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Impact of COVID-19 on Public Mental Health and the Buffering Effect of a Sense of Coherence

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Abstract
Introduction: It is claimed that the coronavirus disease 2019 (COVID-19) pandemic has had a negative impact on mental health. However, to date, prospective studies are lacking. Moreover, it is important to identify which factors modulate the stress response to the pandemic. Previously, sense of coherence (SOC) has emerged as a particularly important resistance factor. ***Objective:*** This prospective study aimed to assess the impact of the COVID-19 outbreak on mental health and to investigate the ability of pre-outbreak SOC levels to predict changes in psychopathological symptoms. ***Methods:*** This study assessed psychopathological symptoms and SOC before and after the COVID-19 outbreak as well as post-outbreak COVID-19-related traumatic distress in a German-speaking sample (n = 1,591). Bivariate latent change score (BLCS) modeling was used to analyze pre- to post-outbreak changes in psychopathological symptoms and the ability of SOC to predict symptom changes. ***Results:*** Overall, there was no change in psychopathological symptoms. However, on an individual-respondent level, 10% experienced a clinically significant increase in psychopathological symptoms and 15% met cut-off criteria for COVID-19-related traumatic distress. Using BLCS modeling, we identified a high-stress group experiencing an increase in psychopathological symptoms and a decrease in SOC and a low-stress group showing the reversed pattern. Changes in SOC and psychopathological symptoms were predicted by pre-outbreak SOC and psychopathological symptom levels. ***Conclusions:*** Although mental health was stable in most respondents, a small group of respondents characterized by low levels of SOC experienced increased psychopathological symptoms from pre- to post-outbreak. Thus, SOC training might be a promising approach to enhance the resistance to stressors.

Introduction

In March 2020, the outbreak of the coronavirus disease 2019 (COVID-19) reached all countries of the Western world [1]. To reduce the speed of its spread, many countries slowed down their economies and enforced pronounced restrictions on public life.

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Effects of COVID-19 on Mental Health

It is well known that pandemics pose a threat to mental health [2–4]. Correspondingly, 2 recent reviews found a consistently negative impact of COVID-19 on mental health, with 16–18% of participants showing symptoms of anxiety and depression [5, 6]. The first evidence indicates that women [7, 8], younger people [9], and those with a poor sleep quality [7, 9] are at an increased risk for mental health problems.

However, so far, no study has assessed whether mental health in the general population has genuinely changed from pre- to post-outbreak. We had conducted a panel study in Germany shortly before the outbreak (February 17–23, 2020) that investigated associations between mental health and health-promoting factors. We were able to contact respondents again in mid-March after the outbreak to gather data reflective of the pandemic's impact on mental health. Furthermore, we assessed the resistance factor of sense of coherence (SOC), which constitutes an important step towards developing interventions aimed at buffering the effects of global stressors [10–12].

Potential Use of Resistance Factors

Such interventions may target resistance factors like SOC, the key component of the salutogenesis framework [13, 14]. Individuals with high levels of SOC perceive life as comprehensible and manageable and believe that life challenges reflect a potential source of growth. In the salutogenesis framework, SOC is conceptualized as a stable disposition that is particularly important in situations that are perceived as highly demanding [15] (see online suppl. material; for all online suppl. material, see www.karger.com/doi/10.1159/000510752). However, previous research has also found short-term stressor-related changes in SOC, challenging its temporal stability [16]. SOC shows a robust positive correlation with mental health [17–19]. Moreover, it may also reflect an aspect of euthymia [20, 21]. The positive component of euthymia is characterized by resistance, flexibility, and a unifying outlook on life-guiding actions and feelings to shape one's future, the latter of which may be encompassed by SOC.

Yet, little is known about the ability of SOC to predict changes in mental health. Only 2 studies – assessing women after pregnancy loss and patients with mental disorders in a psychosomatic rehabilitation clinic – found SOC to be predictive of changes in mental health [22, 23]. However, these studies did not apply state-of-the-art methods for prospective data [24].

Study Aim

In the current study, we aimed to examine the number of respondents who experienced a clinically significant change in psychopathological symptom levels from pre- to post-outbreak assessment or significant levels of COVID-19-related traumatic distress. Based on previous studies on COVID-19-related traumatic distress [5, 25], we expected significant levels of traumatic distress in 10–20% of the sample and stronger stress responses in females, younger respondents, and those reporting a poor sleep quality. Moreover, building on studies on the SARS epidemic [26], we hypothesized that some respondents would show an increase in psychopathological symptoms from pre- to post-outbreak. In line with previous research [16], we expected SOC to decrease over time in those experiencing high levels of stress. Second, we aimed to examine the ability of SOC to predict symptom changes, which should be particularly strong in those experiencing high COVID-19-related stress.

Materials and Methods

Study Design and Sample Recruitment

The current study is part of a larger project investigating the factorial structure of health-promoting factors. For sample recruitment, we used an online panel (WiSoPanel, https://www.wisopanel.net [27]; see online suppl. material for details). Data were collected via the platform SoSci Survey [28] and respondents gave written informed consent according to the Declaration of Helsinki [29] (Fig. 1; online suppl. material).

Measures

SOC was assessed using a 9-item short version of the Antonovsky scales [30]. Psychopathological symptoms were measured using the Mini-Symptom Checklist [31]. Sleep quality during the last week was measured at the post-outbreak assessment using the Single-Item Sleep Quality Scale [32]. COVID-19-related rumination was evaluated at the post-outbreak assessment using a modified version of the Perseverative Thinking Questionnaire (PTQ) [33]. COVID-19-related traumatic distress was measured using a modified version of the Peritraumatic Distress Inventory (PDI) [34]. Following Bunnell et al. [35], scores ≥23 indicate a greater risk for COVID-19-related traumatic distress (see online suppl. material).

Calculation of COVID-19-Related Stress Scores

To assess respondents' COVID-19-related stress, we calculated a COVID-19 stress index as the sum of the *z*-standardized scores of PTQ and PDI (see online suppl. material). Higher scores indicate more severe stress. Scores >0 reflect an above-average COVID-19-related stress burden (high COVID-19-related stress group, score >0; low COVID-19-related stress group, score ≤0).

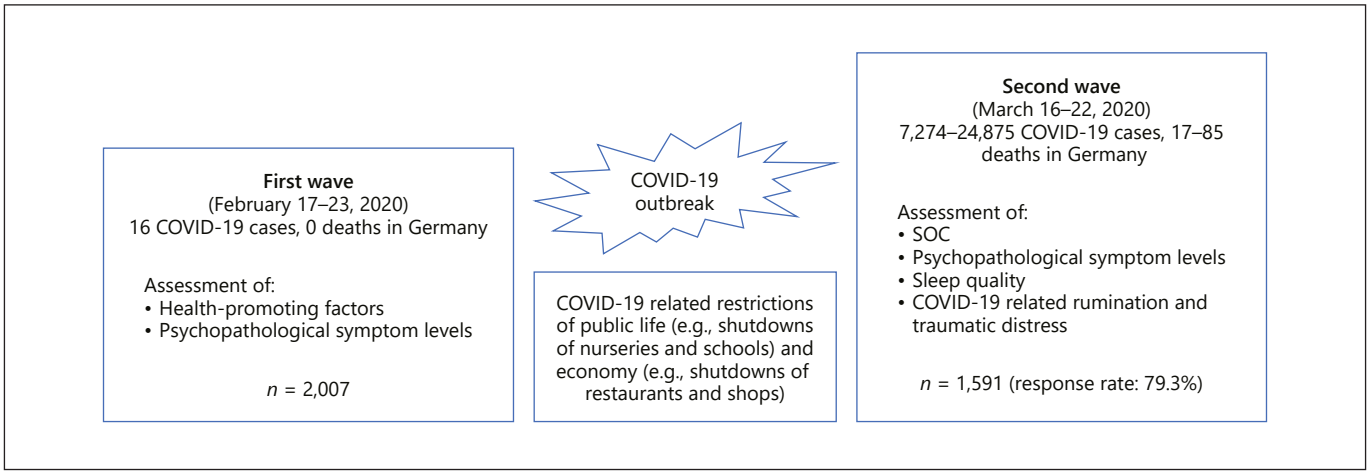

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Fig. 1. Details of the study design.

Data Analyses

Analyses were conducted using RStudio [28] and the lavaan package [29]. We calculated reliable change indices according to the Mini Symptom Checklist (Mini-SCL) manual to quantify clinically significant changes in psychopathological symptoms. To further analyze pre- to post- changes in psychopathological symptoms and SOC and the ability of SOC to predict symptom changes, we applied bivariate latent change score (BLCS) models [27, 36] (see online suppl. material).

Results

Sample Characteristics

The mean age of the participants who completed the second assessment (n = 1,591) was 55.03 years (SD = 13.90, range: 20–95) and 53.6% were female. The majority lived in Germany (96.2%), 2.3% lived in Austria, 1.1% lived in Switzerland, and 0.4% were German speaking but reported living in other countries (i.e., French-German border area). See the online supplementary material for a comparison with the German general public and results after excluding respondents not living in Germany.

Reliable Change in Psychopathological Symptoms

We analyzed reliable change indices and found significant changes from pre- to post-outbreak in 18% of the respondents (n = 287), whereby 10% (n = 152) showed a significant increase and 8% (n = 135) a significant decrease in psychopathological symptom levels. Moreover, 15% exceeded the PDI cut-off for traumatic distress.

Pre- to Post-Outbreak Change Using BLCS

The separate BLCS models for the total sample, the high-stress group (stress score >0, n = 634) and the low-stress group (stress score ≤0, n = 862) showed a good fit (CFI = 1.00; SRMR = 0.00). In the total sample, there was no change in psychopathological symptoms and SOC levels from pre- to post-outbreak (Fig. 2; Table 1). By contrast, in the high-stress group, symptom levels increased while SOC levels decreased. Changes in SOC levels and psychopathological symptoms were negatively correlated. In the low-stress group, psychopathological symptoms decreased from pre- to post-outbreak assessment and SOC levels increased. Again, both changes were negatively correlated.

Differences between the High and Low-Stress Groups

Analyses of group differences revealed that individuals in the high-stress group reported a poorer sleep quality (t[1,469] = 6.72, p < 0.001, d = 0.35, OR = 1.16) and were younger (t[1,470] = 3.74, p < 0.001, d = 0.20; OR = 1.01) and more likely to be female (χ^2[1] = 12.69, p < 0.001, OR = 1.46). The groups did not differ in terms of education level (χ^2[5] = 7.06, p = 0.217). Moreover, the respondents in the high-stress group were not more likely to live in the federal states of Germany that had reported the highest numbers of COVID-19 cases at the post-outbreak assessment (i.e., Bavaria and North-Rhine Westphalia; χ^2[1] = 0.00, p = 0.974, OR = 1.00).

Ability of SOC to Predict Symptom Changes

In the total sample, individual changes in psychopathological symptoms were significantly predicted by

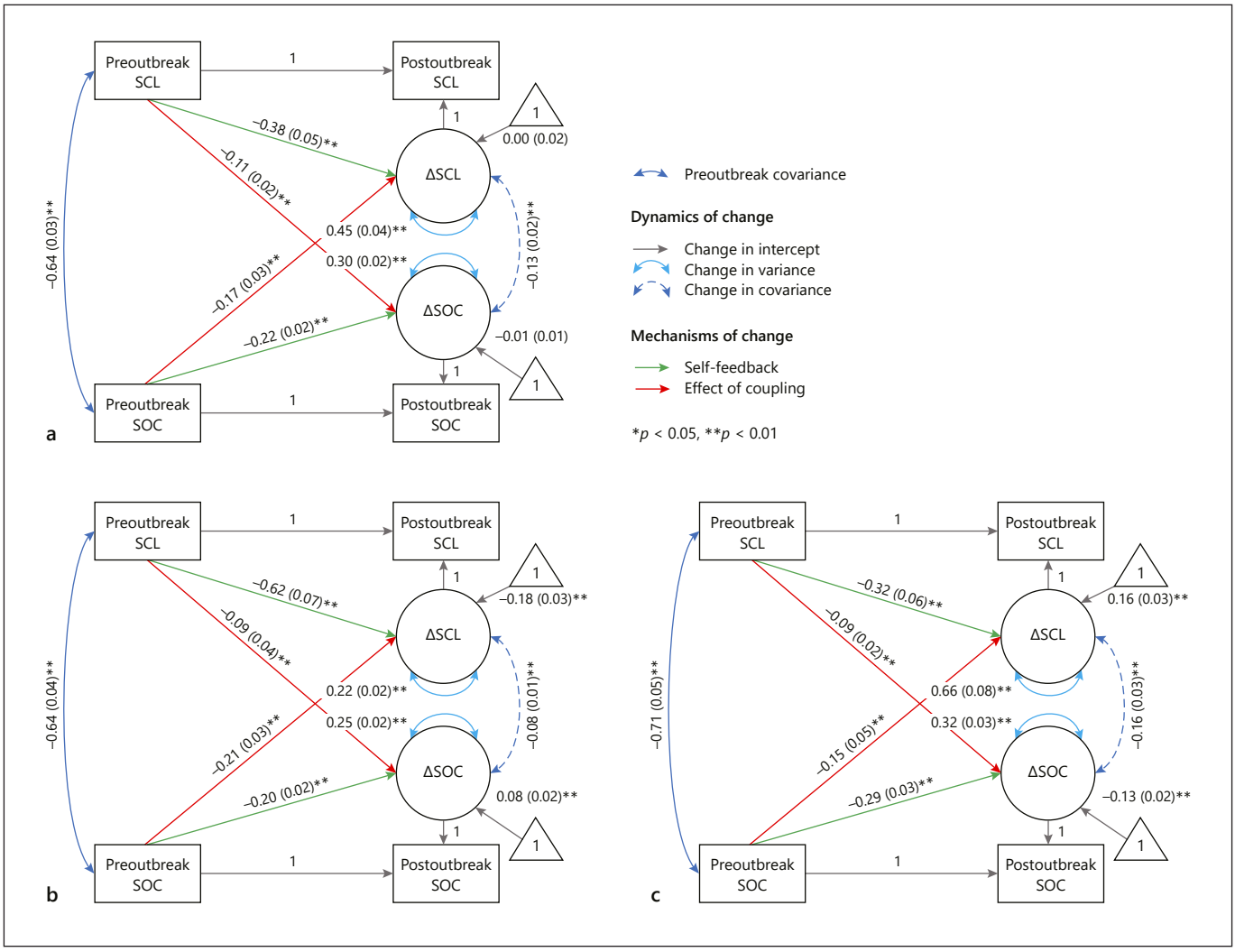

Fig. 2. Estimated parameters for the BLCS model of the relationship between psychopathological symptoms (assessed using the Mini-SCL and SOC). Unstandardized parameters are reported for the total sample (n = 1,591) (**a**) as well as separately for the low- (n = 862) (**b**) and the high-COVID-19-related-stress groups (n = 634) (**c**). **b**, **c** Due to missing data for COVID-19-related rumination and traumatic distress, not all respondents could be included in the subgroup analyses.

pre-outbreak symptoms and pre-outbreak SOC levels. The same pattern of results was found in the high-stress group and the low-stress group (Table 1). Across all analyses, higher pre-outbreak SOC levels were associated with smaller changes (i.e., increases and decreases) in symptom levels.

Ability of Psychopathological Symptoms to Predict SOC Changes

In the total sample, individual changes in SOC were significantly predicted by the pre-outbreak SOC and pre-outbreak symptoms. The findings were the same for the high-stress group and the low-stress group (Table 1). Higher pre-outbreak symptom levels were related to smaller changes in SOC levels.

Discussion

This is the first study to examine mental health before and after the COVID-19 outbreak and potential modulatory effects of SOC. Despite the overall stability (82%), we identified clinically significant symptom changes in 18% of respondents (increased in 10% and decreased in 8%).

Table 1. Results of BLCS modeling

	Change in psychopathological symptoms (ΔMini-$_{SCL}$)	Change in SOC (Δ_{SOC})	Association of change (ρ)	Ability of pre-outbreak SOC to predict symptom change (γ_{SOC})	Ability of pre-outbreak SOC to predict SOC change (β_{SOC})	Ability of pre-outbreak symptoms to predict SOC change (γMini-$_{SCL}$)	Ability of pre-outbreak symptoms to predict symptom change (βMini-$_{SCL}$)
Total sample							
Intercept	0.00	–0.01	–0.13	–0.17	–0.22	–0.11	–0.38
z	0.10	–0.33	–9.07	–5.52	–11.51	–5.45	–8.10
p	0.924	0.744	<0.001	<0.001	<0.001	<0.001	<0.001
High-stress group							
Intercept	0.16	–0.13	–0.16	–0.15	–0.29	–0.09	–0.32
z	5.44	–5.54	–0.623	–0.295	–8.88	–4.04	–5.62
p	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001
Low-stress group							
Intercept	–0.18	0.08	–0.08	–0.21	–0.20	–0.09	–0.62
z	–7.07	4.09	4.09	–6.95	–0.824	–2.50	–9.45
p	<0.001	<0.001	<0.001	<0.001	<0.001	0.012	<0.001

Moreover, 15% showed above-cut-off COVID-19-related traumatic distress. Taking COVID-19-related stress into account, we identified a group that experienced above-average stress levels and another group that experienced below-average stress levels. While symptoms increased in the high-stress group, the low-stress group showed reduced symptoms at the post-outbreak assessment. Moreover, we consistently identified SOC as a predictor of individual symptom change, with higher SOC levels predicting smaller symptom changes.

In line with previous research, we found stress to be higher in women [7, 8] and younger respondents [9]. One may assume that as-of-yet-unknown factors contributed to this observation (e.g., women may be more stressed during lockdown, as they may be overproportionately burdened by childcare duties). Furthermore, corresponding to prior studies [7, 9], stress levels were higher in respondents experiencing a poor sleep quality. Interestingly, respondents living in high-risk regions were not more likely to report higher levels of COVID-19-related stress. As such, factors that are associated with a greater psychological vulnerability seem to be more important than factors associated with the risk of infection in predicting mental health consequences of the pandemic.

Beyond insights on risk factors of COVID-19 related psychopathology, the current study sheds further light on the impact of SOC on psychopathology. Our results firstly demonstrate that pre-stressor SOC predicts symptom changes over a short pre- to post-assessment interval. Higher levels of pre-outbreak SOC were related to smaller symptom changes. SOC may thus buffer the impact of stressors on mental health without necessarily resulting in lower symptom levels. Moreover, we did not find differences between the high-stress group and low-stress group concerning the ability of SOC ability to predict symptom changes. Thereby, our findings challenge the assumption that SOC is of particular importance in high-stress situations and may thus suggest its universal relevance as a component of euthymia [20, 21]. Additionally, our study provides important insights into the temporal stability of SOC. Consistent with the salutogenesis framework [13], we did not find an overall change in SOC levels. However, in line with previous studies challenging the concept of a stable disposition [16, 37], we found SOC to be reduced in respondents reporting above-average stress levels. By contrast, those experiencing below-average stress reported increased levels of SOC and decreased symptom levels. No study to date has demonstrated such a steeling effect of stressful life events on SOC [38]. These findings indicate that SOC-targeting trainings [39, 40] may be useful to enhance resistance by enabling individuals to buffer negative mental health consequences of stressors.

The current study has the following limitations. First, this study used a nonrepresentative sample (see online suppl. material for details) and was purely observational. We aimed to account for different responses to COVID-19 by conducting subgroup analyses. However, changes in psychopathological symptoms also occur in a percentage of respondents when assessing cohorts over

time without specific stressors [41, 42], which may account for some of the findings. Nevertheless, it is important to note that significant pre- to post-symptom increases were more likely in the high-stress group than in the low-COVID-19-stress group ($\chi^2[1] = 52.87, p < 0.001$). This finding strengthens our interpretation. Second, to assess COVID-19-related stress we had to modify well-established instruments, thereby affecting cross-study comparability. Third, the time of assessment may not capture the most stressful period of the COVID-19 outbreak but rather a marked change in policymaking in Germany. Thus, we plan to conduct 2 further assessments in the sample, which will also explore the surprising finding of a potential steeling effect, its potential sources (e.g., successful use of coping resources), and why higher pre-outbreak psychopathological symptom levels were related to smaller symptom changes.

Despite these limitations, the findings of the current study improve our understanding of the mental health consequences of COVID-19. Despite the majority of respondents showing no clinically significant symptom change, our results demonstrate that a group of respondents characterized by low levels of SOC may be at risk for the development of clinically significant symptom change from pre- to post-outbreak. Future studies should investigate the pandemic's impact on public mental health but also its influence on the mental health of health care professionals [43, 44]. Our results may also support the development of resilience trainings [45]. Furthermore, future research should address a broad range of psychosocial consequences of COVID-19 [11] and their impact on treatment access for mental disorders [46, 47].

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Statement of Ethics

This study was conducted in accordance with the ethical standards of the Ethics Committee of Saarland University and the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. According to the Ethics Committee of Saarland University, this study was exempt from ethical approval requirements.

Conflict of Interest Statement

This article received no support from any funding agency, commercial business, or not-for-profit institution. In the last 3 years, the authors have had no commercial conflict of interests.

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Author Contributions

S.K.S., M.R.S., C.G.S., T.M., and A.S.G. designed and planned this study. A.S.G. collected the data. S.K.S., M.R.S., C.G.S., and M.S. analyzed the data and interpreted the results. S.K.S., M.R.S., M.S., and T.M. wrote this paper. All of the authors reviewed and approved the final version of this paper.

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