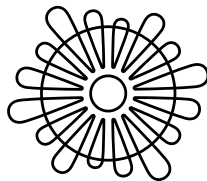


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UNIVERSITY OF ZADAR**

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Editor's Foreword

This book comprises selected proceedings of the 23rd Psychology Days conference in Zadar. The Psychology Days in Zadar is an international psychology conference organised biennially since 1978. The host of the conference is the Department at the Psychology of University of Zadar. Since its beginnings, this conference has outgrown its regional reputation and evolved into a recognized international scientific meeting. Despite the fact that there are many conferences in the region, this conference attracts participants from southern, eastern and middle Europe and beyond. It covers all psychology fields and neighbouring disciplines.

The 23rd Psychology Days in Zadar was held on 26-28 May 2022. It was organised by international scientific and organisational committees. To our knowledge, this was the first psychology conference in Croatia and beyond that was held after the COVID-19 restrictions had been lifted, so it attracted a large number of participants who were eager to present their latest research, communicate with colleagues in person and enjoy the spring sun in Zadar.

The Book of Selected Proceedings publishes exclusively empirical papers, with the exception of invited lectures which can be theoretical or review papers. Numerous participants arrived from following countries: Bosnia and Herzegovina, the Czech Republic, Croatia, Denmark, France, the Netherlands, Serbia, Spain, Sweden, Switzerland, United Kingdom and United States, and they presented more than 170 papers in total. Overall, the conference comprised five invited lectures, three symposia, twenty oral and three poster sessions. The Book of Proceedings contains sixteen papers that have undergone a double-blind review procedure. All papers are in English, written by 38 authors from five different countries. Each paper was reviewed by at least two experts. In addition, the complete edition was reviewed again by two experts, as listed in the book imprint. The papers come from different fields of psychology (clinical, cognitive, developmental, educational, maritime psychology, personality and psychology of sports). We are therefore positive that this edition will be a relevant source of novel and interesting findings.

The editors of the Book of Proceedings would like to express their gratitude to the authors for choosing this edition to publish their work and to the members of Editorial Board for their contribution in preparing this volume. We would also like to thank reviewers and book reviewers for their valuable help in evaluating the single papers and for the *en bloc* book review. Finally, we thank the University of Zadar for their support in publishing this edition.

In Zadar, 9 July 2023

Editors-in-Chief
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One size does not fit all: Cognitive enhancement as a multidimensional construct

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Abstract

Cognitive abilities are the key to success in almost all areas of life. Faster information processing and more efficient recall, greater (working) memory capacity and stronger inhibition of irrelevant stimuli, higher mental flexibility, and efficient associative memory, are some of the more specific cognitive processes underlying not just academic and professional success, but also success in everyday activities. Dynamic everyday life with an increasing flow of information places stronger and greater demands on our limited cognitive capacities. Recently, a larger number of strategies and interventions have been proposed, which are aimed at augmentation of brain functions and enhancement of processing capacities. Cognitive enhancement is relevant for a wide range of "users" - from children with ADHD or those raised in poverty, professionals with cognitively demanding workload, older adults with normative cognitive aging, to people with traumatic brain injuries or neurodegenerative diseases. Not surprisingly, the brain-training industry is one of the fastest growing market branches. Nevertheless, the (in)effectiveness of interventions has been the subject of long-standing controversy and argumentation among researchers. A synthesis of research from different scientific fields suggests that the answer to the effectiveness question requires a departure from the monolithic understanding of cognitive enhancement as a one-dimensional construct. If we accept its multidimensionality, we can discuss the effectiveness of interventions depending on their biochemical, physical, or behavioral nature, the targeted cognitive domain or process, the characteristics and individual variables of the participants, the duration of the intervention, and even the wider social acceptance of the idea of possible enhancement.

Keywords: cognitive enhancement; cognitive training; individual differences; motivation

The popularity of interventions aimed at cognitive enhancement and maintenance of cognitive abilities is widely evident in both scientific research and professional practice. An abundance of theoretical and empirical studies aimed at validation and evaluation of numerous interventions has been published in the past decades. This is well illustrated by a literature search using the keyword "cognitive training" or "cognitive intervention" in the PsychINFO database, which yields 518 peer-reviewed empirical articles, published between 2000 and 2010, and 2979 articles published in the following ten

years. The reasons behind this surge are threefold: 1) evidence of cognitive and neural plasticity which is not limited to infancy and early childhood, but extends throughout the lifespan, 2) technology burst, which facilitates precision in capturing behavioral and neural changes induced by cognitive training, as well as the development of new and effective forms of training, such as computerized cognitive training (CCT) and video games, 3) the so-called greying of the population with the ever-growing share of older adults believed to show a decline in various cognitive functions. These arguments are corroborated

by the observation that between ages 60-70 the decline is more evident in cognitive rather than physical abilities (Salthouse, 2009).

Large demand for cognitive interventions has opened various avenues of pursuing maintenance or enhancement of cognitive abilities. Proposed interventions vary deeply from one another in terms of implementation and the mere nature of intervention. They can be broadly categorized by their strategic approach into biochemical, physical and behavioral interventions. Although not exclusively, psychologists mostly deal with behavioral strategies which are based on new learning and cognitive engagement. Since various proponents advocate and present evidence in favor of their approach, it may seem that one can benefit from whichever procedure.

When discussing factors related to post-intervention gains in various aspects of cognition, studies point to different factors underlying these benefits. These factors are the focus of this paper. First, we will present the key findings which have led to the inauguration of the idea of cognitive intervention, i.e., evidence of interindividual variability in cognitive aging, and how different environments are manifested in this variability. Next, we turn to the brain industry and cognitive training as the most prominent of behavioral interventions. In the final chapter, we will discuss some predictors of training efficacy, which indirectly signal the route towards the personalization of cognitive interventions.

Cognitive development and interindividual differences in plasticity

Probably the best-known finding in the field of cognitive development is the dichotomy of fluid and crystallized abilities (e.g., Cattell, 1963). Fluid abilities are innate abilities of processing and assimilating information and solving problems. The culmination of the development of fluid abilities, such as attention, working memory (WM), executive functions (EF), speed of information processing, takes place throughout the third decade of life, followed by their decline at an average rate of -2% SD per year (Salthouse, 2012). Crystallized knowledge and

abilities, such as vocabulary and general knowledge, are more resistant to change, even to brain injuries (Brown, 2016). Therefore, they are often used to assess cognitive functioning before the injury itself. Crystallized abilities are maintained well into older adulthood. Since the initial findings, the fluid-crystallized dichotomy has somewhat softened. The new perspective is based on the evidence of: 1) crystallized abilities, which are not only maintained, but accumulated knowledge and experience, can even promote their increase well into the sixth and seventh decade (0.3-2% SD; Salthouse, 2012), 2) intensive exercise, which can enhance fluid abilities (e.g., Jaeggi et al., 2008) and slow down their decline (e.g., Willis & Nesselroade, 1990; Anguera et al., 2013).

The diverging age trajectories of the two types of abilities, sustained by the marked intraindividual changes in cognitive outcomes over time, have led to the compensation hypothesis, which suggests that individuals might compensate the decline in fluid abilities by gains in the crystallized ones (Tucker-Drob et al., 2022). This heterogeneity of abilities in aging is indirectly corroborated by implicit theories of aging; when asked to estimate the usual course of cognitive abilities in aging, lay people agree in the belief that abilities generally weaken, but they still predict better cognitive future for their parents rather than their parents' peers (Vernon, 1996; Haimovitz et al., 2011). Long tradition of cognitive aging research has led to the identification of three classes of factors related to cognitive decline: non-modifiable (e.g., genotype), modifiable (e.g., lifestyle, physical activity), and potentially controllable factors (e.g., health conditions such as substance abuse, obesity, hypertension). Interactively or independent from one another, these factors can modify our cognitive trajectories.

Early introduction of modifiable protective factors, such as educational stimulation, physical activity, or rich social network, into one's lifestyle seems to support latent level changes. Mimicking the latent learning paradigm (Tolman, 1948) or the effects of enriched environment (Rosenzweig & Barnes, 2003), the advantage of mental and physical activities, i.e., healthy lifestyle, can be evidenced much later - when one is faced with age-related weakening

or loss of abilities, and even more so when affronted with neurodegenerative diseases or some pathological events and processes (e.g., lesions, damage). The term *cognitive reserve* has been proposed to describe the fascinating phenomenon in which education, stimulating activities and work enable the aging brain to better cope with its losses, particularly with dementia and pathological characteristics of various types of dementia (Stern et al., 1994). In older age, cognitive reserve can contribute to the involvement in lifestyle activities and thus further perpetuate itself (Martinčević & Vranić, 2021). Studies in clinical cognitive neuroscience have taken the reserve terminology one step further; while *brain reserve* constitutes a passive capacity, dependent upon the brain structures, cognitive reserve represents a behaviorally expressed way of coping with brain pathology (Stern, 2002).

The model of reserve is substantiated by the findings of wide-spread age-related decreases in various neural parameters which are paired with the increased frontal engagement. Increased prefrontal engagement is related to a better behavioral performance in older adults (e.g., Gutchess et al., 2005; de Lange et al., 2016). More specifically, neuroimaging studies on aging show age-related volume shrinkage in specific brain regions (e.g., cerebral ganglion and cerebellum), decreases in cortical thickness and white-matter integrity, lowered dopaminergic and posterior brain activity (e.g., hippocampi and occipital areas), yet increased functionality of prefrontal cortex (Cabeza et al., 2004; Reuter-Lorenz et al., 2000). Although with much heterogeneity, destructive neurofibrillary plaques and volume reduction in some brain structures can be found even in highly functioning elderly people (Park & Reuter-Lorenz, 2009). In sum, neuroimaging studies reveal selective changes in the aging brain that can reflect neural decline, as well as compensatory neural recruitment.

To account for this phenomenon of slowed-down decline in the abilities, i.e., a decrease in specific neural parameters, and a compensatory increase in prefrontal activity, the so-called *scaffolding theory* of aging and cognition has been proposed (STAC; Park & Reuter-Lorenz, 2009). Scaffolding postulates a normative life-long circumvention of

neural decline via advancement of alternative neural routes to achieve cognitive goals. STAC postulates that functional age-related changes are a part of a life-long compensatory cognitive scaffolding, which represents an attempt to alleviate cognitive decline associated with aging. For example, well-functioning older adults with the greatest hippocampal reduction show greatest activation in the right PFC (Persson et al., 2006).

Aging can be related to a number of neural changes while the behavior stays intact. This has led to the suggestion of functional reorganization which occurs in the aging brain, i.e., older adults functionally adapt to the neural changes and consolidate their brain interconnectivity with regard to these changes. Available evidence suggests that the ability to use functional reorganization is strengthened by cognitive engagement (Zhang et al., 2015; Deng et al., 2019). In sum, STAC considers an aging mind to be a result of neural challenges and functional deterioration, upon which compensatory scaffolding (e.g., frontal recruitment, neurogenesis, distributed processing) and scaffolding enhancement can be exhibited. The interaction of these factors is a key determinant of one's level of cognitive functioning.

Brain-training industry

Scaffolding enhancement can be achieved via different strategies and actions: new learning, cognitive engagement, exercise and cognitive training. All these activities have a common denominator – active and consistent investment in one's own cognitive processes. Brain-training industry (smartphone applications, computerized cognitive training, even action video-game) rests upon this notion. Although evidence of the efficacy of smartphone apps and casual games is ambiguous and remains in question, an abundance of smartphone applications (apps) offer brain training to their users (e.g., Martinčević & Vranić, 2020). An online survey conducted in 2015 has shown that nearly 56% of smartphone users have used some brain training app (Torous et al., 2016). Interestingly, in the subsample of participants over age 60, brain training

apps were more downloaded by male participants. Majority of them report that brain training has helped them with different aspects of cognition; 66.9% have experienced aid with thinking processes, 69.3% with attention, 53.3% with mood, 65% with memory. Still, 14.9% of app users have reported that they felt there may be dangers with app use. Two complementary points need to be considered here: 1) the majority of sample was young (only 10% of participants were between ages 46-60, and only 2% of participants were older than 60); 2) smartphone ownership at the time of the study was reaching saturation with younger participants. As smartphone owners age, the positive relation of age and brain training apps will increase. This relation will be complemented by the next wave of growth in brain training apps market which will undoubtedly target older population.

A sophisticated step further from the smartphone brain-training apps are cognitive computerized trainings (CCT). CCT provide users with well-known and often validated tasks taping specific processes. These tasks are then implemented within a personalized training protocol, and with the intent to maintain and/or enhance targeted cognitive ability (e.g., attention, working memory, fluid reasoning) (e.g., von Bastian & Oberauer, 2014; Strobach & Huestegge, 2017; Martinčević & Vranić, 2019). CCT is a multimillion dollar industry featuring popular training platforms, such as Lumosity (Lumos Labs, 2007), Peak (Brainbow Limited, 2014), Elevate (Elevate Inc, 2014), and CogniFit Brain Fitness (Cognifit, 1999). A recent online study, with the age-stratified sample of 18-65-year-olds, has investigated attitudes and beliefs toward CCT (Goghari et al., 2020). The data analysis has shown that CCT was used by half of the sample. Among the users, 72% of participants have self-reported psychological or neurological conditions, and were therefore more likely to use the CCT than participants who did not report these difficulties. Furthermore, 45% of CCT users have spent anywhere from one month to more than a year using these apps, and 65% have engaged with brain apps two or more times per week.

The cognitive assessment and training market are projected to grow from USD 3.2 billion in 2020

to USD 11.4 billion by 2025, at a compound annual growth rate (CAGR) of 29.3% during this period. For comparison purposes, CAGR for a well-known firm like Microsoft and AstraZeneca is 13% and 10.21%, respectively (*Cognitive assessment and training market size, share and global market forecast to 2025*, 2020). Increased endorsement of gamification in cognitive assessment, as well as e-learning practices associated with recommendations for social distancing during the COVID-19 pandemic, are expected to push the endorsement of the cognitive assessment and training market even further.

Predictors of training efficacy

Research on cognitive interventions, as well as its market share is expanding rapidly. This expansion is accompanied by the continuous development of experimental designs, i.e., training designs, which are determined by progress in various fields. The main principles of learning, such as distributed learning, adequate difficulty and its adaptivity, or feedback, have always been the guiding principles of training, but nowadays changes are reflected in how technology enables these principles to be incorporated into interventions. Technology has enabled the development of extremely immersive training (e.g., VR) and the use of more complex measurements. Training algorithms have been improved, and gamification is a key element of more and more training software. In addition to technology, the development is aided by the emerging consensus around the method itself (control group, selection of tasks necessary for generalization of the conclusion) (Green et al., 2019).

Despite this burst in knowledge and technology, the results regarding the efficacy of interventions are still ambiguous. What is it that determines training success, what predicts one's achievement in the program? If we were to reach even far back into classical works in the field, the answer on predictors of training efficacy would include cognitive and non-cognitive factors alike. Galton has considered the importance of intelligence and diligence for one's achievement, and zeal and hard work

would be in the core of Darwin's thoughts on the problem (Duckworth et al., 2019). Today's studies on predictors of cognitive training efficacy can often be summed up under the umbrella term of the so-called *baseline dependency*. In the following paragraphs, we will consider some cognitive factors believed to have the baseline dependency with regard to the training outcomes (e.g., cognitive ability, sleep). We will then review the findings on non-cognitive predictors, such as lifestyle, personality, motivation and belief about intelligence, as either fixed or incremental ability.

Cognitive factors. A key cognitive factor associated with cognitive training gains is the baseline cognitive performance. A recent systematic literature synthesis and meta-analysis confirms the baseline dependency of the training efficacy upon the pre-training level of cognitive abilities (e.g., Traut et al., 2021; Vranić et al., 2021). Participants with initially lower abilities gain more from cognitive training than those who were more proficient before the training. This is particularly so in the case of executive function cognitive training (Lövdén et al., 2012; Karbach & Unger, 2014), video games training (Whitlock et al., 2012) and brain stimulation (Habich et al., 2017). Dependency of training gains on the pre-training ability level brings to mind the importance of the adaptivity of the training. Training difficulty must be set according to the baseline performance and should be adjusted to the level of acquired skills during the course of the training. It is interesting to note that certain medications seem to interact with the baseline cognitive ability resulting in differential training outcomes. For example, some substances, such as amphetamine, modafinil, and methylphenidate work mainly in individuals with low baseline performance (Illieva et al., 2013; Finke et al., 2010) and can sometimes even lead to impairments in individuals with higher baseline performance. These findings call for caution and indicate the necessity of an anamnestic checkup at the pretest of any intervention.

Lifestyle. Lifestyle, such as sleep, nutrition, socioeconomic factors and their resulting health status, also seems to be baseline dependent in terms of training efficacy. Sleep appears to enhance mem-

ory performance in participants with a higher baseline memory ability (Wilhelm et al., 2012), working memory (Fenn et al., 2012) or intelligence (Fenn et al., 2015). Genzel et al. (2012) found that cognitive performance benefits from nap in men, while this is evident in women only in the luteal phase of their menstrual cycle (high progesterone, low estrogen). As for nutrition, nutrition rich in omega-3 fatty acids and curcumin appear to elevate levels of brain-derived neurotrophic factor (BDNF), while saturated fats seem to do the opposite. BDNF is a neurotrophic which regulates neurogenesis (Numakava et al., 2017) and stimulates plasticity in adult brain (Miranda et al., 2019) by modulating the energy metabolism of nerve cells. Furthermore, the overall health status affects the level of cognitive benefit derived from medications and cognitive enhancers, mnemonics and sleep (Dresler et al., 2019; Genzel et al., 2015). Lastly, socioeconomic factors might play a role in the outcomes of cognitive interventions since studies strongly suggest that they moderate age-related differences in brain organization and functionality across the lifespan (Chan et al., 2018).

Personality. Studies on personality and their impact on training success are not numerous, and they yield unambiguous results. Double and Birney (2016) have investigated non-cognitive factors in registered users of a commercial brain-training platform with regard to their training success and adherence to the program over an 18-month period. Conscientiousness seems to have guided adherence during shorter training period and, more often, with a younger sample. It appears that individuals who are more open and exhibit higher need for cognition desire novel and challenging activities and are more likely to discontinue the training. A systematic review of 10 studies which have investigated the role of personality in training outcomes have suggested that: 1) Openness to experience and need for cognition are positively related to improvement (e.g., Bekavac & Vranić, 2015); and 2) conscientiousness and agreeableness have a positive moderating effect on the response to intervention, i.e., conscientious and agreeable participants improve significantly more than those scoring low on these traits (Marr et al., 2020).

Beliefs about intelligence. Growth mindset - the belief that intelligence is a malleable quality that can increase through efforts – seems to be related to training outcomes, but mostly regarding the adherence and/or discontinuation of the training. Regardless of their age, participants with fixed beliefs regarding intelligence are more likely to withdraw from participation and to perceive the tasks as too demanding (e.g., Double & Birney, 2016; Grant & Dweck, 2003). Regardless of use history, participants believe that attention and memory are most amenable to positive change through CCT use, followed by reasoning, multi-tasking, intelligence, and social cognition. Recent studies suggest that training-related gains are unlikely due solely to a placebo effect (Liu et al., 2021; Tsai et al., 2018), and expectations may increase motivation and attention during training, which in turn, improves posttest results (Parong et al., 2022).

Motivation. Jaeggi et al. (2014) suggests that intrinsic motivation, pre-training ability and need for cognition determine whether a person will choose to participate and remain engaged in a cognitive training. The most commonly reported reasons to engage in and continue to use CCT are curiosity, cognition enhancement, cognitive decline prevention and maintenance of cognitive abilities, restoration of perceived cognitive losses and, finally, the pleasure of playing (Goghari et al., 2020). Overall, highest training gains are found in participants who are given no incentive or a very small incentive for their participation (e.g., \$20 in Jaeggi et al., 2010), with lower transfer gains found with higher incentive, which operationalizes extrinsic motivation (e.g., \$150 in Anguera et al., 2012, Exp. 2; Studer-Luethi et al., 2010). Substantiating these findings, three other research groups, which have motivated their participants with larger incentives (\$130 - \$800) have also found no training transfer (Chooi & Thompson, 2012; Redick et al., 2013; Thompson et al., 2013). Effect sizes of gains in training studies with low incentive is found twice the size of the gains in the studies with high incentive. In so far, studies seem to unequivocally agree on the importance of intrinsic motivation to participate in interventions.

Conclusion

Future studies should address the extent and type of generalization induced by training paradigms while considering the many possible patterns of improvements from training. Patterns of benefits vary across training types as well as individuals, and understanding individual differences in training benefits will help advance the field. Overall, general population perceives interventions aimed at cognitive maintenance and enhancement as relatively useful. This underlines the critical importance of clear and precise communication of the scientific status of the effectiveness of CCT, as a large portion of population uses brain-training apps and CCT and wants to participate in organized training sessions.

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First-year students' academic motivation during the pandemic: The role of social support and basic psychological needs

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Abstract

Due to the COVID-19 pandemic, academic institutions needed to make swift changes in educational systems. Students needed to adapt and cope with novel challenges, which affected their academic motivation. Research shows that social support and satisfaction of basic psychological needs play an important role in maintaining academic motivation. The current study aimed to explore the role of perceived social support and satisfaction of basic psychological needs in first-year students' academic motivation. Our sample included 117 first-year students who completed the Academic Motivation Scale, Social Support Assessment Scale, and Basic Psychological Need Satisfaction and Frustration Scale. Results showed positive associations of perceived social support from professors, satisfaction of needs for autonomy and relatedness, and autonomy frustration with intrinsic academic motivation. We used hierarchical regression analysis to better understand these associations and found that satisfaction of the need for autonomy was the most important predictor of intrinsic academic motivation, and it also fully mediated the association between social support received from professors and intrinsic academic motivation. Our findings highlight the importance of autonomy-supportive learning opportunities and professors' support.

Keywords: *academic motivation; basic psychological needs; first-year students; pandemic; social support*

Introduction

The worldwide spread of coronavirus (COVID-19) resulted in a forced global shutdown of various activities, including educational activities.

Closing educational institutions affected 91% of the student population around the world (UNESCO, 2022). Moreover, students started having their lectures and exams in the online form. Learning in an online space is not a new concept of learning

in higher educational systems (Dumford & Miller, 2018). However, the pandemic did not only affect transferring to online learning space, but it also influenced the social life and mental health of students with possible long-term consequences (Chaturvedi et al., 2021). First-year university students are already undergoing a major life transition, and the consequences of the pandemic have significantly impacted their mental well-being. This has resulted in increased anxiety, depression, and other mental health issues (Ray et al., 2021). According to Allen et al. (2017), prioritizing mental health promotion increases academic scores significantly. This suggests that prioritizing mental health is beneficial for improving academic performance and motivation.

It is important to understand students' motivation, since it will have a high impact on their engagement and overall school success (López-Pérez et al., 2011). Dörnyei & Ushioda (2011) state that students' academic motivation is the driving force of their choices, engagement, effort, and persistence in learning. Amrai et al. (2011) showed a significant relationship between academic motivation and academic achievement. However, motivation is not a unidimensional concept, rather, it should be seen as a complex and multidimensional construct (Anderman & Dawson, 2011). Deci and Ryan (1985) posit in their Self-Determination Theory that behavior can be intrinsically motivated, extrinsically motivated, or amotivated. This theoretical approach led Vallerand et al., (1992) to develop a measure of academic motivation that we used in this study.

According to self-determination theory (Deci & Ryan, 2012, 2014; Ryan & Deci, 2008), there are three fundamental psychological needs: autonomy, competence, and relatedness. Students feel competent when they successfully complete assigned tasks (Skinner & Belmont, 1993), especially when they receive positive feedback. However, the pandemic has negatively impacted the fulfillment of this need. The shift to online learning and the lack of in-person feedback and support have compromised students' confidence in their abilities, resulting in a decline in their

sense of competence (Teuber et al., 2021). Autonomy is fulfilled when students perceive that they have control over their lives. Having options and choices increases intrinsic motivation, while deadlines decrease it (Zuckerman et al., 1978). With limited opportunities for social interaction and reduced flexibility in their schedules, many students have felt a loss of control in their lives. This lack of autonomy resulted in decreased intrinsic motivation, making it more difficult for students to stay engaged in their studies (Holzer et al., 2021). Finally, relatedness refers to being emotionally connected and interacting with others. Due to limited social interaction and reduced access to support networks, many students have felt emotionally disconnected and isolated (Vergara & Del Valle, 2021). Saeid Karimi and Sotoodeh (2020) demonstrated in their study that the satisfaction of the basic psychological needs for autonomy, competence, and relatedness had significant and direct positive effects on intrinsic motivation of students. However, the satisfaction of needs should be differentiated from the frustration of needs. That is to say, one's needs may not be satisfied, but dissatisfaction does not necessarily imply frustration (Tuin et al., 2020). For example, a student might struggle with the understanding of the subject and experience dissatisfaction of the need for competence, but that does not mean that this student would feel like a failure, i.e., experience frustration of the need for competence.

Since motivation is a complex and multidimensional construct, academic motivation is not only influenced by intrapersonal factors, but also by students' social environments. Tezci et al. (2015) have shown the important role of social support received from parents, teachers, and friends in academic motivation. In addition, interpersonal support promotes self-determined motivation (Deci & Ryan, 1985). According to Reeve (2002), students' motivation increases when their autonomy is supported by their teachers. Research suggests that the perceived social support students had received during the pandemic was negatively associated with their anxi-

ety (Ma & Miller, 2021). Moreover, when students perceived they had good social support, they had better coping mechanisms for their anxiety that was related to the pandemic (Ma & Miller, 2021). Adamou (2018) reported a significant relationship between peer support and student academic motivation, where peer support was found to have a strong direct effect on academic motivation.

Amidst the COVID-19 pandemic, the world has undergone a rapid shift in the way we function, particularly in the realm of education. For first-year university students, this sudden change can be especially daunting, leading to challenges in maintaining academic motivation. This study aims to shed light on the factors that contribute to academic motivation in this context. Drawing on previous research, we hypothesize that higher levels of social support, satisfaction of basic psychological needs, and lower levels of basic psychological needs frustration will be associated with higher levels of academic motivation. To explore the relative importance of these factors, we will conduct hierarchical regression analyses, entering social support variables first followed by basic psychological needs and vice versa, in order to identify the most significant predictors of academic motivation.

Method

Participants and procedure

The criteria for recruiting participants were that they were students (first-year students) who were enrolled in their first year of studying for the first time in the academic year of 2020/2021. A total of 153 people filled in the questionnaire, out of which 117 (83.8% female) students met the mentioned criteria. These students were aged between 18 and 27 years ($M = 20.06$, $SD = 0.96$), and were studying at ten different higher education institutions in Croatia, with the majority studying at the University of Zagreb (70.9%).

After obtaining ethical approval for the study,

an online questionnaire in Google Forms was posted on popular student Facebook pages (Facebook group size varied from 4k to 150k members). Data were collected during February and March 2022, two years into the ongoing COVID-19 pandemic and after first-year students had completed a year of face-to-face learning. As a result, their responses were given retrospectively. To address this, we adapted the wording of the questionnaire to the past tense and provided clear instructions for participants to respond based on their experiences during the 2020/2021 academic year.

Measures

Academic Motivation Scale (AMS; Vallerand et al., 1992) The Academic Motivation Scale (AMS) consists of 28 items. The original version of AMS showed a seven-factor structure (amotivation, three types of extrinsic motivation – external, introjected, identified, and three types of intrinsic motivation – knowledge, accomplishment, and experience). For the current study, we were interested in measuring only extrinsic and intrinsic motivation. Therefore, our scale consisted of 24 items. The items were rated on a 7-point scale, ranging from 1 (“does not correspond at all”) to 7 (“corresponds exactly”). Cronbach’s alpha was .96 for intrinsic academic motivation and .86 for extrinsic academic motivation.

Social Support Assessment Scale (SSAS; Kurtović, 2013) The social support assessment scale is an adaptation of the Social Support Appraisal Scale (Vaux et al., 1986). The scale measures three aspects of social support: support within the family, support from friends, and support at work. It is a self-assessment questionnaire, which consists of 24 items (8 for each subscale), and answers are given on a 5-point scale, ranging from 1 (“does not apply to me at all”) to 5 (“completely applies to me”). For research purposes, the items that measure social support at work have been reformulated to measure social support students perceive they receive from professors. Cronbach’s alpha was .92 for family support, .92 for friend support, and .93 for the professors’ support.

Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Šakan, 2022) This scale is the translated version of The Basic Psychological Needs Satisfaction and Frustration Scale (Chen et al., 2015). The scale consisted of 24 items assessing three needs satisfaction subscales: autonomy satisfaction (e.g., “I feel that my choices express who I am”), competence satisfaction (e.g., “I feel capable at what I do”), and relatedness satisfaction (e.g., “I feel that people I care about also care about me”), and three needs frustration subscales: autonomy frustration (e.g., “I feel forced to do many things I wouldn’t choose to do”), competence frustration (e.g., “I feel like a failure because of the mistakes I make”), and relatedness frustration (e.g., “I feel the relationships I have are just superficial”). Participants provided their responses on a 5-point scale ranging from 1 (“I completely disagree”) to 5 (“I completely agree”). Cronbach’s alpha for six subscales was in the .63 to .85 range.

Results

Descriptive statistics and intercorrelations between all study variables are presented in Table 1. Our participants reported similar levels of intrinsic and extrinsic academic motivation and similar levels of support from friends and family. Highest need satisfaction and lowest need frustration were reported for the need for relatedness, while lowest need satisfaction and highest need frustration were reported for the need for autonomy. To examine the associations between academic motivation, social support and basic psychological needs, we calculated Pearson correlations with a significance level set at $p < .01$. Correlational analysis showed that extrinsic academic motivation was not significantly associated with social support and basic psychological needs. Significant correlations were observed for intrinsic academic motivation, which was positively associated with social support from professors, autonomy and relatedness needs sat-

Table 1. Descriptive statistics and intercorrelations between study variables ($N = 117$)

Variable	$M(SD)$	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1. Intrinsic motivation	5.12 (1.52)										
2. Extrinsic motivation	5.28 (1.25)	.24*									
3. Support friends	4.15 (0.74)	.19	.14								
4. Support family	4.16 (0.88)	.20	.11	.35*							
5. Support professors	2.96 (0.95)	.30*	.10	.31*	.29*						
6. Autonomy satisfaction	3.71 (0.84)	.58*	.03	.22	.21	.35*					
7. Autonomy frustration	3.45 (0.89)	-.38*	.21	-.13	-.23	-.33*	-.51*				
8. Competence satisfaction	3.88 (0.80)	.35	.01	.22	.25*	.27*	.41*	-.33*			
9. Competence frustration	2.75 (1.15)	-.34	.07	-.18	-.28*	-.31*	-.46*	.59*	-.67*		
10. Relatedness satisfaction	4.36 (0.66)	.29*	.00	.64*	.46*	.24*	.37*	-.17	.24*	-.29*	
11. Relatedness frustration	2.15 (0.74)	-.22	.03	-.51*	-.32*	-.18	-.36*	.34*	-.28*	.40*	-.70*

Note. * $p < .01$

Table 2. Results of the hierarchical regression analyses

Step	Model 1				Model 2			
	Beta	<i>t</i>	<i>p</i>		Beta	<i>t</i>	<i>p</i>	
1	Support friends	.08	0.83	.408	Autonomy satisfaction	.46	4.79	<.001
	Support family	.11	1.08	.282	Autonomy frustration	-.15	-1.43	.156
	Support professors	.24	2.54	.012	Competence satisfaction	.14	1.38	.172
					Competence frustration	.05	0.44	.659
					Relatedness satisfaction	.17	1.53	.130
					Relatedness frustration	.13	1.20	.233
	<i>F</i> (3,113) = 4.61, <i>p</i> = .004, adj. <i>R</i> ² = .09				<i>F</i> (6,110) = 10.97, <i>p</i> < .001, adj. <i>R</i> ² = .34			
2	Support friends	.01	0.06	.952	Autonomy satisfaction	.45	4.58	<.001
	Support family	.02	0.21	.836	Autonomy frustration	-.13	-1.25	.215
	Support professors	.06	0.67	.508	Competence satisfaction	.14	1.26	.211
	Autonomy satisfaction	.45	4.58	<.001	Competence frustration	.06	0.46	.649
	Autonomy frustration	-.13	-1.25	.215	Relatedness satisfaction	.14	1.08	.281
	Competence satisfaction	.14	1.26	.211	Relatedness frustration	.13	1.09	.278
	Competence frustration	.06	0.46	.649	Support friends	.01	0.06	.952
	Relatedness satisfaction	.14	1.08	.281	Support family	.02	0.21	.836
	Relatedness frustration	.13	1.09	.278	Support professors	.06	0.67	.508
	<i>F</i> (9,107) = 7.22, <i>p</i> < .001, adj. <i>R</i> ² = .33 ΔF (6,107) = 7.70, <i>p</i> < .001, ΔR^2 = .27				<i>F</i> (9,107) = 7.22, <i>p</i> < .001, adj. <i>R</i> ² = .33 ΔF (3,107) = 0.20, <i>p</i> = .898, ΔR^2 = .00			

Note. Beta = standardized regression coefficient; *t* = *t* value; *p* = *p*-value; *F* = *F*-ratio; Adj. *R*² = adjusted coefficient of determination; ΔF = change in *F*-ratios; ΔR^2 = change in *R*²

isfaction, and negatively with autonomy frustration.

To further examine these associations, since social support and basic psychological needs were also intercorrelated, we conducted a series of hierarchical regression analyses with intrinsic academic motivation as criteria. We entered social support variables first, followed by basic psychological needs and vice versa. Results are

presented in Table 2. When social support variables were entered first in regression analysis, they explained 9% of intrinsic academic motivation with support from professors as a significant predictor. However, when basic psychological needs were entered in the second step, only autonomy need satisfaction was a significant predictor with a full model explaining 33% of the intrinsic academic motivation variance. When

basic psychological needs were entered first in regression analysis, autonomy need satisfaction was a significant predictor with a model explaining 34% of the variance. Adding social support variables in the second step did not improve prediction of intrinsic academic motivation. We tested the possible mediation from model 1 using PROCESS (Hayes, 2018). The tested model was a simple mediation model with intrinsic academic motivation as an outcome variable, social support from professors as a predictor variable, and autonomy need satisfaction as a mediator variable. The indirect effect of social support from professors on intrinsic academic motivation was found to be significant [effect = .19, 95% C.I. (.08, .32)].

Discussion

The current study aimed to explore the role of perceived social support and basic psychological needs satisfaction and frustration in academic motivation during the pandemic. Our sample consisted of first-year students who were enrolled in their first year of studying for the first time in the academic year 2020/2021. While the response rate for our survey was satisfactory, it is important to note that our sample may have been biased towards students who experienced more difficulties during the pandemic. Specifically, most of the comments in response to the question "What were your biggest challenges during the 2020/2021 academic year?" were related to student life, online class organization, and communication with professors. However, this bias could actually be seen as a strength of our study, as it allowed us to gain a more in-depth understanding of the challenges that students faced during the pandemic.

Findings showed that only intrinsic academic motivation was significantly correlated with both perceived social support and basic psychological needs satisfaction and frustration. Furthermore, regression analysis showed that perceived social support received from professors was a signifi-

cant predictor of intrinsic academic motivation, but only when basic psychological needs were not in the regression model. From all basic psychological needs' satisfaction and frustration variables, the satisfaction of the need for autonomy was the most important predictor of intrinsic academic motivation. Perceived social support and basic psychological needs satisfaction and frustration together explain 33% of the variance in intrinsic academic motivation. Mediation analysis showed that social support from professors has an effect on intrinsic academic motivation through the satisfaction of students' need for autonomy. In other words, students who get social support from professors get more satisfaction of their need for autonomy, which contributes to their higher intrinsic academic motivation.

Our results are in line with previous findings from the literature. Camacho et al. (2021) showed that students' anxiety and teachers' social support (reported by parents) were significant predictors of the decrease in students' academic motivation during the pandemic. The literature emphasizes the important role of teachers, as important contributors to fulfilling students' psychological needs when they provide structure and autonomy to the students (Deci & Ryan, 1985; Reeve, 2002). Wentzel (2009) suggests that creating a trustful relationship with teachers is a step forward in improving students' motivation and well-being. Nevertheless, we did not find support for social support from family and friends being a significant predictor of academic motivation. A possible explanation for this is students' different perceptions of social support, where they perceive parents as providers of emotional and instrumental support, classmates of informational and emotional support, and teachers of informational support (Hombrados-Mendieta et al., 2012). Furthermore, inevitable lockdowns resulted in shifting to distance learning, which influenced students' fulfillment of their basic psychological needs and their intrinsic motivation for school (Zaccoletti et al., 2020). Reeve (2002) showed that students' motivation benefits when teachers support their autonomy, which is in line with our finding that

satisfaction of the need for autonomy predicts intrinsic academic motivation. Furthermore, Niemiec and Ryan (2009) highlight the important role of autonomy and self-regulated learning in intrinsic learning motivation, showing that individualized and autonomous learning is an optimal path to students' success. Therefore, we suggest that academic institutions should support self-regulated learning and encourage students to consciously structure and plan their learning in order to feel more autonomous in their studying experience.

Limitations and future directions

The current research has some significant strengths, but also some limitations that we would like to discuss in detail.

First, since the study was conducted in 2022, students' responses were provided retrospectively. However, the phrasing of the questions accounted for this, and we believe it did not pose a major issue. Nevertheless, it is important to keep this in mind when interpreting the data. It would be worth exploring whether this could have influenced the results in any way. Secondly, although students from ten different higher education institutions participated in the study, the total number of participants was modest. This may have limited our ability to detect certain effects, given the larger number of variables in our analysis. Therefore, it is highly advisable to use a larger sample size in future research. Follow-up studies on this topic are needed, especially as COVID measures have changed in recent times. It would also be useful to investigate whether the findings from this study can be applied to other populations, or if they are particular to the sample used in this research. Finally, future studies should consider adopting different approaches to participant recruitment to ensure better representation of the student population. For instance, stratified sampling techniques can be utilized to guarantee a more diverse sample, or specific groups of students who may have been underrepresented in the current sam-

ple could be targeted. Furthermore, it would be interesting to explore whether the results of this study can be replicated in different contexts, or whether they are specific to the particular institutions and students that were included in this research.

Conclusion

The present study highlights the potential importance of perceived social support and basic psychological needs satisfaction and frustration in academic motivation of first-year students. Findings suggest that there may be a relationship between professors' support and intrinsic learning motivation. Moreover, it appears that satisfying the need for autonomy may predict students' intrinsic academic motivation. Mediation analysis suggested that the relationship between social support from professors and intrinsic academic motivation may be explained by the satisfaction of students' need for autonomy. These findings suggest that universities could benefit from promoting a supportive and autonomous environment for students, particularly during challenging times. Additionally, providing accessible communication and support between teachers and students, while encouraging self-regulatory learning experiences, could have positive implications for increasing student academic motivation.

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The relationship of trust, loneliness and social support, and the attitudes towards COVID-19 public health measures

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Abstract

During the COVID-19 pandemic countries implemented public health measures aimed at minimizing social contact. Therefore, the measures have likely altered the quality and the frequency of social relationships, affecting both trust in people and institutions, as well as the sense of loneliness and social support. However, there were contrasting reactions to the implemented measures - some considered them too mild, some too harsh, and others appropriate. This study investigated how these groups of individuals differed in their trust in other people and institutions, as well as in their feeling of loneliness and social support. A Croatian sample of 2115 participants collected at the beginning of the pandemic was examined. The analyses suggested that people who considered measures too mild had lower trust in people, government, and healthcare system than the ones who considered them appropriate. People who considered measures too harsh had lower trust in government, WHO, and were lonelier than people who considered them appropriate. These findings help us elucidate the differences between people with distinct attitudes towards COVID-19 measures in terms of their relationship towards others and the institutions (i.e., trust), and their coping with the challenges of the pandemic (i.e., loneliness and social support).

Keywords: attitudes towards COVID-19 public health measures; institutional trust; interpersonal trust; loneliness; social support

Introduction

During the COVID-19 pandemic, public health measures were introduced to slow down the transmission of the virus. These measures strongly affected people's social lives, both in terms of intensity and quality. They reduced the number of social interactions, which likely increased loneliness (e.g., Bu et al., 2020)¹ and other negative mental health outcomes like depression and anxiety (Wu et al.,

2021). Furthermore, by acting as a proxy for risk assessment, they might have also affected the quality of one's relationships, for instance, by making people more distrustful towards others (Fang et al., 2022; Lo Iacono et al., 2021)² or, differently, more trustful towards institutions they were hoping to keep them safe (Bol et al., 2021; Sibley et al., 2020).

However, not everyone experienced the restrictive measures in the same way – some people approved of them, and some were rather skeptical. It is viable to

¹ There are some studies that challenge this, e.g., Luchetti et al. (2020)

² However, see Esaiasson et al. (2021) for indications that interpersonal trust rose during the pandemic in Sweden.

assume that the subjective experience of measures is a better predictor of their impact on social life than their stringency *per se*. Therefore, this study investigated how the attitudes towards COVID-19 public health measures (ACPM) were related with loneliness and trust in people and institutions. Here, loneliness was conceptualized both as a subjective experience of feeling lonely (*loneliness* in the further text) and as a perception of a lack of social support. Previous research (e.g., Coyle & Dugan, 2012; Routasalo et al., 2006) showed that these two concepts, although somewhat similar, are empirically fairly distinguishable.

Regarding trust, a study conducted in Switzerland (Gilles et al., 2022) found that the perceived effectiveness of implemented measures was positively associated with the trust in medical/scientific institutions, but not with the trust in governmental or non-Swiss institutions (EU, foreign governments, WHO). An experimental study using samples from China and the USA (Yuan et al., 2022) discovered that institutional trust increased voluntary compliance, and that interpersonal trust increased willingness to reduce unnecessary outdoor activities (in Chinese part of the sample). Lastly, Rieger and Wang (2022) found that perceiving the government response as either too weak or too extreme was related with lower trust in government.

Studies investigating the relationship between loneliness and ACPM showed diverging results. For example, Rania and Coppola (2022) found that people who had more negative/opposing attitudes towards social distancing were lonelier. Similarly, Stickley et al. (2021) observed that lonelier people were less likely to engage in COVID-19 preventive behaviors. Finally, in a thought-provoking study, Paykani et al., (2020) found that perceived social support from family was related with more compliance, whereas perceived social support from friends was related with less compliance with measures (the latter was also supported by Hills & Eraso, 2021). One explanation for these diverging results may be that different groups that people rely on for support (e.g., family vs. friends) have divergent expectations from them (e.g., safety vs. fun), which in turn encourages conflicting behaviors.

The goal of this study was to investigate the relationship between ACPM, institutional and interperson-

al trust, and loneliness and social support. To measure ACPM more specifically, a distinction between considering measures as appropriate, too harsh, and too mild was made. It was hypothesized that considering measures either too harsh or too mild (i.e., inappropriate) was associated with lower trust in government and medical institutions. Considering measures too mild was expected to be related to lower interpersonal and institutional trust. Finally, considering measures too harsh was hypothesized to be associated with higher loneliness and lower social support.

Method

Participants

A Croatian sample from the COVIDiSTRESS Global Survey (Yamada et al., 2021) dataset was analyzed in this research. The data can be found on the project's OSF page (<https://osf.io/z39us/>). The project acquired the approval of the Ethics Committee of the Aarhus University on 10th June 2020, after a waiver at the beginning of the data collection. The approval of the Ethics Committee of the Catholic University of Croatia was also obtained. The data in the final Croatian sample were gathered online from 31st March 2020 to 18th May 2020.

The original sample had $N=2965$, but only participants who identified as either male or female ($N=2950$), and who had no missing values in the variables used in modeling were retained, leading to the final sample of $N=2115$ (19.6% male). Those participants were on average 35.4 years old ($SD=12.2$), 15.3% had none or up to 12 years of education³, 16.4% had some college education, 63.1% had a college degree and 5.2% had a doctoral degree.

Instruments

Attitudes towards COVID-19 public health measures (ACPM) ACPM were measured with the

³ Participants with no education and with up to 6/9/12 years of school were pooled in one group due to lower frequencies in the single categories.

question “All things considered, do you believe that the government of the country you currently live in has taken appropriate measures in response to the coronavirus?”. The participants responded on a scale from 0 (too little) across 5 (appropriate) to 10 (too much). Answers 0-3 were grouped into “too mild” (TM), 4-6 into “appropriate” (AP), and 7-10 into “too harsh” (TH). In the final sample, 71.5 % of participants considered measures appropriate, 24.1 % too harsh, and 4.4% too mild.

Institutional and interpersonal trust Institutional and interpersonal trust were measured according to the OECD guidelines (OECD, 2017), using the following questions: (1) “On a scale from 0 to 10, where 0 is not at all and 10 is completely, in general how much do you trust most people?” and (2) “On a scale from 0 to 10, how much do you personally trust each of the institutions below (0 means you do not trust an institution at all, and 10 means you have complete trust): [The parliament/government of the country you currently live in?]; [The health system of the country you currently live in?]; [The World Health Organization (WHO)?]”.

Loneliness and social support Loneliness was measured with the 3-item UCLA loneliness scale (Hughes et al., 2004). Participants answered how often in the last week they felt a certain way on the 5-point Likert scale (1-never, 5-very often). The result was calculated as the average of three values if the participant answered all items; else, it was set to missing. Cronbach’s alpha was $\alpha=.74$.

Social support was measured via the shorter 10-item Social Provisions Scale (Steigen & Bergh, 2019; the original Social Provisions Scale was translated into Croatian language by Nekić, 2008). Participants expressed their agreement with the statements on a 6-point Likert scale (1-Strongly disagree, 6-Strongly agree). An example item was “I feel a strong emotional bond with at least one other person.” The result was calculated as the average of all values if the participant answered at least 8/10 items; else, it was set to missing. Cronbach’s alpha was $\alpha=.89$.

Socio-demographic variables Age, sex and education were additionally measured as control variables.

Data analysis

The data were analyzed using six regression analyses, each with a distinct outcome variable: trust in people/parliament/health system/WHO, loneliness and social support. ACPM was the main predictor in all regression analyses, and it was modeled via two dummy variables with “appropriate” as the reference category. Control variables in the analyses were age, sex (reference category – male) and education (reference category – none or up to 12 years of education), together with the outcome variables from the other five regression analyses.

The parameters of interest were regression coefficients that marked the differences in the outcomes between AP and TM, and AP and TH. Standardized coefficients were estimated by refitting the models with standardized variables (categorical predictors were not standardized). The regression models were then used to estimate and compare marginal means in outcomes for each category of ACPM (using Tukey correction). The data was analyzed in R (R Core Team, 2021). For the sake of succinctness, only the parameters of interest are reported here (the regression coefficients of control variables are not crucial for testing the hypotheses).

Results

Participants generally reported lower levels of trust in government and higher levels of trust in healthcare institutions (both national and international; Table 1). Levels of loneliness were around the middle of the scale, whereas the distribution of social support scores was shifted towards the higher end and somewhat condensed (as evidenced by skewness < -1 and kurtosis > 1).

The parameters of interest are shown in Table 2. There were significant differences between AP and TM groups in trust in people ($b=-0.56, p<.01$), government ($b=-0.51, p<.05$) and healthcare system ($b=-0.64, p<.01$). Differences between AP and TH were significant for trust in government ($b=-0.36, p<.01$), WHO ($b=-0.41, p<.01$), and for loneliness ($b=0.15, p<.01$). These results are visualized on Fig-

Table 1. Descriptive statistics of numerical variables used in the study

		<i>M</i>	<i>SD</i>	<i>Skew.</i>	<i>Kurt.</i>	<i>Range</i>
Trust in...	people	4.88	1.98	-0.23	-0.38	
	government	3.82	2.24	0.20	-0.55	0-10
	healthcare sys.	6.49	2.23	-0.63	-0.00	
	WHO	5.63	2.50	-0.44	-0.49	
	Loneliness	2.90	0.88	0.10	-0.37	1-5
	Social support	5.06	0.70	-1.06	1.88	1-6

Note. skew. – skeweness; kurt. – kurtosis; health. sys. – healthcare system; range – theoretical scale ranges

ures 1 and 2 - the *b* coefficients correspond to the differences between the estimated marginal means. The *F* values test the significance of the whole ACPM effect (AP-TM and AP-TH effects taken together), and the Tukey post-hoc tests provide significance between categories of ACPM (these are basically comparable to significance of *b*-coefficients but cor-

rected for multiple comparisons).

We can see that, compared to AP, TM had lower trust in people, government and healthcare system. On the other hand, the TH group had lower trust in government and WHO than AP. Finally, the TH group felt lonelier than AP, but there were no differences in social support between the groups.

Table 2. Standardized and non-standardized regression coefficients for the effects appropriate – too mild (AP-TM) and appropriate – too harsh (AP-TH) for six outcome variables

Outcomes	AP - TM				AP - TH			
	β	<i>b</i>	<i>SE</i>	<i>t</i>	β	<i>b</i>	<i>SE</i>	<i>t</i>
... people	-0.28	-0.56	0.20	-2.84**	0.06	0.11	0.10	1.17
... government	-0.23	-0.51	0.20	-2.56*	-0.16	-0.36	0.10	-3.67**
Trust in... ... healthcare sys.	-0.29	-0.64	0.19	-3.39**	-0.03	-0.07	0.09	-0.77
... WHO	0.08	0.20	0.22	0.90	-0.16	-0.41	0.11	-3.80**
Loneliness	0.17	0.15	0.09	1.64	0.17	0.15	0.04	3.43**
Social support	-0.10	-0.07	0.07	-0.97	0.06	0.04	0.03	1.20

Note. The effects of control variables are not shown here for the sake of brevity. Each line represents the results from a separate analysis. Significant effects are bolded; * $p < .05$, ** $p < .01$

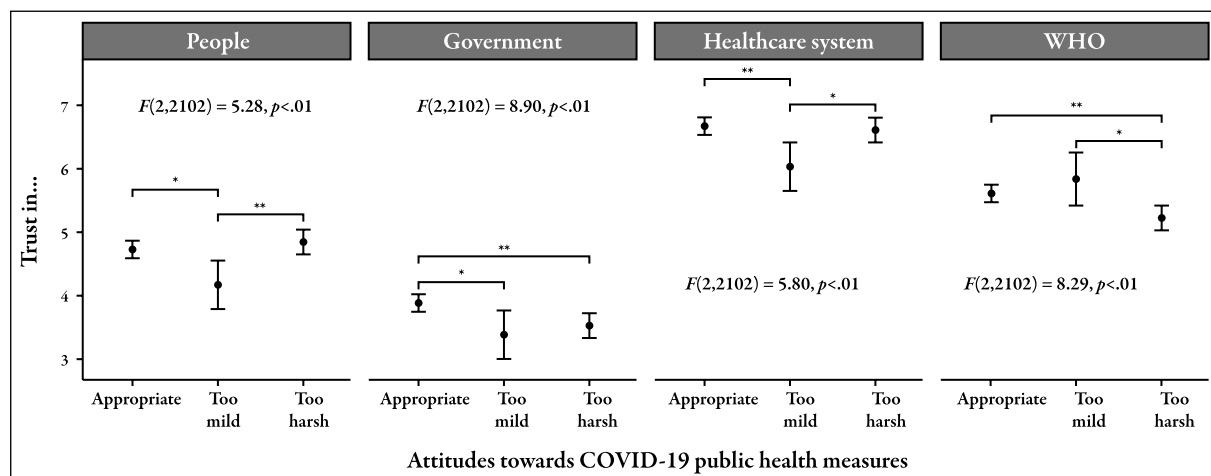


Figure 1. Estimated marginal means and their 95% confidence intervals for ACPM groups in different aspects of trust, together with the *F*-statistic and post-hoc tests for the given effect; * $p < .05$, ** $p < .01$

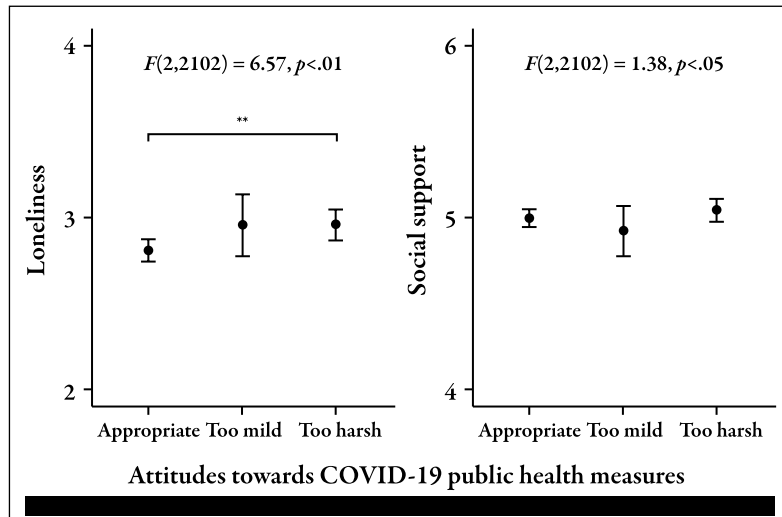


Figure 2. Estimated marginal means and their 95% confidence intervals for ACPM groups in subjective loneliness and social support, together with the F-statistic and post-hoc tests for the given effect; ** $p < .01$

Discussion and conclusions

The analyses showed that people who considered measures too mild had lower trust in people, government and health system than people who perceived them as appropriate. Thus, decreased trust was associated with those a) who were planning and implementing public health policies (government and national healthcare system), and b) who might have been dangerous, that is, infectious (other people).

These results are in concordance with findings of Rieger and Wang (2022), who found that perceiving measures as too weak was related with less trust in government, and the study of Gilles et al. (2022), which showed that those who perceived measures as less effective had less trust in medical and scientific institutions (but not in government). It is possible that the decrease of trust in institutions was a negative reaction, following the conclusion that the measures that were supposed to keep one safe were too weak. Interestingly, Gilles et al., (2022) also found no association of perceived effectiveness of measures and trust in non-Swiss institutions. This partly corresponds with the current findings that there was no difference in trust towards the WHO between the “appropriate” and “too mild” groups. The “too mild” group may have perceived national institutions as lacking com-

petence to handle the pandemic, but maintained confidence in international health institutions. It would be interesting to investigate whether this group generally had more trust towards international institutions, or whether this applied solely to the context of the pandemic (bearing in mind that the questions about trust were general and not explicitly related to the pandemic).

Regarding the decrease in trust towards others, it can be assumed that people who considered measures too mild also perceived COVID-19 as a greater threat. Indeed, Constant et al. (2022) found that those who perceived COVID-19 as more harmful/severe were also more accepting towards implemented/implementing restrictive measures. After concluding that the measures were too mild (and that one is rather vulnerable), it is possible that additional psychological mechanisms for mitigating the infection kicked in. One such mechanism could be reducing the interpersonal trust, as that would likely lead to decrease of social contact. For instance, Siegrist et al. (2021) showed that people who had lower general trust in people also associated the coronavirus with greater health risks, and accepted measures more. However, it is also possible that people who were *a priori* more distrustful towards others considered the measures too mild, as they were doubtful about how committed others were to observing them. Unfortunately, it is not

possible to distinguish between these explanations with the current methodology.

For people who considered measures too harsh, a different pattern of lower trust was observed – it was directed towards government and the experts from outside the country (WHO), while the trust towards the national healthcare system was not compromised. This is in line with the findings by Rieger and Wang (2022) that not only those who perceived measures as too weak (see above), but also those who perceived them as too extreme had reduced trust in government. However, the reasons behind decreased governmental trust in the “too mild” and “too harsh” groups are likely different. As suggested earlier, the first may be worried for their safety, and express distrust towards government as a result. The latter are probably more worried about their personal freedoms (e.g., regarding social interactions, working on-site, traveling etc.), and believe that the tradeoffs for introducing such strict regulations have not been properly scrutinized, as implied by the study of Siegrist et al., (2021). The same study also showed that the people who accepted measures less also indicated less confidence in the society, and a stronger belief that the authorities were not open and honest about things related to the coronavirus. In the current study, this skeptical attitude was probably also transferred to the WHO. However, it is interesting that no similar findings were observed for the national healthcare system in the “too harsh” group, indicating that it was perceived as more trustworthy than government and the WHO (at least at the start of the pandemic). Perhaps the group saw the national healthcare system as an agent that only administrated the decisions related to the stringency of measures, and not as the one who made them (like government and the WHO). Still, no definite conclusions about the reasons for these findings may be drawn from this study alone.

Finally, people who considered measures too harsh were also lonelier than those who considered them appropriate. This is consistent with findings by Raina and Coppola (2022) and Stickle et al. (2021), and may indicate that loneliness is one of the reasons why measures were experienced as too

harsh. Interestingly, no difference in social support between groups was found, further supporting the idea that the subjective loneliness and the amount of social support are not interchangeable constructs. It is possible that differences would be observed had the source of social support been specifically identified, as studies showed contrasting reactions to measures for people with different sources of social support (e.g., Paykani et al., 2020).

In conclusion, people who considered measures too mild and too harsh showed a different pattern of mistrust and loneliness/social support, which might potentially be explained by distinct psychological mechanisms. These findings may prove valuable for the implementation of public health measures in general since they help to elucidate a part of the differences between people who find them appropriate and inappropriate.

Limitations and outlook

Although the results of this study offer interesting insights about the relationship between ACPM, trust and loneliness/social support, there are several limitations that need to be mentioned.

First, the sample was large, but it was not representative – it consisted mainly of female participants and people with higher levels of education. Furthermore, fewer participants in the TM category may have led to some differences being insignificant due to the lack of power (e.g., the AP-TM difference for loneliness). Second, the data were gathered at the beginning of the COVID-19 pandemic. It is questionable whether such findings would be replicated later when more information about the coronavirus was available. Third, we cannot be sure what the true nature of the relationships observed in the study is, that is, whether the variables are causally linked (and if yes, in which direction). Finally, to understand individual differences in ACPM better, it would be valuable to conduct qualitative studies where people may explain in detail why they find the measures (in) appropriate.

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The relationship between performance motivational climate and coaches' leadership behavior

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Abstract

In the context of competitive sports, the performance motivational climate is significantly shaped by a coach who gives different amounts of attention to athletes based on their talent level, punishes athletes for mistakes, and encourages rivalry between them. The aim of this paper is to broaden empirical knowledge about the relationship between performance motivational climate and different types of coaches' leadership behaviors. A convenience sample in the present study consisted of 152 football players aged 15-18 years, who played in registered football clubs in the Republic of Croatia. The results showed that 28.3% of the variance in perceived performance motivational climate can be explained by coaching behaviors, with coaches' Insensitivity to Athletes' Well-being, Negative Feedback, and Results Orientation being statistically significant positive predictors.

Keywords: *performance motivational climate; coaching leadership behavior; young football players*

Introduction

Performance motivational climate is characterized by the importance of demonstrating normative superiority. In such a socio-psychological environment, the most talented individuals have preferential treatment, while mistakes are punished (Seifriz et al., 1992). In the sports context, this type of motivational climate is shaped by a coach who provides different amounts of attention to his/her athletes based on

their talent and abilities, punishes athletes' mistakes, and encourages rivalry between them (Newton et al., 2000). A systematic literature review by Harwood et al. (2015) indicates that performance climate is associated with different maladaptive outcomes. Performance motivational climate is positively associated with ego goal orientation, amotivation, negative affect, etc. (Harwood et al., 2015), and negatively associated with group cohesion (Eys et al., 2013) and perceived performance (Al-Yaaribi & Kavussanu, 2018).

The other core type of motivational climate, mastery, is shaped by coaches who emphasize the importance of effort and personal growth, try to make every player feel that their role is important, and encourage cooperation between team members (Newton et al., 2000). In this type of environment, mistakes are viewed as part of the learning process. The mastery motivational climate is positively associated with task goal orientation, intrinsic motivation, positive affect, etc. (Harwood et al., 2015).

Smith et al. (2005) emphasize the importance of studying antecedents of the perception athletes have about the motivational climate in their sport's collective. They suggest that coach behavior could be one of those antecedents. The authors presume that the athletes who perceive their coach to provide less positive reinforcements and more punishing behaviors will be prone to perceive their socio-psychological environment as performance oriented. The findings of their research, on a sample of high school female basketball players, confirm that lower degree of positive and higher degree of punishing behavior are predictive of performance motivational climate (Smith et al., 2005). On a sample of volleyball players, Mohammadzade et al. (2012) determined that Autocratic Coaching Behavior is predictive of performance climate, but Democratic Behavior, Social Support, Positive Feedback, and Training/Instructions¹ are not. Barić (2005), accounting for the predictive validity of coaching behaviors in explaining the variance of performance climate on a sample of young football players, found that Training/Instructions acts as a negative, and Positive Feedback as a positive predictor. Studying the same criterion on a sample of young basketball players, Training/Instructions and Social Support emerged as negative predictors (Barić, 2005). Alfermann et al. (2005) collected data on a sample of young swimmers at two points in time. While at the second point of data gathering performance climate was not correlated with positive and encouraging coaching behaviors, at the first point there was a statistically significant (but small) negative correlation between this type

of motivational climate and Democratic Behavior.

The aim of this study is to broaden empirical knowledge about the relationship between perceived coaching leadership behaviors and performance motivational climate. The findings reported in the literature about the relationship between positive and encouraging coaching behaviors and performance climate are inconsistent. When statistically significant correlations were found, they were small and negative. Therefore, we expect that positive and encouraging coaching behaviors will act as negative predictors of performance motivational climate (Alfermann et al., 2005; Barić, 2005; Mohammadzade et al., 2012; Smith et al., 2005). According to the achievement goal theory postulates (Nicholls, 1984) and empirical findings (Mohammadzade et al., 2012), we assume that Insensitivity to Athletes' Well-being, Negative Feedback, Results Orientation, and Autocratic Behavior will be positive predictors of performance motivational climate because those behaviors are controlling, punishing and ignoring, which is also how performance motivational climate is often perceived (Newton et al., 2000; Seifriz et al., 1992).

Method

Sample

The convenience sample consisted of 152 male football players aged between 15 and 18 years, who were competing in registered football clubs in the Republic of Croatia. Young footballers played in 34 selections (under the leadership of 31 coaches) in 21 different clubs. The average age of participants was 16.6 years ($SD = 1.00$).

Instruments

The Croatian version (Greblo, 2011) of the *Leadership Scale for Sports* (LSS; Chelladurai and Saleh, 1980) consists of 40 items across five subscales: Training and Instructions (e.g., „[My coach] Instructs every athlete individually in the skills of the sport.”), Democratic Behavior (e.g., “[My coach] Asks

¹ Alfermann et al. (2005) described the latter four behaviors as positive and encouraging coaching behaviors.

for the opinion of the athletes on strategies for specific competitions.”), Autocratic Behavior (e.g., “[My coach] Speaks in a manner which discourages questions.”), Social support² (e.g., “[My coach] Looks out for the personal welfare of the athletes.”) and Positive Feedback (e.g., “[My coach] Expresses appreciation when an athlete performs well.”). Participants were instructed to estimate the frequency of particular coaching behavior based on a Likert-type scale (1 – never, 5 – always). It was noted that responses should be based on the behaviors of the coach who was training their team during 2019/2020 season. Higher scores indicate higher frequencies of particular coaching behavior. In the present study, the Cronbach alpha coefficient of the Autocratic Behavior subscale was $\alpha = .50$, which is why this subscale was excluded from the rest of the analysis³. The lower reliability of this subscale is in line with previous findings (e.g., Greblo Jurakić & Keresteš, 2017). Alpha coefficients of the remaining LSS subscales are satisfactory, ranging from $\alpha = .74$ to $\alpha = .88$.

The *Negative Coaching Behaviors Questionnaire* (NCBQ; originally Upitnik negativnog ponašanja trenera, UNPT; Greblo Jurakić & Keresteš, 2017) consists of 13 items and is used for assessment of the frequency of negative coaching behaviors. Items are distributed in three subscales: Insensitivity to Athletes’ Well-being (e.g., “[My coach] Does not help athletes in stressful situations.”), Negative Feedback (e.g., “[My coach] Insults athletes in practice.”), and Results Orientation (e.g., “[My coach] Wants athletes to win no matter the cost.”). Participants were instructed to estimate the frequency of particular coaching behavior based on a Likert-type scale (1 – never, 5 – always). It was noted that their estimates should be based on the behaviors of the coach who was training their team during the 2019/2020 season. Higher scores indicate a higher frequency of the particular negative coaching behavior. Alpha coefficients of all NCBQ subscales are satisfactory, ranging from $\alpha = .71$ to $\alpha = .85$.

² We excluded the item “My coach invites the athletes home.” on the basis of our opinion that this item could be misinterpreted and reflect some negative coaching behaviors.

³ Alfermann et al., (2005) did not include this subscale in their study due to expectations of low reliability. Multiple sources (according to Tavakol & Dennick, 2011) note the inadequacy of using variables with reliability lower than 0.70.

As a measure of the performance motivational climate, a subscale of the adapted Croatian version (Barić, 2004) of the *Perceived Motivational Climate in Sport Questionnaire* (PMCSQ; Seifriz et al., 1992) was used. This subscale consists of 12 items (e.g., “On this team, players are encouraged to outplay the other players.”). Participants were instructed to estimate the degree to which particular items applied to their team during the 2019/2020 season on a Likert-type scale (1 – strongly disagree, 5 – strongly agree). Higher scores indicate greater salience of the performance motivational climate in their team. The alpha coefficient of the performance motivational climate subscale was satisfactory with $\alpha = .79$.

Procedure

This study was conducted via an online survey created in LimeSurvey. The data was collected in May and June of 2020. The coaches’ or boards’ permission for the participation of young football players in the study was requested via phone. A written request was sent to the clubs’ representatives who agreed to participate in the study. The purpose and the method of conducting the research were explained in the request. All contacted clubs had an online group for internal communication (WhatsApp, Viber, or Facebook groups), and coaches, or club representatives, forwarded the survey link to those groups. The purpose of the study was explained to participants in the opening part of the survey. The anonymity and the possibility of withdrawing from the study at any time were guaranteed. Participants gave their consent for participation and confirmed that they were older than 14 years of age. It was made salient that participants should give their answers based on the 2019/2020 season. The estimated time for completing the questionnaire was approximately 15 minutes.

Results

Table 1 contains descriptive information on the scales used in this research. The normality of the variables was tested with two procedures. Re-

Table 1. Descriptive statistics ($N = 152$)

	<i>M</i>	<i>SD</i>	<i>K-S</i>	p_{K-S}	Skew.	Kurt.
Training and Instruction	4.22	0.53	0.10	.00	-0.86	1.31
Democratic Behavior	3.63	0.64	0.07	.05	-0.46	0.82
Social Support	3.74	0.72	0.09	.00	-0.30	-0.38
Positive Feedback	4.15	0.60	0.12	.00	-0.59	0.45
Insensitivity to Athletes' Well-being	1.68	0.83	0.22	.00	1.58	2.16
Negative Feedback	1.29	0.58	0.31	.00	3.05	10.12
Results Orientation	3.12	0.91	0.07	.09	-0.03	-0.68
Performance motivational climate	2.91	0.62	0.08	.02	0.29	-0.02

Note. *M* = mean; *SD* = standard deviation; *K-S* = value of Kolmogorov-Smirnov test; p_{K-S} = significance of Kolmogorov-Smirnov test; Skew. = skewness; Kurt. = kurtosis

Table 1. Correlations matrix ($N = 152$)

	1	2	3	4	5	6	7
1. Training and Instruction							
2. Democratic Behavior	.65**						
3. Social Support	.65**	.70**					
4. Positive Feedback	.75**	.63**	.65**				
5. Insensitivity to Athletes' Well-being	-.26**	-.23**	-.18*	-.22**			
6. Negative Feedback	-.27***	-.25***	-.21***	-.28***	.46***		
7. Results Orientation	.02	-.01	-.09	-.04	.33**	.29***	
8. Performance motivational climate	-.05	-.06	-.03	-.08	.44**	.36***	.39**

Note. * $p < .05$; ** $p < .01$. Since the distribution of Negative Feedback significantly deviates from the normal distribution (see skewness and kurtosis values in Table 1), correlations between this and other variables were calculated via Spearman's rank coefficient. Correlations between other variables were determined using Pearson's correlation coefficient

sults of the Kolmogorov–Smirnov (K-S) test indicate that only the distributions of Results Orientation and Democratic Behavior do not differ significantly from the normal distribution. This is in line with the results of previous research. In a study conducted by Greblo Jurakić & Keresteš (2017), distributions of all NCBQ subscales, except Results Orientation, significantly differed from normal (based on the K-S test). Kline (2011) argues that distributions can be considered approximately normal if the skewness of the distribution does not exceed 3, and the kurtosis does not exceed 10. According to Kline's (2011) suggested criteria, only Negative Feedback deviates from normality.

Inspecting the correlations in Table 2 shows that there were no statistically significant correla-

tions between performance motivational climate and positive and encouraging coaching behaviors. Moderately high statistically significant correlations between performance motivational climate and negative coaching behaviors were established.

Table 3 presents the results of the hierarchical regression analysis with performance motivational climate as the criterion. Values of tolerance range from .35 to .84, and variance inflation factor (VIF) values range from 1.19 to 2.87, which indicates no meaningful singularity and multicollinearity issues (Miles, 2014). Multicollinearity and singularity are problems that occur when variables in a regression analysis are highly correlated, which can bias regression coefficients (Tabachnick & Fidell, 2013).

Table 3. Hierarchical regression analysis with performance motivational climate as the criterion ($N = 152$)

	$\beta M1$	$\beta M2$
Training and Instruction ⁴	.02	.08
Democratic Behavior	-.06	-.05
Social Support	.06	.08
Positive Feedback	-.10	-.07
Insensitivity to Athletes' Well-being		.28**
Negative Feedback		.16*
Results Orientation		.26**
R^2	.01	.28
F	0.31	8.13
p	>.05	<.01
ΔR^2		.28
$F\Delta R^2$		18.41
$p\Delta R^2$		<.01

Note. * $p < .05$; ** $p < .01$; β = standardized regression coefficients; M1, M2 = groups of predictors in the hierarchical regression analysis (models); R^2 = total criterion variance explained; F = the value of the F ratio; ΔR^2 = additional variance explained by the additional group of predictors; $F\Delta R^2$ = the value of the F ratio for the additional group of predictors.

Variables were included in the hierarchical regression analysis in two blocks. Positive and encouraging coaching behaviors were included in the first block. None of these behaviors were statistically significant predictors for the performance motivational climate. Negative coaching behaviors were included in the second block. Total R^2 suggests it is possible to explain 28.3% of the performance motivational climate variance based on coaching behaviors. Negative coaching behaviors (Insensitivity to Athletes' Well-being, Negative Feedback, and Results Orientation) emerge as statistically significant predictors.

⁴ Although the correlations between positive and encouraging coaching behaviors and performance motivational climate are not statistically significant, they were still retained in the regression analysis. Given the fact that those behaviors have significant correlations with some of the negative coaching behaviors (see Table 2), their inclusion can possibly control some of the negative coaching behaviors variances that are unrelated to the criterion, and thus enhance the relationship between negative behaviors and the criterion variable (Cohen et al., 2003).

Discussion

The aim of this study was to determine the role of coaches' leadership behaviors in the explanation of performance motivational climate variance in a sample of young football players. The results showed that negative coaching behaviors (Insensitivity to Athletes' Well-being, Negative Feedback, and Results Orientation; see Table 3) are positive predictors of the level of perceived performance motivational climate. This finding is in line with expectations, considering the fact that coaches who constantly emphasize the importance of winning and achievement of good sports results as imperative, who give most of their attention to the best players and are generally uninterested in the feelings and needs of athletes, and who use inappropriate verbal and physical behaviors in order to punish athletes for mistakes, failure or unfulfilled expectations, are the ones that, according to the achievement goal theory (Nicholls, 1984), create performance motivational climate. Also, Autocratic Behavior, one of the coaching behaviors that could be considered similar by nature to negative coaching behaviors included in the present study, was shown to be positively predictive of performance motivational climate (Mohammadzade et al., 2012). However, it should be noted that negative coaching behaviors, such as Insensitivity to Athletes' Well-being and Negative Feedback, are perceived by the participants in the present study to be very rare, with average answers fluctuating between never and seldom. In this study, positive and encouraging coaching behaviors (Training and Instructions, Democratic Behavior, Positive Feedback, and Social Support) were not statistically significant predictors of performance motivational climate, which is in line with the results of some previous research (e.g., Alfermann et al., 2005; Mohammadzade et al., 2012).

The contribution of this study consists in deepening the understanding of the relationship between different coaching behaviors and young football players' perception of the performance motivational climate. The work of Greblo Jurakić

& Keresteš (2017) was incited by the underrepresentation of negative coaching behaviors in coach leadership research literature. This study covers a wider range of negative coaching behaviors compared to the research conducted by Barić (2005) or Mahammadzade et al. (2012). The limitations of the present study include its correlational design. Because of that, it's not possible to draw causal conclusions about relations between variables. A potential limitation arises from the fact that groups of several participants evaluated the same coaches, which could lead to data clustering. In that case, the answers of two participants from the same club could be more similar than the answers of two participants from different clubs. The problem of clustering can lead to inaccuracy in the conclusions when applying regression analysis. One way to solve this problem is to use multilevel analysis (Cohen et al., 2003). A large part of the variance in the performance motivational climate remains unexplained in this study. Ego goal orientation is shown to be a prominent predictor of this type of motivational climate (Barić, 2005). Considering this, future research on performance motivational climate predictors in the sport context should include ego goal orientation besides negative coaching leadership behaviors.

Conclusion

In conclusion, this study established coaches' Insensitivity to Athletes' Well-being, Negative Feedback, and Results Orientation as positive predictors for performance motivational climate, which is considered a less desirable type of motivational climate and is associated with different maladaptive outcomes in sports context (Harwood et al., 2015). Such results add to leadership behavior literature, strengthening the assumption that coaches could be an important factor in shaping the motivational climate in sports.

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Children's letter naming in the year before school enrollment in the context of Croatian language and orthography

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Abstract

Early literacy refers to the skills and abilities essential to the later acquisition of reading that a child acquires before formal instruction begins (Scarborough, 2001). Two groups of factors related to the concept of early literacy are distinguished: language and environmental factors (Kuvač Kraljević et al., 2019). Among language factors, letter knowledge is the single most important predictor of successful reading (Georgiou et al., 2012; Muter & Diethelm, 2001; Torppa et al., 2006), especially in alphabetic languages with transparent orthography like Croatian. Foreign research shows that children at risk of developing reading disorders, i.e., dyslexia know fewer letters than their typically developing peers (Lyytinen et al., 2004; Puolakanaho, 2007). The aim of this study is to describe letter knowledge in Croatian-speaking typically developing and at-risk preschool children. As hypothesized, children at risk named on average fewer upper- and lowercase letters than their typically developing peers. Considering the importance of predictors of reading and the possibility of developing prevention programs in this area, it is important to understand the meaning, contexts and development of pre-skills in reading and writing.

Keywords: *early literacy; letter knowledge; transparent orthography; risk of developing reading disorders (dyslexia)*

Introduction

Nowadays, an increasing amount of research focuses on language development and its importance for reading (Bishop & Snowling, 2004; Catts & Kambi, 2005). Numerous studies are dedicated

to finding typical features of language functioning in specific populations (persons with developmental language disorders, specific learning disorders, etc.), that is, deviations in the development and/or function of individual's language at the level of different linguistic components and their connection

with reading (Ivšac & Lenček, 2011). Reading and writing pre-skills are increasingly being studied in typically developing children and in children who have difficulty mastering early reading and writing, and/or who are at developmental or family risk of developing reading and writing disorders (e.g., dyslexia). Despite the growing body of research, there is still a lack of data on the reading and writing pre-skills of at-risk children. In addition, most research has been conducted on children whose first language is English. Therefore, due to differences in orthography and language typology, their results are not fully transferable to the Croatian language.

Early literacy: Letter knowledge

Early literacy refers to the skills and abilities essential to the later acquisition of reading that a child acquires early in life, before formal instruction begins (Scarborough, 2001). Two groups of factors related to the concept of early literacy can be distinguished: 1) language and 2) environmental and informal factors (Kuvač Kraljević et al., 2019). Language measures of early literacy generally refer to phonological skills and processes, narrative skills, lexical knowledge, and letter knowledge.

Letter knowledge is the single most important predictor of successful reading (Georgiou et al., 2012; Muter & Diethelm, 2001; Torppa et al., 2006), especially in alphabetic languages with transparent orthography (Anthony & Francis, 2012; Caravolas et al., 2012).

Letter knowledge requires making a connection between a visual symbol and a phonological form (Ivšac Pavliša & Lenček, 2011). It is important for children to realize that each letter has multiple identities, i.e., graphic versions (e.g., uppercase, and lowercase letters, printed and written letters, handwritten letters; Foulin, 2005). Research shows that children begin to distinguish uppercase letters earlier than lowercase letters, they learn more quickly letters that are visually easy to distinguish, or those that are visually similar in lowercase and uppercase execution (e.g., uppercase and lowercase c/v/z, etc.), and those that are common in written language. They know letters from the first half of the al-

phabet better than those from the second half, they master letters whose names and pronunciations match more quickly, and they are more successful in what they are taught and more often exposed to (Adams, 1990; Bracken & Crawford, 2010; Piasta et al., 2012).

The aforementioned characteristics and development course refer to typically developing children. Considerably less data is available for letter knowledge in children who are at developmental or family risk of developing reading and writing disorders. The results of foreign research show that these children, whether due to socioeconomic, cognitive, or genetic factors, know fewer letters than their typically developing peers (Lyytinen et al., 2004; Puolakanaho, 2007). Longitudinal studies indicate that their poor achievements are a predictor of reading disorders (Catts et al., 2001; Elbro & Petersen, 2004).

Consistent with one of the main theories about the cause of dyslexia - phonological processing deficit (Reid, 2016; Swan & Goswami, 1997), another most frequently mentioned language factor of early literacy is phonological awareness. It refers to the ability to manipulate the sounds in the structure of spoken language (Ehri et al., 2001), that is, to recognize, form, and manipulate the phonological units that make up a word (Chard & Dickson, 1999). According to Torppa et al. (2006), letter knowledge interacts with phonological awareness since graphemes in written language correspond to phonemes in spoken language. Foreign research (Worden & Boechler, 1990) shows that children can name letters before phonemic awareness (awareness of individual phonemes is considered a higher level of phonological awareness; Chapman, 1999) develops. However, this knowledge requires explicit instruction (Foorman et al., 2016; Paige et al., 2018). Given this, the importance of preschool curricula in promoting early literacy skills is undeniable.

Therefore, considering the developmental outcomes of children at risk of literacy problems and academic failure, as well as the effectiveness of early and timely intervention (Siegel, 2020), it is important to demonstrate the value of letter knowledge and the specific characteristics of this segment in the context of language and script.

Aim and hypotheses

The aim of this study is to describe the characteristics of letter knowledge in Croatian-speaking typically developing and at-risk (of developing reading disorders, i.e., dyslexia) preschool children in the year before school entry. Given the importance of this parameter for reading acquisition, the purpose of this paper is to warn about the need for systematic monitoring of children at potential risk of developing reading disorders. This will be done by providing insights into the level of letter knowledge in the children studied, focusing on the need to provide opportunities for letter learning and the value of a speech and language pathologist's assessment of reading and writing pre-skills. In the Republic of Croatia, no in-depth and systematic research has been conducted to compare children at risk of developing reading disorders with typically developing children.

Hypotheses

- H1: Children at risk name fewer uppercase letters on average than typically developing children.
- H2: Children at risk name fewer lowercase letters on average than typically developing children.

Method

Participants

Twenty-four children at risk of developing reading disorder (dyslexia) in the year before school entry were singled out in a kindergarten in Zagreb in the 2017/2018 school year. These were children with poor performance in phonological awareness, consistent with the phonological processing deficit theory. These children were paired with a control group of their typically developing peers who attended the same kindergarten and passed screening on the basis of the entire test (all blocks). Information about the participants can be found in Table 1.

Table 1. Descriptive data on participants

GROUP	N	GENDER		AGE (year; month)			
		boys	girls	M	SD	Min.	Max.
RISK	24	13	11	5;9	0;5	5;10	7;06
TD	21	11	10	5;8	0;4	5;11	6;07

Note. RISK = Children at risk of developing reading disorders (e.g., dyslexia), TD = typically developing children

Measures

The test for assessing reading and writing pre-skills PredČiP (Kuvač Kraljević & Lenček, 2011) serves to assess school readiness, especially in terms of language and visual perception. It is used as a screening test in monitoring children in the regular preschool system. It consists of several tasks (subtests), including phonological awareness (syllabic and phonemic analysis and synthesis, rapid automatized naming), repetition of isolated (pseudo)words and sentences, visual perception and discrimination (recognition and tracing/copying shapes), and narration. For the purposes of this study, the Phonological Naming of Upper- and Lowercase Letters subtest was used. In the tasks, children are asked to name 30 uppercase and lowercase letters each, presented separately in a random order on a single printed sheet. Both lists contain all the graphemes of the Croatian alphabet, which means that a child can score a maximum of 60 points.

Procedure

All children were examined individually by a speech and language pathologist who speaks Croatian correctly and fluently, and, in addition to basic education, has received additional training in conducting the aforementioned test, and in evaluating and interpreting the results. The test was conducted in a quiet room without noise and other potentially disturbing factors. The examiner was previously familiar with the children he examined as a member of the professional team of the institution where the examination was conducted.

Data analysis

Data processing was performed with the program IBM SPSS Statistics - version 26. It included testing the normality of the distribution of the results for the variables Phonological Naming of Uppercase Letters and Phonological Naming of Lowercase Letters by using the Shapiro-Wilk test, and testing the differences between the groups and the descriptive statistics data.

Results

Difference between groups in Phonological Naming of Uppercase Letters Considering that the distribution of the results on the Phonological Naming of Uppercase Letters variable turned out to be normal ($p > .05$), the t-test for independent samples was used to test the difference between the two groups. Descriptive statistics data (Table 2) already indicate that typically developing children name twice as many uppercase letters than children at risk of possible reading disorders (e.g., dyslexia), and a statistically significant difference between the groups was found with a large effect size ($t(32) = 5.874$, $p < .01$, $d_{\text{Cohen}} = 1.7$).

Table 2. Difference between groups in Phonological Naming of Uppercase Letters

GROUP	<i>N</i>	<i>M</i>	<i>SD</i>	Min.	Max.
RISK	24	12.33	9.29	0	27
TD	21	24.95	3.46	18	30

Difference between groups in Phonological Naming of Lowercase Letters Considering that the distribution of the results on the Phonological Naming of Lowercase Letters variable turned out to be normal, the t-test for independent samples was used to test the difference between the two groups. Descriptive statistics data (Table 3) already indicate that typically developing children name up to three times more lowercase letters than children at risk of possible reading disorders (e.g., dyslexia), and a statistically

significant difference between the groups was found with a large effect size ($t(43) = 5.631$, $p < 0.01$, $d_{\text{Cohen}} = 1.7$).

Table 3. Difference between groups in Phonological Naming of Lowercase Letters

GROUP	<i>N</i>	<i>M</i>	<i>SD</i>	Min.	Max.
RISK	24	6.67	6.76	0	21
TD	21	17.67	6.27	8	29

Discussion and conclusion

Despite numerous research studies in the last twenty years, the specificity of letter knowledge in Croatian has not been fully explored, especially in preschool children who belong to the at-risk group. Considering the importance of predictors of reading and the possibility of developing prevention programs in this area, and in order to prevent the occurrence of learning difficulties (Lenček et al., 2012), it is important to understand the meaning, contexts, and development of pre-skills in reading and writing. The aim of this study was to describe the characteristics of letter knowledge (as the single most important predictor of successful reading) in typically developing and at-risk preschool children in the year before school entry. In our country, there is little research focusing on early literacy skills and their specifics (Lenček et al., 2012; Lenček & Užarević, 2016; Kuvač Kraljević et al., 2019), and on the peculiarities of dyslexia symptomatology in the Croatian language and script (Kuna, 2021; Lenček & Anđel, 2011), and so far, none of them has dealt with an in-depth analysis of letter naming in children at risk of developing a reading disorder, i.e., dyslexia. The results of our research, as expected, show that children at risk name on average fewer upper- and lowercase letters than their typically developing peers, which is in line with the results of other research conducted abroad (Lyytinen et al., 2004, 2016; Puolakanaho, 2007; Snowling et al., 2007; Torppa et al., 2006). While reviewing descriptive statistics data, it was also found that both groups of participants name more upper- than lowercase letters, which is related to visual

simplicity (lines - straight, diagonal, circular, and their combinations) and the frequency with which children are exposed to these graphemes (Ellefson et al., 2009; Worden & Boettcher, 1990). Further descriptive data have shown that children's knowledge of complex letters (digraphs) and special letters of the Croatian Latin (letters with diacritical marks) is the lowest, which was also shown in some previous research (Lenček et al., 2021; Vuk et al., 2020). Defining and explaining the language factors that best predict later success in reading and writing, especially with respect to a given language and its orthography, is important for designing successful pre-literacy programs and intervention procedures for children with difficulties in developing and acquiring these reading and writing pre- skills (Kuvač Kraljević et al., 2014). The results of our study show that children at risk name most successfully the uppercase letters /A/, /O/, /I/, /R/, /B/, /L/, /M/, /U/, /T/, /N/ (in that order), while typically developing children name equally successfully the letters /A/, /O/, /I/, /B/, /L/, /M/, /N/, followed by the letters /T/, /C/, /K/. Thus, there is an obvious overlap between the studied groups. There is also a high degree of overlap in the letters that children are least successful in naming: children at risk perform worst in naming the letters /LJ/, /Đ/, /DŽ/, /NJ/, /Ž/, and their typically developing peers in naming the letters: /DŽ/, /Đ/, /NJ/, /Ć/, /LJ/ - there is an overlap even in 4 of the selected 5 worst results. The results of correctly named lowercase letters also show a high degree of agreement (9 out of 10 letters) among the top ten letters. The lowercase letters /l/, /đ/, /t/, /g/, /h/, /b/ are identified as the most difficult for children at risk, and /h/, /dž/, /l/, /g/, /đ/, /lj/ for their typically developing peers. It is obvious that these are forms whose graphic realization resembles other letters (e.g., /l/ and /I/), again letters with diacritical marks, and those that are rarely heard in spoken language and/or seen in written language (/đ/, /g/, /h/). The obtained results indicate the possibility of using letter knowledge tasks as one of the keys to identify children at risk of developing reading disorders,

however, further longitudinal studies are needed, and it must be remembered that the at-risk sample was collected using a standardized screening test, but this does not capture all language factors, let alone environmental factors. Despite that, the results point to the need to create a curriculum with clear expectations for early literacy by more precisely identifying specific skills and knowledge that children need for later acquisition of reading and writing. In many countries with high literacy levels and transparent orthography, preschool curricula mandate letter knowledge at an early preschool age, while the Croatian preschool curriculum does not include such a requirement. Moreover, the inclusion of children in the preschool system is not required by law in Croatia (except preschool program of 250 school hours; Croatian National Law on Preschool Education, 2014). The consequences are uneven preparation of children for entering the school system and for early reading and writing, as well as difficulties in early identification of at-risk children. In order to improve literacy skills and raise literacy levels, there is a need to invest in mandatory preschool education programs. In addition, the language factors that best predict later success in reading and writing need to be well defined and explained. These are also prerequisites for successful intervention programs (Kuvač Kraljević et al., 2014).

The question of whether a child should learn letters in the preschool years is answered by scientific research, the results of which demonstrate a clear link between preschool letter knowledge and later academic success. Data on letter naming, such as which letters children find most difficult, can be used to work more intensively on individual letters and features that need to be perceptually emphasized to improve children's knowledge. Given the high demands of today's educational system, it is too late to start teaching letters in school, especially for children at risk of developing reading disorders. On the contrary, teachers should be able to focus on improving reading and learning from the first year of school by using the foundation of previous letter knowledge. If a child does not know the letters and lags behind, it will be difficult to get out of the vicious circle: they

will not like school or learning, will have poor academic results, which will lead to further negative feelings about going to school. This means that promoting (early) literacy is important not only for learning, but also for other areas of child development.

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Certain aspects of mental health and digital activity in youth during the COVID-19 pandemic

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Abstract

Research has shown that psychological distress and symptoms of poor mental health in youth have increased during the COVID-19 pandemic. Regression in socio-emotional development due to reduced interaction with peers, imposed social isolation, and lack of coping strategies has affected youth's mental health status, and presents risk for loneliness, depression, anxiety, stress, PTSD symptoms and avoidant behavior. This research aimed to explore certain aspects of youth's mental health status and digital activity during the pandemic, and to determine whether they correlate. The survey was conducted online during the second wave of the COVID-19 pandemic in Croatia, on 116 participants with an average age of 21 years. The questionnaire consisted of Positive and Negative Affect Schedule (PANAS), Impact of Event Scale-Revised (IES-R), Depression, Anxiety and Stress Scale (DASS-21), UCLA Loneliness Scale and Digital Activity Score scale. Depression, anxiety and stress levels are within non-clinical levels. Main findings include low positive correlation of digital activity with anxiety, intrusion and hyperarousal. Loneliness is moderately related to depression and negative affect. Both positive and negative affect are moderately related to depression. All mental health and PTSD symptomatology dimensions show positive moderate to high intercorrelations. Results of this study can be used in educating Croatian youth on possible effects of digital activity on mental health.

Keywords: COVID-19; digital activity; mental health; youth

Introduction

The mental health of youth

Mental health is our most valuable resource and the basis for positive youth development. Adolescents are most likely to experience depression

and anxiety. According to UNICEF's survey (2019), one-third of adolescents experienced anxiety, and 15% experienced depression symptoms. Early mental health issues tend to predict long-term impairments if left untreated (Kim-Cohen et al., 2003). Contributing factors for mental health issues include early trauma, family dynamics and non-nor-

mative life events (Lindert et al., 2020), such as the COVID-19 crisis.

Mental health during the COVID-19 pandemic

The outbreak of the coronavirus disease in 2020, along with national measures for disease prevention, significantly changed people's everyday habits and lifestyles. These changes included switching from attending schools to online classes, significant decrease and limitation in sports and social activities, unavailability of health systems and strong emotional reactions. Around that time, Croatia's capital Zagreb was struck by a devastating earthquake, jeopardizing the chances for psychological adjustment.

The prevalence of depression and anxiety has doubled during COVID-19, especially for older adolescents and girls (Racine et al., 2021), and Cohen et al. (2021) state that healthy adolescents were also affected. Disrupted personal freedoms, conflicting information, financial insecurities and loss of structure were significant stressors. Pfefferbaum and North (2020) suggest that in "conventional" natural disasters, post-traumatic stress disorder (PTSD) is expected. Levels of stress and loneliness worsened during the pandemic (Elmer et al., 2020), even forging the concept of lockdown loneliness (Shah et al., 2020).

Digital activity refers to any activity that occurs in a digital environment, such as using the Internet, social media or digital devices (Rothrock, 2018). The impact of digital activity on youth's mental health is ambiguous. While there are positive trends, such as using the Internet for health promotion and mental health interventions (De Witte et al., 2021), increased digital activity is also associated with depression (Kopilaš, 2022). Marciano et al. (2022) concluded that positive digital media effects include self-disclosure, friendship, entertainment and relief, while media addiction, social comparison, fear of missing out and violence are potential threats.

This research aimed to explore certain aspects of mental health status, and to determine the

levels and relations between depression, stress, anxiety, loneliness, mood (affect), event specific distress and digital activity during the pandemic in a sample of Croatian youth. Prior to COVID-19, technology overuse was mainly discussed in terms of mental and cognitive deterioration in youth, resulting in isolation, detachment, addiction, lowered social skills, ADHD and depression (Scott et al., 2017). Even the term digital self-harm was coined (Englander, 2012) to define online activities that lead to, support or exacerbate intentional violation of personal well-being. During the pandemic, many authors stated that technology could be a source of support for young people's mental health (Pretorius & Coyle, 2021). Most recent findings suggest that technology improves general mental and emotional well-being in students (Li, 2023). Hence, we expected to find a positive correlation between digital activity and positive affect, and more symptoms of impaired mental health (including loneliness) in participants with lower digital activity.

Method

Participants and Procedure

A total of 116 participants, with an average age of 21 years ($SD = 2.9$; range: 18-29), were recruited using the snowball method. In our sample, 37.1% were men, and 62.9% were women. The majority graduated from high school two years ago (60.3%). The survey was conducted online during the second wave of the COVID-19 pandemic in Croatia.

Instruments

The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) scale measures mood with 20 self-reported items describing positive (e. g., *excited*) and negative affect (e. g., *ashamed*). Participants respond on a 5-point scale, ranging from 1 (*not at all*) to 5 (*extremely*). The total score for each subscale is calculated as a sum of assessments on the corresponding items, where a higher score in-

icates a stronger affect. PANAS is a highly reliable instrument, with both subscales ranging from .80 to .90. In our research, Cronbach α was .84 for positive, and .88 for negative affect.

The Impact of Event Scale-Revised (IES-R; Weiss & Marmar, 1996) assesses the recent presence of PTSD symptomatology. It consists of 22 items divided into three subscales: Intrusion, Avoidance and Hyperarousal. Participants are asked to respond on a 5-point scale (0 - *not at all*; 4 - *extremely*). The total score for individual subscales is an average response value on the corresponding items, with higher scores indicating higher stress levels. The values of Cronbach alpha (.78- .89) for the current sample indicate satisfactory reliability for all subscales (.85- .90 in the original validity study).

The DASS-21 (Lovibond & Lovibond, 1995) is a self-report measure for clinically significant symptoms of depression, anxiety and stress that is used by clinicians and scientists. Each subscale consists of 7 items. Participants rate experienced symptoms over the past week on a 4-point scale (0 - *did not apply to me at all*; 3 - *applied to me very much or most of the time*), and scores for each scale are the sum of item scores. Results outline health status and assess symptom severance, but are not used for diagnosis. In this study, all subscales have proven to have high reliability (depression $\alpha = .90$; anxiety $\alpha = .82$; stress $\alpha = .88$).

The UCLA Loneliness Scale (Russell et al., 1978) consists of 20 items for assessing subjective loneliness. Participants estimate how much they agree with items using a scale from 1 (*I never feel this way*) to 4 (*I often feel this way*). The overall score is formed as a linear combination of estimates on each item, with a higher score indicating greater loneliness. It is a reliable and well-used instrument, with a Cronbach α varying from .90 to .94 (in this study $\alpha = .93$).

The Digital Activity Score Scale (Kopilaš, 2022) is a 10-item questionnaire for assessing daily digital activities (*e.g., Use of cell phone; Scroll through social media*), rated on a response scale ranging from 1 (*very slightly or not at all*) to 5 (*extremely*). The total score is calculated by summing up

responses on all items, and higher scores indicate increased digital activity. The scale shows good reliability, ranging from .80 (in this study) to .85 (Kopilaš et al., 2021).

Results

Descriptive data

The data were analyzed using SPSS software, version 26. Overall descriptive data indicates that depression, anxiety and stress are within the normal range. Regarding stressful life events, the highest score was obtained on the Avoidance scale, and the average result on positive affect was slightly higher than on the negative affect measure. The mean score on the UCLA scale indicates a moderate level of loneliness, the same as digital activity (Table 1). According to self-reported scores, 47.4% of participants estimate that they used mobile phones more often during lockdown, in comparison to the period before the COVID-19 pandemic, while 35.3% spent more time on their computers. Regarding social networks, 45.7% of them accessed Instagram and Facebook more frequently. That is in accordance with the data from comparable studies that show an overall increase of digital activity during the pandemic (Sorkin et al., 2021).

Correlations

Since we have not met all the criteria for parametric statistics, Spearman's correlation was used and presented in Table 2. As expected, participants with higher levels of loneliness are more depressed, anxious and stressed, experience a more negative affect, and are more prone to hyperarousal, although these correlations were low to moderately high. Greater engagement in digital activity is associated with higher levels of depression, anxiety, stress, intrusion and hyperarousal. Although digital activity is significantly related to most variables, the values of Spearman's coefficient were low.

Table 1. Descriptive statistics for all studied variables ($N=116$)

	Scale	Min.	Max.	$M (SD)$	$C(IQR)$	Kolmogorov-Smirnov test
DASS	Depression	0	40	12.03 (11.16)	8 (14)	<.001
	Anxiety	0	34	7.6 (8.2)	4 (10)	<.001
	Stress	0	40	12.59 (9.97)	10 (14)	<.001
IES	Avoidance	1.13	4.13	2.34 (0.73)	2.25 (1.13)	.148
	Intrusion	1	4.63	2.03 (0.82)	1.88 (1.13)	<.001
	Hyperarousal	1	4.5	2.01 (0.89)	1.83 (1.13)	<.001
PANAS	Positive	14	46	29.9 (7.39)	29.5 (12)	.200
	Negative	10	47	23.23 (8.06)	22 (12)	<.001
	Loneliness	21	73	42.79 (12.54)	43 (18)	.200
	Digital activity	11	37	21.12 (6.09)	21 (9)	<.01

Note. M =mean; SD =standard deviation; C =median; IQR = interquartile range

Table 2. Correlation matrix for all studied variables ($N=116$)

	1	2	3	4	5	6	7	8	9
Depression (1)	-								
Anxiety (2)	.62**	-							
Stress (3)	.70**	.81**	-						
Intrusion (4)	.58**	.57**	.69**	-					
Avoidance (5)	.42**	.47**	.49**	.63**	-				
Hyperarousal (6)	.64**	.65**	.72**	.79**	.57**	-			
Positive affect (7)	-.48**	-.22*	-.27**	-.16	-.08	-.20*	-		
Negative affect (8)	.62**	.65**	.66**	.55**	.45**	.62**	-.19*	-	
Loneliness (9)	.38**	.28**	.35**	.19*	.20*	.34**	-.22*	.39**	-
Digital activity (10)	.23*	.29**	.24**	.28**	.21*	.28**	-.04	.20*	.03

Note. * $p \leq .05$; ** $p \leq .01$

Discussion

Most restrictions during the COVID-19 lockdown reduced social interactions, and consequently increased digital activity that could act as a risk or protective factor for youth's mental health. When prolonged, restricted social functioning, solitude and fear could entice PTSD symptoms and loneliness, especially in youth who rely on peer support (Almeida et al., 2022). Despite some evidence of increased loneliness in young adults (Horigian et al., 2021), our participants

reported moderate level of loneliness during the pandemic.

Some longitudinal data suggest that the COVID-19 pandemic had a negative psychological impact on adolescents' mental health and adjustment (Elmer et al., 2020). Anxiety in students after the first outbreak of COVID-19, compared to national norms, was rising (Wang et al., 2020). However, not all youth were equally affected. Positive effects could be seen in the domains of self-care, reflection and the absence of everyday stressors, while the predominant negative effect

refers to disrupted relationships with peers (Bell et al., 2023). Our findings suggest that depression, anxiety and stress levels during the COVID-19 pandemic were mostly within the normal range, according to the DASS manual. It should be taken into account that all mental health self-reports are time-bounded and non-specific, which means that they relate to the mental health state of participants within the last week, and do not address stress levels caused by the fear of exposure to COVID. In a similar study, Kopilaš et al. (2021) found that students who were affected by COVID had higher avoidance tendencies. Also, participants who were in lockdown had higher stress, depression, avoidance and intrusion.

Furthermore, our participants reported slightly more positive emotions such as interest and excitement, which could be an indication of positive adjustment to COVID regulations, reaction to mitigation of lockdown restriction or to alleviated everyday stressors. However, digital activity was not related to positive affect, as we would have expected. For some students, the pandemic facilitated attainability of online tools for mental health protection and alleviated everyday stress by improving their mental health. Contrary to our main hypothesis, digital activity in our sample was not related to positive affect at all, but was related to negative affect and symptoms of impaired mental health. When compared to previous studies, it appears different digital tools are used for different purposes, and we missed out on the opportunity to detect whether our participants used technology for gaming, school (video conferencing), social networking or support.

The findings of Wang et al., (2020) indicate the presence of intrusive thoughts, anger and irritability during the pandemic. This causes young adults to avoid thoughts and feelings related to traumatic situations, and digital activity as one of the coping behaviors during the COVID-19 pandemic (Marciano et al., 2022). Our findings linked digital activity to infringed mental health, represented by anxiety, PTSD and depressive symptoms, but not with loneliness. It is unclear if participants used digital tools to shift focus from

uncertainties or defy loneliness, as was determined in other studies (Karsay et al., 2022; Marciano et al., 2022), since the association of digital activity with mental health indicators suggests otherwise. Given the limitations of the correlation method, we cannot say if anxiety, intrusive thoughts and hyperarousal could emerge after extended digital usage, or if individuals who are inclined to these unpleasant thoughts and feelings also spend more time in digital environment. Despite limited experimental studies, some evidence supports the idea that reduced digital usage results in significantly improved self-reported well-being and mood (Pedersen, 2022).

Further qualitative research should identify the sources of resilience and strengths that were gained through digital tools, accompanied by evaluation of programs promoting mental health that use digital tools and platforms.

Limitations

Main limitations of our research lie in omitted variables such as online school experience, family income, availability of mental health care system, and other variables that covariate with studied variables. We have not included them in order to keep our questionnaire as short as possible and avoid fatigue in our participants. Also, this study examined the relationship between digital activity and certain psychological variables without distinguishing interactive (messaging, learning or content creating) from passive users (browsing, scrolling and overall escapism). Other limitations include well-established shortcomings of self-reported measures and cross-sectional studies, as well as a rather small sample size.

Conclusion

Taking into account all the limitations of this study, we can say, not without caution, that its results suggest that youth in Croatia were within the non-clinical range for depression, anxiety and stress

levels during the second wave of the COVID-19 pandemic, with moderate stressful life events and loneliness levels. Findings showed that increased digital activity was associated with negative emotions, PTSD symptoms, depression, anxiety and stress levels. In contrast to our main hypothesis, digital activity was not related to positive mental health outcomes and emotions.

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Romantic relationships quality and relational aspects of the self among Croatian youth

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Abstract

Romantic relationships in adolescence and early adulthood are normative. They determine the course of adolescents' psychosocial development and are involved in the formation of sexual identity and self-esteem. Self-esteem, as an evaluative component of the self, may influence the quality of intimate relationships. On the other hand, romantic events might influence perceptions of one's worth. However, research on constructs in this area is still underrepresented in Croatian professional and academic settings. Therefore, this study aimed to investigate whether the quality of romantic relationships and the perceived importance of intimate relationships predict the relational aspects of the self - relational esteem, relational preoccupation and relational depression. Results suggest that in adolescence and young adulthood, perceived importance of relationships is the only significant predictor of relational esteem, whereas conflict and participant age were found to be significant predictors of relational depression. These results were interpreted within the framework of the sociometer theory. The present data suggest that conflict in romantic relationships and perceived importance of intimate relationships predict relational aspects of self in adolescents and young adults.

Keywords: romantic relationships; relationship quality; relational depression; relational preoccupation; relational esteem

Introduction

Peer relationships in adolescence and early adulthood play an important role not only in social and emotional development, but also in overall well-being (Chiu et al., 2021; Collins, 2003; Gómez-López et al., 2019; Neemann et al., 1995; Pinquart & Pfeiffer, 2018; Ponti et al., 2010; Schwartz-Mette et al., 2020). In general, a growing body of literature suggests that romantic relationships have an impact on one's overall sense of competence, identity and self-esteem (Furman et al., 1999; Neemann et al., 1995).

Relationship quality may play a particularly important role as one of the key determinants of a romantic relationship in an individual's current functioning and further development (Collins, 2003). It is defined as a multidimensional construct characterized by several positive aspects such as closeness, intimacy, support, security and companionship, as well as various negative aspects, such as conflict and antagonism (Collins et al., 2009; Ponti et al., 2010). For example, relationships that are perceived as conflictual and 'unhealthy' may lead to the development of inappropriate romantic relationship behaviors, resulting in a gradual dete-

rioration of adolescents' psychosocial functioning (Connolly & Konarski, 1994). Moreover, perceptions of the inadequate quality of romantic relationships may be associated with depressive symptoms and internalizing behavior disorders (Davila et al., 2017, Beyers & Seiffge-Krenke, 2007). On the other hand, high-quality romantic relationships are associated with a range of positive psychosocial outcomes, such as feelings of competence, a positive self-image and perceptions of social support (Masten et al., 1995). Such relationships may eventually lead to higher quality romantic relationships in adulthood (Seiffge-Krenke, 2003).

In terms of self-concept and identity formation, romantic experiences may play an important role in the development of the above factors (Furman & Shaffer, 2003). Adolescents develop a different self-image in the romantic sphere, with relational aspects of the self-concept related to whether one has a romantic relationship and, more importantly, to the quality of that relationship (Connolly & Konarski, 1994; Furman & Shaffer, 2003). Thus, positive romantic experiences may lead adolescents and young adults to see themselves as attractive and competent romantic partners, whereas unfavorable romantic experiences may lead to lower relational esteem. For this reason, it is important to emphasize the relationship between the quality of romantic relationships and self-esteem. Self-esteem, as an evaluative component of the self-concept, is defined as a measure of self-acceptance (Baumeister, 2005), as well as a sense of one's competence in various domains (Mruk, 2006). It is also one of the crucial factors when it comes to monitoring other people's reactions to one's own behavior and maintaining interpersonal relationships. This is based on the sociometer theory, which states that "self-esteem is a sociometer, essentially an internal monitor of the degree to which one is valued or devalued as a relational partner" (Leary & Baumeister, 2000). In other words, the sociometer monitors the environment and interactions within it, with the goal of detecting signs that indicate possible negative self-evaluation caused by disapproval, avoidance and rejection by others in various interactions

that are backed by one of the universal psychological needs - the need for belonging and acceptance (Leary and Baumeister, 2000). Depending on the developmental stage, the sociometer is particularly responsive to perceptions of acceptance or rejection in different contexts. Given the importance of intimate relationships in late adolescence and early adulthood, it seems relevant to consider the quality of romantic relationships and the responsiveness of the sociometer in such interactions. According to the sociometer theory, poor relationships and dissatisfaction with intimate partners can significantly reduce self-esteem. In contrast, self-esteem increases when someone feels that their relationship is healthy and their partner is happy (Erol & Orth, 2017).

Harris and Orth's (2020) meta-analysis showed that self-esteem and social relationships reciprocally predict each other over time, with effects that are age- and gender-independent. Although some studies examined the relationship between self-concept or self-esteem and relationship quality (e.g., Kraljević, 2013; Mađarić, 2019; Marić, 2020; Ostović, 2022), the authors of this paper are aware of only one study examining the relational self-concept (Krnić et al., 2022) in the Croatian context. Snell and Finney (2002) distinguish three aspects of the relational self-concept: relational esteem (perception of one's capacity for romantic relationships), relational depression (focus on negative aspects of a romantic relationship) and relational preoccupation (importance of love and a romantic relationship in one's life). Based on the assumption derived from the sociometer theory that poor relationships can be detrimental to the self-concept, this pilot study aimed to examine whether the quality of romantic relationships and the perceived importance of romantic relationships predict relational aspects of the self.

Method

Participants and Procedure

We conducted the research in the spring of 2021. Participants were high-school and university

students who reported being in a romantic relationship. There was a total of 121 participants, 83% of whom were women, aged 17 to 28 years ($M = 19.87$, $SD = 2.436$). They completed an online survey using the Google Forms platform. We distributed the survey questionnaire via social media.

Measures

The questionnaire included demographic questions, the Romance Qualities Scale (Ponti et al., 2010), and the Relational Assessment Questionnaire (Snell & Finney, 2002).

The Romance Qualities Scale (Ponti et al., 2010) originally consisted of twenty-two items with a response scale of 1 (i.e., “not true at all”) to 5 (i.e., “completely true”); however, a modified version with twenty-three items across five subscales was used in this study. These five subscales measure: conflict (e.g., “Sometimes I quarrel even violently with my partner”), companionship (e.g., “My partner and I spend all our free time together”), help (e.g., “If other people were bothering me, my partner would help me”), security (e.g., “If I have a problem at school, at work or at home, I can talk to my partner about it), and closeness (e.g., “If my partner had to move away, I would miss him”).

The Relational Assessment Questionnaire (Snell & Finney, 2002) consists of thirty items, which are assessed using a response scale from 1 (i.e., “not at all characteristic of me”) to 5 (i.e., “very characteristic of me”). The questionnaire includes three subscales: relational esteem (e.g., “I am a good partner for an intimate relationship”), relational depression (e.g., “I am disappointed about the quality of my close relationships”) and relational preoccupation (e.g., “I think about intimate relationships all the time”).

For this study, we developed a six-item scale to measure the importance of romantic relationships. It included items focused on the perceived importance of romantic experiences and feelings related to romantic relationships, as well as items based on the self-assessment of the impact of intimate relationships on one’s mental health and self-esteem.

To investigate the psychometric properties of this scale, we performed an exploratory factor analysis. A KMO value of .698 and a statistically significant Bartlett’s test for sphericity ($\chi^2 = 238.846$, $df = 15$, $p < .001$) allowed us to perform factor extraction. First, we used the principal components method and extracted two factors: one with an eigenvalue of 2.510 and one with an eigenvalue of 1.086. Since only one item was saturated with the second factor, we decided to use the principal axis factoring method with the direct oblimin rotation method to further investigate the one-factor structure. This one factor explained 32% of the variance in the items, with communalities shown in Table 1. The item “I would rather be in any relationship than single” had a communality of less than .30, and was therefore excluded from further analysis. Thus, the importance of romantic relationships was measured with five items on a scale ranging from 1 (i.e., “not at all characteristic of me”) to 5 (i.e., “very characteristic of me”). After recoding the item “I feel better about myself when I’m single or in a casual relationship,” the total score was calculated as a sum of all items.

Table 1. Communalities for the one-factor solution for the Importance of Romantic Relationships Scale

Item	Communality
I find that romantic relationships affect my self-image and self-confidence	.749
I find that I have a better self-image when I’m in a relationship	.713
It’s important to me to be in a romantic relationship or at least to date someone	.618
I find that romantic relationships have an impact on my mental health	.554
I feel better about myself when I’m single or in a casual relationship	-.402
I would rather be in any relationship than single	.121

Results

Descriptive parameters

Table 2. shows descriptive parameters for all variables analyzed. As one can see, participants

perceive moderate conflict in their relationships (mean score 11.56 out of 25), but high companionship (mean score 12.50 out of 15), help (mean score 23.31 out of 25), security (mean score 21.47 out of 25) and closeness (mean score 23.68 out of 25). In addition, they exhibit low relational depression (mean score 17.60 out of 60), moderate relational preoccupation (mean score 25.33 out of 45) and high relational esteem (mean score 24.21 out of 30).

Table 2. Descriptive parameters for all analyzed variables ($N = 121$)

Scale	Min.	Max.	<i>M</i>	<i>SD</i>
Age	17	28	19.87	2.436
Importance of romantic relationships	7	25	14.45	3.490
Conflict	5	23	11.56	3.916
Companionship	7	15	12.50	2.038
Help	8	25	23.31	2.771
Security	12	25	21.47	2.714
Closeness	10	25	23.68	2.618
Relational esteem	11	30	24.21	4.076
Relational depression	10	40	17.60	5.984
Relational preoccupation	10	43	25.33	7.048

Note. *n* – number of participants, Min. – lowest result, Max. – highest result, *M* – mean, *SD* – standard deviation

Because a Cronbach's alpha below .50 indicates low reliability, an alpha between .50 and .75 indicates moderate reliability, and an alpha above .75 indicates high reliability (Hinton et al., 2014), the companionship subscale was excluded from further analysis due to low reliability. Although the Kolmogorov-Smirnov test indicates an asymmetric distribution of all variables except relational preoccupation, only help and closeness have skewness greater than 2, and kurtosis greater than 7 (Table 3.), indicating that their distribution is negatively asymmetric (Curran et al., 1996). Despite this fact, the residuals are normally distributed, and the assumption of homoscedasticity is satisfied.

Table 3. Indicators of normal distribution and reliability for all analyzed variables

Scale	K-S d	Skewness (S.E.)	Kurtosis (S.E.)	α
Age	.31*	.86 (.220)	-.59 (.437)	-
Importance of romantic relationships	.14*	-.79 (.220)	.31 (.437)	.67
Conflict	.13*	.83 (.220)	.62 (.437)	.73
Companionship	.20*	-.88 (.220)	.26 (.437)	.36
Help	.27*	-2.63 (.220)	8.67 (.437)	.79
Security	.16*	-1.06 (.220)	1.07 (.437)	.59
Closeness	.33*	-2.82 (.220)	8.51 (.437)	.85
Relational esteem	.13*	-.72 (.220)	.51 (.437)	.84
Relational depression	.13*	1.16 (.220)	1.73 (.437)	.81
Relational preoccupation	.05	.06 (.220)	-.46 (.437)	.84

Legend. K-S d – Kolmogorov-Smirnov test, α – Cronbach's Alpha, * $p < .001$

We found a positive relationship between the importance of romantic relationships and relational esteem (.26, $p < .05$) and relational preoccupation (.25, $p < .05$), that is, when romantic relationships are more important, adolescents report higher relational esteem and relational preoccupation. Higher relational depression is also related to more perceived conflict (.39, $p < .05$) in a relationship, and less help (-.49, $p < .05$), security (-.38, $p < .05$) and closeness (-.46, $p < .05$). Relational esteem and relational preoccupations are not significantly related to aspects of relationship quality, and age is not significantly related to any other variable. Although not all predictors were significantly associated with the outcome variables, we decided to include them in hierarchical models to see how they act when put together.

The role of relationship quality in explaining the relational aspects of the self

To answer our research questions, we conducted three hierarchical regression analyses with relational esteem, relational depression and relational preoccupation as criteria (Table 4.).

Table 4. Results of hierarchical regression analyses with demographic variables and relationship quality as predictors and relational esteem, relational depression, and relational preoccupation as criteria

	Relational esteem	Relational depression	Relational preoccupation
<i>Predictors</i>	β	β	β
Step 1			
Gender (1-male, 2-female)	.18 (.19*)	-.13 (-.11)	-.06 (-.09)
Age	.05 (.03)	-.15 (-.19*)	.05 (.01)
Rc ²	.02	.02	.01
Step 2			
Importance of relationships	.22*	-.10	.16**
Conflict	.14	.20*	-.04
Help	.15	-.20	.08
Security	.09	-.13	-.11
Closeness	-.01	-.14	.02
Rc ²	.08*	.30**	.02

Note. β – standardized regression coefficient, Rc² – the proportion of explained variance after introducing a new block of variables, () – values of the standardized regression coefficient in the last step of the hierarchical regression analysis, * $p < .05$, ** $p < .01$

In the first step, we introduced demographic variables, i.e., gender and age, as control variables, and in the second step, we added all other predictors, i.e., the importance of romantic relationships, conflict, help, security and closeness. Although VIF values for help and closeness were greater than 2, values for Tolerance were greater than .10 in all three analyses, suggesting that multicollinearity is not present in our data. In the final step, 8% of the variance in relational esteem among adolescents who are in a romantic relationship was explained. Gender and the importance of the romantic rela-

tionship proved to be significant predictors of this aspect of relational self.

On the other hand, we were able to explain 30% of the variance in relational depression with age and perceived relationship conflict. Thus, girls and adolescents in a relationship who perceive romantic relationships as more important report higher relational esteem, whereas adolescents who are younger and perceive more conflict report higher relational depression.

Discussion and conclusions

The purpose of this study is to investigate whether the quality of romantic relationships is related with the relational aspects of the self in adolescents and young adults involved in romantic relationships. The results suggest that age and conflict communication between romantic partners predict the relational depression, while the importance of romantic relationships predict the relational esteem in adolescents and young adults. It should be noted, however, that modest proportion of the variance is explained. Some other variables, such as attachment style, attributional style, general self-esteem or mental health problems, may also play an important role in explaining the relational self-concept.

The results of this study suggest that young people who perceive higher levels of conflict communication patterns in interactions with romantic partners, tend to evaluate their romantic relationships predominantly negatively and view their own romantic competencies as inadequate. Some of the basic assumptions of the sociometer theory may explain these findings. According to the sociometer theory, self-esteem increases when a person feels that he or she is of high value to the people in relationship with him or her, and it decreases when the person feels that he or she is not as important to the important people in his or her life (Leary & Baumeister, 2000). If a person's romantic relationship is characterized by antagonism and conflictual communication, one might conclude that the other person does not like them enough, which in turn could affect the relational aspects of the self - in this

case, relational depression. One could respond to this by ending the unsatisfactory relationship, but it is also possible that the person will internalize this negative self-image, which could have an impact on relationships developed later in life. Regarding the age of the participants, the younger participants perceived their relationships more negatively (relational depression) than older participants. It is possible that personal definitions of the quality of romantic relationships change with age, possibly resulting from the increasing cognitive and emotional maturity and the greater relationship experience.

The importance of romantic relationships proved to be a significant predictor of relational esteem, suggesting that young people who believe relationships are more important believe they have adequate skills to build them. One possible explanation according to the sociometer theory is that young people who perceive their relationships as highly valued, pay more attention to events in their relationship and have a stronger tendency to evaluate themselves. Another possible explanation could be the phenomenon of rejection sensitivity, which refers to the tendency of individuals to anxiously expect, perceive and overreact to rejection. This phenomenon is common among adolescents and young adults, and affects their perception of satisfaction with their relationships (Downey et al., 1999). In general, the results of the current study are consistent with previous findings that romantic relationships and perceptions of their importance are critical to understanding young people's self-concept and romantic competence (Knee et al., 2008).

Limitations of the study

Finally, the results obtained should be interpreted within the limitations of the present study. First, it was conducted at a single measurement point, and our sample was convenient, consisting of 121 high school and college students, mostly women, who were in romantic relationships. Therefore, the results cannot be generalized to the entire population. The number of participants in future studies

should be increased, especially the number of young men and those who have completed formal education. It should also be noted that for this study, we used scales measuring the importance of romantic relationships, companionship, conflict and security, although moderate Cronbach's alpha coefficients suggest that we should more thoroughly question whether these are reliable and valid measures of the constructs of interest. Finally, it would be advisable that future studies on adolescent romantic experiences include the constructs of the contingent self, attachment theory, basic psychological needs and romantic competence.

Despite these limitations, the study conducted demonstrates the importance of the role that romantic experiences play in understanding the relational aspects of the self, especially relational esteem and relational depression. It provides the basis for further research in this sensitive area, which is crucial for the future psychosocial development of young people and their current psychological functioning. In addition, the findings of this study highlight the importance of assertive, yet supportive communication with romantic partners, which is an important practical implication for the development of prevention programs. Because relational depression is associated with more mental health problems (Krnić et al., 2022), building a positive relational self-image could help adolescents not only develop healthy relationships later in life, but also protect their mental well-being.

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How can teachers encourage students' agentic engagement? The role of autonomy-supportive teaching and students' autonomous motivation

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Abstract

Agentic engagement is a relatively new construct within the self-determination theory framework which refers to students' constructive contributions to the flow of the class. Previous research has linked agentic engagement with better student outcomes; therefore, it is important to investigate factors that could encourage it. Studies suggest that autonomy-supportive teaching promotes agentic engagement. However, little investigation has been made into the mechanisms underlying this association. Hence, the aim of this study was to examine the relationship between teachers' autonomy support and students' agentic engagement, and to determine whether it is mediated by the students' autonomous motivation. Additionally, it was investigated if these relationships vary between students who attend different high school programs. The participants were 327 high school students, of which 74% attended a gymnasium program. The analysis concluded that autonomy-supportive teaching is positively associated with agentic engagement, and that the relationship is partially mediated by autonomous motivation. Furthermore, high school program was not found to be a significant moderator of the relationships. The tested model explained about 30% of the agentic engagement variance. The findings suggest the teachers should aim to encourage students' autonomy if they want them to be actively involved in class.

Keywords: *self-determination theory; agentic engagement; autonomy-supportive teaching; autonomous motivation; high school students*

Introduction

Agentic engagement is a relatively new construct introduced by Reeve and Tseng (2011) within the framework of the self-determination theory. It refers to the type of school engagement in which students constructively contribute to the flow of a

class (Reeve, 2013; Reeve & Shin, 2020; Reeve & Tseng, 2011). Specifically, it encompasses behaviors such as providing feedback to the teacher, asking questions that help students in following the class, requesting additional explanations and materials from the teacher, and expressing preferences and goals associated to the class material.

Agentic engagement has been added to the prevailing three-component model of engagement which differentiates between cognitive, emotional and behavioral engagement (Reschly & Christenson, 2012). Cognitive engagement means that students are using deep learning strategies, emotional engagement that they feel positive rather than negative emotions when studying, while behavioral engagement concerns students being active during the class (Fredricks et al., 2004; Reeve, 2012; Reeve, 2013; Skinner et al., 2009). Unlike the other types of engagement, agentic engagement describes students' initiative to create a better class environment (Reeve, 2013; Reeve & Shin, 2020). For instance, students who have high behavioral engagement follow the class with full attention; however, they do not request further help from the teacher, meaning they are passively involved in the class. Students high on agentic engagement, on the other hand, request additional support from teacher if needed, making their actions proactive. Therefore, agentic engagement might be crucial for students' academic outcomes, as well as for their well-being during class. Although agentic engagement is still relatively poorly researched (Jang et al., 2016), studies have associated it with greater need satisfaction, more autonomous motivation, other types of engagement and greater achievement (Mameli & Passini, 2017, 2018; Reeve, 2013; Reeve, Cheon & Jang, 2020; Reeve & Tseng, 2011). Since agentic engagement could be highly beneficial for students, it is important to inspect factors that could encourage it.

Autonomy-supportive teaching

A predictor that research has frequently associated with engagement is teacher's autonomy support (Cheon et al., 2016; Cheon et al., 2019; Núñez & León, 2018; Reeve et al., 2020). Autonomy-supportive teaching is a teaching style in which educators try to take students' perspective and offer them choice (Hagger & Chatzisarantis, 2015; Reeve & Cheon, 2021). In other words, they take into consideration students' interests, give students the ability to make decisions, provide explanation why it is important to do a certain task,

use inviting rather than commanding language etc. Such behaviors incentivize students to show agentic engagement since students trust their teacher will accept and be responsive to their suggestions. However, the research that associates agentic engagement and autonomy-supportive teaching is still somewhat scarce. Moreover, researchers often summarize results of different types of engagement into one result, so it is unclear which type is most prominently associated to teachers' autonomy support (e.g., Cheon et al., 2016; Cheon et al., 2019). Thus, there is a need to further investigate this relationship. Additionally, studies failed to examine potential underlying mechanisms that could explain the relationship.

Autonomous motivation

A possible mediator of the relationship between autonomy-supportive teaching and agentic engagement is autonomous motivation. Autonomous motivation is a type of motivation in which the person engages in an activity because they deem it important, or because they enjoy doing it (Hagger & Chatzisarantis, 2015). It is found to be associated with many favorable academic and personal outcomes, such as higher achievement, effort, well-being, greater self-esteem etc. (Howard et al., 2021). Although there is substantial evidence of autonomy-supportive teaching encouraging autonomous motivation (Bureau et al., 2021), the relationship between motivation and agentic engagement has not yet been thoroughly researched (Reeve, 2013). Students who are autonomously motivated, i.e. interested in the class, are probably eager for the class to be of a higher quality. One way for students to achieve that is to direct their teacher to make the class more suited to their needs and preferences. Therefore, autonomous motivation could lead to students' agentic engagement.

However, some students might need more support in becoming motivated and engaged than others. Students who are already academically successful and are highly encouraged in school activities would probably be involved in school no matter if their teacher is autonomy-supportive. This idea is

supported by research demonstrating that autonomy support has a greater impact on students with less autonomous motivation (Black & Deci, 2000). Hence, when researching the relationship between teaching style, motivation and engagement, it is also important to consider contextual differences between groups of students included. In the Croatian context, the high school program that students attend plays a very important distinguishing factor between them. Students can choose either a gymnasium, a general education track that prepares them for higher education, or a vocational school that prepares them for a certain profession. Students who choose to attend vocational schools have been shown to have less academic success and academic self-efficacy, as well as limited parental support compared to students who choose to attend gymnasium (Šabić et al., 2020). Hence, they might need more encouragement from their teachers to develop an interest in school activities and to participate in them. Therefore, in line with previous findings about the impact of autonomy-supportive teaching, it could be expected that vocational school students might profit more from autonomy-supportive teachers than gymnasium students.

Present study

The aim of the present study is to investigate the relationship between autonomy-supportive teaching and agentic engagement, as well as the possible mediating role of autonomous motivation in that relationship. Additionally, the study will examine the moderating role of high school program in the relationship that autonomy support has with autonomous motivation and agentic engagement (Figure 1). It is hypothesized that autonomy-supportive teaching will be positively associated with agentic engagement, and that that relationship will be partially mediated by autonomous motivation. Furthermore, it is presumed that positive associations which autonomy-supportive teaching has with autonomous motivation and agentic engagement will be stronger for the students attending vocational school program, compared to the students who attend gymnasiums.

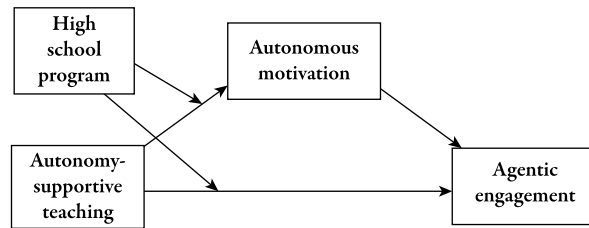


Figure 1. The hypothesized model

Method

Participants

The participants in the study were 327 high school students (74.3% girls) from Zagreb and Karlovac. Most of the students attended a gymnasium high school program (74%), while the rest attended a vocational school, specifically, an administration vocational training program. The mean age of the participants was 16.58 years ($SD = 1.151$). They were equally distributed by the grade they attended: 15.3% attending the first grade, 29.4% the second, 28.7% the third and 26.6% the fourth grade. The participants' mean GPA was 4.38, with the minimum GPA in the group being 3.00 and the maximum 5.00.

Procedure

The research was conducted as part of a pilot study within the project *Free Career Choice*, financed by the Croatian Science Foundation. The researchers recruited the participants by contacting schools. The participants who have consented to participate in the study were sent a link with the study survey by their teachers, or have participated in a group administration of the online survey conducted by their teachers.

Measures

Autonomy-supportive teaching. Teachers' autonomy support was measured with the *Learning Climate Questionnaire* (Williams & Deci, 1996; Sviben, 2006). The questionnaire is comprised of six items referring to the teachers in the students' school in general rather than to a specific teacher. The participants marked their agreement with each

of the items on a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example of an item is: “My teachers listen to how I would like to do things”.

Autonomous motivation. Students’ autonomous motivation was assessed using two subscales of the *Multidimensional School Motivational Scale* (adapted from Gagné et al., 2015). The used subscales measured identified motivation with three items (e.g., “I learn because I believe that a person should be well-educated”), and intrinsic motivation with three items (e.g., “I learn because it is interesting”). The participants marked their agreement with each of the items on a Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Agentic engagement. Students’ agentic engagement was measured using the revised version of the *Agentic Engagement scale* (Tseng & Reeve, 2011; Reeve, 2013). The questionnaire is comprised of five items to which participants mark their agreement using a Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). An example of the item is: “During class, I ask questions to help me learn”.

High school program. Students’ high school program was coded with 1 for students who attended gymnasiums and 0 for students who attended the vocational school.

Results

The analyses were conducted using the IBM SPSS Statistic version 26, with the addition of the Hayes’ Process Macro version 4.0 (Hayes, 2018).

Table 1 presents means, standard deviations and reliabilities of each questionnaire. The analysis showed that all the used scales had high internal consistency.

Table 1. Descriptive statistics ($N = 327$)

	<i>M</i>	<i>SD</i>	α
Autonomy-supportive teaching	4.083	1.385	.903
Autonomous motivation	3.041	0.815	.803
Agentic engagement	4.082	1.567	.901

Firstly, bivariate Pearson correlations were calculated between the variables included in the model that will be tested (Table 2).

Table 2. Correlation matrix ($N = 327$)

	2	3	4
1 Autonomy-supportive teaching	.372**	.424**	.078
2 Autonomous motivation	-	.486**	.154**
3 Agentic engagement		-	.113*
4 High school program			-

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

The results show that all variables were positively associated, except for high school program not being associated to the amount of autonomy-supportive teaching. The correlations were small- to medium-sized.

After it was concluded that the variables are correlated, the hypothesized moderated-mediation model was tested (Figure 2). The tested model corresponds to the Model 8 in the Hayes’ Process Macro (Hayes, 2018). It was tested using 5000 bootstrap sampling with 95% confidence intervals, meaning that if the intervals acquired from the analysis do not contain zero, it can be claimed that the effect is significant with 95% confidence. The proposed model was partly confirmed, and it was able to explain 30.68% of the variance of agentic engagement.

The hypothesis that autonomy-supportive teaching will be positively associated with agentic engagement, and that the relationship will be partly mediated by autonomous motivation was confirmed. Autonomy-supportive teaching was positively associated with agentic engagement directly ($b = 0.261$; $CI = [0.0726-0.4502]$; $p < .05$). It was also positively associated to autonomous motivation of the students ($b = 0.257$; $CI = [0.1523-0.3611]$; $p < .05$), which was then positively correlated to agentic engagement ($b = 0.727$; $CI = [0.5361-0.9185]$; $p < .05$). Both indirect conditional effects were significant. There was a significant indirect pathway between autonomy support and agentic engagement via autonomous motivation for the gymnasium students ($b = 0.140$; $CI = [0.0755-0.2127]$; $p < .05$), as well as

for the vocational school students ($b = 0.187$; $CI = [0.0878-0.2908]$; $p < .05$).

However, the hypotheses about the moderating effects of high school program were not confirmed. High school program moderated neither the relationship between teachers' autonomy support and agentic engagement ($index = -0.0832$; $CI = [-0.1388-0.3051]$; $p > .05$) nor the relationship between teachers' autonomy support and autonomous motivation ($index = -0.065$; $CI = [-0.1918-0.0619]$; $p > .05$). The index of the moderated mediation was statistically non-significant as well ($index = -0.0472$; $CI = [-0.1506-0.0610]$; $p > .05$).

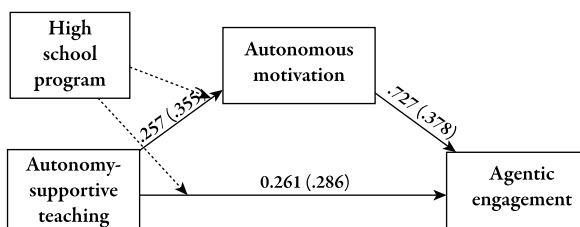


Figure 2. The results of the moderated-mediation regression analysis ($N = 327$)

Note. The regression coefficients in the parenthesis are standardized

Discussion

The aim of the present study was to investigate the relationship between autonomy-supportive teaching and agentic engagement, as well as the possible mediating role of autonomous motivation in that relationship. Additionally, the study examined the moderating role of high school program in the relationship that autonomy support has with autonomous motivation and agentic engagement.

The analysis showed that teachers' autonomy support positively predicted agentic engagement directly and via greater autonomous motivation. The results showing the association between teachers' support and agentic engagement are in line with some previous studies (Cheon et al., 2016; Cheon et al., 2019; Núñez & León, 2018; Reeve et al., 2020). When students see that their teacher is willing to incorporate their interests and needs into their teaching, they are more likely

to voice them on their own. An additional mechanism for this association that was explored in this study was students' autonomous motivation. While numerous studies demonstrated that autonomy-supportive teaching incentivizes autonomous motivation (Bureau et al., 2021), not much is known about the relationship of autonomous motivation and agentic engagement (Reeve, 2013). The analysis has shown that autonomous motivation has a mediating role in the relationship between autonomy support and agentic engagement. When students are autonomously motivated, they have an intrinsic need to learn about the matter presented in the class and, therefore, ask additional questions, give teacher feedback, or influence the class in any other way that could help them learn more. The results indicate that autonomy-supportive teaching can, through two described pathways, explain about 30% of agentic engagement variance, highlighting its importance in encouraging students' engagement.

In a practical sense, these findings suggest that teachers should aim to adopt an autonomy-supportive style. However, this is not an easy task for teachers, either because of the wrongful belief that providing students choice will lead to them not learning enough, or because of the pressures arising from demanding curricula, parents, headmasters and administration (Ryan & Deci, 2020; Wakefield, 2016). Hence, it would be important to provide teachers with effective autonomy-support interventions (e.g., Cheon et al. 2016; Cheon et al., 2019) and make changes in the educational system that would allow them to implement such teaching style.

Another hypothesis that was tested in this study was the potential moderating role of high school programs in the relationship that autonomy support has with motivation and engagement. It was hypothesized that for the students who attend vocational schools, the relationships might be stronger, since they are often students who are less interested in school and have less support. Therefore, support for their teacher might be important in sparking motivation and interest, which gymnasium students are able to gain from other sources such as parents,

or from previous positive experience with school. This notion is supported by some previous research which showed that autonomy-supportive teaching had a greater impact on students with less autonomous motivation (Williams & Deci, 1996). However, the analysis did not confirm the moderating role of high school program. This finding would imply that teachers' support is equally important for students no matter the program they attend, emphasizing the importance of autonomy-supportive teaching for all groups of students.

Nevertheless, two important methodological drawbacks of this study should be considered when evaluating the results and the practical implications of this research. Firstly, the sample used in this study was a convenience sample that consisted mostly of gymnasium students and students from one of the better vocational schools. Therefore, it would not be justified to generalize the conclusions to students who have lower grades or attend less academically demanding vocational programs. This issue also casts doubt on the finding that the school program has no moderating role in the relationship that autonomy-supportive teaching has with autonomous motivation and engagement. It is possible that students who attend the vocational school included in the sample are not representative of vocational school students in general, since they attend a more demanding program and generally have higher grades, although Šabić and colleagues (2020) found that even students attending four-year vocational programs, such as the one included in our study, still had worse academic outcomes than gymnasium students. Nevertheless, future studies that inspect the role of high school programs should aim to include more vocational schools, such as academically less demanding three-year vocational schools. Secondly, the study had a cross-sectional design, meaning that we cannot confidently claim causality or casual order between the measured variables. In other words, it is possible that the tested effects have a different direction or are reciprocal. It is likely that students who display agentic engagement incentivize their teachers to be more autonomy-supportive. Teachers have the information about what students ex-

pect from the class, and feel that their students show responsibility and motivation, which in turn ensures them that they can provide students with more choice. Some studies have already suggested or confirmed that agentic engagement can encourage teachers' autonomy support (Jang et al., 2012; Reeve, 2013; Reeve & Shin, 2020). Hence, future studies should aim to have a longitudinal design which would enable the examination of causal order of variables and reciprocal relationships between them.

Conclusion

The aim of this study was to examine the relationship between the autonomy-supportive teaching style and students' agentic engagement, as well as the possible mediating role of students' autonomous motivation and the moderating role of the high school program that students attend. The results indicate there is a positive association between teachers' autonomy support and students' agentic engagement, which was partially mediated by students' higher levels of autonomous motivation. Furthermore, the analysis indicated that high school programs did not have a moderating role in the relationship which autonomy support has with either motivation or engagement. The overall model was able to explain 30% of the variance of agentic engagement. The results indicate that teachers should aim to provide students with choice, and ensure they can take students' perspective while teaching. Future studies should confirm the finding on a more diverse sample by employing a longitudinal design.

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Subjective well-being components in the HEXACO personality framework

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Abstract

Subjective well-being (SWB) is a multidimensional construct composed of (i) a cognitive component, which includes an assessment of life satisfaction, and two affective components, (ii) positive affect (PA) and (iii) negative affect (NA). These three components are theoretically independent and they may have different relations with other constructs. In various studies, SWB is often associated with personality traits, which have been dominantly operationalized within five-factor frameworks. The aim of the present study is to examine the relationship between SWB components and their relations with personality traits defined within the six-factor personality model, HEXACO. The study was conducted on a sample of 830 young adults (63% women) who completed the Satisfaction with Life Scale, the Positive and Negative Affect Schedule and the HEXACO-PI-R. The results show that the three SWB components are moderately correlated. Extraversion correlated most strongly with all three components, as well as the Conscientiousness, but with smaller effect sizes, while Emotionality had only a significant positive correlation with NA. The findings of this study highlight the importance of distinguishing SWB components, but also the structural differences of the HEXACO personality model compared to five-factor models.

Keywords: *subjective well-being; life-satisfaction; positive and negative affect; personality; HEXACO*

Introduction

Subjective well-being (SWB) is a popular psychological construct that reflects a person's beliefs and feelings about the quality of their life (Diener et al., 2018). Although different definitions can be found in the literature (see Diener et al., 2018; Pocrnić & Bratko, 2021), most researchers have accepted Diener's (1984) conceptualization of SWB. More specifically, SWB is defined as a multidimensional construct with two core dimensions: the

cognitive and affective components. The cognitive component of SWB reflects a person's subjective evaluation of his or her life as a whole, and is usually operationalized with a measure of life satisfaction. The affective dimension of SWB encompasses typical emotional experiences a person has in everyday life, and can be further divided into two independent components: positive affect (PA) and negative affect (NA) (Diener et al., 2017). Thus, SWB is composed of three components in sum and, accordingly, a high level of SWB is characterized by a high level of

life satisfaction, a high level of PA, and a low level of NA (Lucas et al., 1996; Myers & Diener, 1995).

Theoretically and empirically, these three components are independent, but they are not completely uncorrelated. For example, Schimmack (2008) reports a wide range of correlations from .10 to .80 between the cognitive and affective components in various studies. PA and NA also tend to have negative correlations, but it is important to emphasize that they are not two opposite poles of the same affective dimension. It is possible for someone to frequently experience different positive affect, but also the negative affect. In their recent meta-analysis, Anglim et al. (2020) reported correlations of life satisfaction with PA and NA ranging from $|.29|$ to $|.52|$, while PA and NA correlated $-.09$ and $-.39$, depending on the dataset used. In summary, although there are some correlations between different SWB components, they vary in magnitude in different studies and samples, and they are usually in the small or medium range. Therefore, these SWB components should not be considered redundant (Tov, 2018). The other reason why it is important to differentiate SWB components is because they may have different relations with other important psychological constructs.

SWB and personality

One of the constructs that are most strongly associated with SWB are personality traits. Numerous studies have indicated personality as one of the most important predictors of SWB, explaining 30-40% of its variance, substantially more than, for example, demographic variables (Costa & McCrae, 1980; Diener et al., 1999; Lucas, 2018).

In the last 30 years, personality is dominantly operationalized within five-factor taxonomies, like the Five-Factor model (Costa & McCrae, 1992), or the Big5 model (Goldberg, 1990). Studies showed that out of these big fives, two traits that are most strongly associated with SWB components are Neuroticism and Extraversion (e.g., Bratko & Sabol, 2006; Costa & McCrae, 1980; Diener et al., 1992; Grant et al., 2009; Ng et al., 2019; Schimmack et al., 2002; Steel et al., 2008). Extraversion is primarily associated with PA and Neuroticism with NA, which

is in line with the content and structure of these traits. Namely, Neuroticism includes a tendency to experience negative emotions, like sadness, anger or fear, while Extraversion is associated with positive emotionality and cheerfulness. These two traits are indeed more strongly correlated with the affective than the cognitive SWB component, which is also confirmed in the latest meta-analysis (Anglim et al., 2020). Anglim et al. (2020) reported average correlations of .56, $-.39$ and $-.34$ between Neuroticism and NA, life satisfaction, and PA, respectively, while Extraversion correlated .44 with PA and .32 with life satisfaction. Besides these two *emotional* traits, Conscientiousness is also often found as a significant SWB correlate. Tendency to achievement, self-discipline and diligence can definitely contribute to feeling well and satisfied with life. In line with that, Conscientiousness usually has small or medium, but significant correlations with PA and life satisfaction, in the range around .20 to .30 (Anglim et al., 2020; Grant et al., 2009; Ng et al., 2019; Røysamb et al., 2018). While there is agreement that Openness is not a significant SWB predictor the results about the role of Agreeableness are not very consistent. Some studies found significant correlations, but they are usually small in effect size (Anglim et al., 2020; McCrae & Costa, 1991, Steel et al., 2008).

HEXACO personality model and SWB

Although five-factor taxonomies of personality are still dominant in the literature, there is growing support for the alternative HEXACO model that defines six broad personality domains: Honesty-Humility, Emotionality, Extraversion, Agreeableness, Conscientiousness and Openness to Experience (Ashton & Lee, 2001). Identification of the sixth factor Honesty-Humility is the biggest difference between HEXACO and five-factor models, but differences can also be found in HEXACO Agreeableness and Emotionality domains. More precisely, Emotionality includes anxiety, dependent behaviours and sentimentality, which is usually part of Agreeableness in other personality models, but does not have content related to depression or anger. Anger and irritability in HEXACO indicate low Agreeableness. Because of that, content

shifts between Agreeableness and Emotionality domains, so those traits can be considered as the rotated variants of the Big Five Emotional Stability and Agreeableness axes (Ashton & Lee, 2007).

Since the HEXACO model differently conceptualized its broad personality domains, different relations with SWB can be expected. Although there are not many studies that simultaneously used some measure of SWB and the HEXACO personality questionnaire, existing data suggest some consistent differences compared to five-factor models (e.g., Aghababaei & Arji, 2014; Pollock et al., 2016; Romero et al., 2015; Visser & Pozzebon, 2013). In other words, the results indicate that the HEXACO Extraversion is the most significant and sometimes the only domain associated with all three SWB components. This was also confirmed in the meta-analysis by Anglim et al. (2020), which examined 22 independent effect sizes for relationship of SWB and the HEXACO model. The average correlation coefficient of Extraversion with PA is .55, with life satisfaction .43, and with NA -.39. Emotionality, on the other hand, does not show nearly as high levels of association as Neuroticism, and is only significantly associated with NA (.31). Conscientiousness is mostly related to PA (.31), while other HEXACO domains have no significant effects on the degree of SWB components (Anglim et al., 2020). Therefore, relations of SWB with personality traits can depend on the personality model that is used in different studies.

The present study

This study has two main goals. The first one is to examine the relationship between three SWB components in a Croatian sample. More specifically, we want to explore the associations between cognitive component, operationalized as satisfaction with life, and the affective components PA and NA. In accordance with earlier findings, we hypothesised that these three SWB components will have small to medium correlations. The second goal of this study is to investigate the differential relationship of three SWB components with personality traits operationalized through the HEXACO personality framework. Based on what we know from previous studies, we

expect that Extraversion will have the strongest correlations with all three components. Additionally, we aimed to apply three regression analyses to test how much the variance of SWB components can be explained by HEXACO personality traits. We set the hypothesis that personality will explain a higher amount of variance in the two affective rather than in the cognitive component.

Method

Participants and Procedure

Participants were part of a population-based twin sample across six birth cohorts in Croatia, previously formed for the purpose of a larger research project. Thus, the sample consisted of 830 young adults (63% women) with the average age of 22.15 years (range: 19-28 years). All participants had high school education, and the vast majority of them (86%) attended college. Participants filled in self-report measures in the paper-pencil format.

Measures

HEXACO Personality Inventory-Revised. For measuring personality within the HEXACO personality framework, we used the Croatian version of the 100-item version of the HEXACO personality inventory (Babarović & Šverko, 2013; Lee & Ashton, 2018). This instrument measures each of the six broad personality traits from the HEXACO personality model with 16 items, i.e., Honesty-humility (e.g., *I am an ordinary person who is no better than others.*), Emotionality (e.g., *I feel like crying when I see other people crying.*), Extraversion (e.g., *I am energetic nearly all the time.*), Agreeableness (e.g., *Most people tend to get angry more quickly than I do.*), Conscientiousness (e.g., *I clean my office or home quite frequently.*), and Openness to Experience (e.g., *I enjoy looking at maps of different places.*). Every item is accompanied with a five-point Likert-type scale (1 = *strongly disagree*; 5 = *strongly agree*). The internal consistency of the six scales in the present study varies between $\omega = .80$ and $\omega = .86$.

Positive and Negative Affect Schedule (PANAS). To measure the affective components of SWB, we used a shortened version of PANAS. The version we used has 16 items with best psychometric properties after adapting PANAS-X (Waston & Clark, 1994) to Croatian language (Križanić, 2013). Eight items are used for measuring PA (e.g., cheerful, interested, inspired, relaxed), and another eight for measuring NA (e.g., irritable, nervous, lonely, angry). For a single item, participants have to answer how they feel in general on a scale 1 (*not at all or very rare*) to 5 (*extremely*). The internal consistency of the composite scale of PA in this study was $\omega = .82$, and $\omega = .85$ for NA.

Satisfaction With Life Scale (SWLS). The cognitive component of the subjective well-being was measured using a Satisfaction with Life Scale, which is designed to measure global cognitive judgments of one's life (Diener et al., 1985). It consists of 5 items (e.g., *In most ways my life is close to my ideal.*), followed by a seven-point Likert-type scale (1 = *strongly disagree*; 7 = *strongly agree*). The internal consistency of the composite scale in this study was $\omega = .82$.

Results

Descriptive statistics and Pearson's intercorrelations of all study variables are shown in Table 1. Due to a large number of participants in this study, we set the risk ratio for the hypotheses testing to 1%. Because large numbers of participants

can cause low correlations to become significant, we also limited the interpretation to correlation coefficients above .30. As it can be seen from the Table 1, life satisfaction has correlations of -.41 and .48 with NA and PA, respectively, while two affective components correlate -.33. Regarding associations between SWB and HEXACO personality traits, all three SWB components have the strongest correlation with Extraversion. Also, life satisfaction and PA have a correlation greater than .30 with Conscientiousness. NA has more distinctive relations with HEXACO traits since it also significantly correlates with Emotionality ($r = .33$) and Agreeableness ($r = .30$).

To determine the amount of the SWB variance explained by HEXACO personality domains, three separate regression analyses were conducted, where six HEXACO domains were set as predictors for three SWB components as outcomes. The results are presented in Table 2. The HEXACO personality model significantly explains the variance of all SWB components, but mostly for PA ($R^2_{adj} = .39, p < .001$), while for life satisfaction the HEXACO model explains the smallest amount of variance ($R^2_{adj} = .31, p < .001$). The beta coefficients for HEXACO domains are consistent with the results of the correlation analyses - Extraversion is the strongest predictor for all SWB components. It is also found that Honesty-Humility is a significant predictor of life satisfaction and NA, as is Openness for life satisfaction and PA, but the magnitudes of these beta coefficients are small.

Table 1. Descriptive Statistics and Intercorrelations of SWB Components and HEXACO Domains ($N = 830$)

	<i>M</i>	<i>SD</i>	1.	2.	3.	4.	5.	6.	7.	8.
1. Life satisfaction	4.68	1.12								
2. Positive affect	3.43	0.57	.48							
3. Negative affect	2.17	0.65	-.41	-.33						
4. Honesty-Humility	3.57	0.56	.15	.08	-.12					
5. Emotionality	3.28	0.57	-.03	-.06	.33	.12				
6. Extraversion	3.47	0.56	.49	.58	-.45	.02	-.07			
7. Agreeableness	2.93	0.52	.13	.12	-.30	.24	-.17	.12		
8. Conscientiousness	3.58	0.50	.34	.33	-.23	.19	.04	.25	.08	
9. Openness	3.35	0.63	-.01	.18	-.01	.08	.01	.05	.06	.18

Note. All correlations significant at $p < .01$ are in bold.

Discussion and conclusions

The aim of this study was to investigate the associations of different SWB components and their relationships with the HEXACO personality model in a Croatian sample of young adults. Regarding our first problem, the results showed that the correlations between SWB components are in the medium range. This confirms that these constructs are correlated but not redundant. Interestingly, the lowest correlation was between the two affective components ($r = -.33, p > .001$), which is consistent with the theoretical basis that PA and NA are not two poles of the same affective dimensions, but two separable constructs (Tov, 2018; Watson & Tellegen, 1985). Despite the independence of WB dimensions, it is not surprising that these components are not completely orthogonal. Indeed, it is intuitive that the reasons that can lead to life satisfaction, such as the successful achievement of various goals or good social relationships, can also lead to a positive affective balance. Conversely, the fact that one experiences positive affect more often than negative affect can also contribute to a positive evaluation of one's own life, i.e., a higher life satisfaction. Therefore, it was expected that weak to moderate correlations between SWB components would be found.

Our second problem was to examine the relationships between SWB components and HEXACO personality traits. In contrast to the use of five-factor models, where Neuroticism is the main SWB predictor, the HEXACO Extraversion emerged as the main correlate for all three components, with the highest correlation with PA ($r = .58$), which is corresponding with the meta-analytic estimate of .55 (Anglim et al., 2020). Although Extraversion in HEXACO is quite similar to the same-named domain in other personality models and is not emphasized as a differentiating factor, there are some interesting differences that are reflected in our results. More precisely, the HEXACO Extraversion also has a strong relationship with NA ($r = -.45$). These results can be explained if we descend to the level below the broad domains, and focus on the facets that define each domain. Specifically, the HEXACO Extraversion is defined with the facet scale Social Self-Esteem, which refers

to the tendency to have a positive self-regard, where low scorers tend to have a sense of personal worthlessness (Lee & Ashton, 2009). These thoughts can be associated with low self-esteem and depression, which can lead to a tendency for experiencing NA. Besides Extraversion, the HEXACO Conscientiousness correlates around .30 with PA and life satisfaction, which is consistent with previous findings (Anglim et al., 2020; Grant et al., 2009; Ng et al., 2019; Røysamb et al., 2018). Because this trait encompasses behaviours aimed at diligent and dedicated work, individuals who are highly conscientious are more inclined to successfully achieve their life goals, which can in turn lead to life satisfaction and positive emotions associated with success (e.g., happiness, pride) (Headey, 2008; Sheldon et al., 2010). While Neuroticism is the main SWB correlate in five-factor taxonomies, the HEXACO Emotionality is significantly correlated only with NA in our study, with a correlation size of .33, confirming the differences between these two traits. Although Emotionality includes the tendency to experience negative emotions, such as anxiety and fear, it also consists of more neutral tendencies, i.e., dependency and sentimentality, and does not include depression, which is important because depression is usually considered as the most important facet for predicting SWB (Anglim et al., 2020; Quevedo & Abella, 2011; Røysamb et al., 2018; Schimmack et al., 2004). As mentioned earlier, depression is not explicitly defined in HEXACO, but there is some content that can be associated with depression in the Extraversion scale. Finally, consistent with findings in the literature that personality can explain 30-40% of the variance in SWB (Costa & McCrae, 1980; Diener et al., 1999; Lucas, 2018), we found that the HEXACO model explains 31-39% of its variance, and that the affective components are more strongly explained by personality than the cognitive component, which is not surprising given that affective experiences are incorporated in the content core of some personality traits.

Naturally, this study of has some limitations. We used only self-report questionnaires for all study variables. It would be interesting to see the results if other methods were used, such as other-reports, or if SWB components were measured using, for

example, the day reconstruction method. Indeed, some studies have shown that the relationship between SWB and personality is lower when different assessment methods are used, i.e., when there is no method variance (Anusic et al., 2017; Hudson et al., 2016; Lucas & Fujita, 2020). Moreover, our sample consisted of young adults, so it is doubtful if we can generalize our results to other life periods. In future work, it would also be interesting to investigate if there are any gender differences in SWB-HEXACO relationships.

Table 2. Results of the Three Regression Analyses with Six HEXACO Domains as Predictors ($N = 830$)

	SWLS	PA	NA
Predictors	β	β	β
Honesty-Humility	.10*	.03	-.09*
Emotionality	-.02	-.03	.29*
Extraversion	.43*	.53*	-.38*
Agreeableness	.03	.02	-.17*
Conscientiousness	.23*	.18*	-.13*
Openness	-.09*	.11*	.05
$R^2_{adj} (F)$.31 (61.83)*	.39 (89.03)*	.36 (77.37)*

Note. * $p < .01$. SWLS = Satisfaction with Life Scale

In conclusion, the results of this study confirmed that it is important to distinguish SWB components, since they are not redundant constructs. Consequently, our findings suggest that the association between SWB and personality, as well as with other relevant constructs, can depend on which specific SWB component is measured. This study could also help in better understanding the differences between personality models and the domains they define. For example, although Extraversion is usually seen as a domain that is not much different in HEXACO and five-factor models, our findings point out that there are some variations in content that result in higher correlations of that factor with SWB when the HEXACO model is used.

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Brain-train apps: Testing the efficacy of two applications for cognitive enhancement

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Abstract

With the ubiquitous trend of almost every individual in the world owning a smartphone, new trends have emerged within applied cognitive psychology regarding the use of applications for cognitive training purposes. Previous studies have found far-transfer benefits of training a single working memory component, such as gains in fluid abilities. We aimed to evaluate two smartphone applications - Dual n-back, Super Number Memory, tapping the central executive and phonological loop, respectively. Young adults (N=176, $M_{age}=21.5$, $SD=5.42$; 87% female) were randomly assigned to either one of the three experimental groups (Dual n-back app, Super Number Memory app, combination of the two apps), or to a control group. A pre-post design with FU at three months was employed, with a 4-week training (5 sessions a week). A near transfer effect for updating ability in young adults was confirmed for the Dual n-back and combined group, while no other effects were found. The results are discussed in terms of the efficacy of mobile phone apps for cognitive functions improvement.

Keywords: *working memory; brain-train apps; cognitive training; fluid abilities*

Introduction

There are around 6.3 billion smartphone users in the world who use more than 2.87 million applications (apps) from the Google Play Store, or 1.96 million apps from the Apple App Store (Buildfire, 2022). The most common users are people of younger age, and the most popular apps come from the

games category. Although a large number of games are designed with the goal of entertaining users, some of them exhibit positive effects on cognitive functions (Jiwal et al., 2020). This gave developers the idea of using mobile apps as a cognition-enhancement tool, which has resulted in a large number of cognitive training apps (training apps). The emphasis in these apps is often placed on the working me-

memory (WM) function, which is considered crucial for a wide range of cognitive processes. However, WM is not a unitary construct - it consists of several components with the differential effect on other cognitive functions (Baddeley et al., 2000). Furthermore, exercising more of these components could lead to a greater transfer of enhanced abilities to the untrained ones.

The impact of mobile devices on cognitive abilities has been widely explored. Studies show that specific types of smartphone use can have different effects on cognitive abilities. For example, frequent use of mobile devices while performing other tasks, i.e., media multitasking, generally shows negative effects on the attention control (Moisala et al., 2016), and is negatively associated with the selection of goal-directed information in WM and their recollection in long-term memory (Uncapher et al., 2015). However, the use of specific mobile apps can also have positive effects on cognitive functions. For example, a recent systematic review, focused on the usefulness of training apps, showed their positive effects on attention, memory, visuospatial functions, executive functions and problem solving (Vergani et al., 2019).

A large number of cognitive training studies are focused on strengthening WM. WM is a flexible, but limited mental workspace that retains, processes, manipulates and transforms information. It can explain about 50–70% of the variance of higher-level cognitive skills such as reading, mathematics, reasoning and fluid intelligence (e.g., Jarrold et al., 2008). However, different components of WM may contribute to different cognitive abilities. According to the multi-component model proposed by Baddeley et al. (2000), there are four main components of WM: central executive (CE), phonological loop (PL), visuospatial sketchpad and episodic buffer. In this study, we have focused on two frequently studied components - CE and PL.

CE is considered the central part of WM. It is a control system which manipulates the information within WM and controls other WM components. Updating – one important aspect of CE - represents the ability to constantly monitor the content of WM and encode new information that is relevant to the task. It is related to other abilities, such as inhibition, task-switching and fluid reasoning (Gajewski et al., 2018; Rac-Lubashev-

sky & Kessler, 2016). Meta-analysis of the efficiency of updating training shows that enhancing updating can lead to greater efficiency in other updating tasks, but the effects to WM, cognitive control, attention and fluid reasoning are small (Melby-Lervåg & Hulme, 2013; Soveri et al., 2017; Weicker et al., 2016).

PL is responsible for the storage and maintenance of the verbal and auditory information in WM. It serves in language comprehension and vocabulary acquisition (Baddeley et al., 1998; Gathercole, 2006). Also, PL is considered important in tasks which are apparently not dependent on verbal control - switching between tasks (Baddeley et al., 2001), or action control in long-term task conflict (Saeki et al., 2013). Some studies show that PL could also contribute to fluid reasoning (e.g., Chuderski & Necka, 2012), but the results in this area are mixed, often showing non-significant results (e.g., Engle et al., 1999). Although PL is one of the most frequently researched components of WM, surprisingly little studies have been undertaken on its enhancement. Existing studies show that the training designed to strengthen PL has positive effects on the trained ability, but their transfer to other measures is limited (Li et al., 2022).

Given that both types of training confirm near transfer (i.e., to trained abilities), not the lack of far transfer (non-trained abilities), combining both types of training can lead to greater transfer to untrained tasks that have similar underlying mechanisms as the trained ones. Although smartphone users very often employ a large number of mobile apps, there is still a small number of studies that have investigated the efficacy of a single training and/or their combined use on cognitive functioning. In addition, existing studies on training apps have focused on specific populations (e.g., the elderly, people with dementia; Hill et al., 2018; Zmily et al., 2014), while studies with young participants, who have greater benefit from using training apps, are lacking (Bonnechere et al., 2020). Therefore, the aim of this study was twofold: 1) we wanted to investigate the efficacy of a single updating and PL training apps on cognitive function in younger adults, and 2) to investigate whether combining training apps to enhance different components of WM could lead to greater transfer to other non-trained abilities.

Method

Participants

Undergraduate psychology students ($N=176$, $M_{\text{age}}=21.5$, $SD=5.42$; 87% female) were randomly assigned to either one of the three experimental groups (Dual n -back group (DNB), $N=44$; Super Number Memory group (SNM), $N=51$; combined DNB & SNM, $N=36$) or to the control group (Mandala, $N=45$).

All participants have signed an informed consent and received course credit for participation in the study. The study was approved by the Ethics Committee of the Faculty of Media and Communication, Singidunum University.

Material

Several cognitive tasks were included in the battery to assess pre-post-FU (follow-up) differences in the training outcomes. All tasks were administered through the Inquisit software.

Digit and letter memory span task (Lumiley & Calhoun, 1934) assesses the short-term memory capacity, i.e., PL. The task is to memorize a visually presented sequence of either digits or letters in the presented order. In both tasks the score range is 0-16. The longest digit/number sequence recalled correctly is the dependent variable in both tasks.

Dual n -back task (DNB; Jaeggi et al., 2010) is used to test the updating ability. Participants' monitors simultaneously presented sequences of letters on screen and phonemes via speakers. Each time that the currently presented stimuli (in either of the sequences) matched the stimuli presented n -positions earlier in the sequence, participants responded by clicking on the right square (same letters) or the left square (same phonemes) on the screen. In the task started at level $n=2$ participants responded if the currently presented stimuli were the same as the one seen/heard two stimuli earlier, and continued on to level $n=3$, and after that to level $n=4$. Each sequence contains $20 + n$ stimuli, and each level is performed twice. The dependent variable is the proportion of correct answers across all test blocks.

Automated operation span tasks (AOSPAN; Turner & Engle, 1989) is a measure of WM. Participants decide on the correctness of simple arithmetic equations, while simultaneously memorizing a list of visually presented letters (range from 3 to 7). The dependent variable is the sum of all correctly recalled sets of letters (absolute OSPAN).

Baddeley grammatical reasoning task (BGRT; Baddeley, 1968) measures fluid reasoning. In this task, the letters (for instance, AB or BA) precede the statements related to the relation between the presented letters (A precedes B; B follows A). Participants have to verify whether the statement is true or false. The score range is 0-64. The dependent variable is the total number of correct test responses in 3 min.

Training apps

Dual n -back app (DNB; Tyskeranta, 2019) was used to train the updating function of the central executive. The dual n -back task requires the monitoring of a sequence of auditorily presented letters and visually presented squares. Participants' response is required when presented stimuli are equal to the either visual or auditory stimuli presented n -stimuli earlier. DNB starts at $n=2$, and 21 stimuli are presented at each n -level. DNB is adaptive; with less than three or over five mismatches at one level, n is increased or decreased by one, respectively.

Super number memory app (SNM, Schatten, 2015) provides conditions to train PL. At the beginning, participants are presented with a three-digit sequence, and the task is to repeat that sequence. Correct repetition leads to the increase of +1 in the sequence length. There is no maximum length, and participants' task is to repeat the longest length they can during a 20-minute session.

Colorfly: Art Coloring Game (Fun Games For Free, 2022). This app was used for control conditions. It offers various mandala shapes. Participants choose a shape and color it by touching its parts.

Procedure

The study employed a pre-post design with a FU at three months (Figure 1). Participants underwent

a 4-week training period, at the rate of five 20'-session/week. The combined group (DNB&SNM) trained with each app for 10 minutes, always in the same order (first DNB, then SNM). All apps could be downloaded for free.

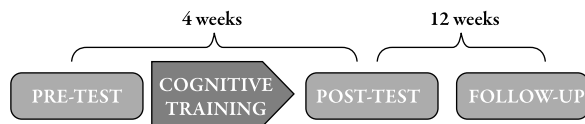


Figure 1. Scheme of study design

Participants were self-tested using the above described task over the Inquisite platform, which was downloaded to their computer. Adherence was assured via screenshots of the final screen after each training session, and mailed to the experimenter.

Results

Data analysis was conducted using the R software (2020) and the lme4 package (Bates et al., 2015). Linear mixed-effects models were used to test the differences in the dependent variables within and between groups. Group (DNB, SNM, DNB&SNM and Mandala group), session (pretest, posttest, follow-up), and

group by session interaction were included as fixed effects, and subjects as a random effect in the model. All parameters were estimated using the restricted maximum likelihood (REML) technique. Tukey HSD post-hoc contrasts were performed for significant effects in the main analysis. Cohen's *d* (Cohen,1988) was used to compute effect sizes comparing pretest with posttest, and follow-up change scores.

Preliminary analysis showed that 17% of the values were missing, with 80% of them referring to the results at the follow-up. Participants who dropped out did not differ significantly in the initial abilities compared to participants who remained in the study. Two outlier values were found in the data and were excluded from further analysis. No deviations from normal distributions were observed.

Descriptive data are shown in Table 1. The analysis of the efficacy of proposed trainings on cognitive outcomes is shown in Table 2.

The results showed a significant interaction only for the DNB task. Participants in the DNB and DNB&SNM group did not differ in the task performance, and they were significantly better at the posttest and follow-up compared to the pretest. Both groups outperformed participants in the SNM and Mandala group at the posttest and follow-up (effect

Table 1. Descriptive data for four groups (DNB, SNM, DNB&SNM, Mandala) and three measurement points (pretest, post-test and follow-up)

	Pretest				Post-test				Follow-up			
	DNB	SNM	DNB&SNM	Mandala	DNB	SNM	DNB&SNM	Mandala	DNB	SNM	DNB&SNM	Mandala
Letter span	<i>n</i> =43	<i>n</i> =51	<i>n</i> =34	<i>n</i> =44	<i>n</i> =38	<i>n</i> =49	<i>n</i> =28	<i>n</i> =44	<i>n</i> =19	<i>n</i> =29	<i>n</i> =24	<i>n</i> =31
	7.67 (1.886)	8.65 (2.904)	7.35 (1.668)	8.82 (2.739)	8.97 (2.804)	8.61 (3.239)	8.36 (2.407)	9.14 (2.483)	8.79 (2.551)	8.72 (2.506)	7.58 (1.248)	8.68 (3.310)
Digit span	<i>n</i> =43	<i>n</i> =51	<i>n</i> =36	<i>n</i> =45	<i>n</i> =38	<i>n</i> =49	<i>n</i> =29	<i>n</i> =45	<i>n</i> =20	<i>n</i> =30	<i>n</i> =24	<i>n</i> =31
	8.09 (2.021)	8.18 (2.463)	7.44 (1.482)	8.18 (2.026)	9.24 (2.399)	9.08 (2.326)	8.28 (1.750)	8.58 (2.210)	9.00 (2.471)	8.60 (2.415)	7.83 (1.239)	8.74 (2.221)
DNB	<i>n</i> =44	<i>n</i> =50	<i>n</i> =35	<i>n</i> =45	<i>n</i> =38	<i>n</i> =49	<i>n</i> =28	<i>n</i> =45	<i>n</i> =20	<i>n</i> =29	<i>n</i> =24	<i>n</i> =29
	0.54 (0.081)	0.50 (0.064)	0.52 (0.060)	0.50 (0.066)	0.68 (0.133)	0.49 (0.092)	0.65 (0.094)	0.54 (0.100)	0.67 (0.110)	0.47 (0.108)	0.62 (0.106)	0.50 (0.098)
AOSPAN	<i>n</i> =42	<i>n</i> =51	<i>n</i> =36	<i>n</i> =43	<i>n</i> =38	<i>n</i> =49	<i>n</i> =28	<i>n</i> =44	<i>n</i> =20	<i>n</i> =29	<i>n</i> =24	<i>n</i> =30
	27.07 (21.822)	36.02 (23.934)	27.14 (18.216)	36.95 (26.403)	35.66 (22.109)	45.92 (20.760)	40.57 (18.614)	41.25 (24.943)	31.25 (25.957)	37.97 (26.000)	31.79 (22.502)	36.13 (25.551)
BGRT	<i>n</i> =43	<i>n</i> =51	<i>n</i> =36	<i>n</i> =45	<i>n</i> =38	<i>n</i> =50	<i>n</i> =30	<i>n</i> =45	<i>n</i> =20	<i>n</i> =30	<i>n</i> =24	<i>n</i> =29
	25.47 (8.453)	23.90 (7.716)	22.69 (7.942)	24.13 (8.698)	30.92 (9.222)	28.32 (8.272)	27.63 (8.950)	26.62 (9.311)	34.35 (7.869)	30.30 (7.804)	29.58 (8.005)	27.90 (10.024)

Note. DNB – Dual n-back, SNM – Super Number Memory, AOSPAN - Automated Operation Span Task; BGRT - Baddeley Grammatical Reasoning Test

sizes are shown in Figure 2). As for the remaining tasks, all groups performed better at the posttest compared to the pretest ($d_{\text{letter-span}}=0.23$, $d_{\text{digit-span}}=0.39$, $d_{\text{AOSPAN}}=0.40$, $d_{\text{BGRT}}=0.49$). Furthermore, participants were better in the AOSPAN task at the posttest compared to the follow-up ($d=0.28$), and better in the BGRT at the follow-up compared to the pretest ($d=0.72$).

Table 2. Results of linear mixed-effects model analyses

		<i>F</i>	<i>df</i>	<i>p</i>
Letter span	Group	1.18	3/173.12	.320
	Session	5.68	2/265.52	.004
	G x S	1.88	6/265.10	.084
Digit span	Group	1.89	3/169.95	.133
	Session	11.56	2/267.67	<.001
	G x S	0.52	6/266.94	.791
DNB	Group	29.763	3/179.38	<.001
	Session	52.34	2/273.13	<.001
	G x S	14.41	6/272.62	<.001
AOSPAN	Group	1.48	3/174.37	.220
	Session	13.41	2/265.92	<.001
	G x S	1.05	6/265.40	.393
BGRT	Group	1.89	3/175.70	.133
	Session	38.42	2/273.58	<.001
	G x S	0.59	6/272.94	.738

Note. DNB – Dual *n*-back task; AOSPAN - Automated Operation Span Task; BGRT - Baddeley Grammatical Reasoning Test

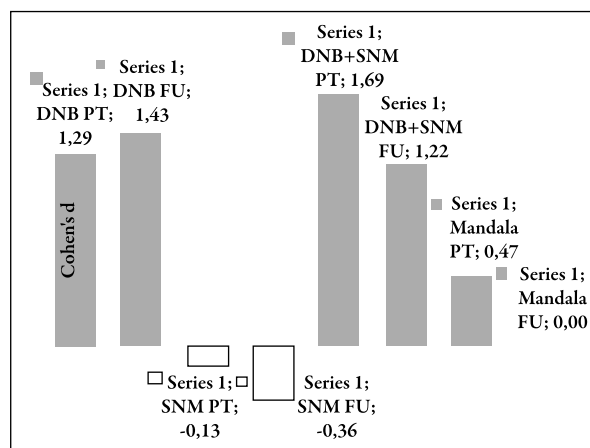


Figure 2. Standardized effect sizes (Cohen's *d*) comparing each group at posttest (PT) and follow-up (FU) versus pretest in DNB task

Note. DNB – Dual *n*-back, SNM – Super Number Memory, PT – posttest; FU – follow up

Discussion

In this study, we tried to answer two questions. First, we investigated whether smartphone apps designed to strengthen a single WM component have an effect on young adults' cognitive functioning, in terms of near and far transfer to different cognitive processes. Secondly, we explored whether combining two training apps within the same training protocol, with each app training one WM component, might exhibit different transfer effects.

Concerning the efficacy of the training via apps, we found that updating training (DNB) resulted in significant near-transfer effects, which were thus maintained at the follow-up at least three months after the training. The combined training of CE and PL (DNB&SNM) has yielded positive effects only for the executive aspects of WM, i.e., near-transfer effects were found on updating. Effect sizes (Figure 2) show comparable size effects found in the combined training group at the posttest and the follow-up, as well as in the DNB training group. This suggests that a shorter DNB training might reap similar levels of efficacy as a longer DNB training. It would be interesting to investigate whether a 10-minute DNB training (as in the combined group) and a 20-minute DNB training itself have comparable effects, or if the similar efficacy of combined training and DNB training was catalyzed by the addition of SNM training to the 10-minute DNB training in the mixed group. Effect was found neither in the case of the PL training (SNM) nor on any of the far-transfer measures.

Our results are in accordance with findings which show that updating training will have the most effect on the updating ability itself, with a small or neutral effect in terms of far transfer to abilities, such as fluid reasoning (Melby-Lervåg & Hulme, 2013; Soveri et al., 2017; Weicker et al., 2016). Studies which find far transfer of updating training to fluid abilities have used nonverbal reasoning tests (Jaeggi et al., 2008, 2010; Stephenson & Halpern, 2013). Since DNB aimed at visuospatial processes, testing for far transfer on nonverbal measures of reasoning might have been a more successful avenue.

Although some studies have shown that the PL training could enhance the PL, i.e., STM abilities

(e.g., Li et al., 2022; Norris et al., 2019), we did not confirm these findings. These previous training sessions were more intense (e.g., a 40-minute session; up to three trainings in one day; Norris et al., 2014), which could be a key factor in enhancing PL. In addition, STM trainings, especially those relying on the verbal component, seem less challenging compared to updating trainings, and therefore show smaller transfer effects (Stephenson & Halpern, 2013). It is possible that participants would have a greater effect on the tasks if they were trained to use a specific mnemonics, freeing thereby their limited PL capacity (e.g., Borella et al., 2017).

However, the lack of near- and far-transfer effects could result from the methodological flaws of the study. For instance, we conducted an online/out-of-lab study. Participants have trained at home, with no supervision during the testing and training sessions. Further research should take into consideration the methodological issues we have faced, especially concerning the selected (updating) task. For instance, our participants trained the updating function with the same task as in the pre- and post-test. By using an additional near-transfer measure (Waris et al., 2015), i.e., a cognitive task that overlaps to a lesser extent with the training task, we could be more certain regarding the effects of a specific training on the updating WM function.

Within the brain-training industry there are numerous possibilities for psychological research to advance the field. Due to their wide use among various population segments, apps offer a practical platform to investigate, for example, the role of various predictors of one's cognitive success, such as sociodemographic characteristics, personality, motivation, beliefs of the malleability of intelligence (the so-called growth mindset). For example, Double and Birney (2016) found that some personality traits, as well as the growth mindset, influence task performance, training adherence and/or its discontinuation. Findings of this nature would further advance the approach and enable the personalization of training protocols.

In conclusion, our study confirmed the efficacy of smartphone apps in enhancing the updating WM function. Since both training groups have used the

DNB app, we can conclude that training with this task is beneficial for updating WM function in young adults, but not for other cognitive functions, such as verbal fluid reasoning. Since numerous brain-training applications are on the market, and their popularity among the general population grows daily, it is becoming essential to conduct validation studies in the field. Based on our research, we cannot state that brain-training apps provide no benefits. However, the criteria for advertising those apps should be tightened by giving straightforward guidelines: for which population the app is intended, how long training should last and which cognitive function it enhances.

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The relationship between personality traits and affect with students' adaptation to student life during the COVID-19 pandemic

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Abstract

Transition to higher education is stressful for many students, and the success of adaptation to college is related to personality traits and affective experience. Also, the COVID-19 pandemic has brought changes to everyday life and the learning environment. The aim of this study was to examine the contribution of personality traits and affective experience in explaining adaptation to college among first-year students during the COVID-19 pandemic. The research was conducted on students ($N = 119$) in Croatia who were in their first year of studies during the pandemic. Participants filled in the Big Five Inventory–2 Short Form, Student Adaptation to College Questionnaire and the Croatian adaptation of the short form of the Positive and Negative Affect Schedule. Results showed that personality traits and affective experience were significant predictors of adaptation to college, explaining 50% of the academic adjustment variance, 46% of the emotional adjustment variance and 40% of the social adjustment variance. Students who experienced more positive affect had better academic adjustment, those who experienced less negative affect had better emotional adjustment, while students with higher extraversion and those who experienced more positive affect had better social adjustment. Results of this study confirm the importance of individual characteristics in adaptation to college during the pandemic.

Keywords: *personality traits; positive affect; negative affect; student adaptation to college; COVID-19*

Introduction

A novel coronavirus (SARS-CoV-2) appeared in December 2019 (Zhu et al., 2020), and because of its wide distribution and high prevalence, the World Health Organization declared the outbreak

of COVID-19 a pandemic in March 2020 (Cucinotta & Vanelli, 2020). In order to reduce the spread of COVID-19, preventive measures were taken by governments, such as closure of public spaces and educational institutions (European Centre for Disease Prevention and Control, 2022). Therefore,

faculties had to switch to online learning. Students had difficulties in adapting to the online learning environment, and the greatest challenges were interaction and technology (Elshami et al., 2021; Pavin Ivanec, 2022). Under such circumstances, freshmen college students had to face an additional challenge – adaptation to the new academic environment.

According to Tinto (1975), individual and social characteristics will influence students' integration into higher education. In line with Tinto's integration model, Baker and Siryk (1984) developed the Student Adaptation to College Questionnaire (SACQ). They included academic and social adjustment, but also two additional categories: emotional and institutional adjustment. Academic adjustment is a degree of students' adaptation to academic demands (e.g., compatibility of invested effort and academic results). Social adjustment is a degree of students' adaptation into the social environment of the college (e.g., they participate in college activities and meet new friends). Emotional adjustment refers to a degree of students' experience of psychological or physical symptoms (e.g., stress and anxiety) in response to a new academic environment. Finally, institutional adjustment refers to a degree of students' identification with the university community (Credé & Niehorster, 2012).

Previous research has shown that personality traits, which are mostly stable characteristics throughout life (Lönqvist et al., 2007; Robins et al., 2001; Soldz & Vaillant, 1999), are correlated with adaptation to college. In general, research has shown that extraversion, neuroticism and conscientiousness are related to adaptation to college (Abood et al., 2020; Araújo et al., 2019; Feldt et al., 2011; Puher, 2009), while some research has also found correlations with openness to experience (Abood et al., 2020) and agreeableness (Feldt et al., 2011; Puher, 2009). More precisely, extraversion is correlated with social adjustment, neuroticism with personal adjustment, and conscientiousness with study experiences (Araújo et al., 2019). Furthermore, positive and negative affectivity correlate with adjustment to college (Halamandaris & Power, 1997). Students who experience more positive and

less negative emotionality have better overall adjustment to college (Credé & Niehorster, 2012).

In this research, the context of pandemic could play a role in the above mentioned associations. There was a high prevalence of anxiety, depression and stress symptoms among students (Talapko et al., 2021). Also, higher levels of neuroticism were associated with higher levels of perceived stress, while high levels of conscientiousness and agreeableness were associated with better mood over time (Rettew et al., 2021). The aim of this study was to examine the contribution of personality traits and affective experience to the adaptation to college among freshman students during the COVID-19 pandemic. Our hypotheses were that students higher on extraversion, conscientiousness, openness to experience and positive affect and lower on negative emotionality and negative affect will have better overall adjustment to college. Students with higher extraversion and positive affect will have better social adjustment, students with higher conscientiousness will have better academic adjustment, and students with higher positive and lower negative affect will have better emotional adjustment.

Method

Participants and procedure

Participants in this study were students ($N = 119$) from different studies of the Universities of Zagreb, Rijeka, Osijek, Zadar and Split, who were in their first year of studies during the academic year 2020/2021. Most of the participants were women (83.2%) and students of the University of Zagreb (71.4%). The average age of the sample was 20.1 (range: 19-27 years; $SD = 0.95$). The majority of students had lectures mostly online (58.8%), while 27.7% of students had lectures completely online. Data were collected using the Google Forms whose link was shared in Facebook groups for students (e.g., *Students of Croatia, University Campus Rijeka, Students from Split*) between 7th February and 7th March 2022, after the study was approved by the Ethical Committee of the Department of Psychology at the Faculty of Social Sciences and Humanities, University of Zagreb.

Measures

The Big Five Inventory–2 Short Form (BFI-2-S; Soto & John, 2017) was used for measuring five personality dimensions: open-mindedness (*I am someone who is original, comes up with new ideas.*), agreeableness (*I am someone who is compassionate, has a soft heart.*), negative emotionality (*I am someone who worries a lot.*), conscientiousness (*I am someone who keeps things neat and tidy.*) and extraversion (*I am someone who is outgoing, sociable.*). The inventory consists of 30 items, and each personality dimension is measured with 6 items on a 5-point Likert scale, from 1 (*I strongly disagree*) to 5 (*I strongly agree*). Cronbach's alphas were adequate for all five scales, .78 for extraversion and agreeableness, .73 for open-mindedness, 0.81 for negative emotionality and .81 for conscientiousness.

The Croatian adaptation of a shortened form of the Positive and Negative Affect Schedule (PANAS-X; Križanić, 2013; Waston & Clark, 1994) consists of eight adjectives reflecting positive affect (e.g., inspired, enthusiastic), and eight adjectives reflecting negative affect (e.g., irritable, nervous). Participants rated to what extent they had experienced each emotion in the past year (academic year 2020/2021) on a 7-point Likert scale ranging from 1 (*not at all*) to 7 (*extremely*). Cronbach's alpha coefficients were .88 for negative affect and .89 for positive affect.

Student Adaptation to College Questionnaire (SACQ; Baker & Siryk, 1984) consists of 67 items and four subscales: academic adjustment, social adjustment, personal-emotional adjustment and institutional attachment. For this research, we used three subscales: Academic adjustment scale which measures how students cope with different educational demands, Social adjustment scale which measures how students adapt to new social environment, and Emotional adjustment scale which measures a student's psychological state, and the extent to which a student is experiencing psychological distress. Institutional adjustment was not used in this study because its factor structure was not confirmed in some studies, and many

items overlap with items on other scales (Taylor & Pastor, 2007; Živčić-Bećirević et al., 2007). Participants were asked to rate to what extent items referred to their study experience in the academic year 2020/2021 during the COVID-19 pandemic, on a 5-point scale ranging from 1 (*does not apply to me at all*) to 5 (*completely applies to me*). Cronbach's alpha coefficients were .84 for academic adjustment, .80 for emotional adjustment and .90 for social adjustment.

Results

Descriptive statistics and intercorrelations between study variables are presented in Table 1. All results were distributed normally, with skewness and kurtosis values being in the range from -1 to +1.

A t-test and a one-way ANOVA were used to compare the scores across different groups. Females reported lower scores on emotional adjustment than males ($t=3.12, p<.01$). Also, females reported higher scores on negative affect ($t=-2.94, p<.01$). With regard to the way lectures were conducted during the pandemic ("completely online", "mostly online", "mostly onsite" or "completely onsite"), there is a significant difference in social adjustment ($F=15.32, p<.001$).

In order to examine the relationship between variables, the Pearson correlation coefficients were calculated. Academic and emotional adjustments correlated positively with positive affect, and negatively with negative affect and negative emotionality. Students who experienced more positive and less negative affect and had lower scores on negative emotionality have higher results on academic and emotional adjustment to college. Social adjustment was correlated positively with positive affect and extraversion, and negatively with negative affect and negative emotionality. Therefore, these correlations indicate that students who experienced more positive and less negative affect and had higher extraversion and lower negative emotionality scores might have had better social adjustment to college.

Table 1. Descriptive parameters and Pearson correlation coefficients between three subscales of SACQ, positive affect, negative affect and five personality dimensions ($N = 119$)

Subscale	$M (SD)$	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. Academic adjustment	27.62 (6.76)	-									
2. Emotional adjustment	20.88 (5.85)	0.54*	-								
3. Social adjustment	25.08 (8.39)	.32*	.39*	-							
4. Positive affect	3.88 (1.16)	.69*	.52*	.55*	-						
5. Negative affect	4.24 (1.29)	-.53*	-.67*	-.42*	-.56*	-					
6. Extraversion	3.17 (0.88)	.07	.24	.41*	.16	-.17	-				
7. Agreeableness	3.84 (0.75)	.20	.06	.16	.11	-.15	.20	-			
8. Conscientiousness	3.36 (0.87)	.12	.04	.13	.11	.01	.40*	.37*	-		
9. Negative emotionality	3.30 (0.90)	-.42*	-.48*	-.45*	-.43*	.58*	-.39*	-.19	-.25*	-	
10. Open-mindedness	3.59 (0.83)	.09	.06	.22	.12	.03	.49*	.09	.27*	-.12	-

Note. * $p < .01$.

Table 2. Results of the hierarchical regression analysis

Type of adaptation to college	Academic β	Emotional β	Social β
Step 1			
extraversion	-.19	.12	.27
agreeableness	.14	-.01	.07
conscientiousness	.00	-.11	-.11
negative emotionality	-.45**	-.47**	-.35**
open-mindedness	.11	-.02	.07
R^2	.18**	.21**	.25**
Step 2			
extraversion	-.17	.11	.28*
agreeableness	.10	-.07	.05
conscientiousness	.04	-.02	-.09
negative emotionality	-.11	-.08	-.14
open-mindedness	.08	.00	.04
positive affect	.54**	.19	.41**
negative affect	-.18	-.50**	-.05
R^2	.50**	.47**	.40**
ΔR^2	.32**	.25**	.15**

Note. β – standardized regression coefficient, R^2 – coefficient of multiple determination, ΔR^2 – change in the coefficient of multiple determination, * $p < .01$, ** $p < .001$

To further understand the associations of personality and affect with adjustment to college, we ran a series of hierarchical regression analysis, predicting each of adjustment domains with personality traits entered in the first step, and positive and negative affect entered in the second step. Results are presented in Table 2. The results from step 1 mirrored the results from the correlational analysis. Negative emotionality was a significant predictor of all three adjustment domains. However, when affective experience was added in the second step, negative emotionality was not a significant predictor any more. For social adjustment, extraversion and positive affect were significant predictors, positive affect was the only significant predictor for academic adjustment, while for emotional adjustment the only significant predictor was negative affect. Personality traits and affective experience explained 50% of the academic adjustment variance, 47% of the emotional adjustment variance, and 40% of the social adjustment variance. Estimated regression coefficients could be inflated and unreliable indicators due to multicollinearity (VIF values are between 1.19 and 1.99). Negative emotionality and negative affectivity have the highest VIF value, which means there is an overlap between these two variables.

Discussion

Results of this study confirmed the importance of personality traits and affective experience for the adaptation to college during the pandemic among first-year students. Correlational analysis indicated that personality traits, negative emotionality and extraversion, as well as positive and negative affect are important for adaptation to college. The results of regression analyses indicate that students who experienced more positive affect might have had better academic and social adjustment, while those who experienced less negative affect might have had better emotional adjustment. Although negative emotionality was a significant predictor in the first step, it was not a significant predictor in the second step, when positive and negative affect were added to the analysis.

Findings of this study are partially consistent with previous research. Positive and negative affect, as well as neuroticism, extraversion and conscientiousness have been found to correlate with adjustment to college (Araújo et al., 2019; Halamandaris & Power, 1997). Positive affect has been found to predict academic and social adjustment, and could have an important role because of its 'undoing-effect' on negative affect (Moneta et al., 2012). Furthermore, according to the 'broaden-and-build theory', positive emotions broaden individuals' thought-action repertoires, leading to strengthened intellectual, social and psychological resources, which are important in coping and resilience (Fredrickson, 2004). Therefore, positive affectivity could have relevant role in coping with a stressful situation such as adapting to new environment. Also, higher levels of positive affectivity and lower levels of negative affectivity are related to fewer emotional and behavioral difficulties, while fewer emotional and behavioral difficulties are related to better academic achievement (Sánchez-García et al., 2018). Therefore, positive affect, as one form of personal resource and protective factor, could contribute to better adaptation to college.

It seems that students higher in extraversion may have better social adjustment in specific circumstances such as the COVID 19 pandemic as well. Previous research has also shown that extraversion is correlated with social adjustment (Araújo et al., 2019; Kurtz et al., 2012), and students who have not developed relationships with other students have worse overall adjustment to college (Halamandaris & Power, 1997). Students higher in extraversion report better social experiences throughout college, they are more socially connected than less extraverted students, feel more like belonging to university, and they are therefore more satisfied with college and life (Harris et al., 2017). Also, research has shown that social connection in adolescence is associated with better well-being in adulthood, and is a better predictor of well-being than academic achievement (Olsson et al., 2013).

Implications of this study findings are that students may have some predispositions that determine how successfully they will adapt to a new

environment. Therefore, it is necessary to identify students that might not adapt well, facilitate their adaptation by educating them about this transition period, and provide them with psychological support at the beginning of their studies.

This research has some limitations that should be mentioned. Firstly, the sample is not representative – it consists mostly of women and students of the University of Zagreb. The non-probability sample in this research is probably biased, which could distort results and lead to unreliable conclusions. It represents a threat to external validity, and the results may therefore not generalize to the population. Also, due to a relatively small sample size, statistical power may be small, which may undermine true associations and cause inflation of obtained results. Also, research was conducted two years after the COVID-19 pandemic and online education started, so students reported about their experiences retrospectively, which may not be the most accurate reflection of the actual experiences. Because of these retrospective ratings, the predictor and criteria are not located in the same space in time. Therefore, the results of the regression analysis should be taken with caution. Another limitation is that the only method that was used is the self-report method, and the results could be inflated due to method variance. Furthermore, adjustment to college, a construct that can change over time, was examined at a single point in time. Future research should conduct a longitudinal study in order to examine whether students have better adjustment in the higher years of study, and which factors contribute to better adaptation.

Conclusions

In conclusion, our results confirm the relevance of personality traits and affective experience in adapting to college in the first-year students during the COVID-19 pandemic. Experiencing more positive and less negative affect during the pandemic helped students to better adjust to college. More extraverted students reported that they adapted more successfully to new social environments, even when

circumstances did not enable much socializing of students due to COVID-19 restrictions. Our findings emphasize the importance of taking into consideration individual characteristics during assessments and interventions with students in the transition to higher education.

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Human aspects of information security questionnaire (HAIS-Q) – Croatian translation and validation

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Abstract

The most vulnerable aspect of the information security system is the human factor. Therefore, information security awareness (ISA) among employees is the key to mitigating risk and protecting organizations from social engineering and cyber attacks. The aim of this research was to adapt and validate the Human Aspects of Information Security Questionnaire (HAIS-Q) on the Croatian population to get a fast, cost-efficient, comprehensive, work behavior-oriented ISA assessment method. The HAIS-Q based on the knowledge-attitudes-behavior model (KAB) was taken for that purpose. Each assessment area in HAIS-Q (knowledge, attitudes and behavior) consists of seven focus areas which represent specific areas of human aspects of IS. The validation of the questionnaire was carried out in three phases. In the first phase, the questionnaire was translated and adapted in collaboration with psychologists, translators and experts in IS. In the second phase, a pilot study was conducted on 18 participants, and some items were simplified and certain terms changed. In the third phase, the main study was conducted to further check the validity, reliability and sensitivity of the questionnaire. All of those parameters were found satisfactory. The responses on individual items are distributed in the full range of possible responses, which shows good sensitivity. Cronbach's Alpha coefficients indicate that the scales measure the same construct, which shows high reliability. Pearson correlation coefficients that show correlation between the HAIS-Q results and risk behavior assessments, as well as between the HAIS-Q results and the Users' Information Security Awareness Questionnaire (UISAQ) results, indicate good validity. Therefore, the results indicate that the questionnaire can be used for a simple and quick assessment of ISA and as a basis for improving IS. The collected data enable an overview of the greatest risks of IS within the framework of human aspects in an organization, which can be used for education, improvement of existing security measures of the organization or development of new ones. Shortcomings and recommendations for further development are listed.

Keywords: *Information Security Awareness; HAIS-Q; Knowledge-Attitudes-Behavior model, UISAQ; Croatian; translation; validation; work behavior-oriented questionnaire*

Introduction

Information security (IS) is defined as “the state of confidentiality, integrity and availability of data” (Information Security Act, NN 79/2007-

2484). In addition to technical protection measures (firewall, antivirus program, encryption, etc.), it is clear that IS is largely influenced by the human factor (Arbanas, 2020). Humans are often referred to in the literature as the “weakest link in the security

chain”, as they are the most common cause of security breaches (Furnell and Clarke, 2012; Mahfuth et al., 2017; Yoo et al., 2019). However, this also makes them the “first line of defense” when it comes to protecting IS. The degree to which an organization’s employees understand the importance and implications of IS and the extent to which they behave in accordance with organizational security policies and procedures is called IS awareness (ISA), and is an important element in protecting the organization from security breaches (Parsons et al., 2017).

Although there is a large amount of scientific research on the topic of IS, there are few instruments for ISA assessment that can be put to use. More specifically, organizations that conduct annual surveys on IS (e.g., Global State of Information Security Surveys - Pricewaterhouse) collect data on security breaches and their impact, but do not represent the experiences and opinions of employees (Parsons et al., 2014). Also, there are numerous methodological objections to such research, such as the choice and design of questions, the selected sample, statistical reporting, as well as the fact that they are often sponsored by organizations that sell security solutions (Anderson et al., 2012, Parsons et al., 2014). Some research aims to verify certain behavioral models (e.g., the Theory of Planned Behavior), which is why it includes only the variables covered by the theory and potentially omits other important variables (Bulgurcu et al., 2010; Pearson et al., 2017). Other research covers only narrow, specific IS areas, such as password use (Stanton et al., 2005) and smartphones (Clarke et al., 2016), or is generic and asks general questions about IS (Bulgurac et al., 2010; Haeussinger and Kranz, 2013). Such surveys are useful for gaining IS insights, but are unable to provide a comprehensive picture of ISA at the organizational level.

More recently, there have been several attempts to develop a holistic measure of ISA that would meet the practical needs of organizations. Some of them are: Users’ Information Security Awareness Questionnaire (UISAQ; Velki et al., 2015), Security Behavior Intentions Scale (SeBIS; Egelman and Peer, 2015) and Human Aspects of Information Security Questionnaire (HAIS-Q; Parsons et al., 2017). The UISAQ

covers potential security risk behaviors and the information system users’ knowledge and awareness at the workplace, but also in their private life. SeBIS is focused on self-reported adherence to computer security advice in relation to device securement, password generation, proactive awareness and updating. HAIS-Q examines knowledge about the most common information system users’ behaviors that lead to security breaches, as well as their attitudes and the frequency of such behaviors.

Our aim was to translate and validate HAIS-Q on the Croatian population. We wanted to have a questionnaire that would enable a quick, cost-efficient and comprehensive assessment of the level of ISA at work, as well as monitoring the effectiveness of targeted interventions. Regarding set conditions, the questionnaire that we found to be the most suitable for the starting point of developing a questionnaire applicable to the Croatian population is HAIS-Q (Parsons et al., 2017).

HAIS-Q

HAIS-Q was designed to assess ISA in Australian public sector employees, and was developed in several phases. Rather than focusing solely on theory verification, the authors used a hybrid methodology, incorporating the inductive, exploratory approach, and combining qualitative and quantitative methods for gathering and analyzing data (Parsons et al., 2013). In the first phase, interviews were conducted with senior management of each organization, and they highlighted human error, i.e., employee naivety, as the most problematic area of IS (Parsons et al., 2014). Accordingly, initial qualitative research was conducted, and several IS policies were reviewed. The findings were used to develop specific focus areas, designed to represent the areas of an IS policy that are most relevant to the employees and the employers, and which also cause the most common human errors (Parsons et al., 2014; Parsons et al., 2017).

The questionnaire is primarily focused on random, unintentional behaviors that are considered human errors. Their intention is not to harm the organization or its resources, but they are associated

with naivety and unawareness. For each of the seven areas, three sub-areas were defined that represented the most common human errors. Given that the questionnaire is based on the knowledge-attitude-behavior model (KAB model), for each of these sub-areas, one claim related to knowledge, attitude and behavior was developed. The KAB model is based on the assumption that increasing employees' knowledge of safe IS-related behaviors in the workplace improves their attitude, resulting in improved IS-related behaviors (Parsons et al., 2014).

Method

The aim of this research was to adapt and validate HAIS-Q on the Croatian population. In order to check criterion validity, in addition to HAIS-Q, the participants filled out UISAQ and several additional questions related to IS, which represent some of the possible aspects of computer users' risky behavior. The participants also filled out the socio-demographic data questionnaire.

Participants

In order to participate in the research, the participants had to meet the following conditions: they had to be employed, had to use a computer during working hours, and their organization had an IS policy/directive. The sample was heterogeneous with respect to the organization they work in, due to a security issue with completing the questionnaire in one organization.

The preliminary research was conducted on a sample of 18 participants (12 men and 6 women), with an average age of 32.5 years ($SD = 2.35$).

The main study was conducted on a sample of 337 participants with an average age of 40 ($SD = 7.70$). Most of the participants were between 31 to 40 (41.6%), and the fewest were aged 51 and above (6.3%). There were 12.3% of participants between 21 to 30, and 39.8% between 41 to 50 years of age. There were 24.3% of women and 75.7% of men in the sample. The participants were heterogeneous in terms of education: 29.4% completed second-

ary education, 26.1% completed a bachelor degree (post-secondary level), 38.9% have further graduate qualifications (university level), and 5.6% have completed a master's degree or doctorate (MSc. or MSc./Ph.D.).

Instruments

HAIS-Q (Parsons et al., 2017) consists of 63 items divided in seven focus areas of IS: *Password Management*, *Use of Email*, *Use of the Internet*, *Use of Social Networks*, *Use of Portable Devices/Telecommunication*, *Information Handling and Incident Reporting*. Each focus area is further divided into three sub-areas resulting in a total of 21 items. Each focus area consists of three items formulated so that the first refers to knowledge, the second to attitudes, and the third to behavior. For example, in the *Password Management* focus area and *Using the same password* sub-area, there are three items that examine:

- knowledge: "It is acceptable to use my passwords for social networks as the passwords of my user computers that I use for work."
- attitudes: "It is safe to use the same passwords on social networks and user accounts that I use for work."
- behavior: "I use different passwords on social networks and user accounts that I use for work."

The scope of responses on each item ranges from 1 (strongly disagree) to 5 (strongly agree). A higher score in the questionnaire reflects a higher level of awareness. The reliability of the questionnaire (Cronbach Alpha) ranges from .75 to .82 (Parson et al., 2017).

UISAQ (Velki et al., 2015) consists of 33 questions grouped into two scales. The first is the *Computer Users' Risky Behavior Scale* ($k=17$), which consists of three subscales: *Computer Users' Common Risky Behaviors subscale* ($k=6$), *Personal Computer Systems Maintenance Subscale* ($k=6$) and *Borrowing Access Data Subscale* ($k=5$). The second is the *Information Security Knowledge Scale* ($k=16$), which

also consists of three subscales: *Degree of Computer Communications Security Subscale* (k=5), *Beliefs About the Computer Data Security Subscale* (k=5) and *Importance of Proper Computer Data Protection Subscale* (k=5). Participants are asked to respond on a Likert-type scale, ranging from 1 to 5, where the answers offered have different meanings depending on the question asked (e.g., frequency, degree of security, degree of conviction, degree of personal data security importance). A higher score in the questionnaire reflects a higher level of awareness. The reliability of the questionnaire (Cronbach Alpha) ranges from 0.66 to 0.89. The questionnaire was used with the authors' permission.

The participants also answered several additional questions related to IS, which represent some of the possible aspects of computer users' risky behavior, as well as some socio-demographic questions. They were asked to estimate their workplace password strength, the number of people who know their workplace password, and to state if their organization has any legal document regulating IS.

Procedure

The research was conducted in several phases. In the first phase, HAIS-Q was translated and adapted for application to the Croatian population. This involved the collaboration of psychologists, translators and information security experts. It was translated from English to Croatian by a professional translator, and revised by an IS expert in order to check the comprehensibility of the items in the Croatian language due to specific expressions. More specifically, one of the more demanding tasks was the translation of professional terms for which there are still no agreed terms in the Croatian language, so the original English terms are often used instead (e.g., work accounts, password, print-out, hard-copy, USB...). Also, the items were cross-checked with several IS regulations from different organizations to ensure the accuracy and relevance of the items. Given that the questionnaire, among other things, examines knowledge of rules related to IS, we wanted to be sure that all the behaviors included in the questionnaire are listed

in Croatian regulations, guidelines or instructions related to IS. Given that all items were covered by IS regulations, they were all retained. Afterwards, a reverse translation was carried out by another professional translator. Since no major differences between original and translated version were observed, the translation was considered adequate. Two IS experts fill it out using the cognitive interview technique - filling out the questionnaire while thinking aloud, and the interview afterwards, to check understanding of concepts, clarity of instructions and all other areas of potential misunderstanding. Most of the objections were related to the translation of professional terms which are not commonly used in Croatian (and are therefore sometimes confusing if translated), but mostly remain untranslated and are used in English. In the second phase, a pilot study was conducted on 18 participants. Following their feedback, some items have been simplified and certain terms changed. The term work account (Croatian: radni račun) was replaced with "poslovni korisnički račun", USB (Croatian: memorijski štapić) with "prijenosna memorija", email (Croatian: elektronička pošta) with "e-poruka", and for some terms such as password (Croatian: zaporka), print-out (Croatian: ispis), USB (Croatian: prijenosna memorija) and link (Croatian: veza), the English terms were left in brackets. In the third phase, we have applied the paper-pencil anonymous questionnaire to 337 respondents. Snowball sampling was used.

Results

Table 1 shows descriptive indicators and reliability for seven HAIS-Q scales (focus areas).

Sensitivity was calculated by the range of obtained results. Although the full range of responses is not obtained when we analyze total results on particular scales, the responses on individual items are distributed in the full range of possible responses. The distribution on all scales is negatively asymmetric, i.e., the results are shifted towards higher values as expected. The highly rated ISA was assessed for Use of Mobile Phones, Use of Social Networks and

Table 1. Descriptive indicators and reliability for seven HAIS-Q scales (focus areas) as well as knowledge, attitudes and behavior scales

	M	SD	Possible range	Min.	Max.	Skewness (SD)	Kurtosis (SD)	α
Password management	38.78	5.41	9-45	20	45	-0.74 (0.13)	-0.12 (0,27)	.68
Email use	35.82	6.59	9-45	17	45	-0.48 (0.13)	-0.43 (0,27)	.71
Internet use	37.32	6.48	9-45	13	45	-0.68 (0.13)	-0.28 (0,27)	.78
Social media use	39.98	5.45	9-45	22	45	-1.21 (0.13)	0.69 (0,27)	.66
Mobile devices	40.08	5.88	9-45	22	45	-1.20 (0.13)	0.46 (0,27)	.79
Information handling	39.98	5.45	9-45	22	45	-1.21 (0.13)	0.69 (0,27)	.75
Incident reporting	37.89	6.02	9-45	22	45	-0.57 (0.13)	-0.68 (0,27)	.80
Knowledge	86.81	12.26	21-105	47	105	-0.79 (0.13)	-0.03 (0,27)	.82
Attitudes	91.44	12.14	21-105	30	105	-1.37 (0.13)	2.28 (0,27)	.88
Behavior	88.08	10.99	21-105	42	105	-0.92 (0.14)	0.36 (0,27)	.83

Use of Information area, and the weakest for Use of the Internet and Use of E-mail area.

In order to check whether the respondents differ according to age, we divided them into 3 groups: younger age (≤ 35 ; $N=109$), middle age (36-50; $N=204$) and older age (≥ 51 ; $N=21$). The Kruskal-Wallis test of variance analysis was applied. Significant age differences were obtained on two scales: younger participants have significantly lower ISA when it comes to Password Management than middle-aged participants ($H(2)=-33.31$, $p=.01$), and lower ISA on the Incident Reporting scale than middle-aged ($H(2)=-28.88$, $p=.04$) and older-aged par-

ticipants ($H(2)=-61.45$, $p=.03$). There are no statistically significant gender differences.

When it comes to the knowledge, attitudes and behavior scales, a statistically significant age difference was obtained only for behavior, whereby younger participants behave more risky than middle-aged ones ($H(2)=-29.03$, $p=.03$). There are no statistically significant gender differences.

In order to check the internal reliability, the Cronbach's Alpha coefficients were calculated (Table 1). They span from .66 to .80 for seven focus areas, and from .82 to .88 for knowledge, attitudes and behavior, which provides evidence of high re-

Table 2. HAIS-Q correlation matrix with criterion variables

	Password strength	Password sharing	UISAQ -CURB scale	UISAQ -ISK scale	UISAQ -total result
Password management	.28**	-.27**	.65**	.2**	.62**
Email use	.13*	-.11*	.46**	.26**	.46**
Internet use	.14*	.10	.48**	.30**	.48**
Social media use	.08**	-.11*	.54**	.31**	.54**
Mobile devices	.17**	-.07	.59**	.36**	.59**
Information handling	.08	-.11*	.54**	.31**	.54**
Incident reporting	.23**	-.17**	.60**	.30**	.60**
Knowledge	.18**	-.10	.53**	.37**	.56**
Attitudes	.13*	-.11*	.57**	.33**	.57**
Behavior	.25**	-.24**	.74**	.35**	.69**
HAIS-Q total	.21**	-.17**	.68**	.42**	.69**

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

liability and indicates that the scales measure the same construct. Furthermore, correlation analyses were performed on seven focus area scales separately for knowledge, attitudes and behavior, and statistically significant positive correlations were obtained in the range from .23 to .69, which indicates a strong connection, but not multicollinearity. This provides justification for calculating the overall score on the knowledge, attitude and behavior scales.

In order to assess construct validity of HAIS-Q, specifically, convergent validity, a series of Pearson product moment correlation coefficients were conducted to examine the relationship between the HAIS-Q results and risk behavior assessments (password sharing and password strength), as well as between the HAIS-Q results and the UISAQ results (Table 2).

Participants who are more likely to share their passwords and generate weaker passwords have lower ISA on almost all HAIS-Q scales. All the correlations between the HAIS-Q and UISAQ results are statistically significant in the expected direction, and the total scores are strongly correlated (.69).

Discussion

The research results show that HAIS-Q is applicable for measuring ISA. On the one hand, the questionnaire enables an overview of the greatest IS risks within the framework of human aspects in the organization, while on the other hand, it provides information for designing interventions, measuring the effectiveness and impacts of training interventions, information security awareness programs and campaigns (McCormarc et al., 2017). Also, the collected data should foster improvements in existing security measures of the organization or development of the new ones.

For the purpose of questionnaire validation, data was collected in multiple organizations, considering that this type of data is highly sensitive and often classified since it reveals potential vulnerabilities of the organization. It was assumed that most organizations should have similar IS regulations.

With this in mind, interpretation of the research results, when it comes to the knowledge scale, must be taken with caution. In order to obtain maximum benefit from the HAIS-Q results, it is important to align questionnaire items with the IS regulations in a particular organization, especially in the knowledge scale.

HAIS-Q showed good sensitivity. The results tend to group towards higher values, which indicates higher ISA. It can be assumed that most employees have some basic ISA when using computers and handling sensitive data in general. Full range of responses obtained for every item indicates that the questionnaire can distinguish even minor differences in the assessment of seven ISA focus areas.

Even though the differences in knowledge, attitudes and behavior for each of the seven focus areas showed good sensitivity and great practical use when we used it in our organization, this data is confidential and exceeds the scope of this paper.

The tendency of increasing ISA with age can be seen for all seven focus areas, but two scales showed statistically significant difference. Younger employees have a significantly lower ISA when it comes to Password Management than middle-aged participants, and a lower ISA in the Incident Reporting focus area than middle-aged and older participants. Perhaps they are less cautious and more willing to use different information systems. Also, they might have fewer negative direct and indirect experiences related to IS violations. Incidents related to security breaches occur rarely, so people are often convinced that such things cannot and will not happen to them. However, older employees may have encountered security breaches during their career or participated in IS educations, and accordingly developed greater awareness.

Furthermore, there is no statistically significant age difference in knowledge and attitudes, but there is when it comes to behavior. Middle-aged employees follow the rules more than younger employees. Regardless of equal knowledge and attitudes about IS rules, differences in behavior can perhaps be explained by a generally higher willingness to take risks among younger people, openness

to experiences and less experience with security breaches. According to Ma et al. (2010), in comparison to younger people (under 30 years of age), older employees showed less risky behavior. The peak of secure behavior is reached in middle adulthood, which is the most responsible period of life (people between 30 and 50 are usually married, have children, care about older family members, have carriers, etc., which makes them more responsible and aware of risks), and then it declines slightly again within the older age group (Velki & Romstein, 2018).

The research results showed satisfactory reliability of HAIS-Q. The correlation analyzes between HAIS-Q and criterion variables provide evidence for the construct validity of HAIS-Q. Individuals who generate stronger passwords show higher levels of ISA in all HAIS-Q focus areas except Information Handling. Also, they have higher results on knowledge, attitudes and behavior scale. Furthermore, sharing password with others is associated with a lower level of ISA in the areas of Password Management, E-mail use, Social Network Use, Information Handling and Incident Reporting, and generally lower scores on the attitude and behavior scale. An interesting fact is that this risky behavior is not related to the knowledge scale, which was unexpected, but some of the research participants provided a possible explanation. More precisely, a large number of employees, especially during the COVID-19 pandemic, were instructed to share their passwords with their colleagues, so that they could complete their tasks in the event of their absence. Accordingly, regardless of their knowledge of this rule, the employees followed the superiors' instructions. Correlations with UISAQ, which measures the same construct, are positive and statistically significant (high for the Computer Users' Risky Behavior Scale and moderate for the IS Knowledge Scale). The total score on UISAQ is also strongly positively correlated with all HAIS-Q scales, as well as with the total HAIS-Q score (.69), which is all in favor of high external validity, and indicates that the same construct is being measured.

Conclusion

HAIS-Q can be used for a simple and quick ISA assessment and as a basis for improving IS. The information obtained through the use of the questionnaire indicates the weakest links of IS, and enables targeted guidance for education. In subsequent research, it is important to use a homogeneous sample of examinees with regard to the IS policy of the organization. Also, further research is needed to determine the key factors influencing ISA (age, level and field of education, personality traits etc.)

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Fair companies, satisfied seafarers: The mediating role of stress on board

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Abstract

The maritime profession is characterised by high demands and stressors, which, according to previous studies, may lead to low levels of job satisfaction, and consequently reflect on health and safety. The goal of this research is to investigate the role of emotional intelligence and justice in the organisational context in explaining job satisfaction, as well as the role of stress on board in mediating the relationship between the examined predictors and job satisfaction. This research included seafarers from the Republic of Croatia (N=177), and the online questionnaire consisted of the Emotional Intelligence Questionnaire, the Stress on Board Scale, the Justice in the Organisational Context and the Job Satisfaction Scale. Higher levels of emotional intelligence directly contribute to higher levels of job satisfaction, whereas higher levels of organisational justice directly contribute to higher levels of job satisfaction, but also indirectly through lower levels of stress on the job. This study's findings not only add to our understanding of seafarers' job satisfaction, but also have important practical implications for shipping companies.

Keywords: *seafaring; organisational justice; emotional intelligence; stress on board; job satisfaction*

Introduction

According to UNCTAD (2021), seafaring is one of the most important professions today, as more than 80% of the world's goods are transported by sea. This occupation is characterised by stressors that are not comparable to land-based occupations (Oldenburg et al., 2009). Occupational stress in seafaring (Slišković, 2017) is seen as a process in which the perception of stressors may lead to short-term reactions and long-term consequences, whereby

individual, organisational and contextual characteristics may moderate and/or mediate this process. Stressors on board can be classified into three categories: psychosocial, environmental and work-related stressors (Comperatore et al., 2005). Long-term separation from home and family is referred to as a psychosocial stressor (Carotenuto et al., 2012), and the separation typically lasts at least six months (Alderton et al., 2004). Environmental stressors include noise, bad weather and constant ship movement, all of which negatively affect the quality of sleep and

leisure time for seafarers (Oldenburg et al., 2010), and heat is an additional environmental stressor for the engine department on board (Oldenburg et al., 2009). Work stressors include the nature of work, such as high demands, the degree of control over the work, peer and company support, and interpersonal interactions (Iversen, 2012).

Since this paper deals with emotional intelligence and organisational justice as possible and rarely studied antecedents of seafarers' job satisfaction, which is considered an important outcome of stress, the following text briefly defines the used constructs.

Salovey and Mayer (1990) define emotional intelligence in terms of four levels: the lowest level is the ability to perceive and evaluate emotions and their expression; the next level is the ability to process emotional experiences into thoughts; the third level is the ability to understand and reflect on emotions, and the highest level is the ability to self-regulate emotions. Bar-On's (2006) emotional intelligence model addresses stress as one of the factors of this model, and other authors agree that people with higher emotional intelligence experience less stress (Pau & Crocher, 2003). Previous studies on samples outside of seafaring have found a positive relationship between emotional intelligence and perceived organisational justice (Ouyang et al., 2015; Zhu et al., 2015).

Justice in the organisational context is a predictor of several work outcomes, including responsible work behaviour, better work performance, and less frequent conflict and unproductive behaviour (Cohen-Charash & Spector, 2001; Colquitt et al., 2001; Penezić et al., 2013). The literature distinguishes three types of justice in the organisational context: distributive, procedural and interactional. According to DeConick and Stilwell (2004), distributive justice refers to workers' assessment of the fairness of outcomes concerning investments. The investments may include education, seniority or some intangible personal characteristics of an individual, while the outcomes are usually expressed in monetary compensation or rewards (Baldwin, 2006). Procedural justice is defined as the perception of fairness of procedures in determining out-

comes (Fortin, 2008), and higher perceptions of procedural justice are associated with higher levels of loyalty to the organisation, behaviours focused on organisational well-being, and higher levels of satisfaction with the manager (Cropanzano et al., 2007; DeConick & Stilwell, 2004). The latest concept of organisational justice is called interactional justice (Bies & Moag, 1986), and it emphasises the value of good communication between supervisors and subordinates through courtesy, honesty and respect (Cohen-Charash & Spector, 2001). According to Jakopec and Sušanj (2014), there are two main sources of justice in the organisational context: managerial fairness and organisational fairness. The former refers to the direct fairness of the manager with whom the employee frequently interacts and whose decisions directly affect the employee, while the latter refers to the fairness of the employer's workplace as a whole, which affects the culture of the organisation (Cropanzano & Prehar, 2001). Results on samples of managers (Suh & Hijał-Moghrabi, 2021) and police officers (Nalla et al., 2021) suggest that organisational fairness contributes to higher job satisfaction.

Job satisfaction is a commonly researched construct in the workplace, and it can be defined as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experience" (Locke, 1976, p. 1304). Sulpice (2011) emphasises that seafarers' job satisfaction can be influenced by better working conditions and more efficient cargo handling processes, resulting in less time spent in port (Fenstad et al., 2016).

Many studies have found that the previously described constructs are interrelated, with stress being associated with higher job dissatisfaction (Xie et al., 2021), emotional intelligence being negatively associated with stress (Jung et al., 2019; Lea et al., 2019) and positively associated with job satisfaction (Suleman et al., 2020), fairness in the organisational context being associated with higher job satisfaction (Hao et al., 2016) and lower shipboard stress (Sić, 2021). Given the importance of the constructs above, this study aims to examine the mediating role of stress on board in the relationship between the predictors examined and job

satisfaction. According to previous research, it was hypothesised that higher emotional intelligence would directly contribute to higher job satisfaction. Also, it was expected that higher perceived justice in an organisational context would lead to higher job satisfaction. Finally, it was expected that stress on board would mediate the relationship between emotional intelligence and justice in an organisational context on one side, and job satisfaction on the other.

Method

Participants

The convenient sample consisted of 177 Croatian seafarers (4.5 % females) on board for at least seven days in the period during which the research was conducted. Their age ranged between 21 and 65 years ($M=35.64$ years, $SD=10.22$ years), and their mean job experience in seafaring was 10.97 years ($SD=9.10$ years). Most participants reported working on cargo ships (62.1%) and multinational crews (91.5%). Deck officers were the most frequent job post in our sample (45.20%), followed by engine officers (15.25%), electricians (9.04%), engine commanders (8.47%) and cadets (8.47%). Regarding participants' marital status, most of them are married (51.41%), followed by those living together with a partner (24.86%) and singles (20.34%), while the fewest are those who are widowed or divorced (3.39%). There are slightly more participants who have children (53.11%), and almost all of them have one or two children (90.11%)

Measures

Participants completed the following measures: Emotional Intelligence Questionnaire (Takšić, 2002), the Stress on Board Scale (Slišković & Penzezić, 2017), the Justice in the Organisational Context Scale (Jakopec & Sušanj, 2014) and the Job Satisfaction Scale (Judge & Klinger, 2008). The Justice in the Organisational Context Scale (Jakopec & Sušanj,

2014) assessed how participants perceived justice by the superior (ship-commander) and work organisation. All of the used measures showed good reliability (Table 1).

Procedure

The study was conducted from March to May 2021 in the online form, and informed consent was obtained before filling in the questionnaires.

Results

Table 1 shows the descriptive parameters of the observed variables.

Table 1. Descriptive parameters of the observed variables ($N = 177$)

Variable	<i>M</i>	<i>SD</i>	<i>Min.</i>	<i>Max.</i>	α
Stress on board	3.55	0.65	1.19	4.94	.87
Emotional intelligence	3.86	0.50	2.20	5.00	.86
Justice in the organisational context	3.31	0.92	1.00	5.00	.98
Job satisfaction	4.74	1.32	1.00	7.00	.87

The mean values of the observed variables are relatively high, considering the theoretical mean values (Table 1).

Table 2 shows the correlation matrix of the observed variables

Table 2. The correlation matrix of the observed variables ($N = 177$)

Variable	1.	2.	3.
1. Stress on board	1		
2. Emotional intelligence	-.22**	1	
3. Justice in the organisational context	-.35**	.39**	1
4. Job satisfaction	-.39**	.42**	.58**

Note. ** $p < .01$

Stress on board is negatively correlated with emotional intelligence, justice in the organisational context and job satisfaction. Emotional intelligence is positively correlated with justice in the organi-

sational context and job satisfaction, while job satisfaction is positively correlated with justice in the organisational context.

Table 3 shows the results of the path analysis for justice in the organisational context and emotional intelligence as predictor variables, stress on board as a mediator variable and job satisfaction as a criterion variable.

Table 3. The results of the path analysis for justice in the organisational context and emotional intelligence as predictor variables, stress on board as a mediator variable and job satisfaction as a criterion variable ($N = 177$)

Effect	β	SE
Justice in the organisational context → Job satisfaction	.423	.059
Justice in the organisational context → Stress on board	-.350	.075
Stress on board → Job Satisfaction	-.201	.070
Emotional intelligence → Job Satisfaction	.210	.057

Higher levels of justice in the organisational context directly contributed to higher levels of job satisfaction. Furthermore, a higher level of justice in the organisational context indirectly contributed to higher levels of job satisfaction through lower levels of stress on board. Higher levels of emotional intelligence directly contribute to higher levels of job satisfaction. It was decided to accept the proposed model since all the parameters used to evaluate the proposed model fit were good ($\chi^2/df=1.698$; $TLI=.970$; $CFI=.995$; $RMSEA=.063$; $SRMR=.027$), according to values proposed by Hu and Bentler (1999).

Discussion

This study aimed to examine the mediating role of stress on board between emotional intelligence and justice in the organisational context as predictors of job satisfaction, thus expanding our understanding of seafarers' job satisfaction. The results of the analyses do not entirely support the hypotheses. Lower stress on board mediates the relationship between higher perceived organisa-

tional justice and higher job satisfaction, but not the relationship between emotional intelligence and job satisfaction. Higher perceived justice in the organisational context contributes to higher job satisfaction both directly and indirectly through lower stress on board, whereas higher levels of emotional intelligence contribute directly to higher job satisfaction.

In order to gain a better understanding of the significance of these findings, it is essential to consider the context of seafarers' work environment, long-term separation from family, high work demands and low control over work (Comperatore et al., 2005). Therefore, our finding that higher emotional intelligence directly contributes to greater job satisfaction is in line with the existing literature on the importance of emotional intelligence in the context of job satisfaction in employed population (Ignat & Clipa, 2012; Miao et al., 2017; Rezvani et al., 2016). Although the relationship between emotional intelligence and job satisfaction has not been explored in a sample of seafarers, Kafetsios and Zampetakis (2008) found that the two variables positively correlate in a study among teachers. Emotional intelligence can have a mitigating effect on all aspects of the work environment that would otherwise lead to job dissatisfaction, as previous research and the results of this study on the relationship between these two constructs indicate.

Regardless of the amount of salary bonuses or promotion awarding, workers want to feel they are treated fairly in the workplace. However, if unfairness occurs, it can act as a stressor (Pérez-Rodriguez et al., 2019). According to Lambert et al. (2007), only distributive justice correlates with workplace stress, suggesting that the relationship between justice and stress is not as straightforward as previously thought. This relationship can be explained by the subjective evaluation of the work done by individuals and their colleagues, or by the reciprocity of investments and rewards in the workplace. As a result, there may be increased stress levels in the case of unfair outcomes.

Procedural fairness, one of the components of organisational fairness, can be used to explain the

direct relationship between fairness in the workplace and job satisfaction. The economic aspect of the job is one of the most critical sources of seafarer satisfaction (Slišković & Penezić, 2015), and promotion to a higher rank is usually associated with a significant salary increase. The study's results suggest that the perception of fairness will play an essential role both in job satisfaction and stress levels. This could be explained by the importance of procedural justice, which emphasises both the process of establishing distributive justice and the importance of the reciprocal distribution of resources. Moreover, according to Chebat and Slusarczyk's (2005) study, fair interactional treatment of employees is associated with the expression of more positive emotions. Future research should think about incorporating different sources and aspects of organizational justice because one limitation of this study is that it only focused on a general measure of it.

The most significant finding of this study is the mediating role of stress on board. This finding suggests the perception of justice may be explained as a buffer for diminishing on board stress, and lower stress significantly increases job satisfaction. These results are important since, according to Judge et al. (2020), job satisfaction reflects on various outcomes such as efficiency, job performance, deviance and absenteeism.

The practical implications refer to strengthening seafarers' resources, such as emotional intelligence. According to Lim and Lau (2021), various interventions and workshops can improve emotional intelligence. It is the responsibility of organisations and ship commanders to treat seafarers fairly, which helps in reducing job stress and increasing job satisfaction. According to Jones and Skarlicki (2012), the perception of fairness can be changed, which can have a positive impact on the two observed outcome variables. Finally, these findings underscore the importance of raising awareness of potential stressors and reducing their impact, even though changing the work environment on a ship is challenging. Given the unique nature of seafarers' work, it is critical to provide stress management interventions in addition to

improving working conditions.

Some of the study's limitations are related to the sample, which is not representative, and most of the participants are officers. Since most of them are seafarers working for foreign companies, Croatian shipping companies are also not adequately represented. Moreover, the high scores of emotional intelligence and job satisfaction among seafarers can be attributed to self-assessment bias (Rosenman et al., 2011), where people tend to overestimate their abilities, which may also be a limitation, given that the measures used in this study are self-report measures. Since longitudinal studies have found an increase in job satisfaction with age and changes in work organisations (Dobrow Riza et al., 2016), a possible limitation of this study is the use of only one measurement point. Moreover, the cross-sectional study design does not allow for making causality conclusions about the examined relationships between constructs. In addition to the limitations already mentioned, this study only focused on a general measure of organisational justice; future research should consider incorporating various sources and aspects of organisational justice.

Despite limitations, this study contributes to our understanding of seafarers' lives by focusing on workplace issues such as organisational justice and stress on board. Companies are responsible for improving living and working conditions on board, which may lead to a better quality of board environment. Moreover, companies should invest in interventions that would improve seafarers' emotional intelligence. Potential changes in this industry should influence attitudes toward seafarers and reduce stress on board, leading to more satisfied workers and a higher-quality workforce.

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On a generality of confirmation bias: Individual differences perspective

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Abstract

Although confirmation bias is being described as the most prominent cognitive bias, it is still unclear if it should be conceptualized as a unitary construct, or rather as an umbrella term for the group of related but independent phenomena. In the present study, we collected nine measures of individual differences in susceptibility to confirmation bias in different aspects of cognitive processing by employing and modifying several experimental paradigms. Results showed an overall preference for confirming over disconfirming information, but indicated that some cognitive tasks need further improvements in order to obtain more reliable measures. Nevertheless, the appliance of confirmatory factor analytic framework for testing hierarchically structured constructs showed that confirmation biases in information search, the weighing of evidence and memory recall are relatively independent constructs. Correlations among them were fair but insufficient to indicate the presence of a reliable second-order confirmation bias factor. In sum, the observed pattern of correlations suggests that it is more plausible to conceptualize confirmation bias as a multifaceted construct.

Keywords: *confirmation bias; individual differences; selection task; 2-4-6 task; interviewee's personality task*

Introduction

Confirmation bias refers to situations in which “information is searched, interpreted, and remembered in such a way that it systematically impedes the possibility that the hypothesis will be rejected” (Oswald & Grosjean, 2004, p. 79). It has been described as the best-known cognitive bias that came out of the literature on human reasoning (Evans, 1989).

Confirmation bias is observed in a wide range of real-life contexts and experimental paradigms,

as well as in distinct aspects of cognitive processing, which led some authors to argue that there exists a variety of discrete confirmation biases rather than one unified phenomenon (see, e.g., Klayman, 1995; Nickerson, 1998). Motivated by this notion, we have employed the methodological approach of differential psychology to examine if various measures of individual differences in confirmation bias indicate that it is better to understand it as a unitary construct, or as a set of relatively related but still independent phenomena. For this purpose, we

have included three experimental paradigms in our study, and adopted them for measuring individual differences in susceptibility to confirmation bias in three distinct cognitive processes. Such an approach is not usual in the field, considering that most of the confirmation bias studies are focused on one aspect of information processing and one paradigm (for a partial exception, see Vedejová & Čavojová, 2022).

Paradigms that are regularly used to demonstrate confirmation bias include the four-card selection task (Wason, 1960), the 2-4-6 task (Wason, 1966) and the interviewee's personality task (Snyder & Swann, 1978). What is common to these tasks is an instruction given to participants to test a hypothesis by searching for specific information. For example, participants might be asked to indicate which cards among E, C, 4 and 9 they would select to examine the rule "If a card has a vowel on one side, then it has an even number on the other side", or to indicate which questions they would ask to check if someone is emotionally stable. A typical finding is that people far more often look for evidence that might confirm/support a given hypothesis (e.g., selecting card "5", or asking the question "What do you do to keep calm in pressure situations?") than for evidence that might falsify/disapprove a given hypothesis (e.g., selecting card "7", or asking the question "How do you show your nervousness?").

Confirmation bias has also been detected in other cognitive processes such as the weighing of evidence. For example, previous research demonstrated that participants evaluate incongruent information much more critically than congruent information (Lord et al., 1979), and opt to retain the initial hypothesis when faced with either ambiguous (Hoch & Ha, 1986) or falsifying evidence (Beattie & Baron, 1988). In our study, we asked participants to indicate for each piece of evidence, either confirming (e.g., "on the back of card 2 is an A") or disconfirming (e.g., "on the back of card 3 is a U"), whether it was informative in deciding if the given rule is true or false.

Finally, some studies demonstrate confirmation bias in memory recall by showing that confirming information is more often perceived as previously encountered than disconfirming information (see, e.g., Eagly et al., 1999; Stangor & Mcmillan, 1992).

In the current study, we presented several outcomes to participants, some of which had already been presented in previous tasks, while the others were completely new, and asked them to indicate which outcomes were presented before.

In sum, we employed three experimental paradigms (selection card task, 2-4-6 task and the interviewee's personality task), and modified them to measure confirmation bias in three cognitive processes - information search (IS), the weighing of evidence (WE) and memory recall (MR). We used a total of nine cognitive tasks to measure individual differences in confirmation bias to compare the strength of its different manifestations, and to explore if the pattern of their correlations suggests that it is more plausible to conceptualize confirmation bias as a singular or multifaceted phenomenon.

Method

Participants

Tasks were administered to the community sample ($N = 200$; 41.5% women) who were recruited by the Fédération S2CH in France to complete an online session, for which they received compensation of €10. The mean age of the participants was 27.08 ($SD = 4.73$). The research was reviewed and approved by the Institutional Review Board-Paris School of Economics (approval number: 2020-022).

Measures

As previously indicated, we have employed a total of nine cognitive tasks in order to measure individual differences in confirmation bias. All tasks included confirming and disconfirming information, and some of them also included neutral information. Participants were asked to respond by indicating which information they would choose in order to examine the given hypothesis (IS tasks), which evidence they find informative (WE tasks), or which evidence had already been presented (MR tasks). On each task, the confirmation bias score was calculated as a difference between responses to confirm-

ing and disconfirming information. A more detailed description of the procedures as well as all materials used and the data collected in the present study, are available at <https://osf.io/saj4c/>.

Procedure

After providing consent, participants completed the tasks in the following order: information search, the weighing of evidence and memory recall. Within each block, participants were first presented with the selection card task, then the 2-4-6 task, and finally the interviewee's personality task.

Analytical strategy

After examining the experimental reliability of confirmation bias across nine cognitive tasks, correlational data were analyzed. To extract more meaningful information from the correlation matrix and to directly test the proposed research question, we have applied a confirmatory factor analytic framework for testing hierarchically structured constructs (Brunner et al., 2012). We examined five competing measurement models. The first assumes that only one general factor underlies performance on all nine tasks (one-factor model). The second model presumes that the performance on nine tasks is organized under three more specific paradigm factors (selection task, 2-4-6 and the interviewee's personality), while the third model presumes that organizing specific factors

are three distinct cognitive processes (information search, the weighing of evidence and memory recall). Both second and third measurement models had two versions in which either (a) correlated but relatively independent specific factors were postulated (first-order factor models without general higher-order factor), or (b) correlations between specific first-order factors were restricted to zero, and uncorrelated general factor that directly influences all nine measures was added to the model (bifactor/nested-factor model that assumes hierarchical structure).

Results

On the whole, participants responded by choosing a confirming option in 69.1% of cases ($SD = 13.6$), and a disconfirming option in 48.1% of cases ($SD = 15.0$). This difference was highly significant ($t(199) = 12.61, p < .001$), showing a strong overall confirmation bias ($d = 0.89, 95\% \text{ CI } [0.73, 1.05]$).

As indicated by the results presented in Table 1, confirmation bias was detected on seven out of nine tasks ($ps < .001$), on which the mean effect of the confirmative information was between 0.27 and 1.04 standard deviations. However, this tendency was not significant on two out of nine tasks in our study, both within the interviewee's personality paradigm, one concerning the weighing of evidence ($p = .22$) and the other concerning memory recall ($p = .70$).

Table 1. Differences between confirming and disconfirming choices on nine tasks

Task	Confirming M (SD)	Disconfirming M (SD)	$t(199)$	p	Cohen's d
Selection Card IS	64.1 (38.3)	21.8 (31.5)	10.90	< .001	0.77
Selection Card WE	80.0 (29.4)	62.9 (38.5)	4.66	< .001	0.33
Selection Card MR	60.0 (24.0)	43.2 (25.1)	5.88	< .001	0.42
2-4-6 IS	87.3 (27.3)	29.8 (36.7)	14.65	< .001	1.04
2-4-6 WE	77.7 (32.8)	64.8 (32.1)	3.78	< .001	0.27
2-4-6 MR	65.3 (24.1)	42.2 (20.1)	10.38	< .001	0.72
Interviewee IS	53.8 (17.1)	36.8 (18.3)	7.26	< .001	0.51
Interviewee WE	84.5 (22.5)	82.2 (23.4)	1.23	.22	0.09
Interviewee MR	49.4 (17.7)	49.9 (16.8)	-0.40	.70	-0.02

Note. IS – Information Search, WE – Weighing of Evidence, MR – Memory Recall

Table 2. Reliabilities (on diagonal) and correlations among nine confirmation bias scores

Measure (number of items)	1	2	3	4	5	6	7	8	9
1. Selection Card IS (4)	.84								
2. Selection Card WE (4)	.23*	.93							
3. Selection Card MR (4)	.12	.48**	.86						
4. 2-4-6 IS (3)	.16	.42**	.28**	.75					
5. 2-4-6 WE (3)	.06	.66**	.25**	.38**	.68				
6. 2-4-6 MR (3)	-.10	.27**	.34**	.20*	.38**	.63			
7. Interviewee IS (4)	.13	.26**	.13	.30**	.28**	.08	.64		
8. Interviewee WE (4)	.18*	.43**	.35**	.20*	.29**	.15	.17	.69	
9. Interviewee MR (4)	-.05	.10	.28**	.05	.04	.13	.05	.33**	.48

Note. IS – Information Search, WE – Weighing of Evidence, MR – Memory Recall; * $p < .01$, ** $p < .001$

Table 3. Fit indices for five competing models

Model	χ^2	df	p	CFI	RMSEA	AIC
1. One-factor model	65.11	26	< .001	.89	.09 [.06 - .11]	3918
2a. First-order paradigm factors	61.48	23	< .001	.89	.09 [.06 - .12]	3920
2b. Nested-factor paradigm factor	59.99	17	< .001	.88	.11 [.08 - .14]	3930
3a. First-order process factors	39.57	23	.02	.95	.06 [.03 - .09]	3898
3b. Nested-factor process factor	32.53	17	.01	.96	.07 [.03 - .10]	3901

The confirmation effect observed on the information search task ($t(199) = 16.74$, $p < .001$, $d = 1.18$, 95% CI [1.00, 1.36]) was significantly larger than the corresponding effect on the memory recall task ($t(199) = 8.34$, $p < .001$, $d = 0.59$, 95% CI [0.44, 0.74]) and the weighing of evidence task ($t(199) = 4.36$, $p < .001$, $d = 0.31$, 95% CI [0.17, 0.45]).

On the other hand, the effect observed within the interviewee's personality paradigm ($t(199) = 5.16$, $p < .001$, $d = 0.36$, 95% CI [0.22, 0.51]) was significantly smaller than the confirmation effect within the selection card paradigm ($t(199) = 10.19$, $p < .001$, $d = 0.72$, 95% CI [0.56, 0.88]), the 2-4-6 task paradigm ($t(199) = 12.82$, $p < .001$, $d = 0.91$, 95% CI [0.74, 1.07]).

However, even when mean differences were not observed, there was considerable variability in the responses of participants, as indicated by the standard deviations of bias scores.

An acceptable level of internal consistency of individual differences across items was observed consistently only on selection card tasks, which is in line with some of the previous research (see, e.g., Stanovich & West, 1998), while the noisiest meas-

ures of individual differences were detected on the interviewee's personality tasks (see Table 2).

Correlations between nine confirmation bias scores were modest on average, but they ranged from zero to as much as .66. The mean correlation was .22, while 24 out of 36 correlations were statistically significant ($ps < .05$).

In the next step, we tested five competing CFA measurement models. Results presented in Table 3 indicate that the model with three correlated but independent first-order cognitive processes factors fitted the data ($\chi^2(23) = 39.57$, $p = .02$; $CFI = .95$, $RMSEA = .06$, 90% CI [.03 - .09], $AIC = 3898$; see Figure 1) significantly better than the one-factor model ($\Delta\chi^2(3) = 25.54$, $p < .001$). Contrary to that, the inclusion of three experimental paradigms factors did not improve the fit of the model significantly in comparison to the one-factor model ($\Delta\chi^2(3) = 3.62$, $p = .31$). On the other side, attempts to further improve the fit of the model by assuming hierarchical structure, that is, by including three specific as well as one general factor, were not successful, either in the case of paradigm ($\Delta\chi^2(6) = 1.49$, $p = .96$) or in process-centered measurement models ($\Delta\chi^2(6) = 7.04$, $p = .31$).

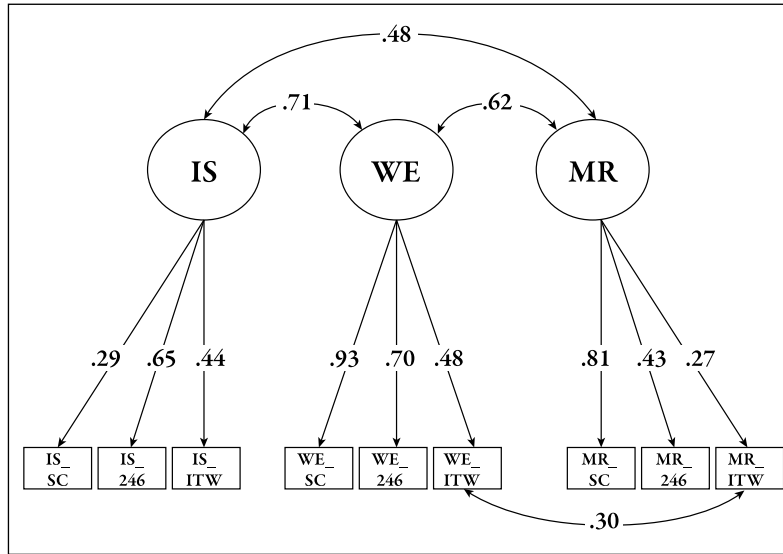


Figure 1. First-Order Factor Model with Three Related Process Factors¹

In sum, the most parsimonious way to organize various measures of individual differences in susceptibility to confirmation bias was to assume three first-order cognitive processes factors that correlate fairly but still insufficiently to indicate the presence of a reliable second-order general confirmation bias factor. Although related, confirmation biases in IS, WE and MR should be seen as relatively independent constructs.

Discussion

Confirmation bias in the present study was observed on a wide range of tasks, and it was relatively robust, which confirms previous findings within the field (Evans, 1989). Following the conceptual distinction introduced by Oswald and Grosjean (2004), it has been shown that some confirmation bias guises are more deceptive than others, and that distortions are especially pronounced in the case of information search. However, reasons for this might be at least partially methodological in the sense that employed tasks were originally designed to meas-

ure biased IS (Snyder & Swann, 1978; Wason, 1960, 1966), while tasks intended to measure the biased WE and MR were subsequently derived from them.

The observed reliability of individual differences was the highest in the case of all three selection card tasks, which is in line with some of the previous findings (Stanovich & West, 1998). Also, results concerning both experimental and differential reliability indices show that the interviewee's personality paradigm alternations of WE and MR tasks were the least successful. This could be due to the specific semantic content of items that were highly loaded with meaning. Furthermore, it has been suggested that differences in the extent to which proposed questions on this task are actually diagnostic with respect to testing given hypotheses might also explain participants' choices (Trope & Bassok, 1983). In that respect, future studies that seek to employ the interviewee's personality paradigm for the purpose of measuring proneness to confirmation bias might benefit from using more abstract or at least content-controlled versions of the task.

The strategy of using multiple measures of confirmation bias within a single study is relatively rare in the field. Vedejová and Čavojeová (2022) have recently examined confirmation strategies of hypothesis testing in three aspects of cognitive processing (IS, WE and MR) by using a unified paradigm. Their study showed that bias was most prevalent in IS, followed by WE, while they fail to detect a biased MR.

¹ It should be noted that the relation between the measures of confirmation bias on two interviewee's personality tasks, namely the weighing of evidence and memory recall, was introduced since it was indicated by the high values of modification indices in all tested models (>10). Nevertheless, this did not influence the main conclusions of the study.

However, we opted to include a wide range of cognitive tasks not only to compare observed effect sizes of confirming information across different tasks, but also to collect a variety of measures of individual differences in susceptibility to confirmation bias and study the pattern of correlations between them. This question brings theoretical importance, considering the stance that confirmation bias is not a single unitary construct, but rather a set of relatively related but still independent phenomena (Klayman, 1995; Nickerson, 1998). For this purpose, we examined five competing measurement models by using a confirmatory factor analytic framework for testing hierarchically structured constructs (Brunner et al., 2012). Results indicated that observed heterogeneity in correlations among different manifestations of confirmation bias stems from the differences between distinct aspects of cognitive processing (IS, WE and MR), rather than from the differences between different experimental paradigms (selection card, 2-4-6 and the interviewee's personality tasks). Furthermore, measurement models which included a general confirmation bias factor (assuming either its sole existence or its overarching role above first-order specific factors) were significantly inferior in comparison to the measurement model, which included only three related but independent first-order factors of confirmation bias in different aspects of cognitive processing. Put differently, the observed pattern of correlations suggests that it is more plausible to conceptualize confirmation bias as a multifaceted construct, i.e., as an umbrella term that encompasses a set of fairly related but still relatively independent phenomena. This finding can also contribute to the understanding of reasons for the poor reliability of general measures of individual differences in confirmation bias (Rassin, 2008).

Besides the attempts to further improve metric properties of existing measures, future studies might benefit from the inclusion of measures of confirmation bias in other processes (e.g., visual search; Rajsic et al., 2015), but also from the inclusion of other experimental paradigms (e.g., argument evaluation task; Stanovich et

al., 2016) and related phenomena (e.g.,myside bias; Perkins, 1989). This could help not only in answering questions about the generalizability of the proneness to the confirmation bias, but also in understanding the conceptual distinction between closely related phenomena (Mercier, 2016). As we have intended to demonstrate in the present study, the conceptual and methodological apparatus of differential psychology can be useful in this endeavor.

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The impact of statistics training and education on reasoning performance

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Abstract

Recent studies have shown that analytical reasoning is related to a number of individual factors including IQ, lower conservatism, as well as other cognitive and personality factors. These studies have been broad, without aiming at specific influences on the development of analytical reasoning. The aim of this study was to determine whether education level and statistics training affect performance in reasoning tasks. Large samples from Croatia and the UK completed the Test of Statistical Reasoning (TSR), as well as a set of modified reasoning tasks. Results revealed that participants with some statistics training performed better in both the reasoning tasks and the TSR. The main finding was a country by education level interaction. Education level had a significant effect on both reasoning and TSR performance in the UK sample (higher level related to better performance), but a non-significant effect in the Croatian sample. An interesting finding was that Croatian participants performed significantly better than their UK counterparts at earlier stages of education, but then plateaued. UK participants reached the same level of performance at later stages. These differences may be explained by the breadth and depth of high school education in Croatia compared to the UK. Overall, statistics training and higher education levels relate to more analytical and statistical reasoning.

Keywords: analytical reasoning; statistical reasoning; dual-process theories; education; statistics training

Introduction

The tradition of researching reasoning within a dual-process approach has developed rapidly in the past decade with new findings and integration with metacognitive measures. Classic models, such as the default-interventionist view of dual-processing, relied on early empirical findings which found that heuristic-based reasoning was fast, cognitively undemanding and automatic. Analytic reasoning was defined as slow, deliberate and cognitively demanding (Evans, 2012). Thus, the two types of processes

were named Type 1 and Type 2, while the systems are usually referred to as System 1 and System 2. Additionally, early findings seemed to indicate exclusivity – responses cued by System 2 were not available to System 1. Limiting cognitive resources by imposing a secondary task should then manifest as a substantial decrease in System 2 responses. However, recent findings using this approach have shown that analytical responses are given at only slightly lower frequency (Bago & De Neys, 2017; Lawson et al., 2020). Further evidence comes from studies relying on the rethinking paradigm. Participants are

required to give a quick initial response (sometimes under cognitive load via a secondary task). Then they are instructed to take time and rethink their responses. Findings show that the vast majority of analytical responses after rethinking come from trials in which the analytical response was already provided as the initial response (Dujmović et al., 2020; Thompson et al., 2011). Indeed, there are examples of rethinking increasing heuristic-based responses rather than analytical responses. The introduction of metacognitive measures (e.g., judgments of confidence) has expanded reasoning to what is known as the field of meta-reasoning. Evidence suggests participants can be just as quick and confident when giving analytical responses as when giving heuristic responses (De Neys & Pennycook, 2019; Dujmović & Valerjev, 2018). These findings have gradually led to more modern views on the dual-process nature of reasoning.

Considering that System 1 can generate both heuristic and analytical types of responses, modern theories posit that intuitive processes of various types exist. Some fit traditional heuristics, such as the representativeness heuristic or belief-based reasoning. However, others may be based on mathematical principles, probability estimates or formal logic (De Neys, 2012). A typical reasoning task will be designed to cue two responses generated by different processes. In the modern dual-process framework, it is presumed that different intuitive processes generate initial responses. These initial responses can be congruent – meaning both processes generate the same response, or they can be in conflict – they generate competing responses. When responses are congruent, there is no conflict and no uncertainty, and a final response can be given without more processing. When responses are conflicting, then depending on the level of uncertainty, System 2 may be triggered to resolve the situation. Initial responses will usually differ in strength, one may be dominant and, depending on the relative difference in strength, it will be more or less likely for System 2 to trigger. System 2 may then result in rationalization of the more dominant response, sampling more evidence for one or both responses, decoupling from the dominant response or in gener-

ating a novel response (De Neys, 2022; Pennycook, Fugelsang et al., 2015).

Early reasoning tasks, such as the Linda problem (Tversky & Kahneman, 1983) resulted in mainly quick heuristic responses, and very rare, slow analytical responses. This was due to the analytical intuitive response being relatively weak or not being generated at all. Stanovich (2018) proposes that *mindware* determines the strength of intuitive processes and responses. Mindware for any type of processing is acquired through a lifetime of experiences and learning. A strong mindware will make it more likely for a particular type of process to generate automatic, strong responses. Representativeness or belief-based responses are usually a product of strong mindware. On the other hand, responses based on estimates or computation of probability, formal logic or complex maths are usually weak, considering the mindware required for these types of processes is typically not as strong. The strength of intuitive responses has also been shown to be sensitive to the instruction type (Valerjev & Dujmović, 2017) and combining modalities in which information is presented (Dujmović & Valerjev, 2017). This indicates that attentional and cognitive resources play a mediating role between mindware and response strength.

There has been a rise in the number of studies which focus on individual differences in reasoning. Usually, the goal is to determine good predictors of analytical reasoning. This, in effect, is a search for correlates of strong analytical mindware. Results have shown that more analytical reasoners tend to be less religious (Gervais & Norenzayan, 2012), less susceptible to *pseudo-profound bullshit* (Pennycook, Cheyne et al., 2015), more intelligent (Kaufman, 2011), and differ compared to more heuristic-based reasoners on a number of other cognitive and personality traits. However, research into the impact of education has been missing from this line of inquiry. There are some studies that ask the question of how education in general and for specific domains transfers to general cognitive capacities, but not to reasoning from a dual-process perspective. Bunge and Leib (2020) review some of these findings, showing that there is a clear gap. First, the studies

mostly look at specific types of reasoning, like relational reasoning, or use IQ tests as shorthand for testing reasoning. And second, the impact of domain specific training mostly relates to very narrow interventions, e.g., tax reasoning skills or law school entrance exam preparation rather than broader statistics education. The aim of this study was to specifically determine whether education level and statistics training relate to reasoning performance on two sets of tasks. One set is contained in the Test of Statistical Reasoning (Rapan & Valerjev, 2020), and the other set is a combination of various classical reasoning tasks. Education, especially statistics training, should strengthen the type of mindware which leads to more analytical responses. This should be particularly pronounced for the statistical reasoning tasks (since the type of mindware and task match more closely), but should also be present for classic reasoning tasks, considering that performance is strongly correlated between the two sets of tasks (Rapan & Valerjev, 2021).

Methods

Design

The study is a 2(country of origin) by 2(type of reasoning task) quasi-experiment at its core. Two further independent variables are the highest completed level of education (high school, undergraduate, graduate or higher), and whether or not the participants received any statistics training (yes/no). Considering the sample size and group allocation, independent 2×2×3 and 2×2×2 analyses will be conducted, depending on whether general education level or statistics training is included as the third independent variable.

Participants

Participants from Croatia and the United Kingdom were recruited online. Croatian participants were recruited via Facebook groups and student contacts, while UK participants were recruited via the Prolific platform (see Table 1). A high proportion

of Croatian participants were current undergraduate students, with quite a large cohort from Psychology departments, which accounts for disparities in completed education and proportion with statistics training between the two countries.

Table 1. Sample characteristics.

	Croatia	United Kingdom
<i>N</i>	292	298
<i>M</i> _{age} (<i>SD</i>)	28.38 (11.51)	31.42 (11.11)
Gender		
Male	27.74%	28.52%
Female	71.92%	70.47%
Other/refused	0.34%	1.01%
Education level		
High-school	52.05%	41.61%
Undergraduate	18.15%	40.93%
Graduate or higher	29.79%	17.45%
Statistics training	64.73%	17.79%

Materials

Participants completed a modified version of the Cognitive Reflection Test (CRT), one item each of a conflict Base Rate task (BR), the Linda problem, Covariation Detection task (CD), as well as the Test of statistical reasoning (TSR).

The CRT (Fredrick, 2005) is a widely used set of tasks designed to induce a misleading heuristic response and an analytical response. It originally consisted of three tasks with an open-ended response mode. Here, the task is modified both in terms of content and response mode. Four new tasks have been created due to overuse of the original. Additionally, the task was changed to a 4-alternative forced choice format, two of which were the heuristic and analytical responses, and the remaining two were distractors (Valerjev, 2019). An example can be seen below.

The ages of Mark and Andy add up to 28 years. Mark is 20 years older than Andy.

How old is Andy?

A) 4 B) 8 C) 6 D) 10

The modified BR task (De Neys & Glumicic, 2008; Dujmović & Valerjev, 2018) pits a response based on typicality of a stereotypical characteristic against the one based on probability. An example can be seen below.

Imagine a group of people consisted of 993 mathematicians and 7 hospitality workers (bartenders, hotel receptionists etc.). One person is chosen at random from that group of a 1000 people.

The person turns out to be very sociable and extroverted. Is it more probable that the person is a mathematician or a hospitality worker?

Probability indicates the person is much more likely to be a mathematician, but the personality traits are much more typical of hospitality workers.

The classic Linda problem pits the representativeness heuristic against probabilistic reasoning. The task content has been modified here, considering how well known the original has become.

John is a professional poker player and spent his college days studying computer science.

A) John is a member of an independent theatre group.

B) John has an above average IQ and is a member of an independent theatre group.

Participants had to indicate the probability of the two options (A and B), given the description of John. The description is more representative of option B, however, the response is incorrect as the conjunction of two events is less probable than either of the two events individually.

The CD task (Stanovich et al., 2016; Valerjev & Dujmović, 2019) pits absolute magnitudes against ratios. An example can be seen below.

Imagine clinical trials for a new COVID-19 vaccine have been started with human patients. Patients are assigned to one of two groups. One receives the vaccine, while the control group gets vitamin boosters. Outcomes are evaluated after 4 weeks, and the results are shown below.

	<i>Negative</i>	<i>Infected</i>
<i>Treatment</i>	200	100
<i>Control</i>	150	50

On a scale from -3 to 3 evaluate to what degree the vaccine correlates with a more positive outcome.

The absolute number of people testing negative for the virus 4 weeks after trials started is higher in the treatment group (200 vs 150). However, the ratio of negative to infected patients is better in the control group (3:1 vs 2:1). The heuristic response is for the vaccine to be correlated with the more positive outcome. The correct response is that it is negatively correlated with the more positive outcome.

The TSR consists of 11 tasks which do not pit heuristic and analytical responses against each other. Rather, it is a timed multiple-choice test primarily concerned with probability and proportion judgments. Each task is limited to 45 seconds (an example can be seen below).

A box contains 4 white, 6 blue and 8 black balls. A single ball is drawn. What is the probability that the ball is blue?

A) 25% B) 33.3% C) 50% D) 66.6%

The study was designed and conducted online via the PsyToolkit platform (Stoet, 2010).

Procedure

This study was part of a larger project in which participants answered a number of demographic-related questions and questions related to beliefs/behaviour concerning the COVID-19 pandemic. The presented reasoning tasks were completed in the order presented here as the final stage of that

study. The order of items within each task (for the CRT and TSR) was randomized for each participant. After they completed the TSR, participants gave a metacognitive judgment about their performance by indicating how many of the 11 tasks they solved correctly. Correct responses on the CRT, BR, Linda and CD tasks were summed and a percentage of correct responses computed for each participant. The same was done for the TSR.

Results

Performance for both TSR and reasoning tasks was normally distributed across groups (Table 2), and no further data processing was required prior to analysis.

Table 2. Performance descriptive statistics across tasks and groups

	TSR		
	<i>M (SD)</i>	Skewness	Kurtosis
Overall	64.23 (19.52)	-0.29	-0.49
Croatia	65.41 (18.66)	-0.31	-0.43
UK	63.09 (20.29)	-0.26	-0.56
	Reasoning tasks		
	<i>M (SD)</i>	Skewness	Kurtosis
Overall	49.58 (24.75)	0.02	-0.83
Croatia	52.89 (23.64)	-0.17	-0.75
UK	46.36 (25.43)	0.23	-0.77

In order to test whether country of origin, type of task and statistics training affected performance, a 2×2×2 mixed ANOVA was conducted (Table 3). The only two significant effects were a large effect of type of task with participants performing better in the TSR than in the set of reasoning tasks, and a small effect of statistics training, which indicates participants with at least some statistics training performed better (see Figure 1).

In order to test whether general education level affected performance, a 2(country)×2(task)×3(education) ANOVA was performed. Education levels were: completed high school, completed undergraduate program and completed graduate or higher level. Results can be seen in Table 4.

Table 3. Group, task and statistical training ANOVA of performance results

Effect	<i>F</i> (1, 588)	η_p^2	<i>p</i>
Country	0.08	<.01	.78
Task	163.84	.22	<.001
Statistics training	14.44	.02	<.001
Country*Task	1.65	<.01	.20
Country*Statistics training	3.56	<.01	.06
Task*Statistics training	0.77	<.01	.38
Three-way interaction	2.33	<.01	.13

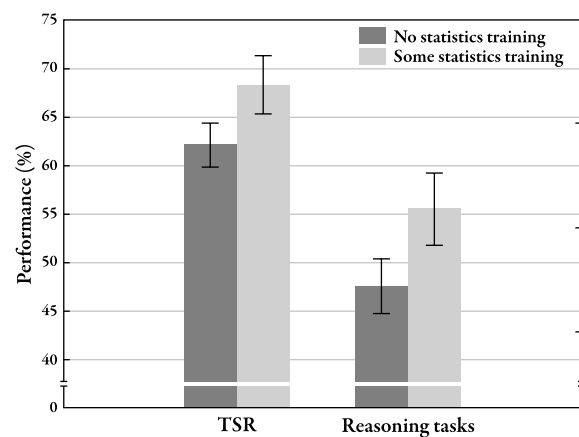


Figure 1. Performance depending on task and statistics training (error bars represent 95% CI)

Apart from the previously shown effect of task type, both education level and the country by education level interaction was significant. Participants with a higher completed level of education tended to have better performance in general (post-hoc Tukey HSD tests indicate this was due to a significant difference in performance between the highest level of education and the remaining two levels). However, the country by education interaction effect was also significant (Figure 2). The interaction effect is significant due to the difference in performance of participants from the two countries being significant only at the lowest achieved education level. In this study, Croatian participants were significantly better at this stage and further education was not accompanied by a significant improvement, while participants from the UK did improve to reach the same level of performance.

An additional analysis was conducted in order to determine whether the effect of statistical training was robust across all levels of education by

conducting a 2(task type) × 2(statistics training) × 3(education level) ANOVA. Apart from the effects already demonstrated, statistics training remained a significant factor ($F(1, 584) = 11.77, p < .001, \eta_p^2 = .02$) with no interaction effects. Therefore, statistics training seemingly increased performance, irrespective of education level.

Table 4. Group, task and education ANOVA of performance results

Effect	$F(df_1, df_2)$	η_p^2	p
Country	3.24 (1, 584)	<.01	.07
Task	225.71 (1, 584)	0.28	<.001
Education	7.01 (2, 584)	.02	<.001
Country*Task	3.60 (1, 584)	<.01	.06
Country*Education	4.41 (2, 584)	.01	.01
Task*Education	0.22 (2, 584)	<.01	.80
Three-way interaction	0.16 (2, 584)	<.01	.81

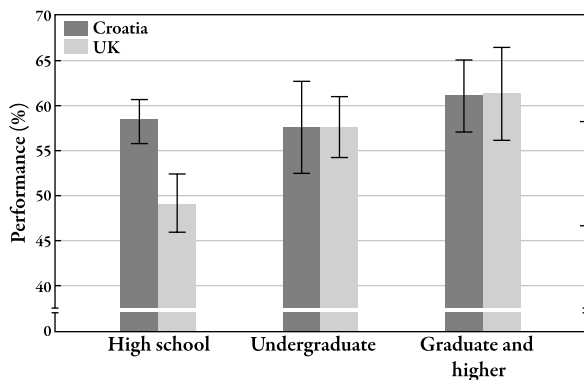


Figure 2. Performance depending on country of origin and achieved level of education (error bars represent 95% CI)

Finally, a metacognitive calibration score was computed for each participant, as the difference between the actual number of correct responses on the TSR and the metacognitive judgment of how many responses they felt were correct. First, a 2(country) × 2(statistics training) ANOVA resulted in no significant effects on metacognitive calibration (all $F(1, 588) < 1.74, p > .18, \eta_p^2 < .01$). However, the 2(country) × 3(education level) ANOVA revealed a slight but significant country by education level interaction effect ($F(2, 584) = 4.35, p = .01, \eta_p^2 = .015$). The interaction is a result of education level having no effect on calibration for participants from the UK, but a small to moderate effect on calibration for par-

ticipants from Croatia ($\eta_p^2 = .04$). Croatian participants at the highest achieved education level exhibit better calibration than other groups (see Figure 3). Note that perfect calibration would have a score of 0 on this variable since it would indicate a perfect match between actual performance and perceived performance. Positive scores indicate underestimating and negative scores indicate overestimating performance. Therefore, all the groups tend to underestimate their performance.

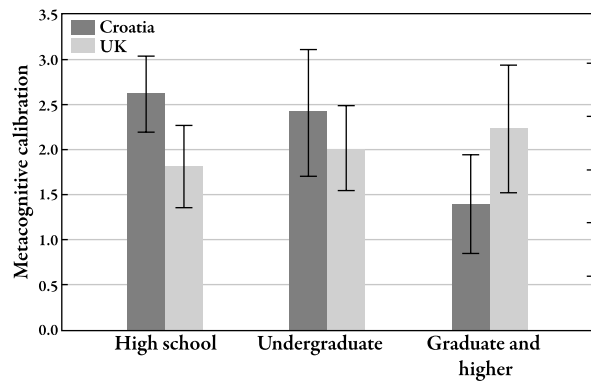


Figure 3. Metacognitive calibration depending on country of origin and education level (error bars indicate 95% CI)

Discussion

The aim of this study was to determine whether education level and, more specifically, statistics training contributed to the strengthening of analytical mindware, and related to better performance on a number of reasoning tasks. The findings show that both general education level and statistics training do indeed relate to increased performance in the TSR and reasoning tasks.

Our findings support the hypothesis that stronger mindware relates to the probability an individual is going to generate and select an analytical response. One possible explanation is that education and statistics training strengthen this mindware and, therefore, performance. However, given the nature of the quasi-experimental design, it is difficult to judge how much education and statistics training contribute to mindware. This would require a longitudinal approach. It is certainly the case that participants who already had developed stronger analytical processes are more likely to

choose to continue their education and study programs which require statistics training. Therefore, it is unknown how much the differences observed in this study are due to the differences occurring earlier in development, and how much due to specific education and training. Results depicted in Figure 2 may give further insight into this question. The key finding is that there is an increase in performance with the increase of education level in the UK, but not in Croatia. Considering how participants were sampled (see Methods), it is plausible that UK participants with a completed high school education include a larger proportion of those who did not continue with their education. The Croatian sample likely contains more undergraduate students who also have a high school education as their highest achieved level. If this is the case, then the fact that performance does not increase with education level in Croatia, and that there is a significant effect of country of origin only at the high school level, may indicate that the propensity toward analytical reasoning rather than education is driving the observed effect. Alternatively, the differences in performance patterns across countries may lie in the differences between the two education systems. The Croatian system is much more comprehensive, with much more information to assimilate and many more concepts to cover and understand. Education in the UK, due to available resources, makes it possible for students to make more choices, and the material is not covered in the comprehensive, old-fashioned manner, as it is in Croatia. This may force Croatian students to develop more analytical strategies for navigating the education system at an earlier age, leading to more of a plateau effect by the end of high school.

On the other hand, statistics training seems to have a robust effect regardless of education level. Though it was expected that participants with statistics training would exhibit a higher probability of choosing analytical responses, it was expected that performance on the TSR would be affected more than performance on the reasoning tasks. Considering the TSR aims to test statistical reasoning, and that statistics training instantiates this specific type of mindware, the effect should have been larger than

for reasoning tasks. This is true even when taking into account that reasoning tasks certainly benefit from a strong statistics mindware, even though they include other types of analytical intuitions as well. It is important to note that the TSR is currently still under development in the hopes of becoming a part of a larger, easy-to-administer, reasoning battery. The results here indicate that additional aspects of statistical reasoning need to be covered by the instrument in the future, at which point performance will likely be influenced more by strengthening statistics-based mindware.

The fact that statistics training does not aid metacognitive calibration in the TSR task further indicates the need for modifications. On the other hand, overall education level does impact metacognitive calibration of Croatian participants, but not participants from the UK. Croatian participants tend to be more accurate at assessing their performance with the increase of education level (with a noted improvement between undergraduate and graduate level – see Figure 3). It is an interesting pattern. Croatian participants across education levels have similar levels of performance (Figure 2), but get better at assessing performance. On the other hand, performance of UK participants increases with education levels, but metacognitive calibration remains equally inaccurate across levels. This, again, may be caused by a number of factors. On one hand, Croatian higher education has numerous midterms and exams compared to higher education in the UK. The sheer volume of test taking and getting feedback may lead to better calibration in general. The alternative explanation would indicate that confidence simply increases as Croatian participants reach higher education levels, regardless of performance (as stated, performance is fairly constant across levels). In that case, calibration would improve as a side-effect of general increase in confidence rather than a more nuanced matching of performance and perception.

This preliminary study has uncovered many potentially interesting effects which will be informative for future research. First, the effect of education on analytical reasoning is likely much more complex than a simple increase in the propensity for analyt-

ical reasoning with higher education. For a more thorough analysis of how the education system may affect analytical reasoning, many more factors need to be measured and controlled (e.g., the area of study, exact current level attended by the participants, details about the particular education system etc.). Second, the TSR task did not benefit more from statistics training than other reasoning tasks, indicating more development is required. However, a more detailed inquiry, longitudinal, or action study in particular types of statistics training would lead to better understanding of how it contributes to development of statistical reasoning processes. Finally, interesting cultural differences may point to interesting opportunities from the perspective of higher education in Croatia. The results indicate that at the point of entering higher education, there may be a window of opportunity to better develop analytical skills than is currently the case.

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Psychological vulnerabilities among asylum seekers in the Republic of Serbia

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Abstract

War and concomitant sociopolitical turbulence in the Middle East and Africa have led to big migration flows across the Balkan route - a route that remains active. Numerous refugees sought asylum in Serbia, but only several dozen receive international protection each year. The aim of the study was to assess the level of psychological vulnerabilities among asylum seekers who have submitted asylum applications in the Republic of Serbia. Sixty participants completed the Refugee Health Screener (RHS-15), aimed at screening for depression, anxiety and posttraumatic stress disorder (PTSD) symptoms and assessing overall psychological vulnerability. Results showed that 43.3% respondents were assessed as psychologically vulnerable and 41.7% as highly vulnerable. Moreover, 36.7%, 23.3% and 25% of participants experienced significant levels of depression, anxiety and PTSD, respectively. The importance of providing a comprehensive and trauma-informed model of support during the asylum procedure is discussed.

Keywords: *asylum seekers; psychological vulnerabilities; asylum procedure; Refugee Health Screener; coping capacities*

Introduction

There are over 89.3 million people forcibly displaced due to war, conflict, persecution or human rights violations (United Nations High Commissioner for Refugees [UNHCR], 2021), and by the end of 2021, the global refugee population reached 27.1 million, representing the highest recorded number so far (UNHCR, 2021). For the majority of them, the asylum procedure (i.e., refugee status determination) represents the first step and a precondition for initiating the phase of obtaining international protection and rebuilding their lives. Even though there are differences in how this procedure is regulated across Europe, e.g., it can last from 8 working days (European Council on Refugees and Exiles [ECRE], 2020a) to up to 21 months (ECRE, 2020b), an applicant needs to go through different stages and comply with several highly challenging requirements in order to obtain international protection, such as to testify in detail on the reasons for leaving their home country and on the painful and traumatic experiences they have been through (Vukčević Marković et al., 2021a).

Numerous studies documented reciprocal relationship between the asylum procedure and the mental health of the applicant, including both the impact that different stages of the asylum procedure can have on mental health of the applicant, and the impact different mental health difficulties can have on the asylum procedure (Vukčević Marković et al., 2021a). Thus, it was shown that a longer asylum procedure and delays and uncertainties have negative effects on refugees' mental health (Hallas et al., 2007; Laban et al., 2004, 2005, 2008), that asylum interviews increase symptoms of intrusions (Schock et al., 2015), and that receiving a negative decision increases suicidal ideation and intentions, as well as PTSD, depression and anxiety-related difficulties (Jakobsen et al., 2017; Silove et al., 2007). On the other hand, psychological difficulties of an applicant can affect different stages of the asylum procedure. Thus, a person suffering from PTSD may have difficulties to remember an important aspect of traumatic events (American Psychiatric Association [APA], 2013), which represents the most im-

portant requirement during the asylum procedure, and this can result in discrepancies in statements or in the inability to recall some details of the traumatic experience, thus affecting the course and the outcome of the asylum procedure (Vukčević Marković et al., 2021a). Furthermore, a person may experience persistent detachment or estrangement from others (APA, 2013), resulting in the absence of emotional reactions that would be considered normal reactions while recalling a traumatic event (Meffert et al., 2010), thus questioning the credibility of asylum claims by asylum officials (Vukčević Marković et al., 2021a). Therefore, it is of crucial importance to consider the psychological state of the applicant during the asylum procedure in order to ensure an unbiased and trauma-informed course and the outcome of the reasoning for the decision.

Current study

Following the massive migration flow from the Middle East to Western Europe that occurred in 2015, changes in European refugee policies have brought on the closure of European borders, an increase of border controls and violent push-back practices (Radjenovic, 2021; UNHCR, 2017). Nevertheless, the migrating flow through south-eastern Europe has not ceased since, leaving refugees and migrants fleeing from war, poverty and prosecution in hands of smugglers and in illegal border-crossing pathways (Médecins Sans Frontières, 2018). During 2020, almost 27,000 illegal border crossings were registered along the Western Balkans migration route alone (European border and coast guard agency, 2021). The closure of borders for many refugees meant prolonged stay in some of the transit countries along the route, which consequently led to a number of them seeking international protection in the Republic of Serbia. Looking at data from the previous five years, the number of refugees that sought asylum in the Republic of Serbia each year ranged from 2,306 to 12,937, while approximately 226 full asylum applications were submitted to the Asylum Office on average per year (Belgrade Centre for Human Rights, 2019, 2020, 2021, 2022). Out of the submitted applications, the number of people

who received international protection in the past five years in the Republic of Serbia is quite low - approximately 23 per year (Belgrade Centre for Human Rights, 2019, 2020, 2021, 2022).

It should be noted that previous studies conducted in Serbia have shown that refugees residing in Serbia were exposed to numerous stressful and traumatic experiences in their countries of origin (Vukčević et al., 2016), during transit (Purić & Vukčević Marković, 2019), as well as during their stay in Serbia (Vukčević Marković et al., 2019b). In addition, mental health screening conducted over the last several years shows high percentages of refugees in Serbia being psychologically vulnerable and experiencing severe symptoms of depression, anxiety and posttraumatic stress disorder (Dimoski & Vukčević Marković 2022; Vukčević Marković et al., 2017, 2018, 2019a, 2020, 2021b). This highlighted the importance of examining the mental health of those going through the asylum procedure in order to prevent and minimize the risks of jeopardizing their well-being, as well as minimizing risks that the course and the outcome of the asylum procedure carry for the most vulnerable among them.

Therefore, the aim of this study was to explore the severity of psychological vulnerabilities among asylum seekers in the Republic of Serbia, and provide evidence for a mental-health-sensitive and trauma-informed asylum procedure in Serbia.

Method

Sample

A total of 60 participants participated in the study (70% male, $M_{age} = 28.07$, $SD_{age} = 9.03$), originating from 15 countries, mostly Afghanistan (25.9%), Burundi (17.2%) and Iran (13.8%). All participants have submitted asylum applications in Serbia.

Instruments

Participants completed the Demographic characteristics questionnaire, developed for the purpose

of this study, which included information about age, gender and country of origin, as well as the Refugee Health Screener (RHS-15) (Hollifield et al., 2013), assessing mental health. RHS-15 consists of: 1) 13 items, followed by a Likert scale in the range of 5 points (0 = not at all, 1 = a little bit, 2 = moderately, 3 = quite a bit, and 4 = extremely), assessing symptoms of anxiety, depression and PTSD. For the purpose of this study, one item (item 1) was excluded from the analysis due to poor metric characteristics, so that each subscale consisted of 4 items (range 0-16); 2) a single item assessing coping capacities in which participants indicate if they feel they are 0 = able to handle (cope with) anything that comes their way, 1 = able to handle (cope with) most things that come their way, 2 = able to handle (cope with) some things but not able to cope with other things, 3 = unable to cope with most things, and 4 = unable to cope with anything; 3) a single item representing a distress thermometer in which respondents are asked to indicate the level of distress during the past week (including the day of the assessment) on an 11-point scale (from 0 = no distress "Things are good" to 10 = extreme distress "I feel as bad as I ever have"). Participants whose total score is 12 or above are considered psychologically vulnerable, while a total score of 25 or above indicates high vulnerability, and it is necessary for the person to be referred for further psychological assessment and psychological support. Moreover, the cutoff value for each subscale (depression, anxiety and PTSD) is 12, meaning those who scored 12 or above are considered to have clinically indicative symptoms of depression/anxiety/PTSD. The instrument shows good psychometric properties (Hollifield et al., 2013).

Procedure

Data was collected from June 2017 to December 2021 in the form of paper and pencil, on the premises of a non-governmental organization PIN – Psychosocial Innovation Network, allowing privacy. Data collection was performed by highly experienced psychologists and psychotherapists experienced in provision of psychological support to refugees during the asylum procedure, with the

assistance of trained and experienced interpreters/cultural mediators, when needed. The data was collected during psychological assessment sessions conducted with the aim of drafting psychological reports to be submitted as part of the asylum procedure documentation for the asylum seeker in question. The questionnaires were administered in four dominant languages of asylum seekers currently residing in Serbia – English, French, Arabic and Persian. The Demographic characteristics questionnaire was translated into the aforementioned languages using the back-translation method. All participants were provided with written consent, and they were informed about the aim and purpose of the research, principles of anonymity, confidentiality, the right to withdraw their consent for participation at any time, and were told that their decision whether to participate in the study or not will not in any way influence their legal status. Only those who provided informed written consent were included in the study. The Institutional Review Board of the Department of Psychology of the Faculty of Philosophy approved the study (protocol numbers #2021-99, #2019-015, #2020-42, #2021-25).

Results

The overview of descriptive statistics of RHS-15 factors (depression, anxiety and PTSD symptoms) can be seen in Table 1.

Table 1. RHS-15 descriptive statistics

	<i>M</i>	<i>SD</i>	Sk(std)	Ku(std)	α
Depression	7.85	4.50	0.78	-1.57	.74
Anxiety	7.50	4.62	1.06	-1.40	.78
PTSD	7.37	4.40	0.63	-1.69	.70
RHS total	24.0	12.91	1.43	-1.01	.89

Note. PTSD – post-traumatic stress disorder, *M* – mean, *SD* – standard deviation, Sk(std) – standardized skewness, Ku(std) – standardized kurtosis, α – alpha reliability

It can be noted that each factor measured was distributed normally (as seen through standardized skewness and kurtosis). Moreover, each factor showed acceptable alpha reliability.

The results of the psychological screening can be viewed in Table 2, providing the incidence of asylum seekers showing clinically indicative symptoms of depression, anxiety and PTSD, as well as overall psychological vulnerability and acute distress.

Table 2. The incidence of screen-positive asylum seekers

Symptoms	<i>N</i>	%
Depression	22	36.7
Anxiety	14	23.3
PTSD	15	25.0
Psychological vulnerability		
Not vulnerable	9	15.0
Vulnerable	26	43.3
Highly vulnerable	25	41.7
Acute distress	38	63.3

Note. PTSD – post-traumatic stress disorder, *N* – number of participants, % – the percentage of participants

It can be noted that more than one-third of the participants showed clinically indicative symptoms of depression, while about one-fourth of the participants showed clinically indicative symptoms of anxiety and PTSD. Moreover, the vast majority of participants were identified as psychologically vulnerable, with a notably high percentage of those identified as highly vulnerable. Finally, slightly less than two-thirds of the participants reported feeling extreme acute distress.

Finally, the results on reported coping capacities are provided in Table 3.

Table 3. Coping capacities of asylum seekers

Circle the one best response below. Do you feel that you are:	<i>N</i>	%
Able to handle (cope with) anything	12	20.0
Able to handle (cope with) most things	19	31.7
Able to handle (cope with) some things, but not able to cope with other things	21	35.0
Unable to cope with most things	6	10.0
Unable to cope with anything	2	3.3

Note. *N* – number of participants, % – the percentage of participants

In parallel with the high incidence of those reporting psychological difficulties, it is shown that asylum seekers' coping capacities remained notably

high, with about half of the participants stating that they are able to cope with anything or most things. However, there is still more than one tenth of the participants stating that they are not able to cope with anything or most things.

Discussion

The aim of this study was to explore the severity of psychological vulnerabilities among asylum seekers in the Republic of Serbia, and provide evidence for a mental-health-sensitive and trauma-informed asylum procedure in Serbia.

The results showed that mental health difficulties are highly prevalent among asylum seekers in Serbia. More specifically, more than one-third of asylum seekers showed clinically indicative symptoms of depression, while about one-fourth of participants showed symptomatology of anxiety and of post-traumatic stress disorder, respectively. Moreover, the vast majority of participants (85%) were identified as psychologically vulnerable, even though most participants still showed preserved coping capacities.

These results are in line with previous studies exploring the mental health of refugees in Serbia (Dimoski & Vukčević Marković, 2022; Vukčević Marković et al., 2017, 2018, 2019a, 2020, 2021b), showing high percentages of those experiencing severe mental health difficulties and acute distress. Therefore, this study highlights the need for ensuring not only a wide range of mental health services that need to be available and accessible to refugees, but also the need to prevent and minimize any additional stressors that might cause further deterioration of their mental health, and provide a safe and supportive environment for processing and healing. However, the circumstances in which refugees reside in Serbia expose them to many challenges and risks. More precisely, it was shown that refugees face numerous postmigration living difficulties, with poverty, lack of work permit, isolation and boredom, separation from family and worries about family back home being the most prevalent ones (Vukčević Marković et al., 2019b). Moreover,

these difficulties are related to more severe mental health problems (Vukčević Marković et al., 2019b). Furthermore, the study exploring experiences of refugees who went through the asylum procedure in Serbia showed numerous challenges faced by the applicants, such as long duration of the procedure, long waiting period between interviews, hearings and the decision, long duration of hearings and not enough breaks, while the main challenge was related to miscommunication with interpreters and lack of professional, trained and experienced interpreters (Vukčević Marković et al., 2019a). Finally, access to comprehensive mental health services in Serbia that could provide support in processing and coping with stressors and challenges is limited (Dimoski et al., 2022; Psychosocial Innovation Network, 2022; Stojadinović et al., 2020; Vukčević Marković et al., 2022).

Based on the study results, there is an urgent need for taking action that will ensure a mental-health-sensitive, trauma-informed and unbiased asylum procedure in Serbia. This should include strengthening both psychological and legal preparation and support before, as well as during all stages of the procedure, which was recognized as a valuable resource of support among those who obtained international protection in Serbia (Vukčević Marković et al., 2019a). Furthermore, it is necessary to ensure the presence of professional and culturally sensitive interpreters during the asylum procedure. Finally, strong advocacy efforts are needed towards improvements of formal characteristics of the procedure – it should be made as efficient as possible, with shorter period of times between the different stages, while maximal duration of interviews and frequency of breaks should also be defined in advance. Furthermore, applicants need to be informed about and encouraged to ask for a break or adjournment of the interview or the hearing when needed (Vukčević Marković et al., 2019a, 2021a). Finally, as previously recognized, the study results point out the need for education and sensitization of all parties involved in the asylum procedure, in particularly legal representatives and decision makers (Vukčević Marković et al., 2021a). These should help them recognize and understand the signs of

psychological difficulties and the emotional and cognitive manifestations of trauma and vulnerability, and enable them to react in adequate and timely manner, thus supporting the applicant through the procedure, as well as ensuring unbiased reasoning for the decision. Bearing in mind the everlasting refugee crisis, together with the new developments around the world, setting up this action as a priority should be recognized by relevant stakeholders since it would improve protection and make healing easier for those forced to flee their homes and search for safety elsewhere.

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