (RWA) Scale. *Personality and Individual Differences, 43*(5), 1223–1234. https://doi.org/10.1016/j.paid.2007.03.013

Mavor, K. I., Louis, W. R., & Sibley, C. G. (2010). A bias-corrected exploratory and confirmatory factor analysis of right-wing authoritarianism: Support for a three-factor structure. *Personality and Individual Differences, 48*(1), 28-33. https://doi.org/10.1016/j.paid.2009.08.006

McCullough, M. E., Pargament, K. I., & Thoresen, C. E. (2000). *Forgiveness: Theory, research, and practice*. Guilford Press.

McCullough, M. E., Sandage, S. J., & Worthington, E. L., Jr. (1997). *To forgive is human: How to put your past in the past*. InterVarsity Press.

McDaniel, E.L., Nooruddin, I., & Shortle, A. (2011) How Religion Shapes Citiziens' Attitudes Toward Immigrants. *American Politics Research, 39*(1), 205-233. https://doi.org/10.1177/1532673X10371300

Medak, J. (2002). *Povezanost religiozne orijentacije, emocionalne empatije i prosocijalnog ponašanja* [Relationship between religious orientation, emotional empathy and prosocial behavior] (Unpublished diploma thesis). Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.

Mullet, E., Barros, J., Frongia, L., Usaï, V., Neto, F., & Rivière Shafighi, S. (2003). Religious involvement and the forgiving personality. *Journal of Personality, 71*, 1-19. https://doi.org/10.1111/1467-6494.t01-1-00003

Nikkhah, H. A., Nia, M. Z., Sadeghi, S., & Fani, M. (2015). The Mean Difference of Religiosity between Residents of Rural Areas and Urban Areas of Mahmoudabad City. *Asian Social Science, 11*(2), 144. https://doi.org/10.5539/ass.v11n2p144

Nikodem, K., & Zrinščak, S. (2019). Između distancirane crkvenosti i intenzivne osobne religioznosti: religijske promjene u hrvatskom društvu od 1999. do 2018. godine [Between Distanced Church Religiosity and Intensive Personal Religiosity: Religious Changes in Croatian Society from 1999 to 2018]. *Društvena istraživanja, 28*(3), 371-390. https://doi.org/10.5559/di.28.3.01.

Parmač, M. (2005). *Stavovi studenata prema osobama homoseksualne orijentacije* [Students' attitudes towards homosexuals] (Unpublished diploma thesis). Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.

Raboteg-Šaric, Z. (1993). *Empatija, moralno rasuđivanje i različiti oblici prosocijalnog ponašanja* [Empathy, moral reasoning, and different types of prosocial behavior] (Unpublished doctoral thesis) Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.

Raboteg-Šaric, Z. (2001). Empathy and moral development: Implications for caring and justice. *Contemporary Sociology*, *30*(5), 487. https://doi.org/10.2307/3089337

Rueckert, L., Branch, B., Doan, T., (2011). Are Gender Differences in Empathy Due to Differences in Emotional Reactivity? *Psychology, 2*(6), 574-578. https://doi.org/10.4236/psych.2011.26088

Rye, M. S., Loiacono, D. M., Folck, C. D., Olszewski, B. T., Heim, T. A., & Madia, B. P. (2001). Evaluation of the psychometric properties of two forgiveness scales. *Current Psychology, 20*, 260–277. https://doi.

org/10.1007/s12144-001-1011-6

Sekulić, D., & Šporer, Ž. (2006). Religioznost kao prediktor vrijednosnih orijentacija [Religiosity as a predictorof value orientations]. *Revija za sociologiju*, *37*(1-2), 1-19.

Sidanius, J., & Pratto, F. (2001). *Social dominance: An intergroup theory of social hierarchy and oppression*. Cambridge University Press. https://doi.org/10.1017/CBO9781139175043

Stark, R., & Glock, C. Y. (1968). *American piety: The nature of religious commitment*. University of California Press.

Stoycheva, D. S. (2018). *Analysis of the relationship between religion and forgiveness*. Dissertations and Theses @ UNI. 930. https://scholarworks.uni.edu/etd/930

Šram, Z. (2008). Ethnocentrism, Authoritarian Tendencies and Religiosity: Relations on a Sample of Zagreb Students. *Migracijske i etničke teme*, *24*(1-2), 49-66.

Tokić, D. (2014). Mora li Kristov učenik baš uvijek opraštati? [Must the disciple of Christ always forgive?] *Društvena istraživanja*, *78*(1), 127-148.

Tomić, I., Huić, A., & Ćepulić, D.B. (2013). *Predviđanje homofobije: uloga demografskih obilježja, kontakta s homoseksualnom populacijom i ambivalentnih stavova prema ženama i muškarcima* [Predicting homophobia: The role of demographic characteristics, contact with the homosexual population and ambivalent attitudes towards women and men] (Unpublished report). Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.

Toussaint, L., & Webb, J. R. (2005). Gender differences in the relationship between empathy and forgiveness. *The Journal of Social Psychology, 145*(6), 673–685. https://doi.org/10.3200/SOCP.145.6.673-686

Vincelj-Bele, L. (2014). Stavovi prema eutanaziji i njihovi prediktori–mračna trijada, emocionalna empatija i religioznost [Attitudes towards euthanasia and their predictors - dark triad, emotional empathy and religiosity] (Unpublished diploma thesis). Department of Psychology, Faculty of Humanities and Social Sciences, University of Zagreb, Croatia.

Vučković, A., & Črpić, G. (2007). Religiosity and Forgiveness. *Društvena istraživanja, 16*(6 (92)), 1201-1218.

Webb, M., Chickering, S. A., Colburn, T. A., Heisler, D., & Call, S. (2005). Religiosity and dispositional forgiveness. *Review of Religious Research*, *46*, 355-370. https://doi.org/10.2307/3512166

Whitley Jr, B. E., & Lee, S. E. (2000). The Relationship of Authoritarianism and Related Constructs to Attitudes Toward Homosexuality 1. *Journal of Applied Social Psychology*, *30*(1), 144-170. https://doi.org/10.1111/j.1559-1816.2000.tb02309.x

Wink, P., Dillon, M., & Prettyman, A. (2007). Religiousness, spiritual seeking, and authoritarianism: Findings from a longitudinal study. *Journal for the Scientific Study of Religion, 46*, 321–335. https://doi.org/10.1111/j.1468-5906.2007.00361.x

Wylie, L., & Forest, J. (1992). Religious fundamentalism, right-wing authoritarianism and prejudice. *Psychological Reports*, *71*(3_suppl), 1291-1298. https://doi.org/10.2466/pr0.1992.71.3f.1291

Zakrisson, I. (2005). Construction of a short version of the Right-Wing Authoritarianism (RWA) scale. *Personality and Individual Differences*, *39*(5), 863-872. https://doi.org/10.1016/j.paid.2005.02.02

Original research

7

Latent structure and reliability of the Croatian version of the Fear of Intimacy Components Questionnaire: A study with adult children of divorced parents

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Abstract

The Fear of Intimacy Components Questionnaire (FICQ; Sobral & Costa, 2015) is a 10-item instrument designed to assess the fear of intimacy in romantic relationships in terms of the fear of rejection (Fear of Losing the Other scale, FLO) and the fear of depending (Fear of Losing the Self scale, FLS). It was designed in Portugal and validated in Portuguese samples. We present in this article a Croatian adaptation of the FICQ that was administered in a larger study with adult children of divorced parents. A total of 344 (71% women) individuals completed the online questionnaire. The main purpose of the current work was to test the factorial validity and reliability of the FICQ data using confirmatory factor analysis. In addition, relationships with sociodemographics and variables related to parental divorce were examined. Overall, the results supported the theoretically grounded, complex structure of the instrument. Cronbach alpha and composite reliabilities statistics were statisfactory for both FLO and FLS. However, convergent and discriminant validity, as assessed using the average variance extracted statistics, were marginal in this sample. Further work on the psychometric properties of this instrument with samples from general population is needed to clarify its convergent and discriminant validity.

Keywords: fear of intimacy, Fear of Intimacy Components Questionnaire – Croatian version, factor structure, reliability, romantic relationships, adult children of divorced parents

Introduction

The Fear of Intimacy Components Questionnaire (FICQ) was developed by Sobral and Costa (2015) to assess two components of fear of intimacy in romantic relationships: fear of losing the other (FLO), and fear of losing the self (FLS). The FLO component, which refers to the inhibited capacity for self-revealing, is reflected in the need of hiding aspects of the self and the fear of self-disclosure, exposure, and rejection. These concerns about intimacy have been captured primarily by previous measures such as the Fear of Intimacy Scale (FIS; Descutner & Thelen, 1991) and the Risk in Intimacy Inventory (RII; Pilkington & Richardson, 1988). The FLS component refers to the discomfort of becoming dependent on the romantic partner, as reflected in the overvaluation of independence and the fear of merging and loss of autonomy and control. Although the latter concerns have long been recognized as an obstacle to the development and maintenance of intimate relationships (e.g., Bartholomew, 1990; Collins & Feeney, 2004; Hatfield, 1984; Hatfield & Rapson, 1996; Prager, 1995; Vangelisti & Beck, 2007), they have been neglected in research on individual differences in fear of intimacy (Sobral & Costa, 2015). Following this observation, the FICQ authors decided to develop a more comprehensive measure of fear of intimacy that would capture both FLO and FLS.

In an effort to also develop a theoretically grounded measure of the two components, Sobral and Costa (2015) assumed an attachment based conceptualization of fear of intimacy, in which FLO-related concerns about self-exposure and fear of partner rejection reflect a negative model of the self, whereas FLS-related discomfort with dependence and loss of autonomy reflects a negative model of the other (i.e., romantic partner). While these models provide distinct frames for understanding the roots and varieties of the fear of intimacy, FLO and FLS are assumed to reflect distinct but interrelated sets of intimacy concerns. This conceptualization is consistent with the literature that emphasizes the importance of achieving balance between autonomy of the self and commitment to the partnership for genuine intimacy and healthy interdependence (e.g., Collins & Feeney, 2004; Erikson, 1963; Hatfield, 1984; Hatfield & Rapson, 1996; Prager, 1995). As Hatfield (1984, p. 213) states, "[p]eople must be capable of independence in order to be intimate with others; capable of intimacy, if they are to be independent... People who lack the ability to be independent *and* intimate can never really be either".

To date, the FICQ has been validated in studies with Portuguese adults (Sobral & Costa, 2015; Sobral, Matos, & Costa, 2015; Sobral, Teixeira, & Costa, 2015). Overall, the results of the factor analyses provided support for the original structure with FLO and FLS as correlated factors, along with evidence of adequate convergent and discriminant validity, as well as of composite and test-retest reliability. In addition, multigroup analyses showed metric invariance of the two-factor structure across gender, age groups, and relationship status (i.e., married/cohabiting vs. dating; Sobral & Costa, 2015). Validity is further supported by the pattern of correlations of FLO and FLS with measures of theoretically relevant constructs, such as perception of risk in intimacy, romantic relationship satisfaction, attachment to partner and parents, and parental inhibition of exploration and individuality. The importance of distinguishing between FLO and FLS was also empirically supported in two studies with romantic couples that found differential associations of FLO and FLS components with relationship satisfaction (Sobral, Teixeira, & Costa, 2015) and, also dependent on gender, with attachment anxiety and avoidance (Sobral, Matos, & Costa, 2015).

The present study

While the original version of the FICQ has been validated in Portugal, we are not aware of any attempts to adapt and validate the English version, especially for the Croatian population. Therefore, the main aim of this paper was to fill this gap by presenting the Croatian adaptation and analyzing its latent structure and reliability, based on data collected in a larger study with adult children of divorced parents. We expected

replication of the original two-factor structure along with evidence of convergent and discriminant validity and reliability. Although adverse experiences such as parental divorce may shape the capacity for intimate relating, we do not assume at this point that their consequences entail the very structure of intimacy concerns in romantic relationships. Similarly, we did not expect FICQ scores to be related to variables in our study that refer to the identity of the custodial parent, participants' age at divorce, and length of time since divorce.

We also tested the relationships of the FICQ scales with participants' current relationship status, gender, and age. Sobral and Costa (2015) suggested using the current romantic relationship as the reference relationship to avoid the problems people may have in describing typical feelings in romantic relationships in general and the resulting biases. Accordingly, the samples they used in the original validation studies included only people who were currently in dating, cohabiting, or marital relationships (Sobral & Costa, 2015; Sobral, Matos, & Costa, 2015; Sobral, Teixeira, & Costa, 2015). However, we note that their suggestion does not necessarily exclude individuals who are currently single but have a relationship history and thus can report their intimacy concerns in a specific past relationship. Such use of the FICQ requires a minor change to the instruction wording. More importantly, including single participants in the design would allow for a comparison of FLS and FLO scores in dissolved and ongoing relationships, potentially also contributing to current knowledge about fear of intimacy across relationship statuses. There is a dearth of studies comparing fear of intimacy between singles and different groups of partnered individuals. However, we expected higher FLO and FLS to be reported for past relationships than for ongoing relationships, particularly among women. This expectation is primarily based on the results of some studies using the FIS, which found higher intimacy concerns among participants who were not in an exclusive relationship compared to those who were dating exclusively (Descutner & Thelen, 1991) and higher breakup likelihood among female participants who reported higher fear of intimacy earlier in the relationship (Thelen et al., 2000). Previous studies using the FICQ with partnered individuals showed no difference between participants who were dating and those who were married or cohabiting (Sobral & Costa, 2015; Sobral, Matos, & Costa, 2015; Sobral, Teixeira, & Costa, 2015).

Regarding gender differences, the results of previous studies are not consistent, but suggest that they may depend on the relationship status of the participants. Studies that used the FICQ consistently reported higher FLO and FLS in partnered men than in partnered women (Sobral & Costa, 2015; Sobral, Matos, & Costa, 2015; Sobral, Teixeira, & Costa, 2015). A similar difference in FIS scores was found in another study with dating participants (Thelen et al., 2000). However, other studies using the same measure reported no gender difference (e.g., Descutner & Thelen, 1991). We therefore expected gender effects to be qualified by participants' current relationship status, with partnered men scoring higher on both FLO and FLS, and no gender difference among single participants, at least not on the FLO, which presumably captures the same intimacy concerns as the FIS.

Finally, taking into account a developmental perspective, i.e., that capacity for intimate relating is in fact a developmental achievement, it can be expected that in an age-heterogeneous sample with a substantial number of individuals in transition to adulthood, scores on the FICQ would correlate negatively, but not necessarily strongly, with participants' age. However, because older participants are more likely to be in an exclusive, committed relationship, we expected this correlation to be partially explained by associations with participants' relationship status.

Material and methods

Participants

Data were collected as part of a larger study of relational functioning of adult children of divorced parents that was approved by the authors' institution IRB. Accordingly, all participants had to be 18 years or older and children of divorced parents. The link to the online questionnaire, which included the informed consent form, was posted in several Facebook groups, along with a request to forward it to individuals in the target population.

A total of 344 (71% women) individuals completed the online questionnaire from August to October 2019. At the time of parental divorce, 86.34% of participants were minors and for the majority of them (84.30%) the custodial parent was the mother. The time since parental divorce ranged up to 49 years (M = 12.36, SD = 8.08). The age of participants at the time of the study ranged from 18 to 54 years (M = 23.49, SD = 5.44), with females being younger than males, 22.75 vs. 25.27, $t(342) = 3.98$, $p < .001$. Relationship status at the time of the study was as follows: 136 were single, 163 were dating, and 45 were married.

Measures

Participants completed the FICQ (Sobral & Costa, 2015), which was adapted to the Croatian language for the purposes of the larger study. The items were translated from the English version of the FICQ (see Sobral & Costa, 2015) into Croatian using the back-translation procedure. The wording of the Croatian and English back-translation items is presented in Table 1. The instrument contains 10 items that measure the fear of losing the self (FLS scale; five items, e.g., *It bothers me when I have to adapt to my partner*.) and the fear of losing the other (FLO scale; five items, e.g., *To avoid my partner thinking badly of me, there are things I don't show/tell*.). Participants were asked to describe their feelings about their current or a past romantic relationship (depending on relationship status at the time of the study) on a five-point rating scale ranging from 1 (*not at all characteristic of me*) to 5 (*completely characteristic of me*). Reliability of the two scales has been satisfactory in previous studies, with composite reliabilities (CR) ranging from .80 to .88 and from .72 to .87 for the FLO and FLS scales, respectively (Sobral & Costa, 2015; Sobral, Matos, & Costa, 2015; Sobral, Teixeira, & Costa, 2015). Accordingly, total scores on the two scales can be calculated by summing or averaging the ratings on the corresponding items, with higher scores indicating higher fear of losing the self (FLS scale) and the other (FLO scale).

In addition to the FICQ, the online questionnaire included a set of sociodemographic questions (age, gender, current relationship status), a series of questions about the experience of parental divorce, and measures of attachment to parents and romantic partners. Results related to the latter set of variables are part of another manuscript and are not presented here.

Results

The descriptive statistics of the FICQ items are presented in Table 1. The five-point rating scale was used in its entirety for all items. With three exceptions (items 2, 8, and 9), the items have acceptable values for skewness, i.e., < 3, and kurtosis, i.e., c.r. < 10 for all items (Kline, 2011). The Mardia value of 13.635 indicates a deviation from multivariate normality. Based on the Mahalanobis d, 15 outliers were identified. After their exclusion, the Mardia value decreased to 5.343, still indicating a departure from multivariate normality. To address this issue, we decided to use the bootstrapping procedure that is incorporated in the Amos program we used to perform the confirmatory factor analysis (Arbuckle, 2011; Byrne, 2016). Since

the results of our analyses with and without the outliers did not differ substantially, we present below the results based on the data of all participants (i.e., *N* = 344).

Table 1
The FICQ items wordings and descriptive statistics (N = 344)

Item	Item wording	*M*	Range	*SD*	Skewness	Kurtosis
FLO scale						
1	Radije ne pokazujem partneru/ici određene aspekte moje osobnosti. [I prefer not to show certain aspects of my personality to my partner.]	2.57	1–5	1.31	0.25	-1.18
3	Pokušavam sakriti od partnera/ice svoje slabosti. [I try to hide my weaknesses from my partner.]	2.71	1–5	1.40	0.18	-1.30
5	Ponekad skrivam istinu kako se moj/a partner/ica ne bi razočarao/la. [I sometimes hide the truth so that my partner won't be disappointed.]	2.57	1–5	1.36	0.31	-1.20
7	Kako bih izbjegao/la da moj/a partner/ica loše misli o meni, ima stvari koje mu/joj ne pokazujem ili ne govorim. [To avoid my partner thinking badly of me, there are things I don't show/tell.]	2.62	1–5	1.39	0.35	-1.16
9	Mislim da bi moj/a partner/ica mogao/la steći negativnu sliku o meni ako sve zna o meni. [I think that my partner might get a negative image of me if he/she knew everything about me.]	2.42	1–5	1.44	0.56	-1.05
FLS scale						
2	U vezi mi najviše smeta kad osjetim da partner/ica ulazi u moj osobni prostor. [What bothers me most in a relationship is when I feel like my partner is intruding my personal space.]	2.20	1–5	1.23	0.66	-0.70
4	Ne volim se opravdavati svome partneru/ici. [I don't like to justify myself to my partner.]	2.99	1–5	1.27	-0.07	-1.01
6	Kad moram donijeti neke osobne odluke, radije ih donosim bez partnera/ice. [When I have to make some personal decisions, I prefer to make them without my partner.]	2.49	1–5	1.27	0.44	-0.82
8	Smeta mi kad se moram prilagođavati svom partneru/ici. [It bothers me when I have to adapt to my partner.]	2.37	1–5	1.18	0.57	-0.61
10	Štitim svoj osobni prostor kako bih sačuvao/la svoju autonomiju. [I protect my personal space to preserve my autonomy.]	2.93	1–5	1.34	-0.02	-1.11

Note. The Croatian wording of the items is followed with the back-translation to English in the parentheses. The original English wording of the FICQ can be found in Sobral and Costa (2015).

Confirmatory factor analysis

The theoretically based model with two correlated factors (FLO and FLS), with ten items loading on their respective target factors, was validated through confirmatory factor analysis (CFA) in the Amos 20 program using the maximum-likelihood estimation with bootstrapping (200 resamples) to generate accurate estimations

with accompanying confidence intervals (bias-corrected at the 95% confidence level). Model fit was evaluated using the following indices: X^2/df , the Bollen-Stine bootstrap *p*-value, the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI), the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMR), and, for comparisons with respecified and alternative models, the Akaike Information Criterion (AIC). Based on recommendations for referent values for adequate fit found in the literature (e.g., Hu & Bentler, 1999; Kline, 2011), we used > .90 and > .95 for CFI and TLI, < .08 and < .05 for RMSEA and SRMR, and < 3.00 and < 2.00 for X^2/df, for acceptable and good fit, respectively. The results are presented in Table 2 (M1). While the values of CFI, TLI, and SRMR indicated an adequate model-data fit, the values of RMSEA and the original ML estimate of X^2/df were marginally above the thresholds for an acceptable fit. The Bollen-Stine *p*-value is below the .05 cutoff, suggesting the rejection of the model (Byrne, 2010). We then examined the modification indices (MI) and performed a post hoc respecification of the best-fitting factor structure by adding two residual covariance terms: items 2–4, MI = 11.800, $\chi^2(1) = .191$, and items 1–3, MI = 13.883, $\chi^2(1) = .181$. In both cases, the modifications seemed justifiable: the corresponding items are from the same scale and are conceptually similar. In Sobral and Costa's (2015) study, inspection of the MI also suggested correlation between the residuals of items 1 and 3. After including the two covariance terms in the model (see Models 1a, 1b, and 1c in Table 2) all fit indices, including the AIC, showed improved and adequate fit. Chi-square difference tests applied to these nested models indicated that, compared to M1, the three models with correlated residuals fit the data better, $\Delta\chi^2 = 13.009$, $\Delta df = 1$, $p = .03$ for M1a, $\Delta\chi^2 = 17.072$, $\Delta df = 1$, $p < .01$ for M1b, and $\Delta\chi^2 = 30.538$, $\Delta df = 2$, $p < .01$ for M1c. Also, M1c fits the data better than M1a, $\Delta\chi^2 = 17.529$, $\Delta df = 1$, $p < .01$, and M1b, $\Delta\chi^2 = 13.466$, $\Delta df = 1$, $p = .02$.

Table 2
Goodness-of-fit indices for CFA models of the FICQ (N = 344)

Model	X^2/df	B-S *p*	CFI	TLI	RMSEA [90%CI]	PCLOSE	SRMR	AIC
M1	3.492***	.005	.946	.928	.085 [.069, .102]	.000	.046	160.733
M1a	3.204***	.005	.953	.936	.080 [.063, .098]	.002	.043	149.724
M1b	3.081***	.005	.956	.940	.078 [.061, .095]	.004	.048	145.661
M1c	2.756***	.005	.964	.949	.072 [.054, .090]	.023	.045	134.195
M2	7.081***	.005	.863	.824	.133 [.118, .149]	.000	.071	287.827
M3	3.492***	.005	.946	.928	.085 [.069; .102]	.000	.046	160.733
M3a	2.756***	.005	.964	.949	.072 [.054, .090]	.023	.045	134.195

Note. M1 = Model with two correlated factors; M1a = M1 with correlated residuals of items 2 and 4; M1b = M1 with correlated residuals of items 1 and 3; M1c = M1 with two correlations between item residuals (1–3 and 2–4); M2 = Model with one first-order factor; M3 = Hierarchical model with one second-order factor and the FLO and FLS as first-order factors; M3a = M3 with two correlations between item residuals (1–3 and 2–4); B-S *p* = Bollen-Stine bootstrap adjusted *p*-value.
***$p < .001$.

In M1, all items had substantial loadings on the factors to which they were originally assigned (Table 3). We examined convergent validity also in terms of average variance explained (AVE), using a cutoff point of .50 (Fornell & Larcker, 1981). For FLO, the standardized factor loadings, .64 < *r*iF < .84, are well

above .50 for all items and the AVE is .574, indicating acceptable convergent validity. For FLS, the range of factor loadings is generally lower but acceptable, .53 < *r*iF < .78, and the AVE of .466 is somewhat below the referent value of .50 proposed by Fornell and Larcker (1981). By the Fornell-Larcker criterion, the validity of discrimination between the two factors is marginal, as both AVE values are somewhat lower than the square of their intercorrelation (.584).

Table 3

Standardized factor loadings of the FICQ items in the CFA (Model 1) and non-spurious correlations of the items with total scores on the FICQ and the FLO and FLS scales (N = 344)

	Factor loadings			Item-total correlations		
Item	*r*iFLO [95%CI]	*r*iFLS[95%CI]	*p*	*r*it(FLO)	*r*it(FLS)	*r*it(FICQ)
FLO scale						
1	.74 [.67, .81] (.70 [.59, .78])		.01 (.02)	.67		.70
3	.77 [.71, .81] (.73 [.65, .80])		.01 (.01)	.70		.68
5	.64 [.53, .69] (.65 [.53, .71])		.04 (.03)	.59		.57
7	.84 [.81, .87] (.86 [.82, .89])		.01 (.01)	.78		.73
9	.78 [.72, .83] (.79 [.73, .85])		.01 (.01)	.72		.66
FLS scale						
2		.71 [.65, .77] (.68 [.60, .76])	.01 (.01)		.64	.63
4		.53 [.45, .62] (.49 [.38, .61])	.01 (.01)		.51	.44
6		.72 [.66, .77] (.72 [.65, .79])	.02 (.02)		.62	.62
8		.65 [.56, .70] (.65 [.54, .71])	.02 (.02)		.58	.56
10		.78 [.73, .83] (.80 [.74, .85])	.01 (.01)		.65	.68

Note. Model 1 = model with two correlated factors (FLO = Fear of Losing the Other; FLS = Fear of Losing the Self); 95% CI = bootstrap confidence intervals; *p* = *p*-values for the estimates using the bootstrap error. The values in the parentheses are from the test of Model 1c (respecified Model 1 with two correlations between residuals of the items 1–3 and 2–4).

The above results and the correlation between the FLO and FLS factors of .764 [.68-.83], $p < .001$, suggested that models with one factor (fear of intimacy) are plausible. Reported in Table 2 are also the values of the fit indices for the model with one first-order factor (M2) and the hierarchical model (M3). The CFA results for M2 showed a poor fit, confirming the multidimensionality of the data. That is, a hierarchical model seemed more plausible. However, for a model with one second-order factor to be identified, there must be at least three first-order factors (Kline, 2011). A way to address this problem with identification is to impose an additional constraint (e.g., to constrain the paths from the second-order factor to the first-order factors to equality). Specifically, we constrained the loadings of the FLS and FLO factors to be equal, i.e., sqrt(.764) =

.874. The CFA results for this model showed a good fit (see M3 in Table 2). Because the estimated second-order factor variance was equal to the covariance between the first-order factors, the pattern of fit indices for this model is the same as for M1. Similarly, the pattern of the 10 items loadings on the two first-order factors is the same as in M1. The loadings of the FLO and FLS factors on the second-order factor were .91 and .84, respectively. After including the two covariance terms in the model (M3a in Table 2) all fit indices, including the AIC, showed improved and adequate fit. Chi-square difference test applied to these nested hierarchical models indicated that, compared to M3, the respecifed model with correlated residuals fit the data better, $\Delta\chi^2 = 30.538$, $\Delta df = 2$, $p < .01$.

Composite reliability and internal consistency

The composite reliability (CR) was good for both factors: .870 and .811 for the FLO and FLS, respectively. The Cronbach's alpha values for the respective scales were .87 and .81, and .89 for the FICQ. The non-spurious item-total correlations were satisfactory for both scales and the whole instrument (Table 3). The intercorrelation of the FLO and FLS scales was $r = .64$, t (342) = 15.22, $p < .001$.

Descriptive statistics and relationships with sociodemographic and divorce-related variables

Total scores ranged from 1.00 to 5.00 on the FICQ and on both the FLO and FLS scales. The means and standard deviations were as follows: *M*FICQ = 2.59, *SD*FICQ = 0.93; *M*FLO = 2.58; *SD*FLO = 1.12; *M*FLS = 2.60; *SD*FLS = 0.95. No gender differences were found by independent t-tests (all *p*s > .05). Differences with respect to participants' current relationship status were significant, with singles scoring higher than dating and married participants on the FLO, 2.91 vs. 2.41 and 2.17, $F(2, 341) = 11.72$, $p < .001$, on the FLS, 2.94 vs. 2.42 and 2.20, $F(2, 341) = 16.74$, $p < .001$, and on the FICQ, 2.92 vs. 2.41 and 2.19, $F(2, 341) = 17.28$, $p < .001$. For FLS, this effect was qualified by gender, $F(2, 338) = 4.37$, $p = .01$. The interaction pertains to single women scoring higher compared to women currently in dating or marital relationships, 3.04 vs. 2.40 and 2.00, both *p*s < .001; among men the difference with regard to relationship status was not significant (all *p*s > .05). No interaction effect was observed for the FLO, $F(2, 338) = 1.17$, $p = .37$, and FICQ, $F(2, 338) = 2.74$, $p = .07$.

As expected, participants' age correlated negatively, albeit weakly, with scores on the FICQ, $r = -.11$, t (342) = -2.07, $p = .04$, and on the FLO scale, $r = -.13$, t (342) = -2.39, $p = .02$, but the correlation with the FLS scale was not significant, $r = -.07$, t (342) = -1.26, $p = .21$. Since age was also associated with relationship status, with singles being younger than partnered participants, 21.35 vs. 24.88, respectively, $t(342) = 6.21$, $p < .001$, we regressed the FICQ and FLO on age and relationship status. As indicated by the partial correlations, after controlling for relationship status, the relationship with age was no longer significant for the FICQ, $r12.3 = -.02$, t (341) = -0.36, $p = .72$, and the FLO scale, $r12.3 = -.06$, t (342) = -1.01, $p = .31$.

Finally, the correlations of the FICQ and its two scales with participants' age at the time of parental divorce and with length of time since divorce were not significant (all *p*s > .05). No difference was observed with respect to the identity of the custodial person (i.e., mother vs. father or other relative) (all *p*s >. 05).

Discussion

This paper sought to evaluate the factor validity and reliability of the FICQ using a sample of Croatian participants. In addition, associations with sociodemographic and divorce-related variables were examined. Because the data were collected as part of a larger study of the relationship functioning of children of divorced parents, all participants were required to be adult children of divorced parents. Later, we consider the implications of our sample composition and some other aspects of our design for generalizability and other issues that warrant cautious interpretation of our results. Next, we discuss the results of the FICQ validity and reliability tests, followed by the results regarding the relationships of the FICQ scores with sociodemographic and parental divorce variables.

Factor validity and reliability

Given the empirical support for the two-factor structure of the FICQ in research using the original version of the instrument (Sobral & Costa, 2015), in our confirmatory factor analysis we first evaluated the model with FLO and FLS as correlated factors. The results corroborated that this structure had an adequate fit, especially after adding two residual covariance terms, including the covariance between items 1 and 3, the addition of which the modification indices in the original study by Sobral and Costa (2015) had also suggested in the model respecification. In our analysis, the factor loadings of both FLO and FLS were substantial and somewhat higher than those obtained for the original version (Sobral & Costa, 2015). Consequently, both scales showed good internal consistency and composite reliability, on the range of those found in the original version (Sobral & Costa, 2015; Sobral, Matos, & Costa, 2015; Sobral, Teixeira, & Costa, 2015).

Regarding convergent validity, the results of the analysis based on the AVE values and the Fornell-Larcker (1981) criterion provided evidence of adequate validity of the FLO. The variance shared between the FLS factor and its indicators was somewhat smaller than the measurement error variance, indicating marginal convergent validity. Since the CR value was satisfactory (i.e., > .60), it seems safe to conclude that the convergent validity of the FLS is still acceptable.

The discriminant validity was slightly below the Fornell-Locker criterion, especially for the FLS, suggesting that the two factors do not discriminate enough in our sample. Because our study is the first to indicate issues with discriminant validity, further research, with more heterogeneous samples, is needed to evaluate the overlap between the FLO and FLS factors. In addition to measurement considerations, this issue should also be explored at a more conceptual level, in terms of the expected association between the two components and perhaps the factors on which its strength might depend. For example, the relationship of the concerns about individuality and threat of over-inclusion of the partner in the self with fear of self-revealing and sharing everything may vary at different stages of the individual's and/or relationship's development. A related issue concerns the developmental pathways of the two components and the dynamics of their differentiation and integration. Further consideration is beyond the scope of this paper, but the literature on the development of intimacy and its relations to identity development (e.g. Årseth et al., 2009; Beyers & Seiffge-Krenke, 2010) may provide useful insights into the dynamics of the FLO and FLS development and interrelations.

Based on the above results and a relatively high correlation between FLO and FLS, we also compared the tested two-factor model with alternative models to one factor of first and second order. Consistent with the assumed complexity of the FICQ and the results from a similar comparison in Sobral and Costa's (2015) study, the model with one first-order factor showed a poor fit to our data. The hierarchical model, with fear of intimacy as the second-order factor, showed an equal fit as the model with two correlated factors. This

is logical because to solve the problem with the hierarchical model identification, we used the correlation between FLO and FLS in Model 1 to impose the equality constraint on the FLO and FLS loadings on the second-order factor. Both first-order factors in the hierarchical model (i.e., FLO and FLS), with high loadings on the second-order factor (.91 and .84, respectively), contributed to explain the fear of intimacy factor. Thus, the results suggest that fear of intimacy, as assessed with the FICQ, can be conceptualized as a unitary, albeit complex, dimension. Accordingly, FICQ total scores can be calculated to indicate the level of fear of intimacy in general, to which – at least in this sample – the FLO seems to contribute more than the FLS.

Relationships with sociodemographic and divorce-related variables

As expected, participants' age was negatively correlated with fear of intimacy (specifically, with the FICQ and the FLO, but not with the FLS), but the observed correlations were weak and no longer significant after controlling for associations with participants' relationship status. That is, FLO concerns decrease with age mainly because older participants tend to be in committed relationships and therefore have less concerns about partner rejection and abandonment. Also as expected, fear of intimacy, including the FLO and FLS components, was lower among partnered participants who provided ratings for their current, dating or marital, relationship than among single participants who provided ratings for a previous relationship, and this difference remained significant even after controlling for participants' age. The absence of a difference in reports for current relationship between the two subgroups of our partnered participants is consistent with the findings of Sobral, Matos, and Costa (2015). Since we did not collect additional information about past relationships and breakup experiences, we can only speculate about the factors that contributed to higher FLO and FLS reports for past relationships. Assuming that intimacy concerns reported for a past relationship reflect actual concerns in the specific relationship, it is possible that such concerns were an issue that contributed to the relationship dissolution. Given that our single participants' reports are in fact recollected concerns after the breakup, it is also possible that such concerns reflect subsequent feelings of rejection and abandonment that may have resulted from the breakup, at least among those who did not initiate it. This is not to say that being single or not in an exclusive relationship is not generally associated with more pronounced intimacy fears (as found, for example, by Descutner and Thelen, 1991, using the FIS). However, because relationship status was confounded with the type of relationship surveyed with the FICQ, our study does not allow us to draw a clear conclusion about the relationship between single status and fear of intimacy.

As predicted, the effect of relationship status on FLS (but not on FLO) was qualified by gender: FLS was higher among single female participants, who provided ratings for a past relationship, than among partnered female participants, who provided ratings for an ongoing relationship. Among male participants, no difference was observed with respect to relationship status (including the distinction between past and current relationships). In other words, for males, reported concerns about dependence and loss of autonomy and control were equally salient for current and past relationships; for females, these concerns, which presumably reflect the salience of the model of the self, were less pronounced when reporting about current than past, dissolved relationships. In line with the above interpretation, the higher FLS reported by single female participants in our study about past relationships may reflect their concerns before its dissolution, which may even have contributed to the breakup. However, this interpretation should be taken with caution. Although it appears to be similar to the pattern observed by Thelen and colleagues (2000), the latter was obtained for the FIS, which addresses fear of romantic intimacy in general and more in terms of the concerns corresponding to the FLO than to the FLS (Sobral & Costa, 2015). In the absence of additional information on dissolved relationships, we can only speculate about the factors that contributed to this pattern on the FLS but not on the FLO. However, it appears to be consistent with the literature suggesting that intimacy and

identity concerns are more concurrently associated in women than in men (Beyers & Seiffge-Krenke, 2010). That is, higher reported fear about losing one's self in a dissolved than in an ongoing relationship may be indicative of a (concurrent or subsequent) process of "breaking away" from the ex-partner and distancing oneself from the past relationship, which is more likely in women, who tend to place more emphasis on interpersonal aspects of identity and experience more trouble learning how to be independent (Hatfield & Rapson, 1986). In addition, from the perspective of the self-expansion model (Aron & Aron, 1997; Lewandowsky & Bizzoco, 2007), higher recalled intimacy concerns may also indicate greater self-expanding past relationship and a perceived loss of self resulting from the end of such a relationship.

In addition to the observed interaction with relationship status, the absence of the main effect of gender in our study also differs from previous work that used the FICQ. In Sobral, Matos and Costa's (2015) study with couples, men showed higher levels of fear of intimacy than women. A similar trend was observed in our study for married participants only, with male (n = 14) vs. female (n = 31) mean scores of 2.66 vs. 2.00 on the FLS, 2.49 vs. 2.03 on the FLO, and 2.57 vs. 2.02 on the FICQ. Whether these trends would reach significance with a larger number of participants is another issue that may be of interest for future studies using this instrument. As noted earlier, higher fear among male partnered participants has also been documented in some previous research with couples using other measures, such as Descutner and Thelen's FIS (e.g., Thelen et al., 2000). However, the original study using the FIS, which included a more heterogeneous sample in terms of relationship status, reported no gender difference (Descutner & Thelen, 1991). While further research is clearly needed, the present study suggests that gender differences may depend on participants' relationship status and the specific relationship (past or current) on which they focus when responding to the measure of fear of intimacy.

Regarding variables related to parental divorce, we found that fear of intimacy was not associated with identity of the custodial person, participants' age, or length of time since divorce. Certainly, the absence of these associations does not mean that such an experience does not affect children's mental representations of themselves, romantic relationships, and romantic partners, and consequently, their capacities to disclose to and/or depend on a romantic partner. Previous research using the FICQ did not examine relationships with parental marital status. In a study that used the FIS, Descutner and Thelen (1991) found no difference in fear of intimacy with respect to parental marital status. However, the number of their participants who were children of divorced parents was rather small (26 and 19 in Studies 1 and 2, respectively). Therefore, further research, especially with the FICQ, is needed for a definite conclusion about the relationship between parental marital status and fear of intimacy, including its FLS and FLO components. In addition to parental marital status, variables related to parent–child bond and the child's experience and interpretation of divorce should be included in the design, as previous research (e.g., Phillips et al., 2013; Rohner et al., 2019) suggests that adult children's fear of intimacy should be associated with recollections of parental care and the extent to which divorce was also perceived as parental rejection and abandonment.

Finally, it should be noted again that the composition of our sample warrants caution in interpreting the results. In particular, the consistency of the CFA results with those reported for the original FICQ does not necessarily imply measurement and structural invariance across parental marital status. Studies with more diverse samples in terms of parental marital status are needed to test psychometric equivalence across the corresponding groups of adult children. Also, because our sample was recruited through online social networks, using in part the snowball technique, and we could not fully control the recruitment process and survey conditions, replications under more controlled conditions are strongly recommended.

Conclusions

To our knowledge, the present study is the first to evaluate the psychometric properties of a non-Portuguese version of the FICQ using a sample from the Croatian population. Although generalizability might be limited by the fact that all participants were adult children of divorced parents, the results provided support for the validity of the models with two correlated factors and with one higher-order factor, as well as for the internal consistency and composite reliability of the FLO and FLS scales, and to some extent for their discriminant validity. Thus, the Croatian version presented may be useful for assessing fear of intimacy in research with Croatian participants, as well as in cross-cultural research examining similarities and differences in (two components of) fear of intimacy between participants from Croatia and other countries. In previous studies with Croatian participants (e.g., Glavak Tkalić & Vulić-Prtorić, 2016; Rohner et al., 2019), fear of intimacy was assessed with Descutner and Thelen's (1991) FIS. However, future studies may benefit from using the FICQ, especially when a more comprehensive assessment of fear of intimacy, including interdependence as well as self-revelation concerns, is of relevance to the study purpose. As indicated by our study results, fear of intimacy, as assessed with this instrument, could be conceptualized as a unitary, albeit complex, dimension. Accordingly, total scores on the FICQ can be utilized to indicate the level of fear of intimacy in general, although the scores on the FLO and FLS scales may be of more interest in research aimed at exploring issues related with specific types of intimacy concerns rather than fear of intimacy in general. Finally, this study is also the first to use the FICQ with both single and partnered participants and assessments of intimacy concerns in both dissolved and ongoing romantic relationships. Although the confound of relationship status and the type of relationship assessed does not allow for a straightforward interpretation, the results suggest that this instrument is sensitive to differences in intimacy concerns reported for dissolved and ongoing romantic relationships, particularly among women.

References

Arbuckle, J. L. (2011). *IBM SPSS Amos user's guide*. Amos Development Corporation.

Aron, A., & Aron, E. N. (1997). Self-expansion motivation and including other in the self. In S. Duck (Ed.), *Handbook of personal relationships: Theory, research and interventions* (2nd ed., pp. 251–270). John Wiley & Sons.

Årseth, A. K., Kroger, J., Martinussen, M., & Marcia, J. E. (2009). Meta-analytic studies of identity status and relational issues of attachment and intimacy. *Identity: An International Journal of Theory and Research*, *9*, 1–32. https://doi.org/10.1080/15283480802579532

Bartholomew, K. (1990). Avoidance of intimacy: An attachment perspective. *Journal of Social and Personal Relationships*, *7*(2), 147–178.

Beyers, W., & Seiffge-Krenke, I. (2010). Does identity precede intimacy? Testing Erikson's theory on romantic development in emerging adults of the 21st century. *Journal of Adolescent Research*, *25*(3), 387–415. https://doi.org/10.1177/0743558410361370

Byrne, B. M. (2016). *Structural equation modeling with Amos: Basic concepts, applications, and programming* (3rd ed.). Routledge.

Collins, N. L., & Feeney, B. C. (2004). An attachment theory perspective on closeness and intimacy. In D. Mashek & A. Aron (Eds.), *Handbook of closeness and intimacy* (pp. 163–187). Erlbaum.

Descutner, C. J., & Thelen, M. H. (1991). Development and validation of a fear-of-intimacy scale. *Psychological Assessment: A Journal of Consulting and Clinical Psychology*, *3*(2), 218–225. https://doi.org/10.1037/1040-3590.3.2.218

Erikson, E. H. (1963). *Childhood and society* (2nd ed.). Norton.

Fornell, C., & Larcker, D. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research*, *18*(1), 39–50.

Glavak Tkalić, R., & Vulić-Prtorić, A. (2016). Odnos samopoštovanja i percepcije roditeljskog prihvaćanja-odbijanja, psihološke prilagodbe i anksioznosti među mladim odraslim osobama. In Z. Penezić, A. Slišković, V. Ćubela Adorić, Lj. Gregov, M. Nikolić, M. Nekić, J. Ombla, A. Šimunić & A. Tokić (Eds.), *Paper summaries from XX. Psychology Days in Zadar* (p. 148). Sveučilište u Zadru.

Hatfield, E. (1984). The dangers of intimacy. In V. J. Derlega (Ed.), *Communication, intimacy and close relationships* (pp. 207–220). Academic Press.

Hatfield, E., & Rapson, R. L. (1996). *Love and sex: Cross-cultural perspective*. Allyn and Bacon.

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance strcuture analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*(1), 1–55.

Kline, R. B. (2011). *Principles and practice of structural equation modelling* (3rd ed.). Guilford Press.

Lewandowski, G. W., & Bizzoco, N. M. (2007). Addition through subtraction: Growth following the dissolution of a low quality relationship. *The Journal of Positive Psychology*, *2*(1), 40–54. https://doi.org/10.1080/17439760601069234

Phillips, T. M., Wilmoth, J. D., Wall, S. K., Peterson, D. J., Buckley, R., & Phillips, L. E. (2013). Recollected parental care and fear of intimacy in emerging adults. *The Family Journal: Counseling and Therapy for Couples and Families*, *21*(3), 335–341. https://doi.org/10.1177/1066480713476848

Pilkington, C. J., & Richardson, D. R. (1988). Perceptions of risk in intimacy. *Journal of Social and Personal Relationships*, *5*, 503–508. https://doi.org/10.1177/0265407588054006

Prager, K. J. (1995). *The psychology of intimacy*. The Guilford Press.

Rohner, R. P., Filus, A., Melendez-Rhodes, T., Kuyumcu, B., Machado, F., Roszak, J., Hussain, S., Chyung, Y-J., Senese, V. P., Daneshmandi, S., Ashdown, B. K., Giovazolias, T., Glavak-Tkalić, R., Chen, S., Uddin, M. K., Harris, S., Gregory, N., Favero, M., Zahra, S, . . . Roy, K. (2019). Psychological maladjust-

ment mediates the relation between remembrances of parental rejection in childhood and adults' fear of intimacy: A multicultural study. *Cross-Cultural Research*, *53*(5), 508–542. https://doi.org/10.1177/1069397118822992

Sobral, M. P., & Costa, M. E. (2015). Development of the Fear of Intimacy Components Questionnaire (FICQ): Embracing a dependence component. *European Journal of Psychological Assessment*, *31*(4), 302–309. https://doi.org/10.1027/1015-5759/a000238

Sobral, M. P., Matos, P. M., & Costa, M. E. (2015). Fear of intimacy among couples: Dyadic and mediating effects of parental inhibition of exploration and individuality and partner attachment. *Family Science*, *6*, 380–388. https://doi.org/10.1080/19424620.2015.1106416

Sobral, M. P., Teixeira, C. P., & Costa, M. E. (2015). Who can give me satisfaction? Partner matching in fear of intimacy and relationship satisfaction. *The Family Journal*, *23*(3), 247–253. https://doi.org/10.1177/1066480715573709

Thelen, M. H., Vander Wal, J. S., Thomas, A. M., & Harmon, R. (2000). Fear of intimacy among dating couples. *Behavior Modification*, *24*(2), 223–240. https://doi.org/10.1177/0145445500242004

Vangelisti, A. L., & Beck, G. (2007). Intimacy and fear of intimacy. In L. L'Abate (Ed.), *Low-cost approaches to promote physical and mental health* (pp. 395–414). Springer. https://doi.org/10.1007/0-387-36899-X_20

Original research

8

Determinants of faking on personality questionnaires in selection situations – A qualitative analysis of the responses of young highly educated candidates

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Abstract

Personality questionnaires are often used in selection, even though research clearly shows that candidates are capable of faking their responses. Since faking cannot be easily detected, a new line of research has started to investigate its determinants, by using correlational and quasi-experimental designs. However, there is a lack of qualitative designs, which could provide deeper insight into how candidates approach responding to personality questionnaires. The aim of this study was to examine the potential determinants of motivation to fake on personality questionnaires, by analyzing candidates' implicit theories. We conducted in-depth interviews with eight highly educated young people with various experience in selection. The results revealed that candidates considered faking as a behavior useful in selection situations. They noted several important individual and contextual determinants, such as perceived discrepancy between their own and the ideal profile, need for the job, ability to fake, length of the questionnaire and warning that faking can be detected and followed by negative consequences. Based on the empirical results, an implicit model of faking personality tests in personnel selection is suggested. These findings have both theoretical implications, i.e., revealing some new potential determinants of faking behavior, and practical implications for reducing faking behavior in selection practice.

Keywords: faking, faking determinants, personnel selection, personality questionnaires, qualitative methodology

Introduction

In recent years, research has consistently confirmed the five basic dimensions that constitute the foundation of all other and comprise the most important variations in personality. These are the dimensions of neuroticism, extraversion, openness to experience, conscientiousness and agreeableness, and a model that describes them is called the Five-Factor Model (Costa & McCrae, 1987). These five dimensions of personality have demonstrated associations with a variety of behaviours in everyday life, including organizational behaviour and performance (Ones et al., 2007; Schmidt & Hunter, 1998). Personality traits, especially conscientiousness and emotional stability (the opposite of neuroticism) are predictive for outcomes in the organizational context such as job satisfaction, work performance, leadership, teamwork, employee turnover and career success (Oswald & Hough, 2011).

The relation from personality traits and work behaviour to organizational outcomes gave an insight into the usefulness of personality testing in selection of employees for a variety of jobs. Although personality can be tested by a number of methods, the cheapest and simplest, and therefore the most commonly used method are personality questionnaires (Šverko, 2012). Findings that suggest that personality contributes to the prediction of outcomes in addition to measures of cognitive ability, which many psychologists considered the best predictor of job success, played a key role in the integration of personality questionnaires in the selection process (Barrick et al., 2001; Furnham et al., 2003; Šverko, 2003). Schmidt and Hunter (1998) found that questionnaires measuring conscientiousness explained 18% additional variance of work performance over cognitive ability measures, while some complex personality traits such as integrity explain up to 27% more variance of the same criteria. These results led to the fact that personality questionnaires are one of the selection methods that is used more and more often, and the benefits of which are being recognized by a growing number of employers (Rothstein & Goffin, 2006).

However, the problem of impression management and response faking is always associated with personality questionnaires (Dilchert et al., 2006; Proroković et al., 2008; Tonković Grabovac, 2013). If faking is defined as an "individual's conscious attempt to distort their responses to be viewed favourably" (McFarland & Ryan, 2000), it is clear that this problem is particularly relevant in selection situations, when it is in the best interest of individuals to show themselves to the employer in the best possible light. Moreover, numerous studies have shown that it is possible to fake responses on personality questionnaires (Geiger et al., 2018; Jerneić et al., 2010; Viswesvaran & Ones, 1999), and that the candidates in selection situations truly do so (Griffith et al., 2007; Krammer, 2020; Morgeson et al., 2007; Robie et al., 2007). According to a meta-analysis conducted by Birkeland et al. (2006), job applicants significantly distort their responses to personality questionnaires, especially on dimensions which are considered relevant for the job. One reason for that probably lies in the fact that it is often obvious to the candidates which answer to a particular questionnaire item is "correct", provided they can assume which traits employers consider important and want to appear better regarding those traits (Klehe et al., 2012; König et al., 2006). The problem arises when such distortions change the rank order of candidates in the selection process (Griffith et al., 2007), and people who do not possess the characteristics that are desirable for a specific job are employed, while individuals whose characteristics may be more appropriate for the job remain disadvantaged. It is important, therefore, to strive for the selection process to be as valid as possible, and to reduce potential threats to its validity such as faking to a minimum. Taking this into account, it should be noted that there are significant differences between individuals in the degree to which they distort their responses (Hendy et al., 2021; Zickar et al., 2004), which raises the question of which particular individual and/or situational determinants may affect the motivation of individuals for faking on personality questionnaires.

Snell et al. (1999) were the first to propose an interaction model of faking. The assumption of this model is that the characteristics of individuals interact with contextual factors. In other words, it is

not possible to determine exactly what types of candidates fake in selection, because the degree of faking depends on the characteristics of the situation as well. Neither the individual nor the contextual factors of faking act directly, but through the ability and motivation for faking, which the authors considered the main and direct determinants of successful response distortion. According to these authors, perceptive situational factors such as behaviour of others, perceived fairness of the selection process, candidates' attitudes towards the importance of the outcome of faking and getting the job, have the most powerful influence on faking, whilst the ability to fake the best answer is predicted by general mental ability and emotional intelligence.

In comparison with this model, McFarland and Ryan (2000) specifically define determinants of faking and suggest their possible interactions. A key part of this model is the effect of beliefs about faking on the intention to fake, and consequently on faking behaviour. Later, the authors (McFarland & Ryan, 2006) extended their model through the integration of Ajzen's Theory of Planned Behaviour (1991), an empirically validated theory used to predict the intentions and behaviour of people. The intention to fake is therefore determined by the beliefs about whether it is right to fake, perceptions about how others see faking, and the beliefs about whether it is possible to fake, thus the intention acts as a direct determinant of response faking. According to this model, the connection between beliefs about faking and the intention to fake will be moderated by situational influences, such as the desire for the job or a warning about the possibility of discovering faking, while the connection between the intention of faking and the final behaviour will be moderated by the ability and the possibility to fake (McFarland & Ryan, 2006).

According to the model by Goffin and Boyd (2009), faking of responses is determined by individual characteristics and contextual factors that also affect faking indirectly, through the motivation for faking. These authors believe that the motivation for faking is the only direct determinant of faking, and that it is defined by relatively stable individual characteristics of candidates, such as personality traits and morality, and their perception of the situation and the perceived ability to fake.

Faking behaviour can also be determined by the use of different strategies in selection situations. Marcus (2009) proposed the self-presentation theory in order to account for faking behaviour. According to his theory, faking presents just one aspect of aspiring to present oneself in favourable light in front of the employer, and therefore depends on self-presentation skills and motivation.

Considering these models, it can be concluded that faking in selection situations is influenced by individual characteristics, contextual factors (subjective and objective), and their interaction, but empirical research to determine the exact determinants of faking in selection is still scarce and leaves room for scientific progress.

Taking into account the importance of a proper selection procedure, its cost and the potential consequences of inadequate selection, there is a clear need to anticipate and prevent faking since it may jeopardize the validity of the selection process (Krammer et al., 2017; Tonković Grabovac et al., 2012). In selection situations, faking behaviour is not easily measured, so it is necessary to predict what individuals will be more willing to engage in faking behaviour on personality questionnaires and in which situations (Goffin & Boyd, 2009), and accordingly to take the necessary measures to minimize the occurrence of that behaviour or even completely prevent it. Since previous empirical studies of determinants of faking on personality questionnaires are few (e.g. Snell et al., 1999; McFarland & Ryan, 2000), and the operationalization of individual determinants somewhat different in each of the studies, it is not yet quite clear what personality traits, and what elements of situational perception determine the motivation of candidates for faking in selection situations. Moreover, it is still unclear and unexplored which objective characteristics of the selection situation affect faking behaviour (Bensch et al., 2019).

Considering that it is still necessary to gain a deeper insight into the previously under-explored area of faking determinants (Schilling, 2019), qualitative research methodology has been used in this study to

collect and process data. The strength of the qualitative research is that it can yield many valuable insights above and beyond all the predominantly quantitative studies on faking.

This methodological approach puts emphasis on a holistic and detailed description of a particular situation or activity (Ajduković, 2007), and its advantage over the quantitative methodology is the possibility of getting a lot of information about the potential determinants of faking and how they affect the motivation to fake directly from a small number of individuals. In order to understand the motivation underlying faking behaviour, which is presumed to be conscious (McFarland & Ryan, 2000), it is important to find out from the candidates themselves what motivates them to fake in selection situations and how they see this behaviour. For example, in a rare qualitative research in this field, König et al. (2012, pp. 442) revealed "that which is typically subsumed under the expression 'faking' actually consists of many facets."

Thus, the overall objective of this research is to examine, from the candidates' perspective, what are the characteristics of the selection situation and individual characteristics of candidates that are potentially predictive of motivation for faking on personality questionnaires in selection situations. More specifically, we will try to answer the following research questions:

1. How do candidates perceive faking on personality measures and its prevalence in selection situations?

2. What aspects of the situation do candidates consider when deciding whether to engage in faking behaviour on personality measures in selection situations?

3. What individual characteristics of candidates potentially determine whether they will engage in faking on personality measures in selection situations?

Material and methods

Participants

The study included 8 participants, balanced by gender (M=4, F=4). The average age of participants was 27 years, and all the participants were of high or higher education. Participants were heterogeneous considering both their current working status and the amount of experience with selection situations. In qualitative research, participants are selected according to criteria specified by the topic of research (Miles & Huberman, 1994), and therefore the study consisted of an intentional sample of people who have had recent experience with personality questionnaires in selection situation. Participants in the study were recruited by researchers, e.g. people with knowledge about the research topic ("the key informants") through informal (i. e. non-work) social networks. The main criterion for selection of participants was for them to have responded to personality questionnaires as part of the selection process at least once in the last two years. A detailed description of the sample of participants is provided in Table 1. None had refused to participate, nor dropped out.

Measures and procedure

The research was conducted using qualitative methodology, by the method of in-depth interviews. Participants agreed to be asked about experience and opinions related to responding to personality questionnaires in selection situations. Since the topic of faking might be delicate, the face-to-face interviews were held one-on-one, in private, outside the workplace setting. The exact number of participants was not predetermined, so the interviews were being carried out until the thoughts of participants

in interviews began to repeat themselves, which Milas (2005) calls "the exhaustion of the topic", or the saturation point.

The interviews were semi-structured (the interview guide is attached in the Appendix), enabling comparison of responses from different individuals, but also easier organization and data analysis. The interviewers (authors of this paper, both female, trained and experienced in conducting in-depth interviews) recorded interviews on audio track with the permission of participants. Their average duration was 30 minutes.

Results

Data analysis

The theoretical framework of the study was to build and organize a theory from the data, as both a grounded theory and a content analysis (Tong el al., 2007). Data were coded independently by two coders, the authors of the manuscript. The themes were identified in advance (see the Appendix for the interview guide), in line with the current literature review. In the Results, we reported only on the data that had been coded by both coders in the same theme. However, some new themes were also derived from the data, which were then discussed within coders and implemented upon mutual agreement.

Results

Response faking in general

In response to the first research question: "*How do candidates perceive faking on personality measures and its prevalence in selection situations?"* qualitative analysis of data obtained yielded answers that can be grouped into two categories: Attitude towards faking and Perception of faking.

Concerning attitude towards faking, we examined the general opinion of participants about faking in selection situations and their implicit definitions of faking. First, we can see that the participants considered faking as normal and even desirable behaviour. For example: *"This is a desirable behaviour, certainly useful... Even when you're meeting someone new, I assume that you want to show yourself in a better light", "I would rather hire someone who has embellished the answers", "it is well-established in the society to make yourself look more presentable".*

Definitions of faking include taking into account your own characteristics but enhancing them to be in line with the characteristics you consider relevant to the employer. Examples are: *"to embellish answers means trying to figure out what is expected and meeting the needs of the workplace", "giving ourselves a higher score than we think we deserve ... to tell the truth but to build it up a little," "presenting yourself in a more favourable light," "adapting responses to the expectations in the selection process."*

Participants expressed the perception of faking as assessing the frequency of faking in selection situations, assessing the general possibility for successful faking on personality questionnaires, as well as assessing one's own tendency to fake responses. Estimates of the frequency of faking in selection ranged between 40% and 97%, and the prevailing view was that most people enhance their responses to personality questionnaires at least to some extent. In addition, participants stated to believe that it is possible to successfully fake the answers to the questionnaire and that they themselves could successfully embellish their answers if they wanted to. Accordingly, the participants recognized the existence of individual differences in the ability and tendency to successfully fake responses to personality questionnaires.

Situational determinants of response faking

To answer the second research question; *"What aspects of the situation do candidates consider when deciding whether to engage in faking behaviour on personality measures in selection situations?"* we will consider six categories of situational factors which the participants reported could increase or reduce motivation for faking. They are: the need/ desire for a job, length of the questionnaire, perceived fairness of the selection process, perception of faking being done by other candidates, selection ratio and the number of available job positions, and finally the warning that faking responses can be detected and will be followed by negative consequences. It is important to note that the participants independently thought of only the first two of these situational factors, the need/desire for a job and the length of the questionnaire, while they expressed their assumptions about the remaining factors only when they have been subjected to their attention.

A strong need or desire for a job proved to be a determinant of the situation that in the opinion of most participants influences the motivation for faking answers, and in a clear direction: the more we want or strongly require a particular job (either for some personal reasons or because of the general situation in the labour market), the more motivated we will be to fake responses in order to increase the chances of getting the job.

According to the participants: *"(whether I will fake or not) mostly depends on how much I want the job," "if I really need the job I will do whatever it takes", "those who do not want to work, do not embellish ... they reduce their chances of getting the job because they don't really want it", "if you really want or need the job, you will try harder, you want to show yourself in the best possible light."* It is similar with a seemingly irrelevant feature of the situation - the length of the questionnaire. It seems that long questionnaires reduced the motivation of candidates for faking, as they tend to lose concentration required for faking and simply respond with the first that comes to mind, which is usually the most honest answer.

When the perceived fairness of the selection procedure is concerned, the participants reported that it has no impact on faking, because when the treatment is unfair (for example, the job is awarded through personal connections) candidates perceive to already have no chance to get the job and believe there is no point in trying. In other words, the perceived injustice of the selection process in general discourages candidates to participate in it in the first place, and they would be more likely to try to find a job in another company.

Ambiguous results were obtained in terms of perception of faking being done by other candidates, selection ratio and the number of available job positions. Part of the participants would embellish more if they knew that other candidates also embellish their answers, while the other part would embellish less or completely ignore the fact. Also, some of the candidates would embellish their answers more if the selection ratio is small and there is little chance of getting the job (for example 20%), while the others would embellish more if there is a big chance of getting the job, or if the selection ratio is high (for example 80%). The same applies to the number of available job positions: some participants believe that they would embellish most if they knew they were competing against a lot of other candidates, regardless of how many people will be employed, while for the others the key information would be the number of vacancies, and they would embellish more if that number is small, regardless of the number of candidates.

There were some interesting responses of the participants in the category of warning that faking responses can be detected and will be followed by negative consequences. In fact, while most of the participants reported that such a warning would certainly reduce their motivation for faking responses (even though they would still fake, but more subtly) and that the potential negative consequences certainly could deter candidates from faking, some participants expressed doubts about the possibility of detecting faking, stating that it is possible only in extreme situations, and therefore the threat of negative consequences following wouldn't deter them from faking.

Individual determinants of response faking

In response to the last research question: *"What individual characteristics of candidates potentially determine whether they will engage in faking on personality measures in selection situations?"* using qualitative data analysis we recognized categories of perceived deviation from the ideal profile, intelligence and personality traits.

Participants recognized that there are individual differences among people in their tendency to fake responses and the ability to fake. The differences in response faking tendency are attributed primarily to differences in the perception of their own deviations from the ideal profile – the more the candidates are aware that their characteristics do not correspond to those required for a specific job, the more they are inclined to embellish their answers to solve the discrepancy, "boost their characteristics in the right direction." For example: *"Well, if you're aware that your traits don't meet the requirements, you will try to make it appear as they do", "candidates who feel they are not adequate for the job will fake more".* If, however, they believe that their characteristics are in accordance with the requirements of the employer, they don't feel the need to fake their responses, but are also more self-confident and realistic.

Differences in the ability to fake were mostly attributed to intelligence, and those individuals who are not successful in faking were characterized as less intelligent or even naive. In addition, it can be concluded that successful faking has to do with knowledge of the desirable characteristics, since it is necessary to identify desirable traits in order to respond in the right direction.

In addition to these individual determinants, interviews included also morality and religiosity, which showed no relevance to the motivation for faking. Participants agreed that faking is not a behaviour that is determined by morality or individual religiosity.

Discussion

The aim of this study was to examine which are the contextual factors and individual characteristics of candidates potentially predictive for motivation for faking responses to personality questionnaires in selection situations. Because the research area of determinants of faking has so far been insufficiently explored, in order to gain a deeper insight into how candidates approach answering personality questionnaires in selection situations, this study used qualitative research methodology to collect and process data.

In the first research question, we were interested in how candidates perceive faking on personality measures and its prevalence in selection situations. The results show that highly educated young people believe that the answers to personality questionnaires can be faked, and that most of the candidates fake their answers in selection situations. Moreover, they themselves state that embellishment of responses in selection situations is actually adaptive behaviour, and is associated with "common sense" as a means to an end. Marcus (2009) called this behaviour self-presentation, and defined it as legitimate attempts by candidates to adapt their image to the demands of attractive employers. He also stated that faking is implicitly or explicitly defined as morally unacceptable behaviour that has negative consequences on the process of professional selection, while self-presentation does not imply evaluative assumptions about the ethics of behaviour or desirability of the outcome. This view on faking seems to be accepted by participants in this study, who mentioned that faking has nothing to do with the moral set of people, and is therefore not seen as morally unacceptable behaviour. In addition, this finding would be in line with the view that faking is actually introducing construct-relevant variance into responses, i.e., faking is an ability itself that is related to achievement. In their recent study, Geiger et al. (2021) found that faking ability was correlated meaningfully with other socio-emotional abilities.

The finding that people are inclined to fake responses to personality questionnaires whether in selection, clinical or any other context is continuously confirmed in studies through different cultures and different sample structures (e.g. Cofer et al., 1949; Griffith et al., 2007; Robie et al., 2007; Viswesvaran & Ones, 1999). The finding that between 40% and 90% of candidates fake their answers can be compared to the findings of previous research which tried to empirically determine the percentage of candidates who fake. Their average estimates ranged around 30% (Griffith & Converse, 2011). The discrepancy between the estimates of participants who fake in this study and the data obtained by empirical research may be explained by differences in the operationalization of faking. For example, to determine which extent of response distortion could be considered faking, in their study on faking including "honest" and selection testing situation, Griffith et al. (2006) took a criterion that faking is a response distortion in selection situation, which exceeds the standard measurement error interval of the "honest" results in the non-selection situation. In this study, the candidates characterized any embellishment, however subtle, as faking. Accordingly, although the motivation for faking is somewhat different in different contexts, most of it comes down to managing the image of yourself and attempting to appear better than you really are (Villanova & Bernardin, 1991). Such motivation is especially relevant in the selection context in which there is a strong need for candidates to stand out among the competition, in order to succeed in achieving their goal and ultimately getting the job. In many models of faking motivation is listed as the basic, direct determinant of faking (e.g., Ellingson & McFarland, 2011; Goffin & Boyd, 2009; McFarland & Ryan, 2000, 2006).

But what determines the motivation for faking? Results of this study show that the motivation for faking is conditioned by individual and situational characteristics. According to the model by McFarland and Ryan (2006), the intention to fake is primarily determined by positive attitudes toward the behaviour, subjective norms, and perceived behavioural control. Candidates in this research clearly have a relatively positive attitude toward faking, and it is seen as a socially established, expected behaviour, which is quite easy to execute. In addition, the ability to fake, along with the possibility, is an important moderator of the connection between intentions and actual behaviour. Characteristics of the questionnaire, such as transparency of items, and individual characteristics such as self-monitoring, self-awareness and cognitive skills can potentially enhance the ability to fake. It is interesting that it is precisely these qualities and characteristics that participants in this study recognized as important predictors of the ability to fake. On the other hand, the finding that the length of the questionnaire could potentially impact faking behaviour is in line with insights from a study conducted by Holden and Marjanovic (2021), which point to faking as a dynamic process which involves heterogeneous responding. In addition, according to Snell et al. (1999), candidate experience should also have impact on the ability to fake. Candidates with experience in certain jobs will identify characteristics important for the job easier than those without experience in similar jobs, and in order to successfully fake their responses, they will also be able to identify traits that are being measured by the selection test. Similar results were obtained in this study, in terms of knowledge about the desirable profile. Individuals with experience in certain jobs probably know more about the characteristics desirable for the job, which helps them embellish the responses in a successful way.

Building on the question of motivation, it is intuitively clear that the desire and/or need for work are important determinants of faking. After all, if someone does not care about getting a job, he will not be motivated to work hard to get it, and accordingly will not embellish responses. Perceived need to fake responses is therefore an important element in all models dealing with faking, although its operationalization is somewhat different in each of them. In this study the importance of the outcome of getting the job proved the most important situational determinant of faking. This finding may be explained from the standpoint of the expectancy theory, according to which the motivation of individuals increases with the importance of the outcome of their behaviour (Vroom, 1964). In addition, according to Vroom's theory, it is also important that the candidate expects that he can really get the job. In other words, if a candidate is expecting a positive

outcome, that faking can lead to getting the job, he will be more inclined to embellish his responses. This is corroborated by the results obtained for the perceived fairness of the selection process - if a candidate believes that the selection process is unfair and expects that his efforts can not affect the outcome of the process, he will not be motivated to embellish, but rather will answer honestly. Finally, the instrumentality of the behaviour is also key, that is, candidates must perceive that faking in the selection situation will indeed result in higher chances of getting the job. According to Ellingson and McFarland (2011), behaviour instrumentality, valence and outcome expectancy are the most important factors influencing motivational determinants of faking.

Current research has shown that warning the candidates that faking can be detected and will be followed by negative consequences is a relatively effective way of preventing faking (Oswald & Hough, 2011; Parmač Kovačić et al., 2014), and Goffin and Boyd (2009) included it in their general model of faking as one of the most important contextual factors that determine the motivation for faking. However, what is important is the candidate's perception of the warning, and not the warning itself. For example, a candidate may believe that it is not possible to detect faking, and a warning that faking will result in negative consequences does not discourage such individuals to still embellish their responses. This is supported by the statements of some of the participants in this study, who expressed doubts about the possibility of detecting faking and noted that warnings like these would not deter them from faking. On the other hand, if the candidates believe that faking can be detected (with or without specific warning), they will be more inclined to answer honestly. This can be related to either concerns about detecting faking when scoring personality questionnaires (König et al., 2012), or discovering faking later on, in case the candidate is employed and their performance doesn't reflect their declared personality characteristics. Most participants, however, said that a warning would reduce their faking at least to some extent, which is in line with the results of empirical research on the impact of warnings on faking (Dwight & Donovan, 2003; Pace & Borman, 2006).

The impact of the selection ratio on faking is ambiguous. Some of the participants would embellish their responses to a greater degree when the selection ratio is stricter, while the others would do it in a situation with a more lenient selection ratio. Some authors (eg, Snell et al., 1999; Pace & Borman, 2006) suggest that the need for faking should be higher when the selection ratio is strict. In such conditions, when candidates perceive to have little chance of getting the job, faking may seem to be the only strategy that can increase the chance of outdoing competitors and being employed. However, scarce empirical research has not yet confirmed this hypothesis, and the connection between the strictness of the selection ratio and the motivation of candidates for faking is yet to be determined.

When the individual characteristics of candidates that affect the motivation for faking responses are concerned, the most important seems to be the perceived deviation from the ideal profile. This factor is actually the result of the interaction of individual characteristics, values and attitudes with the elements of the situation such as the nature of work and requirements of the job for which the candidate applies. In essence, the applicants will be more inclined to fake their answers if they perceive that their individual characteristics differ substantially from the characteristics the employer requires. According to Marcus (2006) the discrepancy between self-image and perceived ideal profile affects the candidates' motivation for self-presentation, on condition that the candidate has specific information about the situation and the demands of the job. So candidates who face such discrepancy need to cut through it by faking, while candidates who already possess the characteristics important for the job do not need to embellish as much (McFarland & Ryan, 2000).

In addition, it appears that individual characteristics play an important role when it comes to the ability to successfully fake responses, which affects faking regardless of motivation. To be able to successfully display themselves as the right person for the job, candidates must correctly identify which qualities employers are looking for. Some of them are universal, necessary for each job, such as dedication, hard work,

responsibility, honesty, while others are specific to certain activities, such as creativity, teamwork and presentation skills. It seems that success in faking depends mostly on intellectual abilities, resourcefulness and moderation, and already mentioned knowledge about the desirable profile. According to Snell et al. (1999), cognitive and emotional intelligence are individual determinants that increase the ability to fake responses.

When interpreting the findings of this study, some of its limitations need to be considered. The research was, in accordance with the requirements of qualitative methodology, conducted on a small deliberate sample of highly educated people who have had recent experience in dealing with personality questionnaires in selection situations. The aim was to get information from individuals similar to those that usually participate in psychological testing for job selection, including filling out personality questionnaires - educated young people who are just entering the labour market and whose job performance cannot be predicted on the basis of their previous experience. In addition, highly educated candidates are suitable participants in this type of research that requires deep thinking about their own behaviour. It should be taken into account that this sample is not representative of the population of people filling in personality questionnaires for selection purposes, and the possibility of generalizing the results to the entire population of candidates is limited. Also, when comparing its results with the results of previous research, it should be remembered that this is one of the few studies conducted in Croatia.

Also, with respect to the applied qualitative methodology, we cannot make definite conclusions about the existence of causal relationships or the real connection between motivation for faking responses and mentioned individual and contextual factors. It should also be noted that participants often do not know which personality questionnaire they were taking (or even if they were indeed taking one) and how successful their faking behaviour has been, which brings to question the reliability of their self-reports and the conclusions drawn from them. However, given the lack of theoretical and empirical studies of motivation for faking, it continues to be necessary to reach a larger quantity of information directly from the candidates who go through the selection process, to provide a deeper insight into the determinants of response faking from their perspective. Due to this, the use of qualitative methodology is the major contribution of this study. The results obtained by qualitative methods serve as an excellent source of hypotheses and basis for future empirical research. More specifically, this survey revealed some determinants that have not been included in other models, such as the length of the questionnaire, while some other determinants such as morality are often present in models of faking, but the candidates do not consider them relevant for motivation.

Conclusions

This research examined the general attitude toward response faking in selection situations, as well as individual and situational determinants of motivation for faking. Candidates see faking responses to personality measures as an adaptive behaviour that is often used in selection, which is not immoral, but is in a way conventional. Faking behaviour is the result of motivation that is determined by individual and situational factors, and above all their interaction. The motivation for faking is strongly increased by the need and desire to work, perceived discrepancy between one's own and the ideal profile, and the general attitude toward faking, while it is reduced by the warning that faking can be detected and will be followed by negative consequences, the length of the questionnaire and perceived fairness of the selection process.

On a practical level, the results of this study may help experts in creating a selection process. First of all, they should be prepared for a high rate of response faking by Croatian candidates, which can be further enhanced by recession, high unemployment rates and a greater need for work which proved to be one of the most powerful determinants of motivation for faking. The findings show that response faking can be reduced by a warning, creating a lengthy questionnaire and less transparent items.

References

Ajduković, M. (2007). *Metodološki pristup empirijskom istraživanju kvalitete studija na pravnom fakultetu (projektni materijal).* [Methodological approach to the empirical research on the quality of studies at the Faculty of Law of the University of Zagreb (project materials)]. University of Zagreb: Faculty of Law.

Ajzen, I. (1991). Theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211. https://doi.org/10.1016/0749-5978(91)90020-T

Barrick, M. R., Mount, M. K., & Judge, T. A. (2001). Personality and performance at the beginning of the new millennium: What do we know and where do we go next?. *International Journal of Selection and Assessment*, *9*(1-2), 9-30. https://doi.org/10.1111/1468-2389.00160

Bensch, D., Maaß, U., Greiff, S., Horstmann, K. T., & Ziegler, M. (2019). The nature of faking: A homogeneous and predictable construct? *Psychological Assessment*, *31*(4), 532. https://doi.org/10.1037/pas0000619

Birkeland, S. A., Manson, T. M., Kisamore, J. L., Brannick, M. T., & Smith, M. A. (2006). A meta-analytic investigation of job applicant faking on personality measures. *International Journal of Selection and Assessment, 14*(4), 317-335. https://doi.org/10.1111/j.1468-2389.2006.00354.x

Cofer, C. N., Chance, J., & Judson, A. J. (1949). A study of malingering on the Minnesota Multiphasic Personality Inventory. *The Journal of Psychology*, *27*(2), 491-499. https://doi.org/10.1080/00223980.1949.9917439

Costa, P. T., & McCrae, R. R. (1987). Validation of the Five-Factor Model of Personality Across Instruments and Observers. *Journal of Personality and Social Psychology, 52*(1), 81-90. https://doi.org/10.1037/0022-3514.52.1.81

Dilchert, S., Ones, D. S., Viswesvaran, C., & Deller, J. (2006). Response distortion in personality measurement: born to deceive, yet capable of providing valid self-assessments? *Psychology Science*, *48*(3), 209.

Dwight, S. A., & Donovan, J. J. (2003). Do warnings not to fake reduce faking? *Human Performance, 16*, 1-23. https://doi.org/10.1207/S15327043HUP1601_1

Ellingson, J. E., & McFarland, L. A. (2011). Understanding faking behavior through the lens of motivation: An application of VIE theory. *Human Performance*, *24*(4), 322-337. https://doi.org/10.1080/08959285.2011.597477

Furnham, A., Chamorro-Premuzic, T., & McDougall, F. (2003). Personality, cognitive ability, and beliefs about intelligence as predictors of academic performance. *Learning and Individual Differences*, *14*(1), 47-64. https://doi.org/10.1016/j.lindif.2003.08.002

Geiger, M., Bärwaldt, R., & Wilhelm, O. (2021). The Good, the Bad, and the Clever: Faking Ability as a Socio-Emotional Ability? *Journal of Intelligence*, *9*(1), 13. https://doi.org/10.3390/jintelligence9010013

Geiger, M., Olderbak, S., Sauter, R., & Wilhelm, O. (2018). The "g" in faking: Doublethink the validity of personality self-report measures for applicant selection. *Frontiers in Psychology, 9*, 2153. https://doi.org/10.3389/fpsyg.2018.02153

Goffin, R. D. & Boyd, A. C. (2009). Faking and Personality Assessment in Personnel Selection: Advancing Models of Faking. *Canadian Psychology, 50*(3), 151-160. https://doi.org/10.1037/a0015946

Griffith, R. L., Chmielowski, T., & Yoshita, Y. (2007). Do applicants fake? An examination of the frequency of applicant faking behavior. *Personnel Review, 36*(3), 341-355. https://doi.org/10.1108/00483480710731310

Griffith, R. L., & Converse, P. D. (2011). The rules of evidence and the prevalence of applicant faking. In M. Ziegler, C. MacCann, & R. D. Roberts (Eds.), *New perspectives on faking in personality assessment* (pp. 34–52). Oxford University Press.

Griffith, R. L., Malm, T., English, A., Yoshita, Y., & Gujar, A. (2006). Applicant faking behavior: Teasing apart the influence of situational variance, cognitive biases, and individual differences. In R. L. Griffith, & M. H. Peterson (Eds.), *A closer examination of applicant faking behavior* (pp. 151-178). IAP.

Hendy, N., Krammer, G., Schermer, J. A., & Biderman, M. D. (2021). Using bifactor models to identify faking on Big Five questionnaires. *International Journal of Selection and Assessment*, *29*(1), 81-99. https://doi.org/10.1111/ijsa.12316

Holden, R. R., & Marjanovic, Z. (2021). Faking on a self-report personality inventory: Indiscriminate, discriminate, or hyper-discriminate responding? *Personality and Individual Differences, 169*, 109768. https://doi.org/10.1016/j.paid.2019.109768

Jerneić, Ž., Galić, Z., Parmač Kovačić, M., Tonković, M., Prevendar, T., Bogdanić, A., Brozičević, M., Bučar, M., Ćatipović, A., Đaković, I., Gospodnetić, F., Hrebac, M., Jakovina, A., Jelovica, V., Knezović, A., Lovrić, A., Löw, A., Paić-Antunović, J., Pavković, I., Petretić, M., Rajić-Stojanović, I., Salkičević, S., Sekulić, S., Taslak, M., Terzin-Laub, N., Tomiša, T., Ugarković, M., Vračević, T., & Zlatar, A. (2010). *Ličnost i radno ponašanje: priroda i mjerenje socijalno poželjnog odgovaranja. [Personality and work behaviour: nature and assessment of socially desirable responding].* FF Press.

Klehe, U. C., Kleinmann, M., Hartstein, T., Melchers, K. G., König, C. J., Heslin, P. A., & Lievens, F. (2012). Responding to personality tests in a selection context: The role of the ability to identify criteria and the ideal-employee factor. *Human Performance, 25*(4), 273-302. https://doi.org/10.1080/08959285.2012.703733

König, C., Melchers, K., Kleinmann, M., Richter, G., & Klehe, U. (2006). The ability to identify evaluation criteria and social desirability as factors influencing responses in an integrity test. *Psychological Science*, *48*.

König, C. J., Merz, A. S., & Trauffer, N. (2012). What is in applicants' minds when they fill out a personality test? Insights from a qualitative study. *International Journal of Selection and Assessment, 20*(4), 442-452. https://doi.org/10.1111/ijsa.12007

Krammer, G. (2020). Applicant faking of personality inventories in college admission: Applicants' shift from honest responses is unsystematic and related to the perceived relevance for the profession. *Journal of Personality Assessment*, *102*(6), 758-769. https://doi.org/10.1080/00223891.2019.1644342

Krammer, G., Sommer, M., & Arendasy, M. E. (2017). The psychometric costs of applicants' faking: Examining measurement invariance and retest correlations across response conditions. *Journal of Personality Assessment*, *99*(5), 510-523. https://doi.org/10.1080/00223891.2017.1285781

Marcus, B. (2009). „Faking" from the Applicant's Perspective: A theory of self-presentation in personnel selection settings. *International Journal of Selection and Assessment, 17*(4), 417-430. https://doi.org/10.1111/j.1468-2389.2009.00483.x

McFarland, L. A., & Ryan, A. M. (2000). Variance in faking across noncognitive measures. *Journal of Applied Psychology*, *85*(5), 812-821. https://doi.org/10.1037/0021-9010.85.5.812

McFarland, L. A. & Ryan, A. M. (2006). Toward an integrated model of applicant faking behavior. *Journal of Applied Social Psychology, 36*(4), 979-1016. https://doi.org/10.1111/j.0021-9029.2006.00052.x

Milas, G. (2005). *Istraživačke metode u psihologiji i drugim društvenim znanostima. [Research methods in psychology and other social sciences*]. Naklada Slap.

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Sage.

Morgeson, F. P., Campion, M. A., Dipboye, R. L., Hollenbeck, J. R., Murphy, K., & Schmitt, N. (2007). Reconsidering the use of personality tests in personnel selection contexts. *Personnel Psychology*, *60*(3), 683-729. https://doi.org/10.1111/j.1744-6570.2007.00089.x

Ones, D. S., Dilchert, S., Viswesvaran, C., & Judge, T. A. (2007). In support of personality assessment in organizational settings. *Personnel psychology*, *60*(4), 995-1027. https://doi.org/10.1111/j.1744-6570.2007.00099.x

Oswald, F. L. & Hough, L. M. (2011). Personality and its assessment in organizations: Theoretical and empirical developments. In Zedeck, S. (Ed.), *APA handbook of industrial and organizational psychology, Vol 2: Selecting and developing members for the organization,* (pp. 153-184). American Psychological Association.

Pace, V. L., & Borman, W. C. (2006). The use of warnings to discourage faking on noncognitive inventories. In R. L.

Griffith & M. H. Peterson (Eds.), *A closer examination of applicant faking behavior* (pp. 283-304). CT: IAP.

Parmač Kovačić, M., Galić, Z., & Andreis, L. (2014). Upozorenje o lažiranju odgovora u upitniku ličnosti: Jesu li upozoreni ispitanici iskreniji? [Warning against faking on personality questionnaire: Are warned participants more honest?]. *Suvremena psihologija*, *17*(1), 35-52.

Proroković, A., Slišković, A., & Bumbak, I. (2008). Osobine ličnosti i socijalna poželjnost u selekcijskoj situaciji [Personality traits and social desirability in selection situation]. *Društvena istraživanja, 17*(6 (98)), 1157-1177.

Robie, C., Brown, D. J., & Beaty, J. C. (2007). Do people fake on personality inventories? A verbal protocol analysis. *Journal of Business and Psychology*, *21*(4), 489-509. https://doi.org/10.1007/s10869-007-9038-9

Rothstein, M. G., & Goffin, R. D. (2006). The use of personality measures in personnel selection: What does current research support? *Human Resource Management Review, 16*(2), 155-180. https://doi.org/10.1016/j.hrmr.2006.03.004

Schilling, M. (2019). *Enhancing the knowledge about faking: ability, motivation, and beyond* (Doctoral dissertation). Saarländische Universitäts-und Landesbibliothek.

Schmidt, F. L., & Hunter, J. E. (1998). The Validity and Utility of Selection Methods in Personnel Psychology: Practical and Theoretical Implications of 85 Years of Research Findings. *Psychological Bulletin, 124*, 262-274. https://doi.org/10.1037/0033-2909.124.2.262

Snell, A. F., Sydell, E. J., & Lueke, S. B. (1999). Towards a theory of applicant faking: Integrating studies of deception. *Human Resource Management Review, 9*(2), 219-242. https://doi.org/10.1016/S1053-4822(99)00019-4

Šverko, B. (2003). Novije spoznaje o valjanosti selekcijskih metoda: od doktrine o situacijskoj specifičnosti do postavke o generalizaciji valjanosti. [New insights about the validity of selection methods: from the doctrine of situational specificity to the premise of generalization of validity]. *Suvremena psihologija, 6*(2), 293-313.

Šverko, B. (2012). *Ljudski potencijali: Usmjeravanje, odabir i osposobljavanje. [Human resources: Orientation, selection and training].* Hrvatska sveučilišna naklada.

Tong, A., Sainsbury, P., & Craig, J. (2007). Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *International Journal for Quality in Health Care, 19*(6), 349-357. https://doi.org/10.1093/intqhc/mzm042

Tonković Grabovac, M. (2013). Historical Overview of Conceptualizations of Socially Desirable Responding in Personality Questionnaires. *Društvena istraživanja*, *22*(3), 413-434. https://doi.org/10.5559/di.22.3.02

Tonković Grabovac, M., Jerneić, Ž., & Galić, Z. (2012). The effects of faking on the construct validity of personality questionnaires: A direct faking measure approach. *Psihologijske teme, 21*(3), 455-472.

Villanova, P., & Bernardin, H. J. (1991). Performance appraisal: The means, motive, and opportunity to manage impressions. In Giacalone, R. A., & Rosenfeld, P. (Eds.), *Applied impression management: How image-making affects managerial decision*, (pp. 81-96). Sage.

Viswesvaran, C. & Ones, D. S. (1999). Meta-analyses of fakability estimates: Implications for personality measurement. *Educational and Psychological Measurement*, *59*(2), 197-210. https://doi.org/10.1177/00131649921969802

Vroom, V. H. (1964). *Work and motivation.* Wiley.

Zickar, M. J., Gibby, R. E., & Robie, C. (2004). Uncovering faking samples in applicant, incumbent, and experimental data sets: An application of mixed-model item response theory. *Organizational Research Methods*, *7*(2), 168-190. https://doi.org/10.1177/1094428104263674

Table 1
Detailed description of study participants (N=8)

ID	Gender	Age	Education	Work status	Occupation	Experience with personality questionnaires	Interview duration (minutes)
1	F	27	Master level	Unemployed	Journalist	- Once, selection purposes	31
2	M	28	Master level	Employed, permanent contract with probationary period	Electrical engineer	- Three times, selection purposes - Once as part of army recruitment procedure	43
3	M	28	Master level	Employed, fixed-term contract	Economist	- Twice, selection purposes - Once as part of army recruitment procedure	29
4	M	25	Master level	Employed, permanent contract	Computer engineer	- Twice, selection purposes - Once as part of army recruitment procedure	34
5	F	26	Master level	Unemployed	Chemical technology engineer	- Once, selection purposes	23
6	F	27	Bachelor level	Employed, permanent contract	Economist	- Three times, selection purposes - Once for research purposes	24
7	F	34	Master level	Self-employed	German language teacher and linguist	- Twice, selection purposes	34
8	M	23	Bachelor level	Freelancer	Economist	- Twice, selection purposes	22

Interview guide

Before we begin, I would like to note that participation in this study is completely voluntary and that, if you wish, you can decide not to participate at any time. The data gathered through this study will be used solely for research purposes. Your answers will be confidential and anonymous. If you don't mind, I would like to record this conversation so I do not have to take notes during the interview.

Today I will ask you about your experience and opinions related to responding to personality questionnaires in selection situations. "Personality questionnaires" are questionnaires that contain questions about attitudes, feelings, and typical ways of responding that you answer with "yes" and "no," or some answer on a multi-level scale. An example is the statement "*I finish everything I start*", for which you need to express your agreement on a five-point scale from 1 (does not apply to me at all) to 5 (fully applies to me).

EXPERIENCE WITH PERSONALITY QUESTIONNAIRES

Do you have experience in answering such questionnaires? In what situations? Approximately how many times? What is your opinion about such questionnaires and the questions they contain? What is the purpose of applying such questionnaires? What do they measure?

THE PROCESS OF RESPONDING AND FAKING

How do you approach responding to such questionnaires? For example, what is your thought process when you read the statement "*I finish everything I start*"? What does your response to that statement depend on? If you were to answer the questionnaire anonymously and were sure that no one but you could see the results, would you answer differently? What determines whether you will fake your answer on a statement or not? What does faking mean to you? What qualities would you fake? What traits do employers consider important? Are there universally "correct" answers or do they depend on the workplace?

SITUATIONAL CHARACTERISTICS

In what situations / under which circumstances would you fake your answers on personality questionnaires? In what situations / under which circumstances would you not? How would you behave in a situation when you really need or really want a job? How much would your faking behaviour depend on the situation in the labour market? How much would your faking behaviour depend on how much other candidates fake? How much would your faking behaviour depend on the fairness of the selection process? What aspects of injustice would motivate you to fake? How does your mood and health affect your faking behaviour? In which direction? What do you think is the relationship between the amount of questions in the questionnaire and faking behaviour?

SELECTION RATIO

Are you more likely to fake some of the responses if your chance of getting the job is 20% or 80%? How about 50%? Please explain your answer. Would you rather fake when the job is "at arm's length" or when "you have nothing to lose"? Would you rather fake in a selection process in which 1 out of 10 candidates is selected, or in a process where 10 out of 100 candidates are selected? What do you think is the relationship between that (selection) ratio and the degree of faking?

NUMBER OF OPEN POSITIONS

Are you more likely to fake some of the responses if only one candidate is accepted, if several candidates are accepted (2-3), or if many candidates are accepted (10 and more)? In what situation would you most likely fake? Please explain your answer. Would it matter to you how many candidates applied? What do you think

is the relationship between the number of open positions and the degree of faking? In your opinion, is faking more determined by the number of open positions or the selection ratio?

WARNING

How would a warning that faking can be detected affect your motivation to fake? What do you think, can it be detected and how? How would your motivation to fake be affected by the warning that faking, if discovered, will have negative consequences? What would be the negative consequences that would deter you from faking in the selection situation?

PERCEIVED ABILITY TO FAKE

What do you think, is it even possible to successfully fake your answers to a personality questionnaire? If you wanted to, do you think you would be successful in faking? What sets you apart from people who are more successful in faking than you? And what sets you apart from those who are less successful?

OWN DEGREE OF FAKING

Compared to other people, would you say that you are more or less inclined to fake? If (on a scale of 1 to 10) 1 means you never fake and 10 means you always fake your answers in selection situations, how would you rate yourself?

PERSONAL CHARACTERISTICS (PERSONALITY)

What distinguishes you from those who fake more than you? What distinguishes you from those who fake less than you? What are these people like as persons?

MORAL REASONING

What is the moral structure of the people who fake, and what is the moral structure of those who do not fake? What do you think is the connection between faking and moral reasoning? Is faking related to (non) religiosity?

SUBJECTIVE NORMS AND ATTITUDE TOWARDS FAKING

What percentage of people, in your opinion, fakes their answers to the personality questionnaire? Finally, what is your general view on faking on personality questionnaires? Is it desirable or undesirable behaviour? Useful or useless?

If you think there are some other important factors that enhance / discourage faking behaviour, feel free to add them now.

Original research

9

Bad luck comes in (contradictory) pairs: Cognitive style and superstitious beliefs as correlates of doublethink

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Abstract

People tend to concurrently endorse mutually incompatible beliefs, a tendency we have labeled doublethink. In previous studies, we have shown that it is related to both rational (negatively) and intuitive (positively) thinking styles. We have also previously demonstrated that those who are more prone to doublethink are also more prone to conspiratorial beliefs. Thus the aim of the current study was to further examine doublethink's relations to cognitive styles and irrational beliefs. We hypothesized that those who are more prone to doublethink will also endorse more superstitious beliefs; have a lower need for cognition, and lower ability to suppress intuitive responses. A total of 74 participants filled in the Doublethink, Superstition, and the Need for cognition scales, and the verbal Cognitive Reflection Test (CRT). Results show that proneness to doublethink is positively related to superstition, and negatively related to need for cognition. There was no significant correlation with the CRT measure, which could be due to a ceiling effect. Overall, the results offer further support that doublethink is a distinct construct that can be viewed as a thinking style that accommodates inconsistencies more easily, which is why it is favored by those who are more prone to irrational beliefs.

Key words: doublethink, belief inconsistency, superstition, need for cognition, cognitive reflection test

Introduction

If someone claims at one point that, for example, everyone is capable of growth and change, but then that same person is also adamant about some people being clearly irreparable, they are endorsing two logically opposed beliefs. These everyday occurrences of people simultaneously expressing mutually incompatible beliefs seem to be frequent, despite our implicit assumptions about consistency in our own belief system. This tendency to tolerate inconsistencies in one's beliefs can be labeled as doublethink (Irwin et al., 2015b), by borrowing from Orwell, but it has been previously discussed as belief inconsistency (Irwin et al., 2015a) or cognitive polyphasia (Jovchelovitch, 2008) as well.

Individual differences in proneness to accept contradictory beliefs have been documented previously. This proneness can be viewed either as a lack of metacognitive ability to detect inconsistencies or as a high entropy thinking style that allows inconsistent beliefs to assimilate more easily within our belief system (Petrović & Žeželj, in press). However, this notion that people can easily tolerate inconsistencies stands in contrast with a large body of work that suggests the opposite, that people feel discomfort when faced with incompatible cognitions, and even actively try to change one of the dissonant cognitions in order to alleviate the negative affect (Festinger, 1957; Heider, 1946). Thus it seems that the goal of cognitive consistency might not be as universal as it was initially proposed. In addition to individual differences in preference for consistency which have been documented (Cialdini et al., 1995), it was recently suggested that inconsistent cognitions do not necessarily cause discomfort and negative feelings. Some authors argued that when a new cognition appears, it updates the expectancy of a certain outcome tied to it (Kruglanski et al., 2018). This updated expectancy can then lead to either negative or positive feelings depending on the desirability of the outcome itself. For example, a person might believe that they are bad at math, and hence expect a negative outcome of failing their math course. However, if they then take a math test and believe they did well on this recent math test, this lowers the expectancy of the negative outcome (i.e. failing math). While the belief of doing well on a math test is inconsistent with the prior belief of being bad at math, this new cognition leads to positive feelings instead of negative ones. This is why people sometimes do not feel discomfort when they are faced with inconsistent cognitions, which is why they might not be motivated and prompted to change them. Both of the cognitions can persist if they lead to higher expectancy of a desirable outcome or lower expectancy of an undesirable one. This further strengthens the idea of doublethink – for example, if both contradictory beliefs update the expectancy of an outcome in a desirable way for the person.

Despite the fact that proneness to doublethink can be positioned simply as lack of consistency within the consistency paradigm, we argue that it should be viewed as a distinct construct. In a previous study (Petrović & Žeželj, in press), we focused specifically on inconsistency. The reason is twofold. Firstly, by defining doublethink as a tolerance of inconsistent beliefs, we were able to develop a measure of proneness to doublethink that consists of pairs of mutually logically incompatible items. Constructing the measure in such a way enabled us to directly test whether a person has a tendency to endorse contradictory beliefs, without relying on their own perception and self-report measures. Secondly, conceptualizing it as a tolerance of inconsistency seems to be complementary to a certain type of worldview, in a way that mere preference for consistency is not. More specifically, our previous findings suggest that, unlike preference for consistency, doublethink could be particularly predictive of a set of beliefs labeled irrational (Žeželj & Lazarević, 2019) or epistemologically suspect (Rizeq et al., 2020).

Doublethink as a correlate of irrational beliefs

Earlier research has shown that doublethink is related to different types of irrational beliefs. A study found a significant relation between paranormal beliefs (Irwin et al., 2015b) operationalized through a scale comprising traditional religious beliefs and new age beliefs, with doublethink being related only to

traditional religious beliefs. However, paranormal beliefs are a much larger category and thus further empirical validation of the relation between doublethink and paranormal beliefs is needed. Moreover, the lack of correlation between doublethink and the other type of paranormal beliefs measured in this study could be due to the shortcomings of the doublethink scale that was used.

Our previous study (Petrović & Žeželj, in press) set out to test the relation of doublethink to another set of irrational beliefs, namely conspiratorial beliefs. We have found that doublethink is moderately related to conspiratorial beliefs, regardless of how they are measured (either as a more general susceptibility to conspiratorial ideation, i.e. conspiracy mentality (Bruder et al., 2013) or as belief in specific and contradictory conspiracy theories). Previous findings attest to the fact that those who are prone to endorsement of conspiracy theories can also simultaneously believe two mutually incompatible theories about the same event, such as the notion that Princess Diana faked her death, but was also killed by the British secret services (Wood et al., 2012). Evidently inconsistent beliefs are possibly sustained because they are compatible with a higher-order belief of a large cover-up at hand, even if they are logically incompatible amongst themselves (Lukić et al., 2019; Wood et al., 2012). Doublethink can thus be a thinking style that is particularly favored by those prone to endorsing conspiracy theories and other irrational ideas.

Since irrational beliefs tend to correlate moderately with each other (e.g. Darwin et al., 2011; Lobato et al., 2014; van Elk, 2015) and form a latent structure of intercorrelated factors corresponding to different types of irrational beliefs (Rizeq et al., 2020; Šrol, 2020), it is possible that doublethink is not only predictive of conspiratorial beliefs, but other irrational beliefs as well. Particularly, it could be characteristic of other types of paranormal beliefs, such as superstition. Superstition can broadly be defined as a set of irrational beliefs characterized by an incorrect perception of a causal link between certain specific behaviors or events and some unrelated outcome (Vyse, 1997). However, a precise definition of superstitious beliefs is lacking, and there is also no agreement as to what superstition conceptually entails (Lindeman & Aarnio, 2007), making it harder to empirically examine this construct. Moreover, superstitious beliefs are often lumped together with other paranormal beliefs, as in the Paranormal Belief Scale (Tobacyk, 2004). Recent studies have however shown that epistemologically suspect beliefs (i.e. paranormal, conspiracy and anti-science beliefs) are best described by a three factor hierarchical structure, where paranormal beliefs form one general higher-order factor, and four specific ones, including superstition (Rizeq et al, 2020). Thus, superstition has its own unique qualities. Lindeman and Aarnio (2007) suggest that superstition entails a violation of core knowledge of physical, psychological and biological entities, where these categories and the processes related to them fuse together. This means that those who are prone to superstition tend to unjustifiably attribute mental processes to physical objects and vice versa. Superstition can also be considered a syndrome of different forms of beliefs and behaviors – it encompasses both beliefs about negative and positive outcomes of certain events that range in specificity, as well as protective behaviors (Žeželj et al., 2009). These beliefs and behaviors are often inconsistent with known laws of nature or scientific facts (Vyse, 1997), and this overlook of clear inconsistencies might be supported by high proneness to doublethink.

Doublethink and other modes of superficial information processing

We argued that doublethink could be viewed as a particular form of high-entropy thinking style that easily accommodates inconsistent beliefs. As such, it should be related to more broad thinking styles, such as the rational and experiential thinking styles (Epstein, 1994). These two styles represent two modes of information processing – one that consists of implicit beliefs and is governed by associative learning processes, with fast, automatic and intuitive processing of information, and the other which is more deliberate and based on logic and consideration of evidence (Epstein, 2014). Our previous study has shown that doublethink is negatively related to rational thinking style, but positively to experiential thinking style, which

means that it is favored by those who prefer to rely on rapid, gut-feeling decision making instead of careful deliberation. Based on these previous findings, we also expect it to be related to other similar constructs, such as low need for cognition (Cacioppo & Petty, 1982) or low cognitive reflection (Frederick, 2005). Need for cognition (Cacioppo et al., 1984) assesses a person's enjoyment of engaging in effortful cognitive activities, while cognitive reflection refers to a person's ability to suppress incorrect intuitive answers to relatively easy cognitive tasks that elicit such intuitive answers (Frederick, 2005). Both of these tendencies should imply a lower proneness to doublethink.

Aims and hypotheses

Combining two previous lines of research (that on irrational beliefs and that on styles of thinking), it has been shown that paranormal beliefs are primarily related to a preference for intuitive information processing (Aarnio & Lindeman, 2005), but that they also relate negatively to need for cognition (Lobato et al., 2014), cognitive reflection (Pennycook et al., 2012) and rational thinking style (Aarnio & Lindeman, 2005). Superstitious beliefs show the same pattern – they relate positively to intuitive thinking style (Epstein et al., 1996; Lindeman & Aarnio, 2007) and it has also been demonstrated that those higher on rational thinking endorse less superstitious beliefs (Lindeman & Aarnio, 2007).

Taking all of the above into account, we wanted to further establish the distinctiveness of doublethink as a construct, and to see how it relates to other irrational beliefs and measures of thinking style. To this end, we ran a pilot study to test whether doublethink is related to superstitious beliefs on one hand, and to measures of need for cognition and cognitive reflection on the other. We hypothesized that doublethink would be positively related to superstitious beliefs, but negatively to need for cognition and cognitive reflection.

Material and methods

Participants

The sample consisted of 74 third-year psychology students (83.8% female; Mage = 21.4, SDage = 1.18), who completed the measures as part of a bigger battery, in exchange for course credits. Given the small sample size, we ran a sensitivity power analysis using G*Power 3.1 (Faul et al., 2009) to check the effect size we could detect. With the power set at 80% and alpha at $\alpha = .05$, the minimum correlation that we could reliably detect with this sample size is $r = .32$.

Measures

Proneness to doublethink (Petrović & Žeželj, in press) was assessed using the Proneness to doublethink scale. The scale measures a person's tendency to concurrently accept mutually incompatible beliefs. It consists of 11 pairs of contradictory items (e.g. *Some people are essentially irreparable* vs *Every single person is capable of growth and change*). The content of the scale is diverse, and ranges from attitudes on health, parenting, and voting behavior to broader beliefs about human nature. Participants indicate their agreement with the items on a 4-point scale, to avoid the possibility of a neutral answer. Answers are subsequently re-coded into either a 0 (disagree) or a 1 (agree). If a person agrees with both statements in the pair, they are assigned a score of 1 on the pair, otherwise they receive a 0. The final score is calculated by counting the number of pairs where a person agreed with both statements. The score then ranges from 0 to

11. The scale's reliability was assessed using the Greatest Lower Bound measure given the very skewed distributions on the items (Trizano-Hermosilla & Alvarado, 2016). The reliability was satisfactory (*GLB* = 0.78).

The Superstition Scale (Žeželj et al., 2009) measures the tendency toward superstitious beliefs and behaviors and consists of 20 items (e.g. *I never walk underneath a ladder, even if I have to travel a longer distance.*), seven of which are reversely coded. The answers are given on a 1 (*completely disagree*) to 7 (*completely agree*) point scale. The final score is calculated by taking the mean of all items after re-coding. The reliability of the scale was good α = .81.

The Need for cognition scale (Cacioppo et al., 1984) measures a person's preference for engaging in cognitively effortful activities and consists of a total of 18 items (e.g. *I prefer complex to simple problems*). Half of the items are inversely coded. Participants indicate how characteristic the statement is for them on a scale ranging from 1 (*completely uncharacteristic of me*) to 5 (*completely characteristic of me*). The reliability of the scale was very good α = .91, which allowed us to calculate a single score by taking the mean of all items after re-coding the inverse ones.

The verbal cognitive reflection test (Sirota et al., 2020) measures cognitive reflection with items that are less saturated with mathematical ability and are less familiar, as opposed to those in the original cognitive reflection test (Frederick, 2005). The test consists of 10 open-ended items (e.g. *How many of each animal did Moses put on the ark?*) that have a wrong intuitive answer and a correct reflective one. Participants' answers are coded so that reflective answers receive a 1, otherwise they score a 0. The score is then calculated as a sum of correct responses on all 10 items, where higher scores indicate higher cognitive reflection. The reliability of the whole test was α = .81.

Results

Table 1 details means, standard deviations, as well as distribution properties of all used scales. As Table 1 shows, the participants endorsed on average close to 3 pairs of contradictory beliefs. While the scale's range does not fully cover the highest scores, the distribution does not deviate from the normal distribution (as shown by the standardized Skewness and Kurtosis). This means that the scale is discriminative and manages to capture variability in individual differences in proneness to doublethink.

Table 1
Ranges, means, standard deviations and standardized skewness and kurtosis statistics for all measures

	Min	*Max*	*Mean*	*SD*	zSk	zKu
Doublethink	0.00	8.00	2.89	1.94	1.30	-1.06
Superstition	1.00	4.35	2.27	0.80	2.17*	-0.24
NFC	2.11	4.78	3.61	0.62	-0.43	-0.79
CRT	0.00	10.00	7.45	2.53	-3.74**	0.62

Note. NFC - Need for Cognition; CRT - Cognitive Reflection Test; * $p < .05$; ** $p < .01$

Superstitious beliefs were not as present in the sample, and this reflected in the distribution, which was positively skewed. Conversely, the cognitive reflection test showed that the participants on average gave around 7 reflective answers, leading to a negatively skewed distribution. Both of these deviations from the normal distribution can be attributed to the fact that the sample size consisted only of psychology students that tend to achieve higher on cognitive tasks, but lower on irrational beliefs. All variables that violated the normal distribution assumption were normalized prior to conducting the rest of the analyses using a rank-

based Rankit transformation (Solomon & Sawilovsky, 2009).

To test our hypotheses, we calculated Pearson's correlations between all scales (Table 2).

Table 2
Intercorrelations of all constructs

	1	2	3
1. Doublethink			
2. Superstition	.28*		
3. NFC	-.31**	-.31**	
4. CRT	-.12	-.23†	.16

Note. NFC - Need for Cognition; CRT - Cognitive Reflection Test; * $p < .05$; ** $p < .01$; † marginally significant - $p = .046$

Doublethink related positively to superstitious beliefs and behaviors, and negatively to need for cognition, in line with our expectations. However, it did not correlate significantly with cognitive reflection, which was not related to need for cognition either. This lack of correlations with cognitive reflection might be due to a strong ceiling effect on this variable, where almost 60% of the sample had a score of 8 or above (on a scale of 0 to 10), and the most frequent score was the highest possible one. Finally, as expected, proneness to superstitious beliefs and behaviors was also negatively related to both need for cognition and the cognitive reflection test, albeit the latter correlation was only marginally significant.

Discussion

The results of the study were mostly in line with our expectations. We set out to preliminarily inspect relations between doublethink, superstitious beliefs and thinking style. Firstly, doublethink was negatively related to the need for cognition. This is in line with our previous findings showing that higher proneness to doublethink is related to lower preference for the rational thinking style, but also higher preference for the intuitive thinking style (Petrović & Žeželj, in press). This further supports the notion of doublethink being akin to a thinking style that accommodates inconsistencies more easily than other modes of information processing. Doublethink, however, related only moderately to need for cognition, so it cannot be reduced to it. It is possible that reliance on rapid, impulsive processing leads to contradictory beliefs arising without a person experiencing dissonance, and that doublethink is a more specific type of thinking style that then acts as a mechanism that sustains contradictions within the belief system.

Irrational belief systems seem to be especially riddled with such contradictions, leading us to conclude that people that endorse irrational beliefs might be particularly prone to tolerating contradictions in their beliefs. Our second finding confirms this and is in line with our previous findings of links between doublethink and belief in conspiracy theories – those who are more prone to superstitious beliefs and behaviors also tend to be more prone to doublethink. Similar to the conspiratorial belief system (eg. Lewandowsky et al., 2018), superstitious beliefs are often contradictory (e.g. astrology sign profiles often include traits and recommendations that directly contradict each other). Doublethink might facilitate and strengthen these type of beliefs because it allows a person to tolerate clear contradictions in their environment – it is possible to imagine a number of examples where superstitions prove to be clearly unfounded (for example, a person can break a mirror and not experience seven years of sorrow) and yet these beliefs persist in spite of evidence to the contrary. Conversely, it is also possible that this tendency to support contradictory beliefs might make a person more susceptible to establishing unsound beliefs such as superstitions.

Future studies could further explore whether all types of irrational beliefs are characterized by inconsistent thinking, by examining the link between doublethink and other irrational beliefs, such as, for example, other modes of paranormal beliefs (Tobacyk, 2004) or science scepticism (Rutjens et al., 2021). Additionally, these relations of different types of epistemically suspect beliefs and doublethink could also be tested within a single design to explore which type of irrational belief is most strongly predicted by the global tendency to endorse contradictions. This could also help in designing interventions for tackling irrational beliefs. It is possible that employing an experimental design to reduce doublethink, via an intervention that makes people focus on and search for inconsistencies, could also reduce epistemically suspect beliefs and subsequently even their consequences.

Conclusions

It is important to stress that this study was conducted on a small sample, which is why we were limited to only interpreting correlations. The effect sizes detected in this study are not robust, given they were slightly smaller than the minimum our sensitivity power analysis suggested. Moreover, the sample consisted of only psychology students that are typically not prone to endorsing irrational beliefs. This is why this study should be viewed as a preliminary look at the relations between doublethink and superstition – future studies should look to replicate these results on larger and more diverse samples. Despite the limitations, these findings add to previous research by offering further support that doublethink is a distinct construct and that it seems to be particularly favored by those who endorse irrational beliefs. Doublethink could be a mechanism that allows the irrational belief system to be upheld by tolerating contradictions between particular beliefs, while still remaining seemingly stable overall.

References

Aarnio, K., & Lindeman, M. (2005). Paranormal beliefs, education, and thinking styles. *Personality and Individual Differences*, *39*(7), 1227–1236. https://doi.org/10.1016/j.paid.2005.04.009

Bruder, M., Haffke, P., Neave, N., Nouripanah, N., & Imhoff, R. (2013). Measuring Individual Differences in Generic Beliefs in Conspiracy Theories Across Cultures: Conspiracy Mentality Questionnaire. *Frontiers in Psychology*, *4*. https://doi.org/10.3389/fpsyg.2013.00225

Cacioppo, J. T., Petty, R. E., & Feng Kao, C. (1984). The Efficient Assessment of Need for Cognition. *Journal of Personality Assessment*, *48*(3), 306–307. https://doi.org/10.1207/s15327752jpa4803_13

Cacioppo, J. T., & Petty, R. E. (1982). The Need for Cognition. *Journal of Personality and Social Psychology*, *42*(1), 116–131.

Cialdini, R. B., Trost, M. R., & Newsom, J. T. (1995). Preference for consistency: The development of a valid measure and the discovery of surprising behavioral implications. *Journal of Personality and Social Psychology*, *69*(2), 318–328. https://doi.org/10.1037/0022-3514.69.2.318

Darwin, H., Neave, N., & Holmes, J. (2011). Belief in conspiracy theories. The role of paranormal belief, paranoid ideation and schizotypy. *Personality and Individual Differences*, *50*(8), 1289–1293. https://doi.org/10.1016/j.paid.2011.02.027

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, *49*(8), 709–724. https://doi.org/10.1037/0003-066X.49.8.709

Epstein, S. (2014). *Cognitive-experiential theory: An integrative theory of personality*. Oxford University Press.

Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of Personality and Social Psychology*, *71*(2), 390–405. https://doi.org/10.1037/0022-3514.71.2.390

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149–1160. https://doi.org/10.3758/BRM.41.4.1149

Festinger, L. (1957). *A theory of cognitive dissonance.* Stanford University Press.

Frederick, S. (2005). Cognitive Reflection and Decision Making. *Journal of Economic Perspectives*, *19*(4), 25–42. https://doi.org/10.1257/089533005775196732

Heider, F. (1946). Attitudes and Cognitive Organization. *The Journal of Psychology*, *21*(1), 107–112. https://doi.org/10.1080/00223980.1946.9917275

Irwin, H. J., Dagnall, N., & Drinkwater, K. (2015a). Belief Inconsistency in Conspiracy Theorists. *Comprehensive Psychology*, *4*. https://doi.org/10.2466/17.CP.4.19

Irwin, H. J., Drinkwater, K., & Dagnall, N. (2015b). The role of doublethink and other coping processes in paranormal and related beliefs. *Journal of the Society for Psychical Research*, *79*(2), 80–97.

Jovchelovitch, S. (2008). The Rehabilitation of Common Sense: Social Representations, Science and Cognitive Polyphasia. *Journal for the Theory of Social Behaviour*, *38*(4), 431–448. https://doi.org/10.1111/j.1468-5914.2008.00378.x

Kruglanski, A. W., Jasko, K., Milyavsky, M., Chernikova, M., Webber, D., Pierro, A., & di Santo, D. (2018). Cognitive Consistency Theory in Social Psychology: A Paradigm Reconsidered. *Psychological Inquiry*, *29*(2), 45–59. https://doi.org/10.1080/1047840X.2018.1480619

Lewandowsky, S., Cook, J., & Lloyd, E. (2018). The 'Alice in Wonderland' mechanics of the rejection of (climate) science: Simulating coherence by conspiracism. *Synthese*, *195*(1), 175–196. https://doi.org/10.1007/s11229-016-1198-6

Lindeman, M., & Aarnio, K. (2007). Superstitious, magical, and paranormal beliefs: An integrative model. *Journal of Research in Personality*, *41*(4), 731–744. https://doi.org/10.1016/j.jrp.2006.06.009

Lobato, E., Mendoza, J., Sims, V., & Chin, M. (2014). Examining the Relationship Between Conspiracy Theories, Paranormal Beliefs, and Pseudoscience Acceptance Among a University Population: Relationship between unwarranted beliefs. *Applied Cognitive Psychology*, *28*(5), 617–625. https://doi.org/10.1002/acp.3042

Lukić, P., Žeželj, I., & Stanković, B. (2019). How (ir)rational is it to believe in contradictory conspiracy theories? *Europe's Journal of Psychology*, *15*(1), 94–107. https://doi.org/10.5964/ejop.v15i1.1690

Pennycook, G., Cheyne, J. A., Seli, P., Koehler, D. J., & Fugelsang, J. A. (2012). Analytic cognitive style predicts religious and paranormal belief. *Cognition*, *123*(3), 335–346. https://doi.org/10.1016/j.cognition.2012.03.003

Petrović, M., & Žeželj, I. (in press). Thinking inconsistently: Development and validation of an instrument for assessing proneness to doublethink. *European Journal of Psychological Assessment.*

Rutjens, B. T., Sengupta, N., der Lee, R. van, van Koningsbruggen, G. M., Martens, J. P., Rabelo, A., & Sutton, R. M. (2021). Science Skepticism Across 24 Countries. *Social Psychological and Personality Science*. https://doi.org/10.1177/19485506211001329

Rizeq, J., Flora, D. B., & Toplak, M. E. (2020). An examination of the underlying dimensional structure of three domains of contaminated mindware: Paranormal beliefs, conspiracy beliefs, and anti-science attitudes. *Thinking & Reasoning*, 1–25. https://doi.org/10.1080/13546783.2020.1759688

Sirota, M., Dewberry, C., Juanchich, M., Valuš, L., & Marshall, A. C. (2020). Measuring cognitive reflection without maths: Development and validation of the verbal cognitive reflection test. *Journal of Behavioral Decision Making*, 1–22. https://doi.org/10.1002/bdm.2213

Solomon, S. R., & Sawilowsky, S. S. (2009). Impact of Rank-Based Normalizing Transformations on the Accuracy of Test Scores. *Journal of Modern Applied Statistical Methods*, *8*(2), 448–462. https://doi.org/10.22237/jmasm/1257034080

Šrol, J. (2020). *Individual differences in epistemically suspect beliefs: The role of susceptibility to cognitive biases*. PsyArXiv. https://doi.org/10.31234/osf.io/4jcf7

Tobacyk, J. (2004). A Revised Paranormal Belief Scale. *International Journal of Transpersonal Studies*, *23*(1), 94–98. https://doi.org/10.24972/ijts.2004.23.1.94

Trizano-Hermosilla, I., & Alvarado, J. M. (2016). Best Alternatives to Cronbach's Alpha Reliability in Realistic Conditions: Congeneric and Asymmetrical Measurements. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00769

van Elk, M. (2015). Perceptual Biases in Relation to Paranormal and Conspiracy Beliefs. *PLOS ONE*, *10*(6):

e0130422. https://doi.org/10.1371/journal.pone.0130422

Vyse, S. A. (1997). *Believing in magic: The psychology of superstition.* Oxford University Press.

Wood, M. J., Douglas, K. M., & Sutton, R. M. (2012). Dead and Alive: Beliefs in Contradictory Conspiracy Theories. *Social Psychological and Personality Science*, *3*(6), 767–773. https://doi.org/10.1177/1948550611434786

Žeželj, I., & Lazarević, L. B. (2019). Irrational beliefs. *Europe's Journal of Psychology*, *15*(1), 1–7. https://doi.org/10.5964/ejop.v15i1.1903

Žeželj, I., Pavlović, M., Vladisavljević, M., & Radivojević, B. (2009). Construction and behavioral validation of superstition scale. *Psihologija*, *42*(2), 141–158. https://doi.org/10.2298/PSI0902141Z

Original research

10

Empirical overlap and predictive validity of Big Five and HEXACO personality models

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Abstract

In the field of personality research, there has long been a consensus that personality structure is best captured with five broad factors. However, another model, HEXACO with six factors, is increasingly used. We aimed to investigate the overlap between those personality models, as well as their predictive validity for relevant outcomes. A total of 132 psychology students (81.8% women, Mage = 23.33, SD = 1.31) filled in HEXACO-60, BFI, Subjective Happiness Scale and reported their grade-point average (sGPA). Results of 11 multiple regression analyses, in which five BFI scales predicted each of the six HEXACO-60 scales and vice versa, showed that BFI scales do not capture variance of HEXACO Honesty-Humility (R2adj = .08) and Emotionality (R2adj = .36) factors well. Regarding predictive validity, both BFI and HEXACO significantly predicted variance of subjective happiness, but BFI explained the larger amount than HEXACO, while only BFI scales captured a significant amount of sGPA variance. Therefore, findings of this study suggest that BFI scales do not capture all HEXACO variance well, but the results of the predictive validity comparison indicate that we cannot definitively conclude that one model is better than the other.

Keywords: personality, Big Five, BFI, HEXACO, subjective happiness, GPA

Introduction

One of the key subjects in the field of personality psychology refers to personality structure. If we want to investigate personality, it is important to know how many and which basic traits we need to measure. For the last three decades the most accepted view has been that there are five basic and broad traits that subsume interindividual personality variance among people. Those big five traits are mostly known as Extraversion, Neuroticism/Emotional stability, Agreeableness, Conscientiousness and Openness/Intellect. They have been firstly discovered within lexical studies of personality-descriptive terms in the English language and operationalized via Big Five model (Goldberg, 1990), while they were additionally popularized with development of the Five-Factor model of personality (Costa & McCrae, 1992).

However, more recent lexical studies on at least 12 different world languages, as well as on more comprehensive variable sets, showed that personality structure can be best described by six, not only five factors (Ashton & Lee, 2001). Based on those findings, the HEXACO model of personality, which defines six broad factors, was operationalized (Ashton et al., 2004). While Extraversion, Conscientiousness, and Openness share very similar content with their Big Five counterparts, substantial differences of the HEXACO and other personality models is manifested in the other three factors. Those factors are defined with specific content and represent either the newly identified and operationalized factor (i.e., Honesty-Humility), while Emotionality and Agreeableness factors are described as rotated versions of the Big Five Neuroticism/Emotional stability and Agreeableness. For a more detailed explanation of those factors and their differences from the big five factors, see e.g., Ashton and Lee (2007).

Empirical overlap between HEXACO and five-factor models

Although HEXACO model is increasingly being applied in personality research, some researchers emphasize its redundancy. Namely, the biggest novelty of the HEXACO refers to the identification of the new Honesty-Humility (HH) factor, but the main question remains whether this factor is really something new in personality models? Some believe that the content of the HH factor has already been subsumed within big five Agreeableness factor, which has narrower traits that refer to the same content, for example Straightforwardness and Modesty facets in the Five-Factor model (McCrae & Costa, 2008). Some argue that authors of the HEXACO just rearranged the already existing content of the big five factors (e.g., DeYoung, 2015). Therefore, it is questionable if using the HEXACO does provide anything new or different comparing to the models with five factors.

Aiming to address these criticisms, authors of the HEXACO model published a few papers to investigate how well five-factor measures capture the variance of the HEXACO factors (Ashton & Lee, 2019; Ashton et al., 2019; Lee & Ashton, 2019). Results of those studies showed that different measures (i.e., BFAS, BFI, BFI-2, IPIP-50, NEO-FFI, NEO-PI-R) do not explain the variance of the HEXACO scales well, and account for less variance of the HEXACO factors in average than vice versa. The important finding is that the missing variance for most five-factor measures is primarily located in the HH factor. For example, BFI-2 captures only 12% of the HH factor variance (Ashton et al., 2019), BFAS 27% (Lee & Ashton, 2019), while NEO-FFI captures 26% or 28%, IPIP-50 21% or 8%, and BFI scales 25%, 17% or 12%, depending on the data sets (Ashton & Lee, 2019). Those findings imply that five-factor measures do not contain the content related to the HH factor in their items. The exception is NEO-PI-R, which is better at capturing overall variance of the HEXACO (mean R^2adj = .61, while the mean R^2 *adj* of all other instruments is between .40 and .52), as well as the variance of the Honesty-Humility (R^2 *adj* = .50) (Ashton & Lee, 2019). That finding is somewhat expected, since NEO-PI-R is a long instrument that assesses a wide range of content. However, Ashton and Lee (2019) state that the NEO-PI-R also has substantial missing variance, which is not mainly located only in the HH factor (R^2 *adj* = .50), but is equally distributed in Agreeableness (R^2 *adj* = .52) and Emotionality (R^2 *adj* = .51) factors (Ashton & Lee, 2019).

Therefore, it has been shown that different five-factor measures insufficiently account for the HEXACO scale variances, although there are some specific differences dependent on the used five-factor measure, regarding where the missing variance is located. Ashton and Lee (2020) believe that these results are proof that HEXACO model is not redundant. On the contrary, using measures of the five-factor model can lead to loss of important information and capturing of personality variance to the smaller extent.

Predictive validity of the HEXACO and five-factor models

Since HEXACO model captures a broader personality variance, it is intuitive to assume that it is also better at predicting some relevant outcomes. That is usually one of the main arguments when considering the advantages of the HEXACO model. For example, studies showed that HEXACO can predict variables like materialism, manipulativeness, or unethical decision making significantly better than the five-factor measures (Ashton & Lee, 2008). However, it is quite reasonable that HEXACO, which contains traits that refer to honesty, modesty, lack of greed and deceptive behaviour, is useful for predicting variables clearly conceptually related to the HH factor. What about variables which are not so similar to Honesty-Humility? Is the HEXACO model also better at predicting those relevant outcomes?

It is well known in the literature that personality is indeed important for predicting different life outcomes (Roberts et al., 2007). One of the outcomes that has been the subject of numerous studies and consistently shows a significant relationship with personality traits is well-being, i.e. the different measures of that construct. Recent meta-analysis of Anglim et al. (2020) showed that both five-factor and HEXACO personality traits capture the substantial amount of well-being variance, but, on average, OCEAN factors explain more variance of well-being than HEXACO factors. Therefore, it seems that using five-factor measures can result in capturing the larger amount of well-being variance than using HEXACO inventories. However, it is important to note that there is a big discrepancy in the number of independent effect sizes in the meta-analysis that are estimated from the studies that used HEXACO (k = 22) compared to the studies using five-factor measures (e.g., k = 170 for NEO scales; k = 125 for BFI).

Educational achievement is another example of the important life outcome which is associated with personality traits. Numerous studies, mainly with the five-factor model as a personality framework, found significant associations of personality with achievement in different educational contexts, including a few meta-analyses (McAbee & Oswald, 2013; Poropat, 2009; Richardson et al., 2012; Trapmann, et al., 2007). The importance of personality is usually manifested through Conscientiousness trait, which has the most crucial role. Only a few studies used HEXACO inventories as measures of personality (e.g., de Vries et al., 2011; Janošević & Petrović, 2019; Noftle & Robins, 2007), but their results are mostly in accordance with familiar findings regarding significant association of Conscientiousness and achievement, with correlation coefficients usually around .20 - .30 (see e.g., McAbee & Oswald, 2013). However, it would be interesting to investigate whether there are some observable differences between HEXACO and the five-factor models in ability to predict educational outcomes.

The present study

This study has two main goals. The first one is to examine the empirical overlap between personality measures that are based on the five- or six-factor models in a Croatian sample, and to compare obtained results with recent studies on this subject (Ashton & Lee, 2019; Ashton et al., 2019; Lee & Ashton, 2019). More specifically, we are going to focus on the relationship between the two instruments of similar length, HEXACO-60, and BFI-44. Based on the findings from previous studies, we expect that HEXACO model will be statistically more efficient at capturing variance of BFI scales than vice versa. Moreover, we expect that the missing variance in predicting HEXACO scales will be primarily focused in the HH factor.

The second goal of this study is to investigate the predictive validity of those different personality measures for two relevant outcomes – subjective happiness, as a measure of well-being, and self-reported grade point average as a measure of academic achievement. Considering well-established findings in personality research, we expect that HEXACO and BFI will significantly predict both outcomes. However, based on the results of the recent meta-analysis (Anglim et al., 2020) we hypothesised that BFI scales will account for larger amount of subjective happiness variance than HEXACO. For academic achievement, we do not expect any significant differences between BFI and HEXACO.

Material and methods

Participants

The sample consisted of 132 students (81.8% women) of the final year of graduate psychology study at Faculty of Humanities and Social Sciences, University of Zagreb. The average age of the sample was 23.33 years (range: 22-29 years; *SD* = 1.31). Participants filled in self-report measures in the paper-pencil format at the faculty during the classes for course credit.

Measures

For measuring personality within the six-factor model approach, we used the Croatian version of the 60-item version of the HEXACO personality inventory (Ashton & Lee, 2009; Babarović & Šverko, 2013). This instrument measures six broad personality traits from HEXACO personality model. Each of the six factors is represented with 10 items, with accompanying five-point Likert-type scale (1 = *strongly disagree*; 5 = *strongly agree*). The internal consistency of the Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness, and Openness scales in the present study were .68, .82, .81, .76, .81, and .82, respectively.

For assessing five basic personality traits, participants filled in the Big Five Inventory (BFI; John et al., 1991). Participants rated their agreement with 44 items on a five-point Likert-type scale (1 = *disagree strongly*; 5 = *agree strongly).* The internal consistency of the Neuroticism, Extraversion, Openness, Agreeableness, and Conscientiousness scales in the present study were .86, .85, .85, .82, and .81, respectively.

As a measure of participants' well-being, a Subjective Happiness Scale (SHS; Lyubomirsky & Lepper, 1999) was used. SHS is a brief measure with only four items, but with well-established psychometric properties. Every item is followed by a seven-point Likert-type scale, with different anchor labels, depending on the item content. The internal consistency of the composite scale in this study was .87.

Academic achievement in this study was operationalized with a self-reported grade point average (sGPA). Participants reported their GPA for undergraduate and graduate study levels. Based on these two grades (r = .78, p < .001), the average sGPA was calculated. In Croatian educational system, the possible grades range from 1 to 5, where 5 represents the highest, excellent achievement.

Results

Descriptive statistics and intercorrelations of all study variables are shown in Table 1. Due to a large number of conducted analyses in this study, statistical significance for all results was set at p < .01. As it can be seen, each personality instrument had small or medium inter-scale correlations. Within HEXACO, the biggest correlation coefficient was found between Emotionality and Conscientiousness scales (r = .34, p <

.001), while Neuroticism and Agreeableness were the BFI scales that correlated the most (r = -.46, p < .001). It is also noticeable that HH factor had a non-significant correlation with HEXACO Agreeableness (r = .09, p = .328) and with BFI Agreeableness (r = .21, p = .015). Subjective happiness was significantly correlated only with HEXACO Extraversion (r = .63, p < .001), while it was significantly correlated with BFI Neuroticism (r = -.65, p <.001), BFI Extraversion (r = .44, p < .001), BFI Agreeableness (r = .40, p < .001) and BFI Conscientiousness (r = .23, p = .008). As for sGPA, it was significantly correlated only with HEXACO Conscientiousness (r = .31, p < .001) and BFI Conscientiousness (r = .40, p < .001).

Table 1

Descriptive Statistics and Intercorrelations of the HEXACO-60, BFI, Subjective Happiness Scale and sGPA (N = 132)

	M	*SD*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
HEXACO-60														
1. Honesty-Humility	3.44	0.56												
2. Emotionality	3.43	0.68	.27**											
3. Extraversion	3.47	0.63	-.08	-.19										
4. Agreeableness	3.15	0.58	.09	.03	.08									
5. Conscientiousness	3.63	0.60	.18	.34**	.10	-.06								
6. Openness	3.69	0.69	-.06	-.14	.02	.17	-.07							
BFI														
7. Neuroticism	2.69	0.70	.08	.42**	-.53**	-.31**	.07	-.02						
8. Extraversion	3.55	0.69	.04	-.11	.80**	-.12	.18	-.04	-.33**					
9. Openness	3.72	0.62	.02	-.09	.14	.20	.00	.76**	-.07	.17				
10. Agreeableness	3.68	0.61	.21	.13	.43**	.67**	.08	.02	-.46**	.25**	.14			
11. Conscientiousness	3.63	0.59	.20	.22	.31**	.01	.71**	-.09	-.09	.39**	.18	.17		
12. SHS	5.03	1.10	.03	-.13	.63**	.14	.03	-.13	-.65**	.44**	.02	.40**	.23**	
13. sGPA	3.99	0.45	.12	.08	.08	-.02	.31**	-.15	.10	.12	-.06	.01	.40**	.01

Note. ** p < .01

To examine the ability of BFI to account for the variance in HEXACO-60 and vice versa, we used the same data analytic strategy as were used in the previous studies on that subject (Ashton & Lee, 2019; Ashton et al., 2019; Lee & Ashton, 2019). In other words, 11 multiple regression analyses were performed. Firstly, we tested how well the five BFI scales together can predict each of the six HEXACO-60 scales, and then how well all HEXACO scales predict each of the BFI scales individually. Table 2 summarizes the results of these analyses.

Table 2
Prediction of Each HEXACO Scales by all BFI Scales, and Vice Versa (N = 132)

HEXACO ← BFI	R^2adj	*pF*	BFI ß HEXACO	R^2adj	*pF*
Honesty-Humility	.08	.007	Neuroticism	.45	<.001
Emotionality	.36	<.001	Extraversion	.69	<.001
Extraversion	.73	<.001	Openness	.58	<.001
Agreeableness	.55	<.001	Agreeableness	.63	<.001
Conscientiousness	.53	<.001	Conscientiousness	.55	<.001
Openness	.62	<.001			
M	.50		*M*	.59	

Note. pF – *p*-value of *F*-value. For calculating the average amount of explained variance (*M*), the Fisher *rz* transformation was used.

In general, adjusted R^2 coefficients showed acceptable correspondences between measures, with the highest compatibility on Extraversion factor for both models. Despite some correspondences, the results showed that BFI scales capture only 8% of the Honesty-Humility variance. Moreover, HEXACO Emotionality variance was captured less by BFI scales (R^2adj = .36) than BFI Neuroticism by HEXACO-60 scales (R^2adj = .45). The amounts of explained variance for each BFI scales by HEXACO were more similar to each other (range: .45 - .69) than the values of adjusted R^2 when BFI scales were predicting different HEXACO scales (range: .08 - .73). Finally, when calculating the average amount of explained variance, HEXACO was more successful in predicting BFI than vice versa (mean R^2adj = .59 *vs.* 50).

In order to investigate the predictive validity, we run four regression analyses. Two analyses were run for subjective happiness and two for sGPA - one with BFI factors as predictors, and the second one with HEXACO factors as predictors. The results of these four analyses are presented in Table 3.

Table 3
Results of the Regression Analyses (N = 132)

Outcome	Model	*R*	R^2	R^2adj
Subjective happiness	BFI	.71**	.50	.48
Subjective happiness	HEXACO	.66**	.43	.41
sGPA	BFI	.43**	.19	.16
sGPA	HEXACO	.35	.12	.08

Note. ** $p < .01$

For subjective happiness, the results showed that both BFI and HEXACO scales are significant predictors, but with somewhat larger amount of variance explained with BFI than with HEXACO (R^2adj = .48 *vs.* .41). For the sGPA as a dependent variable, results showed that only BFI captures the significant amount of its variance (R^2adj =.16), while HEXACO scales were not significant predictors.

Discussion

With the present study we aimed to examine the relationship between two popular measures of different personality models in a Croatian student sample, focusing on two different problems: (i) the amount of variance that factors of one instrument can explain in the other, and (ii) comparing the ability of those instruments to predict two relevant outcomes. To our knowledge, this is the first study which aimed to replicate the findings and analytic strategy in examining the overlap of the HEXACO and big five measures, that was not conducted by the authors of the HEXACO model. Furthermore, our results provide new insights regarding the direct comparison of HEXACO and five-factor model for predicting academic achievement.

Empirical overlap between HEXACO and BFI

Regarding the first problem, obtained results were in line with our hypotheses. The HEXACO scales in overall capture more variance of BFI scales than vice versa. Moreover, it was shown that the missing variance of BFI is primarily located in the HH factor – the BFI scales capture only 8% of the HH variance. These results are in line with those obtained in the Ashton and Lee (2019) study. In that paper, three different sets of BFI data were examined. Results were somewhat different dependent on the specific data set ranging from 12-25%, but the main conclusion was that "the BFI accounted for Honesty-Humility much less well than it accounted for the other five HEXACO scales" (Ashton & Lee, 2019, p. 570), which is in accordance with the findings in our sample. We can directly compare our results with those based on Hilbig et al.'s (2016) data set, since they also used 60 item version of HEXACO inventory. In that data set, BFI scales captured 12% of the HH factor variance, which is comparable with 8% from our data. Furthermore, the average amount of explained variance for all HEXACO scales was 44%, while HEXACO captured 55% of all BFI scales on average. Those values are also comparable to our results, where average adjusted R^2 values where 50% for HEXACO scales, and 59% for BFI scales. Therefore, our study, conducted on a new sample from a different culture, suggest that the variance of the HH factor is indeed not captured well by BFI factors, and that HEXACO scales overall capture more BFI variance than vice versa. That can be taken as a counterargument for the objection that HH factor has the content that is already a part of the big five Agreeableness factor. In addition, the HH factor had a non-significant correlation with BFI Agreeableness (r = .21, p = .015). That also shows that the BFI items do not include the content of the HH factor. Moreover, when excluding the HH factor, the average amount of explained variance of other five HEXACO factors with BFI raises to 57%, which is almost the same as the average value that HEXACO achieved in explaining BFI scales (59%). That indicates that this newly identified factor in HEXACO model is basically the main reason why the average amount of explained variance is smaller when BFI scales predict HEXACO than vice versa.

Although the HH factor is essential for difference between BFI and HEXACO, it is noticeable that BFI also does not capture well the Emotionality variance (R^2adj = .36), which is in accordance with previous findings (Ashton & Lee, 2019; Lee & Ashton, 2019). Namely, the results on three different data sets with BFI and one with the BFI-2 showed that Emotionality has the highest amount of the missing variance, after the

HH factor. That suggests that BFI items do not successfully cover behaviours that are defined by Emotionality factor in HEXACO. As was earlier stated, Emotionality has specific content, it is not directly comparable with Neuroticism, and therefore this finding is not very surprising. However, it is interesting that the variance of BFI Neuroticism was more significantly explained by HEXACO (R^2adj = .45) than Emotionality by BFI, which indicates that Neuroticism is better represented in the HEXACO model, than Emotionality in five-factor models (Lee & Ashton, 2019).

Predictive validity of HEXACO and BFI

In studying personality, researchers often focus on testing predictive validity of certain traits for important life outcomes. Thus, when examining validity of personality measures, it is advisable to test how well they can predict some relevant outcomes that should be linked to personality in some degree. We therefore aimed to investigate the differences in predictive validity of HEXACO and BFI, but with outcomes which are not conceptually related to the HH factor, as was explained in the introduction.

It is well known in the literature that different well-being measures have significant associations with personality traits (Anglim et al., 2020; Lucas, 2018; Steel et al., 2008). Both BFI and HEXACO models explained a substantial amount of subjective happiness variance in our study. However, results showed that BFI scales account for a larger amount of subjective happiness variance than HEXACO, with values of adjusted R^2 of 48% and 41%, respectively. This is in line with our hypothesis and the results of Anglim et al.'s (2020) meta-analysis, which showed that five-factor scales explain well-being to a larger degree than HEXACO. It is also interesting to focus on the associations between specific personality factors and happiness. Namely, subjective happiness only correlated with the HEXACO Extraversion scale, but with all BFI scales, except Openness. Theoretically, and accordingly to the findings of numerous studies, different well-being measures are mainly associated with Neuroticism and Extraversion, but also have a moderate or small correlation with Conscientiousness, and sometimes also with Agreeableness factor (Anglim et al., 2020; Steel et al., 2008). Our results showed that BFI scales are in line with these expected associations, since those four factors showed substantial correlations with subjective happiness. On the other hand, HEXACO model does not support those anticipated associations of specific traits and well-being. Studies that used HEXACO model in well-being research generally show that within HEXACO model Extraversion is primarily related with different well-being measures (Angelim et al., 2020), which is in line with the results in our study. HEXACO Extraversion had basically the same size of correlation coefficient (but in different direction) with happiness as BFI Neuroticism in our data (r = .63 and -.65, respectively). However, it is surprising that other HEXACO factors did not have significant correlations with happiness at all. For example, well-being measures usually have at least small negative correlations with Emotionality, while in our study those variables were not related.

One possible explanation could be found in the content of Emotionality factor, which includes sentimentality, but excludes content that is associated with negative affect, like anger or depression. Studies showed that among the Neuroticism facets, depression is the key trait for well-being and often has the biggest correlation with it (Røysamb et al., 2018; Schimmack et al., 2004). Therefore, the lack of the content related to depression can explain why Emotionality is not associated with subjective happiness. Although there is no specific facet related to depression in HEXACO model, there are some reversed items within HEXACO Extraversion (i.e., the social boldness facet) that refer to depressive thoughts. That can explain the larger correlation of HEXACO Extraversion, compared to the same-named scale from BFI, with subjective happiness, as well as the substantial correlation with BFI Neuroticism (r = -.52, p < .001). In addition, stronger predictive validity of BFI than HEXACO for subjective happiness can partly be associated with self-report response styles, primarily with social desirability. Namely, BFI scales intercorrelated

substantially more than HEXACO scales in our study (see Table 1), which can reflect evaluative component (Block, 1995).

Educational achievement is also one of the important life outcomes known to be predicted by personality traits (McAbee & Oswald, 2013; Poropat, 2009; Richardson et al., 2012; Trapmann, et al., 2007). Our results showed that BFI scales capture a significant amount of the sGPA variance in our sample (R^2adj = .16). It is noticeable that the overall amount of explained variance is generally lower than for subjective happiness, but it was shown in other studies as well that personality has lower associations with educational achievement than with well-being measures (for GPA, see e.g., Poropat, 2009; for well-being, see e.g. Anglim et al., 2020). What was somewhat unexpected is the finding that HEXACO scales do not capture a significant amount of sGPA variance in our study (R^2adj = .08). However, the small size of explained variance is in line with the results of other studies. For example, de Vries et al. (2011) showed that HEXACO Conscientiousness and HH factor explained 10% of GPA's variance. Moreover, in meta-analytic study by Zettler et al. (2020) HEXACO Conscientiousness correlated .26, i.e. explained 7% of variance in achievement/performance variable, which included different levels of achievement, like academic and job performance. It is well-established that the most important personality trait for educational achievement is Conscientiousness (Poropat, 2009; Trapmann, et al., 2007). In our study both BFI and HEXACO Conscientiousness correlated substantially with sGPA. However, BFI Conscientiousness had a stronger correlation (r = .40, p < .001) than HEXACO Conscientiousness (r = .31, p < .001), although those scales should be conceptually identical. Therefore, it seems that BFI captures something important for sGPA in academic context better than HEXACO-60.

The results of our study showed that BFI is better in prediction of both subjective happiness and sGPA. As stated earlier, we intentionally decided to use outcomes that are not theoretically linked to the HH factor. However, with different criterion variables we could easily get different results. Studies with outcomes that are theoretically relevant to HH factor, e.g., unethical decision making (Heck et al.,2018) or prosocial behaviour (Thielmann et al.,2020), have shown stronger associations with HH scale than with Big Five scales.

Limitations of the study

The reported study has some limitations. The biggest objection definitely refers to our sample – it is quite small, and it consisted only of psychology students, which are mostly women. Therefore, it is doubtful if we can generalize our results. However, since our findings are in accordance with those obtained on different samples and cultures (Ashton & Lee, 2019), we believe that our sample structure did not have a substantial effect for the main conclusions in our study. Moreover, we believe our results are robust since the estimated required sample size for linear multiple regression with six predictors using Gpower 3.1 (Faul et al., 2009) program (f^2 = .15, Type-1 error rate =.05, statistical power = .80) was N = 98, less than our final sample size of 132 students.

Additional limitations are related to measures used to operationalise relevant outcome variables in our study. Our outcome measures were short, especially for educational achievement, and measured only one (narrower) part of the intended constructs (well-being and educational achievement). For example, it is questionable if sGPA is generally a good choice for measuring achievement at the academic level. The mean sGPA in our study was above the theoretical average (M = 3.99) and the variation between students was small (SD = 0.45). However, again our results were mostly in line with previous findings on the associations between personality and both outcomes. In general, these results could be viewed as preliminary findings that need to be confirmed in future studies using samples from general population and longer outcome measures.

Conclusions

Results of the present study indicate that HEXACO model provides a broader personality picture that is not completely captured by the five-factor measures, at least not with BFI. Using BFI instead of HEXACO can primarily result in loss of information about behaviours, thoughts and feelings related to the Honesty-Humility factor, and to a lesser extent to Emotionality factor as well. However, that does not necessarily imply that measures based on the HEXACO personality model will better predict different personality-related outcomes. Our results show that although BFI scales do not contain the Honesty-Humility content, they nevertheless can explain more variance of some important variables, i.e., subjective happiness and sGPA, than HEXACO. It seems that although HEXACO has additional personality factor not captured with BFI factors, BFI is a more adequate instrument for predicting subjective happiness and sGPA compared with HEXACO-60.

Therefore, our findings indicate that we cannot say there is only one personality model, or more specifically, measure of that particular model, that is always a better choice for personality research and assessment. When considering which personality inventory to use, it is always important to have in mind what is the main goal. If we want to predict specific outcomes, then it is important to consider what each instrument measures. Sometimes, the HEXACO model will be a better choice, especially if we want to explain the variance of the variables which are closely related with the Honesty-Humility factor. However, if we want to predict other outcomes, like subjective happiness or sGPA, BFI, or some other, five-factor measure can be a better option for personality assessment.

References

Anglim, J., Horwood, S., Smillie, L. D., Marrero, R. J., & Wood, J. K. (2020). Predicting psychological and subjective well-being from personality: A meta-analysis. *Psychological Bulletin*, *146*(4), 279-323. https://doi.org/10.1037/bul0000226

Ashton, M. C., & Lee, K. (2001). A theoretical basis for the major dimensions of personality. *European Journal of Personality, 15*(5), 327-353. https://doi.org/10.1002/per.417

Ashton, M. C., & Lee, K. (2007). Empirical, theoretical, and practical advantages of the HEXACO model of personality structure. *Personality and Social Psychology Review, 11*(2), 150-166. https://doi.org/10.1177/1088868306294907

Ashton, M. C., & Lee, K. (2008). The prediction of Honesty-Humility-related criteria by the HEXACO and Five-Factor models of personality. *Journal of Research in Personality, 42*, 1216-1228. https://doi.org/10.1016/j.jrp.2008.03.006

Ashton, M. C., & Lee, K. (2009). The HEXACO–60: A short measure of the major dimensions of personality. *Journal of Personality Assessment, 91*(4), 340-345. https://doi.org/10.1080/00223890902935878

Ashton, M. C., & Lee, K. (2019). How well do Big Five measures capture HEXACO scale variance? *Journal of Personality Assessment, 101*(6), 567-573. https://doi.org/10.1080/00223891.2018.1448986

Ashton, M. C., & Lee, K. (2020). Objections to the HEXACO model of personality structure - And why those objections fail. *European Journal of Personality, 34*(4), 492-510. https://doi.org/10.1002/per.2242

Ashton, M. C., Lee, K., Perugini, M., Szarota, P., de Vries, R. E., Di Blas, L., ... & De Raad, B. (2004). A six-factor structure of personality-descriptive adjectives: solutions from psycholexical studies in seven languages. *Journal of Personality and Social Psychology, 86*(2), 356-366. https://doi.org/10.1037/0022-3514.86.2.356

Ashton, M. C., Lee, K., & Visser, B. A. (2019). Where's the H? Relations between BFI-2 and HEXACO-60 scales. *Personality and Individual Differences, 137*, 71-75. https://doi.org/10.1016/j.paid.2018.08.013

Babarović, T., & Šverko, I. (2013). The HEXACO personality domains in the Croatian sample. *Društvena istraživanja, 22*(3), 397-411. https://doi.org/10.5559/di.22.3.01

Block, J. (1995). A contrarian view of the five-factor approach to personality description. *Psychological Bulletin, 117*(2), 187-215. https://doi.org/10.1037/0033-2909.117.2.187

Costa, P. T., Jr., & McCrae, R. R. (1992). *NEO PI-R. Professional manual*. Odessa, FL: Psychological Assessment Resources, Inc.

de Vries, A., de Vries, R. E., & Born, M. P. (2011). Broad versus narrow traits: Conscientiousness and Honesty-Humility as predictors of academic criteria. *European Journal of Personality, 25*(5), 336–348. https://doi.org/10.1002/per.795

DeYoung, C. G. (2015). Cybernetic Big Five theory. *Journal of Research in Personality, 56*, 33–58. https://doi.org/10.1016/j.jrp.2014.07.004

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior ResearchMmethods, 41*(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Goldberg, L. R. (1990). An alternative" description of personality": the big-five factor structure. *Journal of Personality and Social Psychology, 59*(6), 1216-1229. https://doi.org/10.1037/0022-3514.59.6.1216

Heck, D. W., Thielmann, I., Moshagen, M., & Hilbig, B. E. (2018). Who lies? A large-scale reanalysis linking basic personality traits to unethical decision making. *Judgment and Decision Making, 13*(4), 356–371.

Hilbig, B. E., Moshagen, M., & Zettler, I. (2016). Prediction consistency: A test of the equivalence assumption across different indicators of the same construct. *European Journal of Personality, 30*, 637–647. https://doi.org/10.1002/per.2085

Janošević, M., & Petrović, B. (2019). Effects of personality traits and social status on academic achievement: Gender differences. *Psychology in the Schools, 56*(4), 497-509. https://doi.org/10.1002/pits.22215

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

Lee, K., & Ashton, M. C. (2019). Not much H in the Big Five Aspect Scales: Relations between BFAS and HEXACO-PI-R scales. *Personality and Individual Differences, 144*, 164-167. https://doi.org/10.1016/j.paid.2019.03.010

Lucas, R. E. (2018). Exploring the associations between personality and subjective well-being. In E. Diener, S. Oishi, & L. Tay (Eds.), *Handbook of Well-being* (pp. 284-303). DEF Publishers.

Lyubomirsky, S., & Lepper, H. (1999). A measure of subjective happiness: Preliminary reliability and construct validation. *Social Indicators Research, 46*(2), 137-155. https://doi.org/10.1023/A:1006824100041

McAbee, S. T., & Oswald, F. L. (2013). The criterion-related validity of personality measures for predicting GPA: A meta-analytic validity competition. *Psychological Assessment, 25*(2), 532-544. https://doi.org/10.1037/a0031748

McCrae, R. R., & Costa, P. T., Jr. (2008). The five-factor theory of personality. In O.P. John, R.W. Robins, & L. A. Pervin (Eds.), *Handbook of Personality Theory and Research* (3rd ed., pp. 159–181). Guildford Press.

Noftle, E. E., & Robins, R. W. (2007). Personality predictors of academic outcomes: big five correlates of GPA and SAT scores. *Journal of Personality and Social Psychology, 93*(1), 116-130. https://doi.org/10.1037/e514412014-495

Poropat, A. E. (2009). A meta-analysis of the five-factor model of personality and academic performance. *Psychological Bulletin, 135*(2), 322-338. https://doi.org/10.1037/a0014996

Richardson, M., Abraham, C., & Bond, R. (2012). Psychological correlates of university students' academic performance: A systematic review and meta-analysis. *Psychological Bulletin, 138*(2), 353-387.

https://doi.org/10.1037/a0026838

Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science, 2*(4), 313-345. https://doi.org/10.1111/j.1745-6916.2007.00047.x

Røysamb, E., Nes, R. B., Czajkowski, N. O., & Vassend, O. (2018). Genetics, personality and wellbeing. A twin study of traits, facets and life satisfaction. *Scientific Reports, 8*(1), 12298. https://doi.org/10.1038/s41598-018-29881-x

Schimmack, U., Oishi, S., Furr, R. M., & Funder, D. C. (2004). Personality and life satisfaction: A facet-level analysis. *Personality and Social Psychology Bulletin, 30*(8), 1062-1075

Steel, P., Schmidt, J., & Shultz, J. (2008). Refining the relationship between personality and subjective well-being. *Psychological Bulletin, 134*(1), 138-161. https://doi.org/10.1037/0033-2909.134.1.138

Thielmann, I., Spadaro, G., & Balliet, D. (2020). Personality and prosocial behavior: A theoretical framework and meta-analysis. *Psychological Bulletin, 146*(1), 30-90. https://doi.org/10.1037/bul0000217

Trapmann, S., Hell, B., Hirn, J. O. W., & Schuler, H. (2007). Meta-analysis of the relationship between the Big Five and academic success at university. *Zeitschrift für Psychologie/Journal of Psychology, 215*(2), 132-151. https://doi.org/10.1037/e518532013-271

Zettler, I., Thielmann, I., Hilbig, B. E., & Moshagen, M. (2020). The nomological net of the HEXACO model of personality: A large-scale meta-analytic investigation. *Perspectives on Psychological Science, 15*(3), 723-760. https://doi.org/10.1177/1745691619895036

Original research

11

Mental health of people with chronic health conditions during a health crisis caused by COVID-19 pandemic

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Abstract

Previous research and clinical practice have shown that people with history of chronic diseases are more likely to develop certain mental health difficulties during pandemic. The aim of this study was to examine the relationship between chronic health conditions and mental health indicators during COVID-19. The data were collected as part of a broader research project of the Zagreb Child and Youth Protection Center. The study involved 1482 healthy individuals and 205 having a chronic disease. The assessments included sociodemographic data, the Hope for the Future and the Depression-Anxiety and Stress Scale-21. Results have shown statistically significant differences aspects of mental health in relation to living with chronic disease, in anxiety, stress and depression. In all scales, people with chronic disease achieved worse outcomes. Furthermore, chronic diseases lead to significant moderating effect on the relationship between hope for the future and anxiety. The negative correlation between hope for the future and mental health indicators is greater in people who have a chronic illness.

Keywords: mental health, chronic diseases, COVID-19

Introduction

Novel coronavirus (COVID-19) pandemic has been a major global health issue since the beginning of 2020. The number of confirmed cases and deaths from this disease has risen sharply since the onset of the pandemic, which initially originated in China's Hubei province. In January 2020, The World Health Organization declared COVID-19 disease international public health emergency (Mahase, 2020), and in March 2020 novel Coronavirus disease was declared a pandemic (WHO, 2020). The severity of the novel coronavirus disease, social isolation measures and information overload, some of which are false and not based on scientific evidence, could all lead to mental health distress in general population (Zandifar & Badrfam, 2020). Some authors suggest that the unpredictability and the uncertainty of the current situation can evoke stress reactions in all age groups, which in some people could even lead to PTSD related symptoms (Bao, Sun, Meng & Lu, 2020; Dutheil, Mondillon & Navel, 2020). Furthermore, impact of COVID-19 pandemic on human psychological well-being can be perceived through potential high levels of anxiety (Shigemura et. al., 2020). Also, some authors emphasize potential risk of high health anxiety levels due to high infectivity of coronavirus disease (Asmundson & Taylor, 2020). Another mental health consequence of current health crisis is depression, with prevalence in the general population increasing by 7% since the COVID-19 outbreak began (Mowbray, 2020). Existing literature review shows that besides COVID-19 pandemic greatly affecting physical health, it also negatively affects mental health of people from all around the world.

Furthermore, to this date, literature indicates a significant association between mental health difficulties and chronic diseases such as diabetes, cardiovascular disease, pneumonia (Mukeshimana & Chironda, 2019; Rosario & Masho, 2018), meaning that those who had chronic diseases are more likely to develop mental health disturbances. During pandemic, this risk could become even bigger, since it has been shown that people with chronic diseases are more likely to develop certain mental health difficulties during a pandemic (Brooks et al., 2020), which proved to be correct in the recent research during COVID-19 pandemic on the Croatian sample, where participants with chronic health conditions had higher concerns and more safety behaviours compared to those with no chronic conditions (Lauri Korajlija & Jokić Begić, 2020). COVID-19 symptoms have shown to be the most harmful for older individuals and for those who have various chronic diseases, such as diabetes, cardiovascular diseases, hypertension, asthma and stroke (Onder et al., 2020, Ruan et al., 2020, Yang et al., 2020). Individuals with cardiovascular disease show the greatest vulnerability to develop anxiety and depressive states during this period, while those with comorbid chronic diseases show the greatest vulnerability to stressful experiences and reactions (Sayeed et al., 2020). Besides that, previous research and clinical practice have shown that people with history of chronic diseases are at higher risk of more serious clinical manifestations from COVID-19 (Zhang et al., 2020). Additionally, COVID protection measures reduce the availability of routine medical care to individuals, especially in areas that are already facing limited health resources (Pellino and Spinelli, 2020). With the spread of the COVID virus, the fear of infection in the chronically ill grows, the movement of people is limited, and a sense of insecurity and uncertainty prevails. Many of the psychological problems faced by patients with chronic diseases in the current situation will potentially be neglected due to health system overload or measures to prevent the spread of the virus (Kang et al., 2020). This suggests that people with chronic illnesses will currently face a variety of mental health difficulties, such as anxiety, depression, confusion and stigma (Brooks et al., 2020), possibly making them one of the most vulnerable subpopulations during this period.

Moreover, given the global context of COVID-19 health crisis, it is expected that consequences will be long-term and involve various aspects of well-being. Erikson (1984) introduces the construct of belief in the species, which refers to the fundamental belief that life is basically good and worth liv-

ing, especially when one predicts what the future could look like. This concept includes two relatively independent subcomponents, trust in humanity and hope for a better future (McAdams et al., 1998). Hope for the future is a concept which describes optimism towards the future, hope for a better life for future generations and faith in the progress of humanity (Tucak Junaković, 2011), all three of which may be disturbed and impaired during prolonged periods of isolation and reduced welfare of general population.

Since during COVID-19 pandemic mental health problems can be overlooked in relation to physical health problems, it is important to stress out that both these aspects of health are closely related. Based on the literature review, it is clear that chronic diseases can make people more vulnerable to COVID-19 infection complications, as well as to developing mental health difficulties. To the best of the author's knowledge, this is the first study which puts emphasis on mental health risks for people with chronic health conditions during pandemic on Croatian sample. Furthermore, the aim of this study was to examine the level of depression, anxiety and stress in the Croatian sample during the pandemic between a group of individuals who state that they have chronic disease and those who state that they do not have chronic health condition. This study also investigates whether there is a moderating effect of chronic diseases on the relationship between hope for the future and anxiety, depression, and stress for the first time.

Material and methods

Participants

Participants (N = 1482) were Croatian citizens between the ages of 18 and 65 (M = 33,3). The majority of the sample consisted of women (n = 1230). At the time of data gathering, 205 participants stated that they have one or more of the following chronic health conditions: endocrinological (n=73), pulmonary (n=61), cardiovascular (n=59), locomotor (n=13), autoimmune (n=6), neurological (n=5), kidney disease (n=5), cancer (n=5), mental health (n=3).

Measures

Sociodemographic data were collected on gender, age, marital status, parental status, number of children and household size. Respondents were asked to state any history of chronic health conditions and whether being quarantined by a health authority.

Mental health status was measured using The Depression, Anxiety and Stress *Scale* (DASS-21; Lovibond & Lovibond, 1995). It is a self-report questionnaire consisting of 42 items, 14 items per subscale: depression, anxiety, and stress. Participants are asked to score every item on a four- point Likert-type scale, from 0 (did not apply to me at all) to 3 (applied to me completely). Final score is a linear combination of responses. Higher score indicates higher level of depression, anxiety and / or stress. In this study, the adapted and standardized version of DASS-21 was used (Reić Ercegovac & Penezić, 2012). The Cronbach's alpha coefficient for the stress subscale is .93, for the depression subscale .95, and for the anxiety subscale it is .90 (Reić Ercegovac & Penezić, 2012), The reliability of the DASS in this study population was $\alpha = .95$ for Depression subscale, $\alpha = .9$ for Anxiety subscale and $\alpha = .93$ for Stress subscale.

The hope for the future scale (Tucak Junaković, 2009) was constructed to examine hope for a better future. It is consisted of 8 statements which capture the belief that life is good and worth living, optimism about the future, hope that life will be better for future generations, etc. (e.g. "I hope to improve life in future generations."). Participants express the degree in which they agree with each statement on five-point Lik-

ert-type scale, from 1 (I do not agree at all) to 5 (I completely agree). Total score is presented as the average value of the estimates on the individual statements, so theoretically results can range between 1 and 5. Higher result indicates a more pronounced hope for a better future. The hope for the future scale was shown to have a one factor structure and high internal consistency (Tucak Junaković, 2011). A Cronbach-alpha coefficient of α = .9 was determined in a sample of this study.

Procedure

This research was carried out in Croatia between 19th March 2020 and 17th April 2020. The data in this study were obtained within the framework of larger research about aspects of adult mental health during the COVID-19 (coronavirus) pandemic. Before the research has been carried out, it was necessary to ensure that the research is in accordance with the relevant ethical standards. Therefore, it was applied for ethical approval and it was approved by the Ethics Committee of the Zagreb Child and Youth Protection Center. Research was carried out using structured online questionnaire, developed by using Google Forms, which included consent form. To recruit participants, snowball sampling method was used. Croatian citizens of 18 years and older were invited to participate in online study. The link which included questionnaire was sent through e-mails to the contacts of the researchers. The participants were encouraged to roll out the study to as many people as possible in order to forward it to people apart from the first point of contact and so on. Although the sample was convenient, researchers tried to include participants from various parts of Croatia by sending invitations to schools throughout Croatia with a request to forward the questionnaire to parents. Before taking the study, participants were presented with information about the study and provided informed consent. After that, if they had accepted to take the study, they provided their demographic information and afterwards answered a set of questions that appeared sequentially, page by page.

Results

Statistical analysis

All results were reported either as mean ± standard deviation or frequency (percentage) (%). Differences between the groups were tested by Welch's t-tests. Series of hierarchical regression analyses were performed to identify possible moderation effect of chronic diseases on the relationship between hope for the future and mental health variables used in this study. All statistical analyses were conducted in R Core Team (2020) and $p < ,05$ was considered to be statistically significant.

Results

There were 1482 participants in this study. Their sociodemographic characteristics are presented in Table 1, as means, frequencies and relative values. Most respondents were women (83.0%). The mean age of the sample was 33.3 years (*SD*=12.2), with household size of 3.8 members (*SD*=1.57). It should be noted that 35.0% of participants were married, 27.5% were in a relationship, 33.1% single and 4.4% divorced. In addition, 61.4% of participants reported having no children. The mean number of children reported by participants who had children was 2.03 (*SD*=1.03). Chronic health condition was reported by 13.8% respondents and 21.6% reported being in self-isolation as ordered by health authorities.

Table 1
Sociodemographic characteristics of the sample

		N	***M***	***SD***	**%**
Age			33.3	12.2	
Gender	Female	1230			83.0
	Male	252			17.0
Marital status	Married	520			35.0
	Divorced	65			4.4
	Single	476			33.1
	In a relationship	407			27.1
Children	No	910			61.3
	Yes	574			38.7
	Number of children		2.03	1.03	
Number of household members			3.8	1.57	
Chronic disease	No	1279			82.2
	Yes	205			13.8
Self-isolation	No	1169			78.4
	Yes	315			21.6

Note. N – number of participants, *M* – mean, *SD* – standard deviation, % - percent

A series of Welch's t-tests were conducted to examine differences between depression, anxiety and stress depending on chronic disease. It was found that there are significant differences in anxiety: $t(245{,}96) = 3.82$; $p < .001$ ($d = .34$), stress $t(263{,}93) = 2.32$; $p = .02$ ($d = .18$); and depression: $t(255{,}1) = 2.41$; $p = .02$ ($d = .20$). The obtained results show that people who have chronic illness have higher score than people who don't have chronic disease in all three cases, although the effect sizes are small.

To examine the moderation effect of chronic diseases on the relationship between hope for the future and mental health, a series of hierarchical regression analyses were conducted. In the first step of these analyses, the predictors were hope for the future and the existence of a chronic disease, while in the second step, their product was added as a predictor. Three such analyses were performed in total, with the criteria variables being anxiety (Table 2), depression (Table 3), and stress (Table 4).

Table 2
Summary of regression analysis with chronic disease, hope for the future and their product as predictors of anxiety as a criterion variable

	Anxiety				
	B	β	*SDB*	*t*	*p*
Chronic health condition	-0.84	-.53	0.2	-4.27	< .001
Hope for the future	-0.41	-.54	0.04	-9.2	< .001
Chronic health condition X Hope for the future	0.18	.5	0.05	3.62	< .001

Note. B – unstandardized regression coefficient, β – standardized regression coefficient, *SDB* – standard error of *B*, *t* – t-test value for significance testing of *B*, *p* – *p*-value of *t*.

Table 3
Summary of regression analysis with chronic disease, hope for the future and their product as predictors of depression as a criterion variable

	Depression				
	B	β	*SDB*	*t*	*p*
Chronic health condition	-0.53	-.27	0.22	-2.39	.02
Hope for the future	-0.56	-.61	0.05	-11.09	< .001
Chronic health condition X Hope for the future	0.12	.28	0.06	2.18	.03

Note. B – unstandardized regression coefficient, β – standardized regression coefficient, *SDB* – standard error of *B*, *t* – t-test value for significance testing of *B*, *p* – *p*-value of *t*.

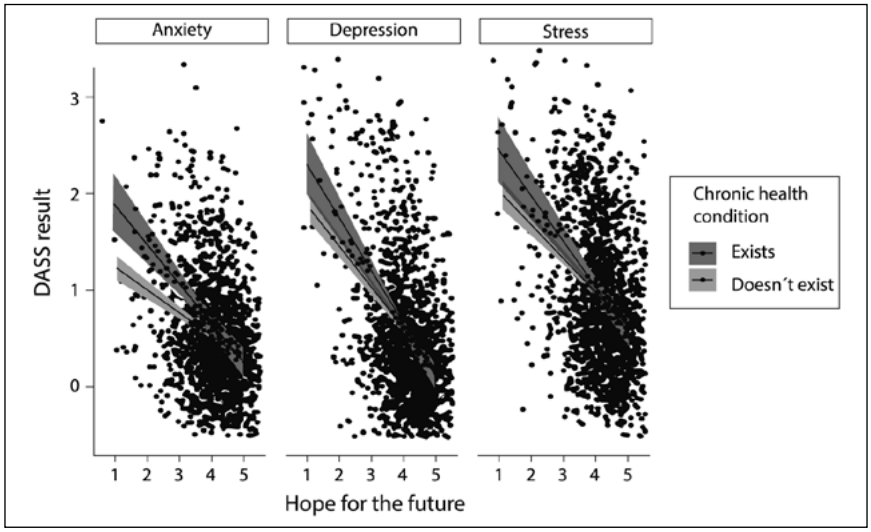
Table 4
Summary of regression analysis with chronic disease, hope for the future and their product as predictors of stress as a criterion variable

	Stress				
	B	β	*SDB*	*t*	*p*
Chronic health condition	-0.55	-.27	0.25	-2.19	.03
Hope for the future	-0.47	-.49	0.06	-8.31	< .001
Chronic health condition X Hope for the future	0.12	.27	0.06	1.96	.0497

Note. B – unstandardized regression coefficient, β – standardized regression coefficient, *SDB* – standard error of *B*, *t* – t-test value for significance testing of *B*, *p* – *p*-value of *t*.

It has been shown that chronic diseases have a significant moderation effect on the relationship between hope for the future and anxiety: $F(1, 1480) = 13.1$; $p < .001$; $\Delta R^2 =$, 01, depression: $F(1, 1480) = 3.86$; $p =$, 0497; $\Delta R^2 = .002$ and stress: $F(1, 1480) = 13.1$; $p < .001$; $\Delta R^2 = .002$. The correlation between hope for the future and mental health indicators is larger for people who have a chronic illness than for people who do not have a chronic illness. An overview of these relationships can be found in Figure 1.

Figure 1
Relationship of hope for the future with anxiety, depression, and stress depending on the existence of a chronic health condition



In order to more elaborately describe these differences in correlations depending on whether a person has a chronic illness or not, correlation coefficients were calculated between hope for the future and mental health indicators, separately in the group with chronic diseases and the group without. These correlations are found in Table 3. All correlations were negative and bigger in group of participants who have chronic health condition.

Discussion

Now, most global healthcare resources are directed on coronavirus disease which could disrupt the continuum of care for patients with chronic diseases and their mental health (Chudasama et al., 2020a; Chudasama et al., 2020b). Various studies (before the surge of pandemic) on this topic showed significant association between mental health and chronic diseases, such as cardiovascular, pulmonary and endocrinological (Rozario & Masho 2018, Mukeshimana & Chironda 2019). Research data from MERS outbreak suggests that individuals with history of chronic disease had increased odds for clinically significant anxiety (Jeong et al., 2016) and depression (Lee et al., 2018). Recent study found that 80% of healthcare professionals from 47 countries reported the mental health of their patients worsened during COVID-19 with diabetes, chronic obstructive pulmonary disease, and hypertension being the most impacted conditions due to reduction in access to care (Chudasama et al., 2020a).

Based on the aforementioned data, the first aim of this study was to examine the amounts of depression, anxiety, and stress during the COVID-19 pandemic between individuals who reported having a chronic disease and those who reported not having a chronic disease. In this study, participants who had chronic disease were shown to have higher levels of anxiety, depression, and stress compared to those who did not report having chronic disease. Possible explanations of these results stem from the fact that people with chronic disease are shown to have higher risk of a more serious clinical manifestations for COVID-19 (Zhang et al., 2020), they are generally more prone to mental health problems (Brooks et al., 2020), and at this time are exposed to a growing number of additional restrictions because of pandemic, all of which can negatively affect them, bringing anxiety, worries and fears, disrupting their mood and general assessment of threat in their lives, which could then lead to prolonged distress. Also, the mental health of individuals with chronic diseases is at the moment impacted by the fear of possible infection (Sayeed et al., 2020). Brooks et al. (2020) suggests that patients with chronic diseases will face mental health issues such as anxiety, depression, and increased stress during COVID-19 pandemic. The data from this research is consisted with late study from Spain which found that chronic disease patients had higher levels of stress, anxiety and depression compared to healthy individuals (Ozamiz-Etxebarria et al., 2020). On the other hand, recent study which investigated mental health in chronic disease patients during COVID-19 pandemic in Greece found that chronic disease patients had significantly higher levels of distress and somatization, but there were no significant differences found for anxiety and depression (Louvardi et al., 2020). Louvardi et al. (2020) suggest that no significant differences found in anxiety and depression between healthy individuals and those with chronic disease could possibly be explained by social support mechanisms that could have been activated during the current pandemic. In addition, authors state that patients with chronic diseases may have received higher support which had positive effects on depressive and anxiety levels, leading to absence of differences from healthy individuals.

Other aim of this study was to examine whether there is a moderating effect of chronic diseases on the relationship between hope for the future and anxiety, depression and stress. In previous research, hope for the future has been found to have a great part in adaptation to a challenging reality (Dixson et al., 2018; Lucas et al., 2020). In addition to that, hope can be considered a coping mechanism among chronic

patients (Soundy et al., 2016; Gallagher & Lopez, 2018) especially in current pandemic. Using hierarchical regression analysis, the degree to which the strength of the relationship between the existence of chronic disease and certain aspects of mental health is dependent on the hope for a better future was tested. As can be seen from the tabular displays, moderating effect of hope for the better future was observed in relation of chronic diseases and all measured aspects of mental health individually, depression, anxiety, and stress. All three interactions proved to be significant predictors of the criteria. Therefore, it can be concluded that negative correlation between hope for the future and mental health indicators used in this study is greater in participants who have a chronic disease, meaning that, when compared with healthy individuals, individuals with chronic diseases are more likely to be less hopeful for their future, which then leads to higher depression, anxiety and stress. Existing literature suggests that the maintenance or improvement of optimism and hope among people with chronic disease is associated with recovery from mental anguish and the preservation of resilience (Hou et al., 2010). Also, some authors found that hope is inversely correlated with stress and depression and associated with positive cardiovascular outcomes (Shepperd et al., 1996; Scheier et al., 1999; Warber et al., 2011). Other studies showed that hope contributed to increase life satisfaction or better health outcomes in patients diagnosed with kidney disease (Lopez-Vargas et al., 2014), musculoskeletal system disease (Kortte et al., 2010) and respiratory disease (Richman et al., 2005). Hartley et al. (2008) suggested that hopeful individuals believe that their current circumstances are temporary and can be transformed into better conditions.

Finally, epidemiological measures implemented to reduce the spread of the infection have a number of practical consequences for the health system, which operates to a somewhat limited extent in order to comply with the measures, which may be related to less accessible health care sources. These factors could be an increased source of excess worry and generally impaired mental health for people in this group, and therefore explain negative thoughts and expectations from what future brings (Ozamiz-Etxebarria et al., 2020). Furthermore, chronic disease is usually permanent health condition that requires an individual to adapt to a different lifestyle and certain limitations. Long-term nature of such diseases combined with health pandemic factors could be reasons people who have chronic diseases are less optimistic about future or have lower aspirations to preserve a fundamentally positive picture of life and the world as they predict it in the future.

Limitations of this study are mostly related to methodology, since convenient sample and snowball sampling method were used. Further limitation of our study is the over-representation of female participants. Also, as this study was conducted online, population of older people who do not possess electronic devices or internet access is underrepresented, as well as those with lower socioeconomic status (Bethlehem, 2010). That is a limiting factor because older people are subpopulation which has more chronic health conditions and is also described as vulnerable to COVID-19 complications. Future studies regarding this topic should take this into consideration. Also, it would be convenient for future research to study the importance of hope for future among different chronic diseases (Schiavon et al., 2017) during and after current health crisis. Due to the inability to reach the same participants it is not possible to conduct follow up studies which is a certain limitation to this study. It would thus be useful to conduct longitudinal research to monitor mental health indicators as pandemic changes with time. Since this research was conducted at the beginning of COVID-19 pandemic, it was important to get information about mental health indicators on time in order to be able to propose strategies and information that could be helpful, thus online research as a way of collecting relevant information was justified. Finally, this study contributes to the previous literature on mental health after the COVID-19 outbreak theoretically and practically, providing better understanding of vulnerabilities of people with chronic health conditions, thus emphasizing the vital importance for health care services in Croatia to provide the best possible health care during a pandemic for people with chronic health conditions, but also to prepare resources for possible rise in mental health problems in specific subpopulations in the long run.

Conclusions

These results indicate that people with chronic health diseases are more vulnerable for developing mental health consequences during this pandemic. Also, they indicate that, in addition to physical care, the chronically ill should also be provided with more mental health care resources. When making public health recommendations, proposing protocols and strategies, it is important to provide mental health support to those at high risk of developing difficulties in this area due to underlying comorbid difficulties and chronic diseases.

References

Asmundson, G. J., & Taylor, S. (2020). Coronaphobia: Fear and the 2019-nCoV outbreak. *Journal of Anxiety Disorders*, 70. https://doi.org/10.1016/j.janxdis.2020.102196

Bao, Y., Sun, Y., Meng, S., Shi, J., & Lu, L. (2020). 2019-nCoV epidemic: address mental health care to empower society. *The Lancet*, 395(10224), e37-e38. https://doi.org/10.1016/S0140-6736(20)30309-3

Bethlehem, J. (2010). Selection bias in web surveys. *International Statistical Review*, *78*(2), 161-188. https://doi.org/10.1111/j.1751-5823.2010.00112.x

Brooks, S. K., Webster, R. K., Smith, L. E., Woodland, L., Wessely, S., Greenberg, N., & Rubin, G. J. (2020). The psychological impact of quarantine and how to reduce it: rapid review of the evidence. *The Lancet*. https://doi.org/10.1016/S0140-6736(20)30460-8

Chudasama, Y. V., Gillies, C. L., Zaccardi, F., Coles, B., Davies, M. J., Seidu, S., & Khunti, K. (2020a). Impact of COVID-19 on routine care for chronic diseases: a global survey of views from healthcare professionals. *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, *14*(5), 965-967. https://doi.org/10.1016/j.dsx.2020.06.042

Chudasama, Y. V., Zaccardi, F., Gillies, C. L., Dhalwani, N. N., Yates, T., Rowlands, A. V., ... & Khunti, K. (2020b). Leisure-time physical activity and life expectancy in people with cardiometabolic multimorbidity and depression. *Journal of Internal Medicine*, *287*(1), 87-99. https://doi.org/10.1111/joim.12987

Dixson, D. D., Keltner, D., Worrell, F. C., & Mello, Z. (2018). The magic of hope: Hope mediates the relationship between socioeconomic status and academic achievement. *The Journal of Educational Research*, *111*(4), 507-515. https://doi.org/10.1080/00220671.2017.1302915

Dutheil, F., Mondillon, L., & Navel, V. (2020). PTSD as the second tsunami of the SARS-Cov-2 pandemic. *Psychological Medicine*, 1-2. https://doi.org/10.1017/S0033291720001336

Erikson, E. (1984.), *Childhood and Society*. Triad Paladin.

Gallagher, M. W., & Lopez, S. J. (2018). *The Oxford handbook of hope*. Oxford University Press. https://doi.org/10.1093/oxfordhb/9780199399314.001.0001

Hartley, S. M., Vance, D. E., Elliott, T. R., Cuckler, J. M., & Berry, J. W. (2008). Hope, self-efficacy, and functional recovery after knee and hip replacement surgery. *Rehabilitation Psychology*, *53*(4), 521. https://doi.org/10.1037/a0013121

Hou, W. K., Law, C. C., Yin, J., & Fu, Y. T. (2010). Resource loss, resource gain, and psychological resilience and dysfunction following cancer diagnosis: a growth mixture modeling approach. *Health Psychology*, *29*(5), 484. https://doi.org/10.1037/a0020809

Jeong, H., Yim, H. W., Song, Y. J., Ki, M., Min, J. A., Cho, J., & Chae, J. H. (2016). Mental health status of people isolated due to Middle East Respiratory Syndrome. *Epidemiology and health*, *38*. https://doi.org/10.4178/epih.e2016048

Kang, L., Li, Y., Hu, S., Chen, M., Yang, C., Yang, B. X., ... & Liu, Z. (2020). The mental health of medical workers in Wuhan, China dealing with the 2019 novel coronavirus. *The Lancet Psychiatry*, 7(3), e14. https://doi.org/10.1016/S2215-0366(20)30047-X

Kortte, K. B., Gilbert, M., Gorman, P., & Wegener, S. T. (2010). Positive psychological variables in the prediction of life satisfaction after spinal cord injury. *Rehabilitation Psychology*, *55*(1), 40. https://doi.org/10.1037/a0018624

Lauri Korajlija A., & Jokić-Begić N. (2020). COVID-19: Concerns and behaviours in Croatia [preprint]. *British Journal of Health Psychology*. https://doi.org/10.1111/bjhp.12425

Lee, S. M., Kang, W. S., Cho, A. R., Kim, T., & Park, J. K. (2018). Psychological impact of the 2015 MERS outbreak on hospital workers and quarantined hemodialysis patients. *Comprehensive Psychiatry*, *87*, 123-127. https://doi.org/10.1016/j.comppsych.2018.10.003

Lopez-Vargas, P. A., Tong, A., Phoon, R. K., Chadban, S. J., Shen, Y., & Craig, J. C. (2014). Knowledge deficit of patients with stage 1–4 CKD: a focus group study. *Nephrology*, *19*(4), 234-243. https://doi.org/10.1111/nep.12206

Louvardi, M., Pelekasis, P., Chrousos, G. P., & Darviri, C. (2020). Mental health in chronic disease patients during the COVID-19 quarantine in Greece. *Palliative & Supportive Care*, *18*(4), 394-399. https://doi.org/10.1017/S1478951520000528

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, *33*(3), 335-343.

Lucas, A. G., Chang, E. C., Li, M., Chang, O. D., Yu, E. A., & Hirsch, J. K. (2020). Trauma and suicide risk in college students: does lack of agency, lack of pathways, or both add to further risk? *Social Work*, *65*(2), 105-113. https://doi.org/10.1093/sw/swaa007

Mahase, E. (2020). China coronavirus: WHO declares international emergency as death toll exceeds 200. *BMJ: British Medical Journal*, *368*. https://doi.org/10.1136/bmj.m408

McAdams, D. P., Hart, H. M., & Maruna, S. (1998.), The Anatomy of Generativity. In D. P. McAdams & E. de St. Aubin (Eds.), *Generativity and Adult Development: How and Why We Care for the Next Generation* (str. 7-43), Washington, D.C., APPA Press.

Mowbray, H. (2020). In Beijing, coronavirus 2019-nCoV has created a siege mentality. *British Medical Journal*, *368*. https://doi.org/10.1136/bmj.m516

Mukeshimana, M., & Chironda, G. (2019). Depression and Associated Factors Among the Patients with Type 2 Diabetes in Rwanda. *Ethiopian Journal of Health Sciences*, *29*(6). https://doi.org/10.4314/ejhs.v29i6.7

Onder, G., Rezza, G., & Brusaferro, S. (2020). Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy. *Jama*, *323*(18), 1775–1776. https://doi.org/10.1001/jama.2020.4683

Ozamiz-Etxebarria, N., Dosil-Santamaria, M., Picaza-Gorrochategui, M., & Idoiaga-Mondragon, N. (2020). Stress, anxiety, and depression levels in the initial stage of the COVID-19 outbreak in a population sample in the northern Spain. *Cadernos de Saude Publica*, *36*(4), e00054020. https://doi.org/10.1590/0102-311X00054020

Pellino, G., & Spinelli, A. (2020). How Coronavirus Disease 2019 Outbreak Is Impacting Colorectal Cancer Patients in Italy: A Long Shadow Beyond Infection. *Diseases of the Colon & Rectum*, 63(6), 720–722. https://doi.org/10.1097/DCR.0000000000001685

R Core Team (2020). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. https://www.R-project.org/.

Reić Ercegovac I. & Penezić Z. (2012) Adaptirana skala depresivnosti, anskioznosti i stresa. In A. Proroković, V. Ćubela Adorić, Z. Penezić, I. Tucak Junaković (Eds). *Zbirka psihologijskih skala i upitnika, svezak 6*,

Zadar: Filozofski fakultet u Zadru, 17-24.

Richman, L. S., Kubzansky, L., Maselko, J., Kawachi, I., Choo, P., & Bauer, M. (2005). Positive emotion and health: going beyond the negative. *Health Psychology*, *24*(4), 422. https://doi.org/10.1037/0278-6133.24.4.422

Rozario, S. S., & Masho, S. W. (2018). The associations between mental health status, hypertension, and hospital inpatient visits in women in the United States. *American Journal of Hypertension*, *31*(7), 804-810. https://doi.org/10.1093/ajh/hpy065

Ruan, Q., Yang, K., Wang, W., Jiang, L., & Song, J. (2020). Clinical predictors of mortality due to COVID-19 based on an analysis of data of 150 patients from Wuhan, China. *Intensive Care Medicine*, 1–3. https://doi.org/10.1007/s00134-020-05991-x

Sayeed, A., Kundu, S., Al Banna, M. H., Christopher, E., Hasan, M. T., Begum, M. R., ... & Khan, M. S. I. (2020). Mental health outcomes of adults with comorbidity and chronic diseases during the COVID-19 pandemic: a matched case-control study. *Psychiatria Danubina*, 32(3-4), 491-498. https://doi.org/10.24869/psyd.2020.491

Scheier, M. F., Matthews, K. A., Owens, J. F., Schulz, R., Bridges, M. W., Magovern, G. J., & Carver, C. S. (1999). Optimism and rehospitalization after coronary artery bypass graft surgery. *Archives of Internal Medicine*, *159*(8), 829-835. https://doi.org/10.1001/archinte.159.8.829

Scheier, M. F., Matthews, K. A., Owens, J. F., Schulz, R., Bridges, M. W., Magovern, G. J., & Carver, C. S. (1999). Optimism and rehospitalization after coronary artery bypass graft surgery. *Archives of Internal Medicine*, *159*(8), 829-835. https://doi.org/10.1001/archinte.159.8.829

Schiavon, C. C., Marchetti, E., Gurgel, L. G., Busnello, F. M., & Reppold, C. T. (2017). Optimism and hope in chronic disease: a systematic review. *Frontiers in Psychology*, *7*, 2022. https://doi.org/10.3389/fpsyg.2016.02022

Shepperd, J. A., Maroto, J. J., & Pbert, L. A. (1996). Dispositional optimism as a predictor of health changes among cardiac patients. *Journal of Research in Personality*, *30*(4), 517-534. https://doi.org/10.1006/jrpe.1996.0038

Shepperd, J. A., Maroto, J. J., & Pbert, L. A. (1996). Dispositional optimism as a predictor of health changes among cardiac patients. *Journal of Research in Personality*, *30*(4), 517-534. https://doi.org/10.1006/jrpe.1996.0038

Shigemura, J., Ursano, R. J., Morganstein, J. C., Kurosawa, M., & Benedek, D. M. (2020). Public responses to the novel 2019 coronavirus (2019-nCoV) in Japan: Mental health consequences and target populations. *Psychiatry and Clinical Neurosciences*, *74*(4), 281. https://doi.org/10.1111/pcn.12988

Soundy, A., Roskell, C., Elder, T., Collett, J., & Dawes, H. (2016). The psychological processes of adaptation and hope in patients with multiple sclerosis: a thematic synthesis. *Open Journal of Therapy and Rehabilitation*, *4*(1), 22-47. https://doi.org/10.4236/ojtr.2016.41003

Tucak Junaković, I. (2010). Skala nade u budućnost. In I. Tucak Junaković, V. Ćubela Adorić, Z. Penezić, A. Proroković (Eds). *Zbirka psihologijskih skala i upitnika: svezak 5*, Zadar: Filozofski fakultet u Zadru, 112-119.

Tucak Junaković, I. (2011). Neki aspekti brige odraslih za mlađe generacije: spolne i dobne razlike. *Društvena istraživanja*, *20*(113), 671-692.

Warber, S. L., Ingerman, S., Moura, V. L., Wunder, J., Northrop, A., Gillespie, B. W., ... & Rubenfire, M. (2011). Healing the heart: a randomized pilot study of a spiritual retreat for depression in acute coronary syndrome patients. *Explore*, *7*(4), 222-233. https://doi.org/10.1016/j.explore.2011.04.002

World Health Organisation (WHO). Coronavirus disease (COVID-19) outbreak. https://experience.arcgis.com/experience/685d0ace521648f8a5beeeee1b9125cd

Yang, J., Zheng, Y., Gou, X., Pu, K., Chen, Z., Guo, Q., Ji, R., Wang, H., Wang, Y., & Zhou, Y. (2020). Prevalence

of comorbidities and its effects in patients infected with SARS-CoV-2: a systematic review and meta-analysis. *International Journal of Infectious Diseases*, 94, 91–95. https://doi.org/10.1016/j.ijid.2020.03.017

Zandifar, A., & Badrfam, R. (2020). Iranian mental health during the COVID-19 epidemic. *Asian Journal of Psychiatry*, *51*. https://doi.org/10.1016/j.ajp.2020.101990

Zhang, J., Wang, X., Jia, X., Li, J., Hu, K., Chen, G., Wei, J., Gong, Z., Zhou, C., Yu, H., Yu, M., Lei, H., Cheng, F., Zhang, B., Xu, Y, Wang, G., & Dong, W. (2020). Risk factors for disease severity, unimprovement, and mortality of COVID-19 patients in Wuhan, China. *Clinical Microbiology and Infection*. https://doi.org/10.1016/j.cmi.2020.04.012

Original research

12

Validation of the PERMA questionnaire

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Abstract

One of the theoretical models that seek to describe the components of psychological flourishing is the PERMA model according to which psychological flourishing consists of positive emotions, engagement, relationships, meaning and accomplishment. The aim of the study was to check the psychometric characteristics of the five main dimensions of the PERMA questionnaire. For the purpose of the research, the following measuring instruments were used: PERMA questionnaire (Butler & Kern, 2016), PANAS questionnaire (Mackinnon et al., 1999), Life satisfaction questionnaire (Diener et al., 1985), and the DASS-21 questionnaire (Henry & Crawford, 2005). A convenience sample of 287 students from the Catholic University of Croatia participated in the study. The results of the confirmatory factor analysis showed that the 5-factor model had better fit than the 1-factor model in the PERMA questionnaire, but the best model fit showed an ESEM 5-factor model. All five PERMA subscales were significantly positively moderately to highly related to each other. The reliability was good for all subscales except the engagement which was slightly lower and therefore the results should be interpreted with caution. Based on these analyses, the PERMA questionnaire has good psychometric characteristics for most subscales. In addition, it is recommended to calculate the total scores separately for each of the subscales of the questionnaire, rather than the total score on all subscales.

Keywords: PERMA questionnaire, validation, psychological flourishing, well-being, five-factor model

Introduction

The scientific field of exploring human well-being has traditionally been divided into two areas of study: hedonistic or subjective well-being and eudemonic or psychological well-being (Ryan & Deci, 2001). Subjective well-being contains an emotional and cognitive component that are connected (Diener et al., 2018). Psychologists who have focused more on the study of hedonistic well-being primarily focus on what makes a person's life better and more enjoyable (Ryan & Deci, 2001). On the other hand, the study of eudemonic well-being is primarily based on research that seeks to discover how a person can reach his or her potential and live a meaningful life (Ryff & Singer, 2002). Seligman (2011) states that earlier models of well-being include either one or the other aspect, which is not a satisfying solution, so a new model of well-being should unite both hedonia (the experience of positive emotions and satisfaction of desires) and eudaimonia (the presence of meaning and development of one's potentials) into one model.

In recent years, one conceptualization of well-being refers to the concept of flourishing. Fredrickson (2001), in her *Broaden-and-Build Theory*, defined flourishing and placed a particular emphasis on the importance and contribution of positive emotions to an individual's life. Furthermore, Ryan and Deci (2001) wanted to expand the theory behind flourishing, so they added an optimistic view of the world, self-acceptance, meaning in life, a sense of competence, and connection with other individuals which are crucial for achieving flourishing. This concept can explain the nature of psychosocial functioning in many areas of human life. Furthermore, Wong (2011) states that hedonistic and eudemonistic aspects of well-being together form flourishing, thus complementing the paradigm of the study on aspects of flourishing.

Seligman (2011) developed his model that was based on research on flourishing called PERMA model (positive emotion (P), engagement (E), relationships (R), meaning (M), and accomplishment (A)). He stated that a person can assess his degree of flourishing with these five components: positive emotions, engagement, social relationships, meaning, and accomplishment. These main components will be described below. According to Seligman (2011) emotions should be viewed in terms of their valence (negative and positive) and in terms of activation (low and high). Very often people can experience negative and positive emotions at the same time, which was confirmed by Cacioppo and Berntson's (1994) *Evaluative space model*. Also, later in neuroscience research, it has been confirmed that the amygdala is important for negative affect, and that the mesolimbic dopaminergic pathway is important for positive affects, because these two systems are separated, one can experience both kinds of emotions at the same time (Hoebel, et al., 1999). Positive emotions have proven to be important for building relationships, reducing stress and enabling better functioning (Lyubomirsky et al., 2005). In the field of positive psychology, engagement is very often measured as flow experience, and it occurs when there is a high level of involvement, high concentration and enjoyment in the moment (Csikszentmihalyi, 1990). Social relationships are fundamental to human life. Research shows that quality human relationships are associated with lower levels of depression and psychopathology, better physical health, lower mortality rates and healthy behaviors (Taylor, 2011). Meaning is defined as a feeling that life has a purpose, that a person has a sense of connection to something higher than himself, and also, that person's life is worthwhile and that there is a purpose to what he or she is doing (Steger, 2012). Meaning relates to better physical health, lower risk of mortality and higher life satisfaction (Boyle et al., 2009). Accomplishment is very important in today's modern world, and it is influenced by various life circumstances, opportunities, and personal ambitions. Accomplishment gives a person a sense of progress and a feeling of accomplishing a pre-set goal (Ryan & Deci, 2001). Although in his works Seligman (2011) presented empirical literature linking each component with well-being, these facets do not represent a comprehensive list of variables that have a strong correlation with well-being. Some researchers argue that sixteen desires underlie human behavior (Reiss, 2004), or that ten features underlie well-being (Huppert & So, 2013). On the other hand, Seligman's critiques of Diener's (1984) subjective well-being model have led

to the empirical researches of areas of well-being beyond life satisfaction and emotions (e.g. meaning and purpose in life, autonomy) that has not yet been studied in this way.

Cooke et al. (2016) reviewed many questionnaires for the assessment of hedonistic and eudemonic well-being. Short Depression-Happiness Scale measures depression and happiness. This scale has twelve items asking about positive thoughts and feelings as well as thirteen items asking about negative thoughts and feelings (Joseph et al., 2004). The review, made by Cooke et al. (2016), assesses positive and negative affects that are found in most questionnaires because these constructs are crucial for explaining hedonistic well-being. Also, most hedonistic questionnaires measure a global assessment of a person's quality of life, interpreted as understanding how a person can realize his desires and interests that coincide with his mental preconceptions given the cultural social milieu in which he lives according to chosen criteria (Gerino et al., 2017). Assessment of the satisfaction with life is a personal view of different aspects of life, compares the good sides with the bad ones and comes to an overall assessment of life satisfaction (Diener et al., 1985). Questionnaires for the assessment of eudaimonic well-being are much more heterogeneous in their definitions of well-being compared with the hedonistic questionnaires. Different validated measures are tested for measuring satisfaction with a person's life and affect, but there are less confirmed measures of eudemonic well-being and multidimensional well-being measures (OECD, 2013). Most of these questionnaires have factors such as environmental mastery, purpose or meaning in life and positive relationships. An earlier developed questionnaire for the assessment of flourishing was The Flourishing Scale. The Flourishing Scale (FS) is a measure of psychosocial flourishing. It consists of eight items in total and measures the respondent's self-perceived success in important areas such as relationships, self-esteem, purpose, and optimism. The scale provides a single psychological well-being score (Diener et al., 2010).

Butler and Kern (2016) emphasized that there is no single best model for explaining well-being, but different conceptualizations of it can be helpful for further research and development of the questionnaires. Researchers agree that the complex issue of human well-being needs to be approached through multidimensional theoretical systems (Huppert & So, 2013) because the feeling of well-being is not just the absence of negative affects such as loneliness, depression, or insecurity, rather it consists of many more dimensions to consider when researching. The PERMA questionnaire was developed by Butler and Kern (2016) as a multidimensional measure of flourishing. The authors created a set of items that was theoretically relevant to the five PERMA domains, consisting of 109 questions. After that number of items was reduced even more to 70 positively worded items that specifically measured PERMA. They randomly split groups of participants into two halves. An exploratory principal components analysis was separately conducted on each set, specifying a five-factor structure and direct oblimin rotation. They left items that appear in both samples. In both samples, the intrinsic reliability of individual factors ranged from Cronbach's alpha 0.64 to 0.97. Furthermore, they reduced the number of questions to 15 items that measure five main domains with three items per domain and added eight filler items. Therefore, at the end the questionnaire consists of 23 items. Filler items can be used to assess a person's self-perceived physical health, negative emotions (sadness, anger and anxiety), loneliness and overall happiness. Health and negative emotions are defined with three items each, loneliness and overall happines are defined with one item each. Authors recommend the use of the full measure with all 23 items (Butler & Kern, 2016). It is possible to calculate the overall well-being score or to calculate the average score of the items that form each factor. Overall well-being is the average of the main 15 PERMA items and the overall happiness item. But, Butler and Kern (2016) suggest that the multidimensional structure of the measure should be retained, rather than computing to a single flourishing score.

Validation of the PERMA questionnaire was already performed in German- (Wammerl et al., 2019) and English-speaking countries (Umucu et al., 2019), therefore, the goal of this study was to conduct a Croatian validation of the PERMA questionnaire.

Material and methods

Participants

A convenience sample of 287 students from the Catholic University of Croatia participated in the study, of which 216 were female (74.5%) and 71 men (24.5%). The average age of students was 21 years (M = 21.42, SD = 1.788). Considering the field of the study, 81.7% of students study social sciences, while 17.2% of them study humanities. Students participated in the research during January and February 2019.

Measures

The PERMA questionnaire is based on Seligman's PERMA model from his book Flourish (2011). This model defines five pillars of well-being: positive emotions, engagement, relationships, meaning and accomplishment. Later, Butler and Kern (2016) added the following scales to the questionnaire: negative emotions, loneliness, physical health, overall happiness and overall well-being, which they define as filler items, but may provide additional information on the person's well-being. For the purposes of this study, the questionnaire was translated from English to Croatian using the back translation method. In this paper, items involving the five main dimensions of the PERMA model were used for analysis: positive emotions ("In general, how often do you feel joyful?"), engagement ("How often do you lose track of time while doing something you enjoy?"), relationships ("How satisfied are you with your personal relationships?"), meaning ("To what extent do you generally feel you have a sense of direction in life?"), and accomplishment ("How often do you achieve the important goals you have set for yourself?"). Each of these subscales is made up of three items, 15 items in total. Participants gave their answers on a Likert scale of 0 to 10 (0- never, 10-always). Authors point out that the total result can be computed as a composite of the answers person gave on each of 15 items that measure five main domains and one item that measures overall happiness, it shows a degree of psychological flourishing, but results can be computed for each subscale separately. In order to calculate the scores for each subscale, it is necessary to sum up all the responses and to calculate the average score for each subscale. A higher score on the subscale indicates a higher level of each dimension of flourishing.

The PANAS (Positive and Negative Affect Schedule) questionnaire measures a person's mood and their usual and stable characteristics of affective experience. This measurement instrument is based on two independent factors, PA (positive affect) and NA (negative affect). In the original version PANAS consists of 20 items (Watson et al., 1988), and in this study a shortened version of the questionnaire (Mackinnon et al., 1999) was used with 10 items, 5 items for PA ("Excited") and 5 items for NA ("Nervous"). This structure was confirmed by the confirmatory factor analysis (χ^2 = 54.15, p = .01; CFI = .98; TLI = .97; RMSEA = .04, 90% CI = [.025, .073], SRMR = .04). A higher score on the PA subscale indicates a higher level of positive affect, and a higher score on the NA subscale indicates a higher level of negative affect. Participants had to rate their answers on a scale from 1 (not at all or very little) to 5 (strongly) to indicate the extent to which they had felt this way over the past year. The Cronbach α reliability for the PA subscale is .79 and the NA subscale is .89.

The DASS-21 questionnaire (Henry & Crawford, 2005) is a shorter version of the original DASS questionnaire (Lovibond & Lovibond, 1995). The shortened version has 21 items. Both versions have three subscales: depression ("I could not have experienced any positive feeling at all."), anxiety ("My mouth was dry."), and stress ("It was hard for me to calm down."). Each subscale consists of 7 items. Confirmatory factor analysis confirmed a three-factor structure of the questionnaire (χ^2 = 347.97, p = .00; CFI = .93; TLI = .92; RMSEA = .06, 90% CI = [.049, .067], SRMR = .06). All items have a negative direction, so the higher the total score on each subscale, the higher the level of distress associated with symptoms of depression, anxiety

and/or stress. Cronbach α reliability for the stress subscale is .87, for anxiety it is .83 and for depression it is .88.

The Satisfaction with Life Scale (Diener et al., 1985) is used for a global assessment of a person's life satisfaction. Assessment of life satisfaction belongs to the cognitive domain of subjective well-being. This questionnaire consists of five items ("My life is close to what I consider ideal.") and one-factor structure was confirmed in confirmatory factor analysis (χ^2 = 12.97, p = .02; CFI = .99; TLI = .97; RMSEA = .08, 90% CI = [.026, .128], SRMR = .03). The total score is calculated by summarizing the answers on all items, a higher result indicates a higher level of life satisfaction. The Cronbach α reliability for this scale is .84.

Procedure

Prior to conducting the research, the Ethical Committee of the Department of Psychology of the Catholic University of Croatia approved this research. The research was conducted using the paper-pencil method during regular university classes. The researcher came to the beginning of the lecture and gave the participants instructions on how to complete the questionnaires and briefly explained the key constructs. It was emphasized that the participation in the research was voluntary, data will be anonymous, and they could withdraw from the research at any time without any consequences. If participants began to complete the questionnaire, this was considered as their informed consent to participate in the survey. The whole procedure lasted for 20 minutes.

Results

In order to obtain psychometric properties of PERMA questionnaire, we conducted confirmatory factor analysis and reliability analysis. To test the validity of this instrument, we tested correlation with other frequently used measures of subjective well-being to obtain convergent validity and correlation with measures of stress, anxiety, and depression to obtain the divergent validity. All of these results will be described below in detail.

Confirmatory factor analysis (CFA) was conducted in Mplus version 8.4. Before conducting CFA, we checked the required assumptions. That is, we tested if there were univariate and multivariate outliers, univariate and multivariate normality of distributions and multicollinearity. There was only one result that passed the value of 3.29, which is, according to Tabachnik and Fidell (2007), a proof for univariate extreme value. In total, results of 11 participants had p value of chi-squared distribution lower than .001 which points out to multivariate extreme values (Tabachnik & Fidell, 2007). All these results were excluded from further analyses. Kolmogorov-Smirnov test of univariate normality of distribution was significant for all the variables, which means that there was also no multivariate normality of distribution since the univariate normality of distribution is a precondition for multivariate normality (Tabchnik & Fidell, 2007). For that reason, we used robust maximum likelihood estimation MLR that calculates standard errors and a chi-square test statistic robust to non-normality of data (Muthén & Muthén, 2017). Since none of the variables had VIF coefficient higher than 10 which is a critical value, according to Myers (1990, according to Field, 2009), we concluded that multicollinearity did not bias our data.

After checking the assumptions, the CFA was conducted with 272 participants. We compared the fit of one-factor model to five-factor PERMA model. Several well-known goodness-of-fit measures were used: (1) chi-square test which needs to be non-significant to confirm the good fit between the data and the model (Brown, 2015), (2) Comparative fit index (CFI) and Tucker-Lewis indices (TLI) whose values need to be as close as possible to 1, and values above .95 point to good fit (Hu & Bentler, 1999), but values from .90 and

.95 are also acceptable (Bentler, 1990), (3) a root mean square error of approximation (RMSEA) whose values under .05 show good fit, but values under 0.08 can show acceptable fit (MacCallum et al., 1996), (4) a standardized root mean square residual (SRMR) need to have values under .08 to show good fit between data and model (Brown, 2015).

The CFA showed that five-factor model had better fit indices than one-factor model as can be seen in Table 1. The Satorra-Bentler Scaled Chi-Square Difference Test confirmed this result ($p < 0.001$). As can be seen from the Table 1, CFI and TLI of the 5-factor model point to acceptable fit, SRMR to good fit, while χ^2 was significant and RMSEA higher than .08 which point to poor fit.

Table 1
Model Fit Indices for CFA and ESEM Models

	1-factor CFA model	5-factor CFA model	5-factor ESEM model
χ^2 (df)	633.158 (90)	243.803 (80)	77.860 (40)
CFI	.770	.931	.984
TLI	.732	.909	.958
RMSEA (90% CI)	.149 (.138-.160)	.087 (.074-.099)	.059 (.039-.078)
SRMR	.078	.044	.016

Besides this, the latent correlations between five PERMA dimensions (Table 3) were quite high which could point to the low discriminant validity (Brown, 2015). For that reason, we decided to run an exploratory structural equating modeling (ESEM) which is considered as an adequate analysis for resolving problems of inflated latent correlations within multidimensional instruments (Marsh et al., 2010). An ESEM 5-factor model showed good fit to the data (Table 1), better than the best-fitting CFA model, which confirmed Satorra-Bentler Scaled Chi-Square Difference Test ($p < .001$). Furthermore, latent correlations between five PERMA dimensions became lower (Table 3).

All but one item (at the dimension accomplishment) had saturations higher than .30 (Table 2) which is, according to one of the cut-offs, a criterion for the interpretability of factor saturations (Brown, 2015).

Table 2
Factor Solution from the 5-Factor CFA and ESEM Models

	CFA					ESEM				
Item	P	E	R	M	A	P	E	R	M	A
P3	.83**					.79**	.07	.09	.01	-.03
P13	.84**					.94**	.02	.00	.08	-.19
P22	.92**					.57**	-.01	.41**	-.02	.11
E2		.72**				.23	.44**	-.04	-.01	.39**
E10		.87**				.32*	.41**	-.00	.28*	.08
E17		.35**				.02	.57**	.12	-.01	-.07
R8			.75**			-.05	.12	.71**	.18	-.07
R19			.85**			.16	-.06	.72**	.07	-.01
R21			.85**			.25	-.00	.68**	-.05	.11
M7				.90**		.41**	.01	-.00	.50**	.07
M9				.90**		.05	.01	.00	.97**	-.01
M20				.75**		.29*	-.17*	.06	.34**	.28*
A1					.87**	.21	-.01	-.02	.04	.77**
A5					.82**	-.03	.14	.04	.17	.64**
A15					.56**	-.03	.21*	.09	.22*	.27*

Note. P = positive emotions; E = engagement; R = relationships; M = meaning; A = accomplishment; * p < .05.** p < .01.

Although some items had small cross-loadings, the majority of items loaded on a priori specified factor. This model indicates that these 5 dimensions represent the underlying structure of flourishing.

Regarding reliability analysis, Cronbach's alpha was good for subscale positive emotions (α = .90), relationship (α = .86), meaning (α = .87) and accomplishment (α = .78), while Cronbach's alpha for subscale engagement (α = .68) was under the value 0.70 which is lower limit for acceptable reliability of scale (Cortina, 1993). Results for this subscale should be interpreted with extra caution.

Table 3
Latent Correlations between PERMA Dimensions Obtained in CFA and ESEM

	P	E	R	M	A
P	-	.74**	.85**	.84**	.66**
E	.28	-	.55**	.79**	.75**
R	.56**	.10	-	.71**	.53**
M	.65**	.24	.52**	-	.82**
A	.50**	.21	.30*	.61**	-

Note. latent correlations obtained by CFA are shown above the diagonal, while latent correlations obtained by ESEM are shown below it. P = positive emotions; E = engagement; R = relationships; M = meaning; A = accomplishment.

Table 4 shows descriptive results for all PERMA subscales, and manifest correlations between all PERMA subscales, subscales of the DASS questionnaire and measures of life satisfaction and positive and negative affect. As can be seen, participants scored quite high results on each of the five PERMA subscales (*M* from 6.97 to 8.03). For the subscales positive engagement and relationship participants' results included the whole range of the scale (from 0 to 10), while for the subscale meaning that range was from 1 to 10, and for subscales engagement and accomplishment from 2 to 10.

Regarding manifest correlations presented in Table 4, all of the PERMA subscales had a statistically significant negative correlation with measures of depression, anxiety and stress, except correlation between subscale engagement and anxiety ($p > .05$). Based on these results, we can conclude that the PERMA questionnaire had good divergent validity.

To assess convergent validity, correlations between the five PERMA subscales and frequently used measures of subjective well-being – life satisfaction and positive and negative affect were analyzed. All five PERMA subscales had significant positive correlation with measures of life satisfaction and positive affect, while correlation was significantly negative with measure of negative affect ($p < .01$). These results indicate good convergent validity of the instrument.

Table 4

Descriptive results and Cronbach α for all subscales, correlation between all PERMA subscales, subscales of DASS questionnaire, The Satisfaction With Life Scale and subscales of PANAS

	M	SD	Min	Max	α	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1.Positive emotion	7.33	1.68	0	10	.90	1										
2. Engagement	7.30	1.47	2	10	.68	.56**	1									
3. Relationships	8.03	1.58	0	10	.86	.71**	.34**	1								
4. Meaning	7.17	1.90	1	10	.87	.74**	.51**	.62**	1							
5.Accomplishment	6.97	1.52	2	10	.78	.54**	.54**	.45**	.70**	1						
6.Depression	0.65	0.64	0	3	.88	- .68**	-.32 **	-.50**	-.54**	-.46**	1					
7.Anxiety	0.68	0.63	0	3	.83	-.36**	-.11	-.26	-.32**	-.24**	.66**	1				
8.Stress	1.11	0.71	0	3	87	-.50**	-.14*	-.33**	-.39**	-.26**	.73**	.74**	1			
9.Life satisfaction	5.10	1.05	1	7	.84	.73**	.46**	.65**	.75**	.62**	-.59**	-.31**	-.37**	1		
10.Positive affect	3.60	0.64	1	5	.79	.65**	.56**	.46**	.59**	.52**	-.49**	-.27**	-.35**	.58**	1	
11.Negative affect	2.66	0.86	1	5	.89	-.54**	-.18**	-.35**	-.40**	-.32**	.54**	.56**	.60**	-.46**	-.32**	1

Note. *$p < .05$. **$p < .01$

Discussion

In this study the main result was that the five-factor model has a better fit than the one-factor model. This finding has also been confirmed in previous research (Butler & Kern, 2016; Wammerl, et al., 2019), so it can be stated that the PERMA questionnaire must be used as a multidimensional measure.

First, the CFA was conducted, and after it ESEM since there were high correlations between factors and ESEM analysis is more appropriate in that case. Results showed that the ESEM 5-factor model had better fit than the best fitting 5-factor CFA model. Most items loaded on the expected factor and the preasumed 5-dimensional structure of the PERMA questionnaire was confirmed.

Some authors argued that the PERMA model is too similar to subjective well-being theory, because constructs share too much variance (Goodman et al., 2017). On the other hand, we can consider the PERMA questionnaire as an addition to a better understanding of well-being, because PERMA includes both hedonic and eudemonic well-being aspects in one questionnaire. Goodman et al. (2017) suggest that while lower-order indicators of subjective well-being theory and the PERMA model have distinct features, they can also be interpreted by one common factor of well-being.

Furthermore, this research showed that the PERMA questionnaire has good convergent validity. Wammerl et al. (2019) findings also confirm that PERMA has good convergent validity. In their research for assessment of convergent validity authors used Psychological Well-Being Scale by Ryff and Keyes (1995). In this research, it was decided to use different measures because in previous studies it has been shown that the Psychological Well-Being Scale does not have satisfactory metric characteristics (Abbott et al., 2006). Also, if psychological well-being scales were used then the focus is more on constructs such as self-acceptance, personal growth and life's meaning which are too similar in their content to the main dimensions of the PERMA model. Instead, the Satisfaction with Life Scale (Diener et al. 1985) was used, which measures a global estimation of a person's satisfaction with life. PANAS was used to examine a person's regular mood, which gave better a foundation for testing convergent validity.

Regarding the reliability of subscales, Cronbach's alpha was good for all subscales, except for engagement. For the scale of engagement Cronbach's alpha was slightly lower than recommended values. This was also the case in the research conducted by Wammerl et al. (2019). The subscale of engagement is very similar to flow experience, and it occurs when there is a high level of involvement in a specific activity that person finds amusing and enjoyable. It can be assumed that the meaning of this subscale can be very different for each participant, and it is not entirely possible to translate the meaning of the original item in English so our participants could have had different understanding of these questions. Therefore, in future research the translation of questions consisting of subscale engagement should be further improved in order to better reflect the nature of the Croatian language.

One of the disadvantages of this study is that self-reported measures are quite limited when assessing well-being, because the result on scale is significantly influenced by the current mood of participants (Huppert et al., 2009). Also, the sample in the study was convenient so no generalization to the general population is possible and therefore results should be interpreted with caution. In our study, some participants completed questionnaires soon after the Christmas holidays and some completed questionnaires one month later just before the start of the final exam period. It would have been better if all participants had completed the questionnaires at the same time so that we could say that external factors (e.g. current mood due to specific part of the year) did not significantly affect the results.

When we look at the potential impact of this research we can argue that this questionnaire can be used to design quality, positive interventions for improvement in levels of happiness and well-being in the general population. For a long time, the experts in field of psychiatry and psychology focused primarily on mental disorders, and not on the development of positive mental health in a healthy population. Mental

disorders are a great economic burden for societies around the world regardless of the differences between countries (Murray & Lopez, 1996), but some studies suggest that methods which primarily focus on the development of positive emotions and the character traits that underlie well-being are most effective in treatment of mental disorders (Cloninger, 2004). Therefore, the PERMA model can be used for designing these types of interventions to help people with mental disorders to better cope with life's problems and show them that they have a lot in common with other people in terms of achieving well-being.

This questionnaire can help mental health professionals to improve existing interventions and to create new ones that focus on all the essential dimensions of achieving a good quality of life. In most studies, one construct is emphasized as very important and that is sense of meaning, which is also one of the main dimensions in PERMA (D'Souza & Rodrigo, 2004). Meaning can be found by encountering someone or something that is valued, acting with kindness and purpose in the service of others, or developing attitudes such as compassion and humor that give meaning to suffering. Mostly, approaches to mental health make divisions between the human mind and the soul, but it is necessary to look at all the dimensions of human nature that will allow person to progress and achieve insightful awareness through increasing positive emotions, engagement, finding good-quality and long-lasting relationships, meaning in life and sense of true accomplishment.

Conclusions

The results of the confirmatory factor analysis and exploratory structural equating modeling showed a better fit of the 5-factor model compared to the 1-factor model in the PERMA questionnaire. The reliability of all subscales was good except the engagement which was slightly lower and therefore the results on this subscale should be interpreted with extra attention. All five PERMA subscales were significantly positively moderately to highly related to each other. Furthermore, the association was significant and positive with measures of life satisfaction and positive affect for all subscales, and significant and negative with measures of depression, anxiety and stress, and negative affect. The only correlation which was not significant in this analysis was the correlation between the engagement subscale and the results on the anxiety scale. Also, it is recommended to calculate the total scores separately for each of the five subscales of the questionnaire, rather than the total score on all subscales. In conclusion, the PERMA questionnaire has good psychometric characteristics for four out of five subscales, while the engagement subscale in future research should be further improved.

References

Abbott, R. A., Ploubidis, G. B., Huppert, F. A., Kuh, D., Wadsworth, M. E., & Croudace, T. J. (2006). Psychometric evaluation and predictive validity of Ryff's psychological well-being items in a UK birth cohort sample of women. *Health and Quality of Life Outcomes, 4*(76), https://doi.org/10.1186/1477-7525-4-76 https://doi.org/10.1186/1477-7525-4-76

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

Brown, T. A. (2015). *Confirmatory factor analysis for applied research*. The Guilford Press.

Butler, J., & Kern, M. L. (2016). The PERMA-Profiler: A brief multidimensional measure of flourishing. *International Journal of Wellbeing, 6*(3), 1-48. https://doi.org/10.5502/ijw.v6i3.526

Cacioppo, J. T., & Berntson, G. G. (1994). Relationship between attitudes and evaluative space: A critical review, with emphasis on the separability of positive and negative substrates. *Psychological Bulletin, 115*(3), 401–423. https://doi.org/10.1037/0033-2909.115.3.401

Cloninger, C. R. (2004). *Feeling good: the science of well being*. Oxford University Press.

Cooke, P. J., Melchert, T. P., & Connor, K. (2016). Measuring well-being: A review of instruments. *The Counseling Psychologist, 44*(5), 730–757. https://doi.org/10.1177/0011000016633507

Cortina, J. M. (1993). What is coefficient alpha? An examination of theory and applications. *Journal of Applied Psychology*, *73*(1), 98-104. https://doi.org/10.1037/0021-9010.78.1.98

Csikszentmihalyi, M. (1990). Flow: The psychology of optimal experience. *Journal of Leisure Research, 24*(1), 93–94. https://doi.org/10.1080/00222216.1992.11969876

D'Souza, R.F., & Rodrigo A. (2004). Spiritually augmented cognitive behavioral therapy. *Australasian Psychiatry, 12*(2*)*, 148–152. https://doi.org/10.1080/j.1039-8562.2004.02095.x

Diener, E., 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

Diener, E., Wirtz, D., Tov, W., Kim-Prieto, C., Choi, D., Oishi, S., & Biswas-Diener, R. (2010). New measures of well-being: Flourishing and positive and negative feelings. *Social Indicators Research, 39*, 247-266. https://doi.org/10.1007/s11205-009-9493-y

Diener, E., Oishi, S., & Tay, L. (2018). Advances in subjective well-being research. *Nature Human Behaviour*, *2*(4), 253–260. https://doi.org/10.1038/s41562-018-0307-6

Field, A. (2009). *Discovering statistics using SPSS*. SAGE Publications Ltd.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: The broaden-and-build theory of positive emotions. *American Psychologist, 56*(3), 218-226. https://doi.org/10.1037/0003-066X.56.3.218

Gerino, E., Rollè, L., Sechi, C., & Brustia, P. (2017). Loneliness, resilience, mental health, and quality of life in old age: A structural equation model. *Frontiers in Psychology, 8*. https://doi.org/10.3389/fpsyg.2017.02003

Goodman, F. R., Disabato, D. J., Kashdan, T. B., & Kauffman, S. B. (2017). Measuring well-being: A comparison of subjective well-being and PERMA. *The Journal of Positive Psychology, 13*(4), 1–12. https://doi.org/10.1080/17439760.2017.1388434

Hoebel, B. G., Rada, P. V., Mark, G. P., & Pothos, E. N. (1999). Neural systems for reinforcement and inhibition of behavior: Relevance to eating, addiction, and depression. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundations of hedonic psychology* (pp. 558–572). Russell Sage Foundation.

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

Huppert, F. A., Marks, N., Clark, A., Siegrist, J., Stutzer, A., Vittersø, J., & Wahrendorf, M. (2009). Measuring well-being across Europe: Description of the ESS well-being module and preliminary findings. *Social Indicators Research, 91*(3), 301–315. https://doi.org/10.1007/s11205-008-9346-0 https://doi.org/10.1007/s11205-008-9346-0

Huppert, F. A., & So, T. T. C. (2013). Flourishing across Europe: Application of a new conceptual framework for defining well-being. *Social Indicators Research, 110*(3), 837-861. https://doi.org/10.1007/s11205-011-9966-7

Joseph, S., Linley, P.A., Harwood, J., Lewis, C.A., & McCollam, P. (2004). Rapid assessment of well-being: The Short Depression-Happiness Scale (SDHS). *Psychology and Psychotherapy Theory Research and Practice, 77*(4), 463-478. https://doi.org/10.1348/1476083042555406

Lyubomirsky, S., King, L., & Diener, E. (2005). The benefits of frequent positive affect: Does happiness lead to success? *Psychological Bulletin, 131*(6), 803-855. https://doi.org/10.1037/0033-2909.131.6.803

MacCallum, R. C., Browne, M. W., & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*(2), 130-149. https://doi.org/10.1037/1082-989X.1.2.130

Marsh, H. W., Lüdtke, O., Robitzsch, A., Negengast, B., Morin, A. J. S., & Trautwein, U. (2010). A new look at the big-five factor structure through Exploratory Structural Equation Modeling. *Psychological Assessment*, *22*, 471–491. https://doi.org/10.1037/a0019227

Murray, C. J. L., & Lopez, A. D. (1996). *A comprehensive assessment of mortality and disability from diseases, injuries, and risk factors in 1990 and projected to 2020.* Harvard University Press.

Muthén, L. K., & Muthén, B. O. (2017). *Mplus User's Guide. Eighth Edition*. Muthén & Muthén.

OECD (2013). How's Life? 2013: Measuring Well-being, *OECD Publishing.* https://doi.org/10.1787/23089679

Reiss, S. (2004). Multifaceted Nature of Intrinsic Motivation: The Theory of 16 Basic Desires. *Review of General Psychology, 8*(3), 179–193. https://doi.org/10.1037/1089-2680.8.3.179

Ryan, R. M., & Deci, E. L. (2001). On happiness and human potentials: A review of research on hedonic and eudaimonic well-being. *Annual Review of Psychology, 52,* 141-166. https://doi.org/10.1146/annurev.psych.52.1.141

Ryff, C. D., & Keyes, C. L. M. (1995). The structure of psychological well-being revisited. *Journal of Personality and Social Psychology, 69*(4), 719–727. https://doi.org/10.1037/0022-3514.69.4.719

Ryff, C. D., & Singer, B. (2002). From social structure to biology: Integrative science in pursuit of human health and well-being. In C. R. Snyder & S. J. Lopez (Eds.), *Handbook of positive psychology* (p. 541–554). Oxford University Press.

Seligman, M. E. P. (2011). *Flourish: A visionary new understanding of happiness and well-being*. Free Press.

Steger, M. F. (2012). Experiencing meaning in life: Optimal functioning at the nexus of spirituality, psychopathology, and wellbeing. In P. T. P. Wong (Eds.), *The human quest for meaning* (pp. 165–184). Routledge.

Tabachnick, B. G., & Fidell, L. S (2007). *Using multivariate statistics*. Pearson.

Taylor, S. E. (2011). Social support: A review. In H. S. Friedman (Eds.), *The Oxford handbook of health psychology* (pp. 189-214). Oxford University Press.

Umucu, E., Wu J.R., Sanchez, J., Brooks, J.M., Chiu, C.Y., Tu, W.M., & Chan, F. (2019). Psychometric validation of the PERMA-profiler as a well-being measure for student veterans. *Journal of American College Health, 68*(3), 271-277. https://doi.org/10.1080/07448481.2018.1546182

Wammerl, M., Jaunig, J., Mairunteregger, T., & Streit, P. (2019). The german version of the perma-profiler: Evidence for construct and convergent validity of the perma theory of well-being in german speaking countries. *Journal of Well-Being Assessment 3,* 75–96, https://doi.org/10.1007/s41543-019-00021-0

Wong, P. T. P. (2011). Positive psychology 2.0: Towards a balanced interactive model of the good life. *Canadian Psychology*, *52(*2), 69-81. https://doi.org/10.1037/a0022511

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