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Predictors of Adults' Mental Health During Initial Stage of Covid-19 Pandemic in Croatia

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Abstract - Besides causing serious threats to people's physical health and lives, pandemics can lead to psychological distress. This study aimed to investigate the relationship between the COVID-19 pandemic and mental health among adults in Croatia and its association with sociodemographic factors, perceptions of pandemic, locus of control, coping with stress and perceived social support. A cross-sectional, observational study was conducted using a snowball sampling technique. The online survey collected information on sociodemographics, chronic health conditions, self-isolation measure, perception of COVID-19, mental health status, locus of control, coping with stress and perception of social support. Mental health status was assessed by the Depression, Anxiety and Stress Scale (DASS-21). A total of 1482 participants (252 males and 1230 females) completed the study. The mean age of the participants was 33.3 ± 12.2 years, 43 % of the participants had elevated levels of anxiety and 18 % suffered from severe and extremely severe anxiety, 33 % had elevated levels of depression and 12 % suffered from severe and extremely severe depression, and 55 % had elevated levels of stress with 13 % suffering from severe and extremely severe stress. The strongest predictors of mental health symptoms were coping with stress, locus of control, and perceived social support. These results highlight the necessity of implementing psychological interventions during the pandemic to improve the mental health of the adults and vulnerable groups in particular that should include identified factors associated with better mental health status such as coping with stress focused on problem, social diversion and social support.

Key words*:* pandemics; COVID-19; mental health; anxiety; depression

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic is a global health threat. The current pandemic is a relatively new form of stressor with still unknown mental health consequences. Moreover, previous studies indicate a high prevalence of PTSD in the epidemic survivors [1]. PTSD occurred in 39 % of SARS convalescents 10 months after discharge, to 42 % 46 months after discharge [2]. Some recent studies have reported the psychological effect of the COVID-19 outbreak. In China over half the population (53,8 %) experienced a moderate or severe psychological effect [3]. One

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study conducted recently in Australia found that the majority of 1,200 participants reported mild-level anxiety and depression during the pandemic, while 30 % reported moderate to high levels of anxiety and depression [4]. Results from Spain revealed that 36,6 % of participants showed psychological distress due to the COVID-19 pandemic with avoidance being the most prevalent symptom in the total sample and for all genders [5]. Previous studies identified various stressors associated with quarantine that increase the risk of developing mental health problems: (I) fears about own health or fears of infecting others, (II) boredom, frustration, and a sense of isolation from the rest of the world, (III) inadequate basic supplies (e.g. food, water, clothes, or accommodation), (IV) poor information from public health authorities (e.g. concerning severity of the pandemic, insufficient clear guidelines about actions to take), and (V) financial loss and socioeconomic distress [6,7]. All these factors seem to apply to the current COVID-19 pandemic. Previous research has also indicated that psychological reactions during epidemics are likely to be influenced by personal dispositions, individual coping strategies, and one's perceived control over the situation, and social support which is in line with most stress theories [3,8,9]. Coping style may play an important role in mediating psychological symptoms after stressful or traumatic events [10,11]. Three broad dimensions are commonly identified within the literature: emotion-focused coping, problem-focused coping and avoidance-focused coping [12]. Problem-focused coping style have generally been found related to lower psychological distress [13,14]. In contrast, emotion-oriented and avoidance styles have typically been associated with greater psychological distress and depressive symptoms. Locus of control refers to the tendency to perceive outcomes in life as a result of one's own actions and thus being within one's own control (i.e., internal locus of control), as opposed to being determined by external factors, such as chance or powerful others (i.e., external locus of control) [15]. Internal locus of control has been associated with using coping strategies focused on solving problems, help-seeking and positive thinking, as well as lower levels of stress in general [16]. On the contrary, external locus of control has been related to avoidance coping/resignation, greater stress and poor health [16].

Social support has a significant role in conferring resilience to stress and helps people cope with stressful experiences and is highly correlated with good mental health [17-19]. People who report low levels of social support are found to have higher levels of stress, increased mental health morbidity in depression, PTSD, and increased mortality than people with high levels social support [20]. In Croatia, a southern European country, the rates (COVID-19) cases in the first wave have not been as high as in other European counties (Italy, the United Kingdom, Belgium, France) and the rest of the world (the United States, China, Brazil) [21]. Most likely, this is because of a delayed onset, which provided the Croatian government an opportunity to learn from experiences and reactions elsewhere. Lockdown procedures in Croatia have been swift and decisive, relative to other countries and included the shutting down of public transport, schools and universities, aged care facilities, restaurants, sporting events, and shopping malls [22]. However, studies examining the psychological effect on COVID-19 on the adults in Croatia are lacking. Therefore, this study aimed to investigate an immediate effect of the COVID-19 pandemic on mental health and identify risk and protective factors contributing to psychological distress. It is important to study the mental health effects of COVID-19 in various populations for planning effective intervention strategies. The problems in this research were to examine levels of depression, anxiety and stress; to examine associations between perceptions of pandemic, locus of control, coping with stress, social support and psychological responses; and to examine predictive contribution of coping strategies, sociodemographic and COVID-19 related variables in explaining the variances of anxiety, stress and

depression among adults. Due to infection outbreak, we assumed moderate to high levels of depression, anxiety and stress among adults in Croatia during the initial stage of COVID-19 pandemic. Also, we hypothesized that external locus of control, emotional-oriented coping style, lower social support and negative perceptions of pandemic would be statistically significantly positively associated with depression, anxiety and stress levels among adults in Croatia. According to the previous research findings, we expected positive significant predictive contribution of fear of coronavirus, external locus of control, emotional-oriented coping style, and negative significant predictive contribution of coping with stress focused on problem, coping with stress by social diversion, not being in self-isolation, and not having chronic illness in explaining the variance of anxiety. Further, we expected positive significant predictive contribution of female sex, fear of coronavirus and coping with stress focused on emotions, and negative significant predictive contribution coping with stress focused on problem and coping with stress by social diversion in explaining the variance of stress. Also, we assumed positive significant predictive contribution of coping with stress focused on emotions and negative significant predictive contribution of social support, problem-oriented coping with stress, and coping with stress by social diversion in explaining the variance of depression.

Subjects and Methods

Setting and Participants

This was a cross-sectional, observational study carried out in Croatia between 19th March 2020 and 17th April 2020. A snowball sampling technique was used. An online structured questionnaire was developed by using Google forms, with a consent form appended to it. Croatian citizens aged > 18 years old were invited to participate in online survey. The link of the questionnaire was sent through email to the contacts of the investigators. The participants were encouraged to roll out the survey to as many people as possible. Thus, the link was forwarded to people apart from the first point of contact and so on. On receiving and clicking the link the participants got information about the study and informed consent. After they accepted to take the survey, they filled up the demographic details. Then a set of questions appeared sequentially, which the participants were to answer. We received responses from 1482 respondents. The majority of respondents were women (83.0 %), 35.0 % were married and 27.5 % were in a relationship, 61.4 % had no children. The mean age of the sample was 33,3 years (SD = 12.2), and the household size was 3.8 members (SD = 1.57). Chronic health condition was reported by 13.8 % respondents and 21.6 % reported being in self-isolation as ordered by health authorities. Sociodemographic characteristics are also presented in Table 1. The study was approved by the Ethics Committee of the Zagreb Child and Youth Protection Center.

Measurements

Sociodemographic data were collected on gender, age, marital status, parental status, number of children and household size. Respondents were asked to state any history of chronic health conditions and being quarantined (self-isolated) by a health authority.

Mental health status was measured using the Depression, Anxiety and Stress Scale (DASS-21) [23,24]. The DASS-21, is a self-report questionnaire consisting of 21 items, 7 items per subscale: depression, anxiety and stress. Patients are asked to score every item on a scale from 0 (did not apply to me at all) to 3 (applied to me very much). The higher score indicates higher level of depression, anxiety and / or stress. The reliability of the DASS-21 in this study population was $\alpha = 0.95$ for Depression subscale, $\alpha = 0.90$ for Anxiety subscale and $\alpha = 0.93$ for Stress subscale.

Perception of COVID-19 pandemic. The self-reported questionnaire developed by the investigators for the purpose of this study to assess the perception of the participants on some aspects of COVID-19 pandemic included the following six items: the risk of the current COVID-19 pandemic in Croatia, the severity of the pandemic, following measures and directions ordered by health authorities, media exposure, fear of coronavirus infection, and coronavirus as a plot. Patients were asked to score every item on a 5-point Likert - type scale.

The Rotter's Internal-External Locus of Control Scale is a 29-item forced-choice test including six filler items intended to make the purpose of the scale somewhat more ambiguous [15]. Each item consists of a pair of statements. The respondents have to choose between an internal and an external alternative. The

following pair of statements is a clear example: "Many times I feel that I have little influence over the things that happen to me" (external alternative) and "It is impossible for me to believe that chance or luck plays an important role in my life" (internal alternative). Higher scores are indicative of externality and lower scores are indicative of internality. In this study the Cronbach's alpha coefficient of this scale was .77

The Coping Inventory for Stressful Situations (CISS) is a 48-item self-report measure which assess the three coping strategies (emotion-, avoidance-, and problem focused) [25]. Respondents indicate on a 5-point scale, ranging from "not at all" to "very much", to what extent they engage in certain types of activities when encountering a difficult, stressful, or upsetting situation. Higher scores indicate a greater use of that particular coping strategy. The CISS has shown good internal reliability and external validity [10,25]. We used the Croatian version of the CISS which has been validated in healthy adults and students [26]. In the current study, internal consistency for the three coping subscales, as measured by Cronbach's alpha coefficient (a) ranged from 0.71 to 0.87 (Task oriented coping α = 0.87, Emotion oriented coping α = 0.83, Avoidance-oriented coping α = 0.7 and social diversion oriented coping α = 0.81).

Social support questionnaire is a 56-item instrument constructed by MacDonald to measure the perception of social support received from family members and friends, and refers not only to available but also to the social support currently used [27,28]. Items are scored on a 5-point Likert scale (from 1 „I strongly disagree with the statement" to 5 „I completely agree with the statement"). Higher scores indicate a higher perceived social support. The instrument has satisfactory metric characteristics. For Croatian data Cronbach alpha was 0.74 (instrumental family support), 0.95 (social support from friends), 0.78 (self-esteem support from friends), and 0.96 (overall social support) In this study, Cronbach alpha of internal consistency of the whole scale was 0.95.

Results

Sociodemographic Variables and Psychological effects

For the anxiety subscale, 841 (57 %) were considered to have a normal score (score: 0 - 6), 140 (9 %) were considered to suffer from mild anxiety (score: 7 - 9), 247 (17 %) were considered to suffer from moderate anxiety (score: 10 - 14), and 256 (18 %) were considered to suffer from severe and extremely severe anxiety (score: 15 - 42). For the depression subscale, 991 (67 %) were considered to have a normal score (score: 0 - 9), 159 (11 %) were considered to suffer from mild depression (score: 10 - 12), 155 (10 %) were considered to suffer from moderate depression (score: 13 - 20), and 179 (12 %) were considered to suffer from severe and extremely severe depression (score: 21 - 42). For the stress subscale, 673 (45 %) were considered to have a normal score (score: 0 - 10), 363 (24 %) were considered to suffer from mild stress (score: 11 - 18), 255 (17 %) were considered to suffer from moderate stress (score: 19 - 26), and 193 (13 %) were considered to suffer from severe and extremely severe stress (score: 27 - 42). Age was significantly negatively associated with the DASS anxiety subscale ($r = -0.18$, $p < 0.001$), DASS stress subscale ($r = -0.24$, $p < 0.001$) and DASS depression subscale ($r = -0.20$, $p < 0.001$). Females had significantly higher scores in the DASS anxiety subscale ($t(390.29) = -2.99$, $p = 0.003$) with small effect size: $d = -0.19$, DASS stress subscale ($t(368.77) = -4.17$, $p < 0.001$) also with small effect size: $d = -0.28$, but not in DASS depression subscale ($t(351.61) = -0.81$, $p = 0.42$). Significant differences have been found in the DASS anxiety subscale ($F(3.\ 1464) = 22.04$, $p < 0.001$) with small effect size: $\eta^2 = 0.04$, DASS depression subscale ($F(3.\ 1464) = 30.85$, $p < 0.001$) with moderate effect size: $\eta^2 = 0.06$ and DASS stress subscale ($F(3.\ 1464) = 25.15$, $p < 0.001$) with small effect size: $\eta^2 = 0.05$ depending on the marital/relationship status. Scheffé's post-hoc tests showed that single respondents and those in the relationship had higher scores for anxiety, depression and stress than married and divorced participants.

Perception of COVID -19 pandemic and Psychological Effect

Participants perceived the risk of COVID-19 pandemics in Croatia high (mean ± SD = 3.98 ± 0.907) and the severity of the situa-

Table 1. Sociodemographic characteristics of respondents and psychological responses

Characteristic	N (%) Mean (± SD)	DASS Anxiety	t	F	r	DASS Depression	t	F	r	DASS Stress	t	F	r
Age	33.3 (12.2)				-0.18**				-0.2**				-0.24**
Sex													
Male	252 (17.0)	0.47 (.497)	-2.99*			0.54 (0.689)	-0.81			0.8 (0.685)	-4.17**		
Female	1230 (83.0)	0.57 (.555)				0.58 (0.659)				1 (0.77)			
Marital status				22.4**				3.85**				25.15**	
Married	520 (35.0)	0.43 (0.487)				0.38 (0.55)				0.79 (0.661)			
Divorced	65 (4.4)	0.32 (0.384)				0.37 (0.576)				0.66 (0.568)			
Single	476 (33.1)	0.65 (0.556)				0.74 (0.714)				1.7 (0.692)			
In relationship	407 (27.5)	0.64 (0.588)				0.64 (0.666)				1.11 (0.739)			
Children													
No	910 (61.3)	0.64 (0.57)	-7.87**			0.69 (0.694)	-9.26**			1.09 (0.712)	-8.63**		
Yes	574 (38.7)	0.42 (0.485)				0.38 (0.571)				0.77 (0.659)			
No. of children	2.03 (1.03)				0.09*				-0.07				0.1*
Household members	3.8 (1.57)				< 0.1				< 0.1				< 0.1
Chronic medical condition													
No	1279 (86.2)	0.53 (0.524)	3.82**			0.55 (0.649)	2.41*			0.95 (0.7)	2.32*		
Yes	205 (13.8)	0.72 (0.667)				0.69 (0.752)				1.8 (0.751)			
Self-isolation													
No	1169 (78.4)	0.51 (0.518)	5.84**			0.52 (0.623)	5.31**			0.92 (0.683)	4.78**		
Yes	315 (21.6)	0.73 (0.621)				0.77 (0.774)				1.15 (0.717)			

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

DASS = Depression, Anxiety and Stress Scale, t= t-value, F = F-value, r = Pearson correlation coefficient

tion very high (mean ± SD = 4.36 ± 0.799). Following preventive measures ordered by health authorities participants rated very high (mean ± SD = 4.58 ± 0.656) and also reported moderate exposure to media information (mean ± SD = 3.43 ± 1.3) and moderate fear of contamination (mean ± SD = 2.82 ± 1.1). The perception of COVID-19 pandemic as a plot was mild (mean ± SD=1.97 ± 1.14). The results and associations with the DASS subscales are shown in Table 2.

Locus of control and Psychological Impact

Locus of control measured using the Rotter's Internal-External Locus of Control Scale revealed a sample mean score of 11.83 (SD = 4.37). Locus of control was in a moderate correlation with the DASS anxiety subscale (r (1482) = 0.3, p < 0.001), DASS stress subscale (r (1482) = 0.31, p < 0.001), and DASS depression subscale (r (1482) = 0.29, p < 0.001). These results suggest that participants with external locus of control are more prone to developing anxiety, stress, and depression.

Coping with stress and Psychological Effect

On the Coping with stress scale, the participants had the highest result for focus on emotions (mean ± SD = 3.78 ± 0.75), followed by focus on problem (mean ± SD = 3.75 ± 0.66), social diversion (mean ± SD = 2.87 ± 0.82) and the lowest result for distraction (mean ± SD = 2.6 ± 0.98).

Social support and Psychological Effect

A sample mean score on the Adapted Social Support Scale was 231.28 (SD = 28.9). Social

Table 2. Associations between perceptions of pandemic, locus of control, coping, social support and psychological responses

Variable	Mean (± SD)	DASS Anxiety	DASS Depression	DASS Stress
Perception of pandemic				
Risk in Croatia	3.98 (0.907)	0.07**	0.02	0.08**
Severity	4.36 (0.799)	-0.01	-0.06*	-0.02
Preventive measures	4.58 (0.656)	-0.08**	-0.1**	-0.09**
Media exposure	3.43 (1.3)	0.04	-0.03	0.01
Fear of contamination with COVID-19	2.82 (1.1)	0.16**	0.01	0.15**
Plot	1.97 (1.14)	0.05	0.04	0.06*
Locus of control	11.83 (4.37)	0.3**	0.29**	0.31**
Coping with stress				
Distraction	2.6 (0.98)	0.09**	< 0.001	0.06*
Social diversion	2.87 (0.82)	-0.15**	-0.27**	-0.15**
Focused on emotions	3.78 (0.73)	0.55**	0.53**	0.6**
Focused on problem	3.75 (0.66)	-0.25**	-0.34**	-0.24**
Social support	231.28 (28.9)	-0.32**	-0.43**	-0.29**

* p < 0.05; ** p < 0.01
Legend: DASS = Depression, Anxiety and Stress Scale

Table 3. Multiple Regression Analyses Predicting Psychological Responses

		DASS Anxiety					DASS Depression					DASS Stress				
Predictor	Category	B	β	SD_B	t	p	B	β	SD_B	t	p	B	β	SD_B	t	p
Gender	Female	0.07	0.06	0.044	1.62	0.1	0.09	0.06	0.053	1.6	0.11	0.16	0.1	0.058	2.84	< 0.001
Marital status	Single	0.11	0.03	0.147	0.73	0.47	-0.07	-0.01	0.179	-0.39	0.7	-0.05	-0.01	0.193	-0.27	0.79
	Married	0.05	0.04	0.058	0.94	0.35	-0.03	-0.02	0.071	-0.4	0.69	0.04	0.02	0.076	0.52	0.61
	In relationship	0.05	0.02	0.096	0.52	0.6	-0.02	-0.01	0.117	-0.13	0.9	-0.1	-0.03	0.127	-0.79	0.43
No. of children		-0.03	-0.05	.025	-1.2	0.23	-0.03	-0.04	0.03	-0.84	0.4	-0.05	-0.06	0.033	-1.48	0.14
Household size		< 0.001	< 0.001	.019	0.08	0.94	< 0.001	-0.01	0.023	-0.17	0.86	< 0.001	< 0.001	0.025	-0.05	0.96
Chronic health condition	No	-0.13	-0.11	0.041	-3.05	-0.06	-0.06	-0.04	0.05	-1.1	0.27	-0.04	-0.02	0.054	-0.71	0.48
Self-isolation	No	-0.11	-0.07	0.053	-2.12	-0.09	-0.09	-0.05	0.064	-1.35	0.18	-0.06	-0.03	0.07	-0.88	0.38
Risk in Croatia		0.04	0.07	0.029	1.25	0.21	0.02	0.04	0.036	0.64	0.53	0.04	0.06	0.039	1.16	0.25
Severity		-0.03	-0.05	0.028	-1.14	0.25	-0.02	-0.03	0.034	-0.62	0.53	-0.04	-0.05	0.037	-1.09	0.28
Following preventive measures		< 0.001	< 0.001	0.033	-0.13	0.9	< 0.001	< 0.001	0.04	0.04	0.97	-0.02	-0.01	0.043	-0.4	0.69
Media exposure		0.01	0.03	0.015	0.69	0.49	< 0.001	< 0.001	0.018	-0.11	0.91	-0.02	-0.04	0.02	-1	0.32
Fear of coronavirus		0.05	0.1	0.02	2.37	0.02	< 0.001	< 0.001	0.024	-0.09	0.93	0.06	0.1	0.026	2.5	0.01
Perception of coronavirus as a plot		-0.01	-0.02	0.016	-0.48	0.63	< 0.001	0.01	0.02	0.2	0.84	-0.01	-0.02	0.021	-0.53	0.6
Locus of control		0.01	0.1	0.004	2.55	0.01	0.01	0.05	0.005	1.37	0.17	0.01	0.06	0.006	1.68	0.09
Coping focused on emotions		0.3	0.43	0.027	11.07	< 0.001	0.33	0.41	0.033	10.27	< 0.001	0.48	0.51	0.035	13.7	< 0.001
Coping focused of problem		-0.09	-0.11	0.032	-2.73	0.01	-0.14	-0.16	0.039	-3.67	< 0.001	-0.12	-0.11	0.042	-2.78	0.01
Distraction coping		< .001	< 0.001	0.02	-0.12	0.91	-0.02	-0.04	0.024	-0.92	0.36	-0.02	-0.03	0.026	-0.93	0.35
Social diversion coping		-0.06	-0.1	0.03	-2.17	0.03	-0.09	-0.11	0.036	-2.43	0.02	-0.08	-0.09	0.039	-1.96	0.05
Social support		< 0.001	-0.02	0.001	-0.55	0.58	< 0.001	-0.12	0.001	-2.79	0.01	< 0.001	-0.06	0.001	-1.45	0.15

DASS = Depression, Anxiety and Stress Scale, B – unstandardized regression coefficient, β – standardized regression coefficient, SD_B – standard error, t – t-value, p – p-value.

Support was in a moderate negative correlation with anxiety (r (1482) = -0.32, p < 0.001), stress (r = -0.29 p < 0.001) and depression (r (1482) = -0.43, p < 0.001)

Factors associated with mental health – psychological problems

Linear regression analyses were conducted to examine the predictive value of sociodemographic variables, prepandemic (chronic somatic condition) and peripandemic factors (self-isolation), perception of COVID-19 pandemics, locus of control, coping with stress and social support for psychological problems (anxiety, stress and depression) (Table 3).

The model in which anxiety was the criterion was statistically significant: F (22, 530) = 15.55, p < 0.001, = 0.37. Significant predictors were fear of coronavirus, locus of control and coping with stress focused on emotions, which are positively associated with anxiety, and coping with stress focused on problem, coping with stress by social diversion, not being in self-isolation, and not having chronic illness, which are negatively associated with anxiety. Coping with stress focused on emotions proved to be the best individual predictor. The model in which the stress criterion was statistically significant: F (22, 530) = 18.84, p < 0.001, = 0.42. Significant predictors were female gender, fear of coronavirus, and coping with stress focused on emotions, which are positively related to stress, and coping with stress focused on problem and coping with stress by social diversion, which are negatively related to stress. Coping with stress focused on emotions proved to be the best individual predictor. The model in which depression was a criterion was statistically significant: F (22, 530) = 13.28, p < 0.001, = 0.33. Significant predictors were coping with stress focused on emotions, which is positively associated with depression, and social support, problem-oriented coping with stress, and coping with stress by social diversion, which are negatively associated with depression. Coping with stress focused on emotions proved to be the best individual predictor.

Discussion

To our knowledge, this study was among one of the first studies to investigate the immediate effect of the COVID-19 pandemic on the mental health of the adults in Croatia. Our data confirm the great psychological effect of the COVID-19 crisis had on Croatian adults during early stage, more than half of the respondents had elevated levels of stress, about half reported elevated levels of anxiety and about one-third reported elevated levels of depression. Our results are in line with some recent studies worldwide that showed the COVID-19 outbreak has caused mental health problems among adults [3,5,29-38]. Findings reveal increase in mental distress compared with pre-COVID-19 trends with one third to over half the population experiencing a moderate or severe psychological effect [3,5,39,40]. Previous research has also consistently uncovered a link between outbreaks of infectious disease and psychological distress and symptoms of mental illness [41-48]. Similar to previous research, this study also identified populations at higher risk of adverse mental health outcomes, including women, younger adults, persons with chronic health conditions and quarantined (self-isolated) by a health authority [3,32]. In our study, fear of contamination with COVID-19 was positively associated with anxiety and stress. Lack of transparency from health and government officials about the severity of the pandemic and different risks, and insufficient clear guidelines about necessary actions to take might lead in some people fearing the worst [49]. Further, our results suggest that participants with external locus of control are more prone to developing anxiety, stress, and depression. Thus, the results in the present study are in line with studies showing that external locus of control is related to negative mental health outcomes while internal locus of control is related to positive outcomes [16]. Earlier studies have provided evidence that increased use of emotion-focused coping behaviours like self-preoccupation, rumination, or worry is related to subsequent mental illness [3,50]. Consistent with previous research that

a positive coping style may promote emotional well-being the present results showed coping with stress focused on problem was associated with lower levels of stress, anxiety, and depression [51]. Therefore, the adults with negative coping styles should be given attention during early stage of pandemics and the appropriate psychological interventions should be considered urgently [3]. The positive relation found between social support and lower levels of depression among adults in Croatia during early stages of the COVID-19 outbreak in our study is consistent with previous findings on an association between social support and protection from depression [52]. Perceived social support and connectedness have been found to be stronger predictors of decreased depression in young adults than sex, self-esteem, and sleep quality [53]. Research showed that high levels of perceived social support are needed for participants with high levels of stress in order to be able to achieve the protective effects of support on depressive symptoms [54]. Participants with high levels of stress may be less able to keep contact and tight social connections with other participants, thus, keeping others in distance probably because they convey their high stress to their social networks. Implications of these results include the efforts to increase social support during infectious outbreaks and management of stress levels before working with depressive symptoms. There are several limitations to this study. First, the current study employed a cross-sectional design and thus cannot infer the causality in terms of the relationships analysed. Future research should conduct longitudinal study to further explore the link between infection outbreaks, mental health status, locus of control, coping with stress, social support. Second, the study used convenient sampling and all data were collected through self-report, which undermines the generalization of the results. Another limitation is that other potentially influential factors of mental health were not measured and should be explored in the future, such as socio-economic status, history of mental health problems and significant traumas. One limitation of our study is the over-representation of female participants. This is a common problem in studies on mental health as males are more difficult to recruit and research suggests males are less likely than women to recognize and seek help for mental health problems [55,56]. Importantly, one should note that the population in this study was non-clinical. Due to the use of an adult population sample, one should be cautious with the interpretation of the findings as evidence for clinical symptoms. More research is needed to investigate risk and protective factors contributing to mental health status during infection outbreaks in clinical populations.

In spite of the limitations, the current study contributes to the previous literature on mental health during the infection outbreak theoretically and practically. Theoretically, this study adds knowledge to the previous research showing the effect of external locus of control and coping with stress focused on emotions on the development of mental health symptoms and the protective role of coping with stress focused on problem and social support. Practically, the findings are essential for tailoring and implementing relevant mental health interventions to cope and improve mental health and psychological resilience during the COVID-19 pandemic. First, providing up-to-date and accurate information from public health authorities and clear guidelines along with sensible media reporting during the epidemic are necessary to ensure compliance with preventive measures and may be beneficial in tackling mental health challenges. Higher satisfaction with the health information received was associated with lower levels of mental health problems [3]. Further, it is crucial that health authorities develop and implement effective screening procedures to closely monitor exposure to stressors and mental health adjustment, especially in high-risk population. Also, early psychological interventions tailored based on identified risk and resilience factors are crucial in the context of a natural disaster [50,57]. Stress management and relaxation techniques may need to be applied first

in participants with increased levels of mental health symptoms during early outbreaks of epidemics. Existing resources are valuable, but to reach the majority of the adults that is homebound during the epidemic, to reduce risk of virus transmission by face-to-face therapy and the overcome the shortage of mental health professionals, the implementation of telephone-, internet-, and application-based counselling, psychoeducation or intervention is necessary. Online services could be suitable for young adults in particular who are at risk for mental health problems and are also more receptive towards online platforms and smartphone applications. All these approaches must be tailored to the context of COVID-19 to address specific stressors associated with COVID-19 and should include coping skills and social skills training to address issues that are especially likely to affect mental health. Finally, it is vital for health care services to prepare for a possible rise in mental health problems in the population in the long-term aftermath of COVID-19, especially among people with earlier chronic health conditions [58,59].

The present study adds to the literature by investigating the interrelations between mental health status, locus of control, coping with stress and perceived social support during infection outbreak. This study revealed high levels of stress, anxiety, and depression among adults in Croatia in the early stage of COVID-19 pandemic which positively associated with coping with stress focused on emotions, fear of coronavirus and external locus of control. These results highlight that protecting mental health is an important component of public health measures during pandemics. Special interventions to promote mental well-being in the adult population need to be implemented immediately during infection outbreaks, with vulnerable groups (females, younger adults, persons in self-isolation and with chronic health conditions) requiring particular attention. Interventions should include identified factors associated with better mental health status such as coping with stress focused on problem and social support. Future studies investigating other factors that might influence mental health during pandemics are needed. Also, similar research in clinical populations with mental disorders is highly warranted.

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Conflict of interest

None to declare.

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