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Stress appraisal as a mediator between the sense of coherence and the frequency of stress coping strategies in women and men during COVID-19 lockdown

MARZENA LELEK-KRATIUK  and MONIKA SZCZYGIEL 

Department of Pedagogy and Psychology, Institute of Psychology, Pedagogical University of Krakow, Kraków, Poland

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The COVID-19 lockdown experience is a unique and unexpected stressful life situation. In our research project, we explored gender differences in the mean level of stress appraisal (SAQ), the frequency of stress coping strategies (COPE), and the sense of coherence (SOC), as well as gender differences in the strength of the relationships between SAQ, COPE, and SOC during the COVID-19 lockdown. Finally, we tested if stressor appraisal (as a threat, harm/loss, or challenge) mediates the relationship between SOC and COPE in women and men respectively. Data were collected during the first wave of the COVID-19 lockdown in Poland in 2020. An online survey was conducted among 326 adults aged between 18 and 72. We observed gender differences in the level of SAQ, COPE, and SOC and gender differences in the significance and strength of the correlations between these variables. SOC had a twofold effect on COPE in men: direct and indirect through SOC-threat and SOC-harm/loss. In women, SOC did not directly predict COPE frequency but affected COPE in an indirect way through SAQ. SAQ is an important factor that modifies the strength of the SOC effect on COPE in women and men during the lockdown.

Key words: Stress appraisal, stress coping, sense of coherence, gender, COVID-19.

Marzena Lelek-Kratiuk, Department of Pedagogy and Psychology, Institute of Psychology, Pedagogical University of Krakow, ul. Podchorążych 2, 30-084 Kraków, Poland. Tel: +48 502 627 155; E-mail: marzena.lelek-kratiuk@up.krakow.pl

INTRODUCTION

Psychological stress during COVID-19 pandemic

The existing literature strongly asserts that mental health problems are a frequent consequence of the COVID-19 outbreak (Cullen, Gulati & Kelly, 2020; Rajkumar, 2020). Particularly, the experience of severe stress and worry is a common characteristic among populations affected by the pandemic (International Federation of Red Cross and Red Crescent Societies, 2020; Li, Ge, Yang *et al.*, 2020). Apart from an intense stress response, which may have features of post-traumatic stress disorder (PTSD), commonly reported mental consequences of the COVID-19 pandemic are: depression, insomnia, and anxiety (Kang, Li, Hu *et al.*, 2020; Kar, Kar & Kar, 2021; Vindegaard & Benros, 2020; Wang, Pan, Wan *et al.*, 2020). A literature review of studies from China, Spain, Italy, Iran, the US, Turkey, Nepal, and Denmark revealed an increase in symptoms of anxiety (from 6.33% to 50.9%), depression (from 14.6% to 48.3%), post-traumatic stress disorder (from 7% to 53.8%), psychological distress (from 34.43% to 38%), and stress (from 8.1% to 81.9%) in the general population during the COVID-19 outbreak (Xiong, Lipsitz, Nasri *et al.*, 2020). Apart from anxiety and worry, boredom and helplessness were some of the most frequently reported feelings during the COVID-19 outbreak (Bozdağ, 2021; Luan, 2020). These findings also appear to be supported by other studies on quarantine experiences, conducted before the COVID-19 outbreak and indicating that isolation, the loss of daily rhythm, and impaired contact with others caused distressing frustration

and boredom (Brooks, Webster, Smith *et al.*, 2020). A more strongly perceived state of boredom was associated with higher levels of depression, anxiety, and stress during the COVID-19 outbreak. Furthermore, those individuals who had a high sense of meaning in life and experienced boredom were more likely to use media, which increased their vulnerability to experiencing negative psychological consequences (Chao, Chen, Liu, Yang & Hall, 2020). Previous findings also confirmed that pandemic changes emotion recognition in a confinement situation (Meléndez, Satorres, Reyes-Olmedo, Delhom, Real & Lora, 2020). Although the consequences of the restrictive lockdown and protracted pandemic affect both women and men, based on previous research, we suppose to observe some gender differences in the level of stress experienced, its evaluation, and the stress-coping intensity (Asturias, Andrew, Boardman & Kerr, 2021; Ishiguro, Inoue, Fisher *et al.*, 2019; Lembas, Starkowska, Mak *et al.*, 2017).

COVID-19 may be considered as potential factor-induced in non-experimental conditions that increase vulnerability to anxiety, depression, and acute stress, which are more common in women than men (Mauvais-Jarvis, Bairey Merz, Barnes *et al.*, 2020; Rossi, Soccì, Talev *et al.*, 2020). Research shows that during the COVID-19 pandemic women are more likely to experience stress due to the global situation (García-Fernández, Romero-Ferreiro, Padilla, David López-Roldán, Monzó-García & Rodríguez-Jimenez, 2020; Liu, Zhang, Wei *et al.*, 2020; Song, Li, Luo *et al.*, 2020). Research conducted among Polish university students indicates that perceived stress was highest during the first

wave of COVID-19 compared to the second and third waves. Interestingly, in all studies conducted during three subsequent waves of the COVID-19, it was women who reported higher levels of anxiety and stress than men (Rogowska, Ochnik, Kuśnierz *et al.*, 2021). Interesting that research from the Netherlands shows that women responded worse than men to lockdown situations in the area of depressive symptoms and disorders, while they did better in the area of anxiety disorders and symptoms (Vloo, Alessie, Mierau & Lifelines Corona Research Initiative, 2021). However many studies confirm stronger mental health problems in women than men during COVID-19 pandemic situation (e.g., Gualano, Lo Moro, Voglino, Bert & Siliquini, 2020; Prowse, Sherratt, Abizaid *et al.*, 2021; Zhang, Wang, Jahanshahi, Li & Schmitt, 2021).

Differential responses to stress during the COVID-19 pandemic in women and men, demonstrated above, suggest that gender differences may also occur in the area of the relationship between stress appraisal and sense of coherence, which we analyze with particular attention in our study.

Stress appraisal and coping during COVID-19 lockdown

According to Lazarus and Folkman (1984), stress is a consequence of the relationship between individuals and their environment, which they appraise as exceeding their resources and, as such, a threat to their well-being. In this model, there are two critical mediators of the stressful relationship between individuals and their environment, namely, stress appraisal and coping. Cognitive appraisal is a process that enables individuals to decide whether a given interaction with the environment is beneficial to their well-being, and if so, by which means. Stress may be appraised as harm/loss (if harm has already been experienced by the individual and is associated with negative emotions), a threat (the experience is anticipated as harm or loss), or a challenge (the focus is on potential benefits to be drawn from the experience, this is associated with positive emotions) (Folkman, Lazarus, Gruen & DeLongis, 1986). Stress appraisal seems to determine whether individuals can develop adaptive responses to stressors that lead to adaptive coping.

A second significant mediator of the relationship between individuals and their environment is coping. It can be described as flexible efforts to handle (reduce, minimize, mitigate, or tolerate) the external or internal demands that are the consequence of the relationship between individuals and their environment (Folkman *et al.*, 1986). Lazarus and Lazarus (2006) describe problem-focused coping and emotion-focused coping as two main categories of stress management. In problem-focused coping, individuals focus on eliminating the stressor or reducing the strength of its impact. In emotion-focused coping, they do not make an effort to change the situation, but focus on managing emotional distress. However, there is a risk that the problem situation will repeat (because it has not been ameliorated) and cause another experience of stress.

The experience of intense stress in an uncontrollable situation such as the COVID-19 pandemic requires developing proper coping strategies. Therefore, convincing oneself that it is not worth worrying about the existing problem (reappraised) can be a more usable strategy under certain uncontrolled conditions like

lockdown (Kalokerinos, Greenaway & Denson, 2015). Active emotional coping as well as control-self appraisal coping significantly negatively predicted COVID-19 related stress and fear (Ali, Khan, Abbas, Khan & Ullah, 2021). Other research proved that among COVID-19 isolated people cognitive reappraisal negatively moderated the relationship between anxiety symptoms and perceived stress (Xu, Xu, Xu *et al.*, 2020). Accordingly, we can assume that during a COVID-19 pandemic, reassessment allows individuals to reduce stress without changing the external situation. Women compared to men in the COVID-19 pandemic were more likely to perceive the environment as threatening. Similarly, women compared to men scored higher on the sense of loss of control and experienced stress (Bilal & Aamir, 2021).

Research conducted during the COVID-19 pandemic revealed that most of the respondents dealt with their situation actively by participating in activities, talking to others about their worries and emotions, or looking for positive aspects of the situation. However, passive ways of coping with the COVID-19 outbreak involved escapism, smoking, or depending on others. In addition, the avoidance of thinking about the stressful situation, the lack of knowledge about ways of coping, and struggling to cope were significantly associated with anxiety and depression. By contrast, humor as a way of coping was less likely to be associated with anxiety (Fu, Wang, Zou *et al.*, 2020; Kar *et al.*, 2021). Another study showed that avoidant coping behaviors were positively associated with all indices of distress and negatively associated with individual well-being (Dawson & Golijani-Moghaddam, 2020). Therefore, it can be assumed that an active attitude towards coping with stress (taking initiative, protecting one's own and others' emotions) may be a protective factor in the face of the threat of COVID-19 pandemic.

Women perceive the COVID-19 pandemic as more stressful than men and they cope less well with the situation; however, they undertake a greater number of coping strategies (Ahmad, Saleem, Bilal, Jamshed, Ahmad & Ahmad, 2021; Kruse, Luzuriaga, Wang *et al.*, 2021; Liu, Prestigiacomo, Plawecki & Cyders, 2020). Analyses conducted in 59 countries on the consequences of isolation due to the COVID-19 pandemic found that women compared to men: revealed higher levels of trauma-related distress; had a reduced ability to relax; presented more symptoms of anxiety, stress, and depression; and reported lower quality of sleep as well as increased likelihood of taking sleep medication or other sleep remedies; showed lower frustration tolerance (Kolakowsky-Hayner, Goldin, Kingsley *et al.*, 2021).

A study conducted in Austria from 1 February to 29 June 2020 showed that during lockdown women, in comparison to men, significantly reduced their own mobility, avoided shopping centers and recreational places more strongly. Moreover, after the lockdown, men returned to normal more quickly than women (Reisch, Heiler, Hurt, Klimek, Hanbury & Thurner, 2021). Subsequent research showed that women were more likely than men to use both positive (keeping good relationships with family; maintaining emotional closeness with others through the use of social media; supporting family members or close others; taking care of oneself through diet, exercise, or reading) and negative (being easily angered by others; believing that one's own actions are ineffective; panic buying) coping strategies (Ramos-Lira, Rafful,

Flores-Celis *et al.*, 2020). In accordance with the greater diversity of coping strategies undertaken by women during the COVID-19 pandemic, and at the same time the more severe stress they declared compared to men, it is important to provide an in-depth analysis of factors that promote mental resilience or coping with difficult experiences inherent in the current COVID-19 pandemic.

Researchers during the COVID-19 pandemic have been differentiating coping strategies in a number of ways (e.g., into adaptive and maladaptive, positive and negative, passive and active, coping through emotion and problem solving or avoidant) (e.g., Brailovskaia & Margraf, 2020; Dawson & Golijani-Moghaddam, 2020; Ding, Fu, Liu, Hwang, Hong & Wang, 2021; Fu *et al.*, 2020; Ramos-Lira *et al.*, 2020). However, Lazarus (1996) points out that a distinctive understanding of coping misses the mark. Especially when the individual's transaction with the environment has not been analyzed in depth. According to this researcher emotion-focused coping and problem-focused coping, although independent functions, together combine to make up the entire coping effort of an individual. It is their very balance and integration with each other that provides a comprehensive portrayal of coping efficiency. That is why in our study we decided to include a single measure of coping efforts that illustrates both their diversity and intensity (coping frequency).

Sense of coherence as a resilience resource in women and men during COVID-19 outbreak

Many studies indicate that the way stressors are appraised and the effectiveness of coping strategies undertaken by individuals depend on their sense of coherence levels (SOC; e.g., Amirkhan & Greaves, 2003; Cohen & Dekel, 2000; Konaszewski, Kolemba & Niesiołędzka, 2019; Schäfer, Becker, King, Horsch & Michael, 2019). SOC is often presented in the literature as a key construct for understanding why some individuals exposed to stressors remain healthy and cope with stress while others are unable to handle it. A stronger SOC is associated with a better perception of one's own health, especially in the mental area (Eriksson & Lindström, 2006). It is the personal resilience component that enables the continuation of activity, the identification of goals, and the progression towards achievement (Einav & Margalit, 2020). Individuals with a high sense of coherence are able to evaluate the world around them accurately (comprehensibility); are aware that their actions are worth the work and effort they expend (meaningfulness); and actively cope with stressors and remain confident that they have adequate resources to manage them (manageability) (Antonovsky, 1987). Researchers have shown a positive relationship between SOC and a task-based coping style or seeking support from family and friends (Cohen, Ben-Zur & Rosenfeld, 2008; Cohen & Dekel, 2000). However, the significance of SOC (compensatory or protective) for health remains unclear. In the compensatory model, SOC is understood as a resource and acts independently of stress levels, while in the protective model SOC is activated by a threat (Moksnes & Espnes, 2020). Although gender may be a variable that differentiates SOC levels among men and women (Mayer, Louw & von der Ohe, 2019), many studies do not detect this difference (Hochwälder & Saied, 2018; Volanen, Lahelma, Silventoinen & Suominen, 2004).

SOC appears to be relevant to individual well-being during the COVID-19 pandemic. Italian studies have shown SOC's moderating role in the relationship between the experience of illness and psychological well-being. Moreover, gender differences in psychological well-being were revealed (Barni, Danioni, Canzi *et al.*, 2020). Other research undertaken in Italy during the COVID-19 pandemic indicated that women were more likely to present a profile of people with lower levels of SOC which was associated with high fear and low well-being (Danioni, Sorgente, Barni *et al.*, 2021). Studies conducted in several countries (Israel, the Netherlands, Spain, Italy) also during the COVID-19 pandemic suggest that coping resources contributed to the prediction of both anxiety and mental health, with SOC appearing to be the main predictor of these two responses. Many situational factors (health status and financial threat) were more successful predictors of anxiety, whereas SOC and other coping resources were more predictive in explaining mental health (Mana, Super, Sardu, Juvinya Canal, Moran & Sagy, 2021). The buffering role of SOC in the context of COVID-19-related stressors is also supported by other studies (Schäfer, Sopp, Schanz, Staginuss, Göritz & Michael, 2020).

Present study

The COVID-19 pandemic in non-experimental conditions has exposed entire populations to intense stress in the face of a difficult-to-control disease. This situation serves as a unique opportunity to explore the significance of the sense of coherence in coping with stress among people who are suddenly and involuntarily confronted with a powerful and uncontrollable stressor (e.g., illness) that requires drastic lifestyle changes. As previous studies have shown, men and women differ in their assessment of stressors, in the revealed consequences of experienced stress, but also in the level and importance of the sense of coherence in coping with it. Therefore, we were interested in testing gender differences in psychological reactions at the time of the first wave, when all societies were left in shock by the global situation.

Considering the above, our first aim was to test whether there are gender differences in stress appraisal, stress coping, and the sense of coherence during the COVID-19 lockdown. Our second objective was to compare the strength of correlation between stress appraisal, stress coping, and the sense of coherence in women and men. Finally, our third aim was to test whether the manner of stress appraisal mediates the relationship between the sense of coherence and stress coping strategies during the COVID-19 lockdown in women and men. Although research on gender differences in crises has been conducted before, our study aims to check what they look like in the case of common and unprecedented events in human life.

METHODS

Participants

The study was conducted among 326 representative Poles aged $M = 31.21$, $SD = 11.61$, from 18 to 72. Two hundred and thirty women ($M = 30.18$, $SD = 11.31$, 18–69 year-olds) and 96 men took part in the

study ($M = 33.69$, $SD = 11.99$, 18–72 year-olds). No respondent was infected with the coronavirus and less than 5% of the participants were in quarantine while completing the survey. Almost three quarters of the respondents worked from home and around 1% worked on-site. Around 10% of respondents did not work or study. The participants spent almost 2 hours daily ($M = 1.51$, $SD = 1.38$, range 0–10) tracking information about COVID-19.

Measures

Stress appraisal. We used the Stress Appraisal Questionnaire (SAQ; Włodarczyk & Wrześniewski, 2010), which consists of two parts: dispositional and situational stress appraisal. In the paper, we present the results from the situational stress appraisal part, in which participants were asked to appraise their stress levels during COVID-19 lockdown. The participants were asked to evaluate on a four-point scale (0 = definitely not, 1 = rather not, 2 = rather yes, 3 = definitely yes) the degree to which each of 35 items describes their feelings relating to a stressful situation. A higher sum of points can be interpreted as a higher stress appraisal. The SAQ measured four highly reliable factors: Challenge-Activity ($\alpha = 0.86$) that is appraisal conditioning active attitude in a stressful situation, effort or action taken by a person to cope with it; Challenge-Passivity ($\alpha = 0.84$) that is an appraisal of the stressful situation as positive and promising something beneficial, but without the element of activity of the subject; Threat ($\alpha = 0.92$) that is an appraisal of the stressful situation as likely to cause damage, but which has not yet occurred; and Harm/Loss ($\alpha = 0.84$) that is an appraisal of the stressful situation as one that has already resulted in damage and loss associated with important objects.

Stress coping strategies. We used the Polish adaptation of the Brief COPE Questionnaire (Carver, 1997; Juczyński & Ogińska-Bulik, 2009), which includes 28 items regarding various stress coping strategies. The participants were asked to assess the frequency of their using these strategies during COVID-19 lockdown on a four-point scale (1 = I have not been doing this at all, 2 = I've been doing this a little bit, 3 = I've been doing this in a moderate amount, 4 = I've been doing this a lot). We were interested in one indicator of the Brief COPE measure; therefore, we calculated the frequency of stress coping strategies undertaken by adults, similarly to other authors (e.g., Heffer & Willoughby, 2017; Liu, Prestigiacomo, Plawecki *et al.*, 2020). A higher sum of points can be interpreted as a higher intensity and diversity of the coping strategies (Heffer & Willoughby, 2017; Liu, Prestigiacomo, Plawecki *et al.*, 2020). The reliability of the whole scale was $\alpha = 0.78$.

Sense of coherence. We used the Polish language version of the Orientation to Life Questionnaire (SOC-29; Antonovsky, 1987). The scale consists of 29 items that measure the sense of comprehensibility, manageability, and meaningfulness of various life experiences. The participants answered questions on a seven-point scale, the extreme ends of the spectrum covering extreme feelings about different aspects of human life. The indicator of the sense of coherence was calculated as a sum of points for the entire scale, and the reliability of the SOC-29 was satisfactory $\alpha = 0.90$. The higher the SOC-29 score, the more the sense of comprehensibility, manageability, and meaningfulness of various life experiences.

Procedure

An online study was conducted during what is known as the first lockdown in Poland (between 16 March and 14 April 2020). During this period, many restrictions to individual freedom were announced in Poland due to the COVID-19 pandemic. The study was approved by the Ethical Committee [Institute of Psychology, Pedagogical University of Krakow]. The sample was recruited on social media and advertisements posted on websites. Adults interested in participating in the study clicked the link to the survey prepared in Google Forms. The participants were informed about the research purpose (“Appraisal situation, sense of coherence and stress coping in typical and unusual situations”), the participants’

voluntariness and confidentiality, and the possibility of withdrawing from the study. Participants were guaranteed that after completing the study, they would receive a description and interpretation of their results if they wanted. The questionnaires and sociodemographic questions were presented in the following order: the SAQ, the SOC-29, the Brief COPE, gender, age, duration of tracking the media for COVID-19 information, the type of work/learning (online or stationary) and the experience of infection (infected or not/ in quarantine or not). Demographic data were collected to describe the tested sample. The data from questionnaires were used to test hypotheses about gender differences. All scales were administered in Polish and the survey lasted about 20 min.

RESULTS

First, we present descriptive statistics and correlations between all tested variables for women and men calculated in Statistica 13.3 (see Table 1).

To answer the first research question, we tested gender differences with the Mann–Whitney U test. A non-parametric test was used because the assumption of group equivalence was violated and the assumptions of homogeneity of variance (tested with Leven’s test) and normality of distribution (tested with Shapiro–Wilk’s test) in some cases were also violated. The effect size for gender differences was calculated with Lenhard and Lenhard (2016) and was interpreted in accordance with Cohen (1988): 0.2 small effect size, 0.5 medium effect size, 0.8 large effect size. The results indicated that women, in comparison to men, showed a lower level of sense of coherence, a higher frequency of stress coping strategies, a higher level of the appraisal of the COVID-19 pandemic as a threat, harm and loss, and a lower level of the appraisal of lockdown as a challenge in the active dimension (the assessment of a stressful situation as a promise of something positive, which nonetheless requires that the individual should take some action). All observed differences were small. Women and men did not differ in their appraisal of the COVID-19 pandemic as a challenge in the passive dimension (the assessment of a stressful situation as a promise of something positive, but without any activity on the individual’s part).

Then, to answer the second research question, we tested correlations between all variables for women and men. The effect size for correlation is provided based on Evans (1996): $r < 0.20$ very weak, 0.20–0.39 weak, 0.40–0.59 moderate, 0.60–0.79 strong, and >0.80 very strong. The results indicated that the sense of coherence correlated negatively and weakly/moderately with stress appraisal in women and men and was not related to the frequency of stress coping strategies in both genders. The frequency of stress coping strategies was positively and very weakly related to stress appraisal in women (threat, challenge-active, challenge-passive) and positively and weakly/moderately related in men (threat, harm/loss). Women’s appraisal of the pandemic as harm/loss was not related to the frequency of stress coping strategies while men’s appraisal of the pandemic as a challenge was not correlated with the frequency of stress coping strategies.

Finally, to answer the third research question, we conducted mediation analyses in R (*lavaan* and *mediation* packages; Rosseel, 2012; Tingley, Yamamoto, Hirose, Keele & Imai, 2013). We relied on the following model-to-data fit indices: χ^2 , the comparative fit index (CFI), the root mean square error of approximation (RMSEA), the standardized root mean squared

Table 1. Descriptive statistics and correlation coefficients for women and men

	Women		Men		Mann-Whitney <i>U</i>			Pearson's <i>r</i>					
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>U</i>	<i>Z</i>	<i>d</i>	1	2	3	4	5	6
1 SOC-29	125.05	23.10	131.49	24.53	9371.50	-2.15*	0.24	—	0.17	-0.28**	-0.30**	0.48***	0.26**
2 Brief COPE	35.92	8.49	31.98	10.18	8,569	3.18**	0.36	0.12	—	0.42***	0.35***	0.01	0.07
3 SAQ-Threat	11.70	6.09	9.28	6.11	8559.5	3.20**	0.36	-0.33***	0.13*	—	0.70***	-0.24*	-0.19
4 SAQ-Harm/Loss	5.23	2.80	4.29	2.97	8929.5	2.72**	0.31	-0.28***	0.12	0.62***	—	-0.25*	-0.13
5 SAQ-Challenge-Active	10.06	3.18	11.18	2.71	9106.5	-2.49*	0.28	0.38***	0.15*	-0.19**	-0.18**	—	0.56***
6 SAQ-Challenge-Passive	6.49	3.20	7.23	3.60	9,693	-1.74	0.19	0.22**	0.22**	-0.28***	-0.28***	0.40***	—

Notes: **p* < 0.05, ***p* < 0.01, ****p* < 0.001. Correlations for women (*N* = 230) are below the diagonal, and correlations for men (*N* = 96) are above the diagonal. SOC-29 – sense of coherence, SAQ-THL – stress appraisal threat and harm/loss, SAQ-CH – stress appraisal challenge activity and passivity, Brief COPE – frequency of stress coping strategies.

residual (SRMR). We evaluated models in accordance with the evaluation criteria proposed by Hu and Bentler (1999) and Kline (2016): CFI > 0.95, RMSEA and SRMR < 0.08. The sense of coherence and the frequency of stress coping strategies were included as observable variables while the appraisal of stress as a threat and harm/loss and the appraisal of stress as a challenge (both active and passive) were treated as latent variables. This was due to the fact that the indicators of SOC-29 and COPE could be reduced to one score, while the assessment of stress appraisal was multidimensional.

The results for women indicated that the mediation model did not obtain the required chi-square value ($\chi^2_{62} = 23.08; p < 0.001$) but the model-to-data fit indices were near the accepted criteria: CFI = 0.93, RMSEA [90% CI] = 0.11[0.07, 0.16], SRMS = 0.07. A direct path and two indirect paths explained 18% of variance in the frequency of coping strategies (*R*² = 0.18). A better model fit was observed in men. The model fit the data very well ($\chi^2_{62} = 4.97; p = 0.55$) and the fit indices were very satisfactory: CFI = 1, RMSEA [90% CI] = 0 [0, 0.12], SRMS = 0.047. Indirect and direct paths explained 34% of variance in the frequency of coping strategies among men (*R*² = 0.34). The mediation model for both genders is presented in Fig. 1.

The direct path [c] and the total effect [c'] from the sense of coherence to stress coping strategies in women were insignificant. This means that the sense of coherence did not directly predict stress coping strategies no matter whether the stress appraisal of the situation was included or not in the regression model. However, the results indicated weak mediation effects for the appraisal of stress as a threat and harm/loss (a1 × a2: β = -0.11, *p* < 0.01) and the appraisal of stress as a challenge (b1 × b2: β = 0.17, *p* < 0.01) between the sense of coherence and the frequency of stress coping strategies in women. This means that although the sense of coherence could not directly predict the frequency of stress coping strategies in women, it nonetheless affected coping strategies in an indirect way. A higher sense of coherence predicted a lower frequency of coping strategies when the situation was evaluated by women as a threat, harm, and loss. On the other hand, since our model also provided for the evaluation of the situation as a challenge, the sense of coherence became a positive predictor for the frequency of stress coping strategies.

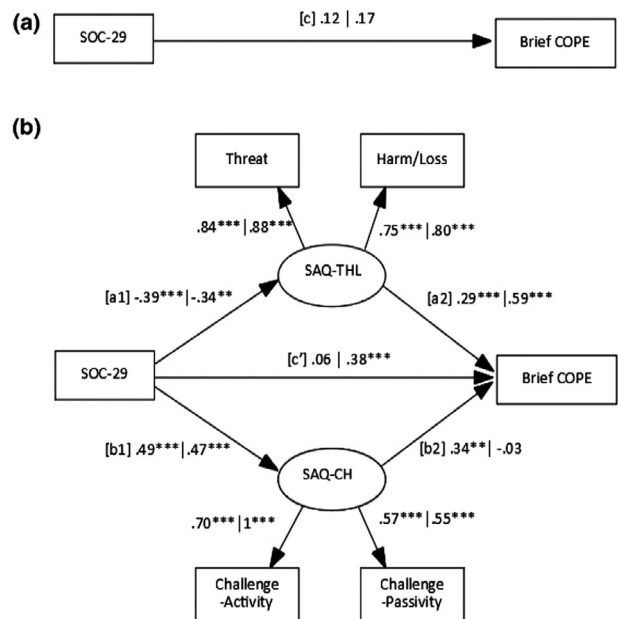


Fig. 1. Panel a presents total effect, panel b presents mediations effects. Notes: The results are presented in the following pattern: Women|Men. SOC-29 – sense of coherence, SAQ-THL – stress appraisal threat and harm/loss, SAQ-CH – stress appraisal challenge activity and passivity, Brief COPE – frequency of stress coping strategies. **p* < 0.05, ***p* < 0.01, ****p* < 0.001.

The results of mediation analyses differed in some points between women and men. The total effect between the sense of coherence and the frequency of stress coping strategies in men was insignificant [c], but when mediators were included in the model the suppression effect was observed: the direct path became significant [c']. The appraisal of stress as a threat and harm/loss mediated (a1 × a2: β = -0.20, *p* < 0.01) the sense of coherence and the frequency of stress coping strategies in men. However, the appraisal of stress as a challenge (b1 × b2: β = 0.01, *p* = 0.79) did not mediate this relationship. This means that the sense of coherence had a twofold effect on the frequency of stress coping strategies in men. An increase in the sense of coherence level led to a weak decrease in the frequency of stress coping strategies if the situation was appraised by men as a threat

and harm/loss. However, when both stress appraisal types were included in the model (as a threat and harm/loss (1) and as a challenge (2)), then the sense of coherence directly, positively, and moderately predicted the frequency of stress coping strategies. The results mean that the appraisal of a stressful situation as a threat and harm/loss limited the positive effect of the sense of coherence on the frequency of stress coping strategies and changed the effect of the sense of coherence on the frequency of stress coping strategies.

DISCUSSION

Gender differences in the sense of coherence, stress appraisal, and stress coping

The rapidity and unexpectedness of COVID-19 lockdowns announced in many countries throughout the world, including Poland, made it possible to examine what women and men felt and how they coped in extreme situations. Research results so far have proven that people evaluate their stress and undertake coping strategies differently in everyday situations and during the COVID-19 pandemic (Brose, Blanke, Schmiedek, Kramer, Schmidt & Neubauer, 2020; di Fronso, Costa, Montesano *et al.*, 2020; Lieberoth, Lin, Han *et al.*, 2021). These results can be explained by the fact that the pandemic outbreak was something unusual and unexpected. Since less is known about the individual differences in dealing with the first wave of lockdown, in our research project we focused on gender differences in the levels of the sense of coherence, stress appraisal, and the frequency of stress coping strategies.

We observed that men, in comparison to women, had a little stronger sense of coherence during COVID-19 lockdown. This finding is consistent with the results of a prospective cohort study from the UK, which also showed that significantly more men than women reported strong SOC (47.6% vs. 37.4%). In addition, the authors of the study observed a 30% reduction in mortality (primarily, cardiovascular and cancer mortality) among men and women associated with strong SOC (Surtees, Wainwright, Luben & Day, 2003). These results indicate that men perceive the world as more comprehensible, and it is also easier for them to find meaning in their own life experiences and to realize that they can influence their own lives. Through this life orientation, they may find it easier to mobilize and select resources for coping with stress.

On the other hand, we observed that women scored significantly higher on the frequency of coping strategies than men which can be interpreted as using the larger number of strategies with greater intensity. These results are in line with previous studies (Nolen-Hoeksema, 2012; Schmied *et al.*, 2015). Studies conducted in 59 countries (Kolakowsky-Hayner *et al.*, 2021) on gender differences in coping with COVID-19 pandemic using the Brief COPE tool (as in our study) revealed that women are more likely than men to use 12 of the 14 strategies identified in the Brief COPE: self-distraction, active coping, use of emotional support, behavioral disengagement, denial, venting, use of instrumental support, positive reframing, self-blame, planning, acceptance, and religion. No differences

were detected in substance use and humor coping (Kolakowsky-Hayner *et al.*, 2021). It should be also noted that Liu, Prestigiacomo, Plawecki *et al.* (2020) revealed that during the initial impact of COVID-19 women, when compared to men, used more coping strategies but they did so less efficiently. These findings (at least in terms of the variety of coping strategies used) are consistent with the research from the UK, which indicates that women, compared to men, are more likely to use all the coping strategies included in the study (problem focused, emotion focused, avoidant, socially supported) (Fluharty & Fancourt, 2021). Nevertheless, it should be noted that studies implemented before the COVID-19 outbreak also have shown that women use approach coping strategies more frequently than men (Jones, Mendenhall & Myers, 2016). However other studies have shown that women used more emotion-based and avoidance strategies than men. They were also less likely to cope using rational and detachment coping strategies. In addition, women presented somatic symptoms and psychological distress more often than men (Matud, 2004). It may be possible that the higher frequency of coping strategies applied by women in the face of stress is a consequence of their stronger stress reactivity at psychic and somatic levels.

The results indicated that there were also weak gender differences in the way stress was evaluated. Women were more likely to evaluate lockdown as a threat, harm, and loss than men, but men assessed this situation as a greater challenge, the challenge being regarded as something passive rather than active. However, not all studies have identified differences in gender-based responses to stress in the face of COVID-19 (Bisht, Bisht & Sagar, 2021). According to many researchers being a woman might be a risk factor for suffering distress during the COVID-19 pandemic (Boyras & Legros, 2020; Dragan, Grajewski & Shevlin, 2021; Losada-Baltar, Jiménez-Gonzalo, Gallego-Alberto, Pedrosa-Chaparro, Fernandes-Pires & Márquez-González, 2021). Some researchers indicate that women are more likely than men to suffer from stress-related psychiatric disorders due to sex-differentiated stress response systems (Bangasser & Wicks, 2017). However considering morbidity and mortality rates of COVID-19 that are higher for men than women, the stronger emotional response in women may be associated with other stress generating factors than the severity of the disease (García-Fernández *et al.*, 2020). Gender differences in psychological reactions to COVID-19 pandemic stress may be due to the heavier burden taken by the pandemic and lockdown on the lives of women rather than to gender differences in coping tactics or resilience (Laufer & Shechory Bitton, 2021). Women who have had to undergo social isolation in the face of lockdown experience stronger anxiety than men, which may be related to their predominant roles as family caregivers and frontline healthcare workers (Gebhard, Regitz-Zagrosek, Neuhauser, Morgan & Klein, 2020; Spagnolo, Manson & Joffe, 2020). Moreover, women who have lower levels of SOC may perceive the pandemic situation as more unpredictable than men. The latter, on the other hand, because of their higher sense of coherence levels, they may be able to define the COVID-19 outbreak in terms of a challenge that they see themselves as competent to handle. However, more research in this area is required.

Relationships between the sense of coherence, stress appraisal, and coping in women and men

We also observed some gender similarities and differences in the significance and strength of the correlation coefficients. First of all, we did not observe a relationship between the sense of coherence and the frequency of stress coping strategies in both genders. The results seem to be somewhat contradictory to previous studies, which demonstrated that people with higher SOC presented higher levels of coping resources (Gustavsson & Bräänholm, 2003). The lack of correlation between SOC and the frequency of stress coping strategies may be due to the fact that we did not qualitatively differentiate the strategies but focused on the intensity of efforts to cope with the stressor (regardless of the adaptability of the strategy in a given situation). As the previously mentioned studies have shown, the frequency of using coping strategies does not always correlate with their effectiveness (see Liu, Prestigiacomo, Plawecki *et al.*, 2020). Studies exploring the relationship between SOC and types of coping strategies revealed that a higher SOC level was associated with task-oriented strategies and fewer emotional coping strategies (e.g., Amirkhan & Greaves, 2003; Heiman, 2004).

Second, we observed that both in women and men there is a moderate negative correlation between the sense of coherence and the appraisal of stress as a threat, harm, and loss. We also observed an intuitive pattern of results indicating that the sense of coherence is weakly/moderately and positively related with stress appraisal if the situation is evaluated as a challenge. These results are in line with other studies showing that a low SOC was associated with a perception of the situation as more stressful and a lower confidence in being able to cope with the stressor (McSherry & Holm, 1994). Individuals with a stronger SOC adapted more swiftly to various social adversities they experienced in life. At the same time, individuals with a weak SOC engaged in behaviors that were less supportive to health because they were less able to cope with daily stress (Wainwright, Surtees, Welch, Luben, Khaw & Bingham, 2007). Likewise, a study conducted during the COVID-19 pandemic concludes that low levels of SOC correlated with stronger feelings of distress (Ruiz-Frutos, Ortega-Moreno, Allande-Cussó, Ayuso-Murillo, Domínguez-Salas & Gómez-Salgado, 2021). Moreover, during the outbreak of COVID-19, SOC was positively associated with psychological well-being (Barni *et al.*, 2020). Getting to the point, a high level of SOC helps individuals to perceive their situation as more understandable, meaningful, and likely to change using their own resources. This may be why people with a higher SOC level in our study perceived the COVID-19 outbreak more as a challenge and less as a threat or harm/loss.

Finally, we revealed that the frequency of stress coping strategies used by men is positively and weakly/moderately related to the evaluation of the pandemic situation as a threat and harm/loss but is not related to the appraisal of the situation as a challenge. By contrast, in women we observed positive and very weak/weak relationships between the frequency of stress coping strategies and the appraisal of stress as a threat and a challenge but no relationship with the evaluation of the situation as harm/loss.

The results suggest that the relationship between stress appraisal and the frequency of coping strategies differs by gender.

Men intensify their coping efforts when they interpret their situation as loss, whereas women react in this way when they interpret their situation as a threat but also as a challenge. In a study by Ptacek, Smith and Zanas (1992), evaluating the stressor as a challenge was more often associated with problem-focused coping than with evaluating the situation as a threat for both genders. Men, as compared to women, no matter whether they assessed the stressor as a threat or a challenge, were more likely to cope by focusing on the problem. To sum up the results of our study in the context of already existing data, men, regardless of whether they interpret the situation as a threat or a challenge, focus on solving the problem, which can lead to quick removal of the source of stress without the need to use different coping strategies. When a situation is perceived by men as a loss, they intensify their coping skills (coping frequency) to deal with the perceived loss. Women, on the other hand, cope by focusing on the problem when they interpret the situation as a challenge. However, in contrast to men, a high frequency of coping skills in women is associated with the interpretation of situation as a challenge.

Apart from checking gender differences in the level of stress appraisal, stress coping strategies, and the sense of coherence, as well as relations between these variables, our main objective was to assess whether there are gender differences in the effect the sense of coherence has on the frequency of stress coping strategies, including two types of stress appraisal: as a threat and harm/loss and a challenge (challenge-activity and challenge-passivity). Indeed, the results indicated that there were gender differences in the effect that the sense of coherence had on the frequency of stress coping strategies. We observed that the direct relationship between the sense of coherence and stress coping strategies was insignificant in both genders. However, when the stress appraisal variable was included in the mediation model, a direct relationship was revealed in men but not in women.

In the case of women, we observed two indirect paths between the sense of coherence and stress coping strategies: a weak negative mediation effect for the appraisal of stress as a threat and harm/loss and a weak positive mediation effect for the appraisal of stress as a challenge. In the case of men, apart from the direct path, we observed only one indirect path: a weak and negative mediation effect through the appraisal of stress as a threat and harm/loss. These results are in contrast to Braun-Lewensohn, Sagy, and Roth (2011), who did not demonstrate a mediating effect of stress appraisal between SOC and stress reactions among adolescents facing an acutely stressful situation. However, they did not analyze the mediation mechanism separately in girls and boys. Although further studies are needed in this area, our results reveal that depending on their assessment of the situation both genders differed in the way their personal characteristics (e.g., SOC) were related to the frequency of their coping strategies. Our results suggest that the function of SOC (as an intensifier of coping) is dependent on whether the stressor is appraised as a threat, harm/loss, or a challenge. In the pandemic situation, one of the main factors determining the level of stress and the nature of the interpretation of the situation as stressful are media reports about COVID-19 (Garfin, Silver & Holman, 2020).

Interestingly, coping with a pandemic by using social media is more common among women than men (Pahayahay & Khalili-

Mahani, 2020). Unfortunately, frequent use of this type of media is associated with a negative impact on perceived stress among women (Prowse *et al.*, 2021). Considering the above, the mediating effect of stress appraisal that we detected in our study between SOC and the frequency of stress coping strategies (especially for women) may confirm the results of the study of Ahmad *et al.* (2021). They not only indicated that women showed more fear and were more worried about the pandemic situation than men, but also that women were more sensitive to information about the COVID-19 pandemic than men. This fact may play a key role in the appraisal of a stressful situation such as the pandemic and mediate the relationship between SOC and the frequency of stress coping strategies.

Limitations and practical implications

Notwithstanding the results, our conclusions should be formulated carefully. The study has some methodological limitations that should be presented. First of all, we did not compare gender differences in non-pandemic and COVID-19 pandemic situations. Therefore, we cannot conclude that observed gender differences results from the pandemic. Indeed, previous studies conducted in stressful conditions reveal results mostly consistent with our observations. Lockdown triggered stress reaction and thus, we could observe coping and stress appraisal in conditions close to a natural experiment. Therefore, in our opinion, the results can be generalized to stressful situations that are unusual, uncontrolled, and have unpredictable consequences. Since the pandemic is a worldwide situation, it can be assumed that similar results will be observed in populations culturally similar to Polish adults. However, it should be remembered that the actions of governments in different countries varied. The lockdown in Poland was introduced when there were very few infections in the country and was very restrictive. The sudden announcement of many restrictions, which were severe for everyday life, could have caused a strong stress reaction related to an unknown virus. When considering the possibilities of generalizing our research results, we must indicate that our sampling has a number of limitations. The study was conducted online, so only internet users took part in it. Moreover, despite the wide age range (18–71 year-olds), most participants were young adults (20–40 year-olds). We did not collect additional data on the sample (e.g., education, profession, SES, health status) and we did not control sociodemographic factors in our analyses, which should be done in future studies. We collected some types of the data like the amount of time spent on tracking pandemic information or type of work but we did not control these variables. It was because many reasons. For example, retirees could spend more time tracking information because they had more free time than students and people of working age but also people working online could spend more time on the internet than those at places of employment. Older people could experience a higher level of stress because of COVID-19 and at the same time, people working stationery could experience more intense stress associated with the possibility of becoming infected. The sample was also biased by gender: we collected more data from women than men. Although it is a common phenomenon that women more often than men take part in psychological research, taking

into account the objectives of our study, gender group inequality is a challenge for our study.

The results of our research confirm that women and men react differently to a stressful situation such as the pandemic, which in turn has implications for the intensity and diversity of their coping activities. Our study shows that the sense of coherence, which itself is a factor widely recognized in the literature as specific support for coping with stress, is related to the frequency of stress coping strategies; however, its effect on coping is shaped through the way a given stressor is evaluated. This may provide important indications of defense against stress in the current COVID-19 outbreak situation to both individuals and larger social system players such as the media. As previous research has shown, people have a particular tendency to use mass media during a pandemic. Therefore, when working with individuals, it is important to increase their sensitivity to media content, which may influence their assessment of stressors as a challenge or a threat and harm/loss, and thus modify their coping skills regardless of their life orientation. In addition, media representatives also need to be aware of the mechanisms through which information can influence the specific coping skills of their audience. The detected relations indicating the moderating role that the appraisal of the COVID-19 stressor has on the relationship between the perception of the world (SOC) and the frequency of coping efforts require further research which could take into account, for example, the aspect of cultural differences.

This research meet all applicable standards with regard to the ethics of research integrity and have been approved by the Ethical Committee, Institute of Psychology, Pedagogical University of Krakow.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in OSF at <https://osf.io/3aytd/> reference number DOI 10.17605/OSF.IO/3AYTD

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