Research Paper

The relationship between social media use, stress symptoms and burden caused by coronavirus (Covid-19) in Germany and Italy: A cross-sectional and longitudinal investigation [☆]

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A R T I C L E   I N F O

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A B S T R A C T

Introduction: The need for "social distancing" to reduce the spread of Covid-19 is accompanied by an increase of social media use (SMU). Many people engage in intensive online activity to find information about the current Covid-19 situation and to interact about it with other users. The present study investigated the extent of SMU as Covid-19 information source and its relationship with stress symptoms and burden caused by the pandemic in Germany and Italy.

Methods: Cross-national longitudinal (Germany, $N = 501$; 3-months period) and cross-sectional (Italy, $N = 951$) data on Covid-19 information sources, stress symptoms and burden caused by Covid-19 were collected via online surveys.

Results: About 50% of the German sample and about 60% of the Italian sample frequently used SM as Covid-19 information source. Cross-sectional analyses in both countries revealed that SMU is positively associated with stress symptoms and experienced burden. Moreover, stress symptoms mediated the link between SMU and burden. This was also confirmed by longitudinal analyses in Germany (burden assessed three months after SMU and stress symptoms).

Limitations: The mostly female and relatively young sample composition limits the generalizability of present findings. Only two European countries were investigated.

Conclusions: The present findings reveal a potential negative impact of enhanced SMU on individual mental health state and behavior. Additionally, they emphasize the significance of a conscious and cautious use of SM as information source specifically during the pandemic.

1. Introduction

"Social distancing" reduces physical contact among people. It is an important step to slow down the spread of the coronavirus disease 2019 (Covid-19; severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) (Fong et al., 2020). Its extent varies across countries, but mainly includes governmental measures such as temporary closure of schools, universities and non-essential businesses, bans on public gathering and travel, increased home-office and virtual-schooling. In some regions a total "stay-at-home" order belongs to the measures. The wearing of face masks and the maintaining of distance from other people in public places are mandatory in many countries (Lewnard and Lo, 2020; Sohrabi et al., 2020).

The introduced measures can restrict daily life and are perceived as a heavy burden by some people. This can result in a negative emotional response characterized by hopelessness, frustration and confusion (Salari et al., 2020). Depression and anxiety symptoms can increase (Bueno-Notivol et al., 2020). The way people perceive and deal with the Covid-19 situation can longitudinally impact their mental and physical health state (Galea et al., 2020; Salari et al., 2020). Of course, individuals may also experience the measures as less burden and react more adaptively, for instance maintaining a daily routine and making the best of the current Covid-19 situation (Brailovskaia and Margraf, 2020b). On this background, the investigation of factors that can predict the level of burden caused by the current Covid-19 situation is of great importance.

The early identification of the factors can contribute to the reduction of the burden experience and thus to the protection of both mental and physical health.

Considering recent research, stress symptoms could belong to such factors. In a longitudinal study, individuals who had higher stress levels six months prior to the pandemic outbreak, experienced higher burden by the outbreak than people with lower stress levels (Brailovskaia and Margraf, 2020b). Furthermore, cross-sectional studies described a close positive relationship between Covid-19 related stress (e.g., fear to be infected or that family members are infected) and dysfunctional coping-strategies, such as enhanced alcohol use and over-eating, as well as negative mental health outcomes, such as anxiety symptoms and sleep disturbances (e.g., Barzilay et al., 2020; Taylor et al., 2020).

Stress symptoms can be enhanced by different factors. Earlier studies conducted previously to the Covid-19 outbreak described a positive relationship between intensive use of social media (SM), such as Facebook, Instagram and Twitter, and the experience of stress (Brailovskaia and Margraf, 2017; Marino et al., 2018). Individuals who regularly use Facebook had higher stress levels than people who consciously waived the membership on this social platform (Brailovskaia et al., 2019). Emotional and cognitive overload caused by the high amount of information provided on SM and the permanent pressure to engage in multiple social interactions foster the stress level (Chen and Lee, 2013; Vanman et al., 2018).

The introduction of "social distance" to fight the pandemic spread resulted in a de facto increase of SM use (SMU). Many people were and still are isolated from in-person social interaction and turn to substitute social platforms (Cellini et al., 2020). Here, they find steady updated information about the Covid-19 situation. And in contrast to other information sources such as newspaper articles (print media), television reports and official sites of government and authorities, they can simultaneously communicate about the Covid-19 updates with other SM users – friends and strangers (Allington et al., 2020; Gao et al., 2020). This can reduce loneliness and increase the feeling of social connectedness (Bayer et al., 2020). However, on SM, fake news that exaggerate and falsify the official information can rapidly spread via for example retweets on Twitter and re-sharing of updates on Facebook (Brennen et al., 2020; Budhwani and Sun, 2020; Ng et al., 2018). Exposure to unfiltered (mis)information can foster stress symptoms and evoke negative emotions. The online communication about the negative experiences and Covid-19 related worries contributes to an emotional contagion and a rapid spread of the stress symptoms (Gao et al., 2020; Garfin et al., 2020; Holman et al., 2020). Stress symptoms, in combination with the fear of missing updates and the need for social exchange about the updates, contributes to further intensive SMU. This creates a vicious circle of SMU and stress feeding into each other (Garfin et al., 2015).

Based on the presented background, it can be assumed that intensive SMU as Covid-19 information source can contribute to an enhanced stress level that fosters the experience of burden by the current extraordinary situation. The investigation of this assumption can support the identification of individuals at risk for high burden experience, its reduction and thus the protection of mental and physical health. Therefore, the present study had two primary aims. First, the extent of SMU as Covid-19 information source should be compared with the use of other forms of media (i.e., newspaper articles, news reports on television and official governmental online sites). Second, following hypotheses should be investigated: It is expected that SMU as Covid-19 information source is positively associated with stress symptoms (Hypothesis 1a) and burden caused by Covid-19 (Hypothesis 1b). Stress symptoms and burden are assumed to be positively related (Hypothesis 1c). Moreover, it is expected that the link between SMU and burden is mediated by stress symptoms (Hypothesis 2).

To gain a broader cross-national picture about the potential impact of SMU on burden caused by Covid-19, it should be investigated whether similar result patterns occur in samples from two European countries: Germany and Italy. Moreover, to go beyond cross-sectional conclusions,

burden caused by Covid-19 should be assessed longitudinally at two measurement time points over a 3-months period in Germany.

Italy was the first European country that was seriously impacted by Covid-19 – specifically its Northern provinces. In the beginning of March 2020, the Italian government imposed national quarantine. The population was advised to stay at home except for necessary work, buying of food, and health circumstances. Easing of the lockdown was introduced in the end of May. Wearing of face masks in public places and keeping of distance remain mandatory (Ministero della Salute, 2020). On September 18, a total of 293,025 Covid-19 cases was registered in Italy (https://github.com/owid/covid-19-data/tree/master/public/data).

In Germany, the national quarantine started in the middle of March due to the rising Covid-19 cases. Its timeline and extent differed between the federal states. While in some states curfews were imposed, other states only encouraged a "stay-at-home". Nationalwide, public gatherings of more than two non-family members were prohibited. In the end of April, easing of the restrictions began. Wearing of face masks in public transport, shops and buildings with public traffic and keeping of distance remain mandatory (Bundesministerium für Gesundheit, 2020). On September 18, a total of 267,773 Covid-19 cases was registered in Germany (https://github.com/owid/covid-19-data/tree/master/public/data).

2. Methods

2.1. Procedure and participants

German sample. The German sample is comprised of 501 participants (76.4% women; $M_{age}(SD_{age})$ = 27.37(7.00), range: 18–71; occupation: 64.1% students, 34.5% employees, 1.2% unemployed, one retired person; marital status: 42.9% single, 43.5% with romantic partner, 13.6% married). At the first measurement time point (baseline, BL), 9.2% reported to belong to the Covid-19 risk group (i.e., age-related, pre-existing condition, weakened immune system) and one person was currently tested positive for Covid-19. In March 2020 (BL), an invitation including a link leading to the first online survey that assessed all variables of interest was emailed to a randomly collected group of 700 persons. They all are current or former students of a large university in the Ruhr region and had previously agreed to be contacted for research investigations. In June 2020 (follow-up, FU), 527 persons who responded to the first survey, received an emailed invitation including a link for the second online survey that assessed the level of experienced burden. There were no specific requirements for participation. It was voluntary and compensated by course credits for students.

Italian sample. The Italian sample is comprised of 951 participants (77.5% women; $M_{age}(SD_{age})$ = 24.86(5.62), range: 19–70; occupation: 87% students, 12% employees, 1.1% unemployed; marital status: 44.1% single, 42.7% with romantic partner, 13.2% married). Of them, 5.3% belonged in the Covid-19 risk group. One person has been currently tested positive for the virus, and four persons were previously tested positive but were recovered at the time of data collection. Data were collected between the end of April and the beginning of September 2020 via an online survey. The link to the survey was send to all institutional email addresses of the students of the University of Florence together with an invitation to disseminate the link via email or SM among friends and acquaintances. There were no specific requirements for participation, it was voluntary and not compensated.

The present study was approved by the responsible Ethics Committees in Germany and in Italy. All participants were provided instruction and gave informed consent to participate via an online form. The surveys were provided in the national language of the samples.

3. Measures

Covid-19 specific media use. Participants rated their usage frequency of various forms of media to inform themselves about the current Covid-

19 situation: 1) newspaper articles (print media), 2) news reports on television, 3) official sites of the federal government and authorities, and 4) social media (e.g., Facebook, Twitter) on a 7-point Likert scale (1 = *not at all*, 7 = *intensively*).

Stress symptoms. Stress symptoms were measured with the stress scale of the Depression Anxiety Stress Scales 21 (DASS-21; Lovibond and Lovibond, 1995). The seven items (e.g., "I tend to over-react to situations") are rated on a 4-point Likert scale (0 = *did not apply to me at all*; 3 = *applied to me very much or most of the time*; scale reliability: Germany, BL: Cronbach's α = 0.876; Italy: α = 0.891). The higher the sum score, the higher the level of the stress symptoms.

Burden caused by Covid-19. The experience of burden caused by Covid-19 was assessed with six items (e.g., "I am burdened by the current social situation", "I feel restricted in my everyday life") rated on a 7-point Likert scale (1 = *I do not agree*, 7 = *I totally agree*; scale reliability: Germany, BL: α = 0.757, FU: α = 0.783; Italy: α = 0.601). Higher sum scores indicate higher level of burden.

3.1. Statistical analyses

Statistical analyses were conducted using SPSS 26 and the macro Process version 2.16.1 (www.processmacro.org/index.html; Hayes, 2013). First, the extent of SMU was compared with the extent of use of the other information sources (i.e., newspaper articles (print media), news reports on television, official federal sites) by calculating dependent t-tests (effect size measure: Cohen's d). Next, zero-order bivariate correlations were calculated to assess the relationship between the information sources, stress symptoms and burden caused by Covid-19. In the last step, a mediation model was calculated (Process: model 4). SMU as Covid-19 information source was included as predictor in the model, stress symptoms as mediator and burden as outcome. In Germany, the model was calculated twice (outcome: 1. burden, BL; 2. burden, FU). Age and gender served as covariates. Path *a* denoted the relationship between SMU and stress symptoms; the association between stress symptoms and burden was denoted by path *b*. The indirect effect (*ab*) was represented by the combined effect of path *a* and path *b*. Path *c* (the total effect) denoted the basic link between SMU and burden, and path *c'* (the direct effect) denoted the association between SMU and burden after the inclusion of stress symptoms in the model. The mediation effect was assessed by the bootstrapping procedure (10,000 samples) that provides accelerated confidence intervals (CI 95%).

4. Results

As presented in Table 1, the usage patterns of the Covid-19 information sources show a similar trend in Germany and Italy.

In both countries, most participants frequently used official governmental sites as information source (range "4" to "7": Germany: 74.3%, Italy: 75.3%), followed by news reports on television (range "4" to "7": Germany: 66.5%, Italy: 67.1%) and SM (range "4" to "7": Germany: 49.3%, Italy: 59%). Newspaper reports (print media) were the least used media form (range "4" to "7": Germany: 19.2%, Italy: 19.8%).

More specifically, in both countries, t-tests revealed that participants tended to use SM significantly more frequently than newspaper articles (Germany: $t(500)$ = 12.000, $p < .001$, $d = 0.793$; Italy: $t(950)$ = 21.740, $p < .001$, $d = 1.005$), and less frequently than official governmental sites (Germany: $t(500)$ = −8.811, $p < .001$, $d = 0.362$; Italy: $t(950)$ = −7.967, $p < .001$, $d = 0.364$) and news reports on television (Germany: $t(500)$ = −5.750, $p < .001$, $d = 0.541$; Italy: $t(950)$ = −4.100, $p < .001$, $d = 0.174$) as source of Covid-19 information.

In Germany, the correlation analyses revealed that of SMU was the only information source that was significantly positively correlated with stress symptoms (*M(SD)* = 6.32(4.62), range: 0–19), $r = 0.128$, $p < .01$. Burden at BL (*M(SD)* = 23.18(6.43), range: 6–40) was significantly positively correlated with SMU, $r = 0.132$, $p < .01$, use of official governmental sites, $r = 0.107$, $p < .05$, and use of television news reports, $r = 0.105$,

Table 1

Descriptive statistics of the use of the Covid-19 information sources.

	Germany, *N* = 501	Italy, *N* = 951
M (SD; Min–Max)		
Newspaper	2.04 (1.63; 1–7)	2.11 (1.63; 1–7)
Television	4.29 (2.10; 1–7)	4.32 (1.99; 1–7)
Official Sites	4.60 (1.83; 1–7)	4.68 (1.87; 1–7)
Social Media	3.53 (2.10; 1–7)	3.97 (2.05; 1–7)
Frequency of ratings (%): Newspaper		
"1"	61.3	56.8
"2 to 3"	19.6	23.4
"4 to 5"	13.8	14.3
"6 to 7"	5.4	5.5
Frequency of ratings (%): Television		
"1"	18.2	14.1
"2 to 3"	15.4	18.8
"4 to 5"	30.1	33.2
"6 to 7"	36.3	33.9
Frequency of ratings (%): Official Sites		
"1"	9.4	8.6
"2 to 3"	16.4	16.1
"4 to 5"	36.9	35.6
"6 to 7"	37.3	39.6
Frequency of ratings (%): Social Media		
"1"	26.5	18.8
"2 to 3"	24.2	22.2
"4 to 5"	25.3	29.9
"6 to 7"	24	29.1

Notes. *M* = Mean, *SD* = Standard Deviation, *Min* = Minimum, *Max* = Maximum; due to rounding, the sum of the frequencies is not always 100%.

$p<.05$. Burden at FU (*M(SD)* = 21.60(6.51), range: 6–41) was significantly positively correlated only with SMU, $r = 0.112$, $p<.05$. Stress symptoms were significantly positively correlated with burden (burden, BL: $r = 0.445$, $p < .01$; burden, FU: $r = 0.318$, $p < .01$).

In Italy, SMU was also the only Covid-19 information source that was significantly positively correlated with stress symptoms (*M(SD)* = 9.75(4.91), range: 0–21), $r = 0.131$, $p < .01$. Burden (*M(SD)* = 23.57(6.08), range: 6–41) was significantly positively correlated with SMU, $r = 0.136$, $p<.01$, and with the use of official governmental sites, $r = 0.098$, $p<.01$. Stress symptoms and burden were significantly positively correlated, $r = 0.416$, $p < .01$.

As shown in Fig. 1a and Fig. 1b, in Germany, stress symptoms significantly mediated the positive association between SMU and burden caused by Covid-19. The basic relationship between SMU (predictor) and burden at BL (outcome) was significant (total effect, *c:* $p = .007$). The association between SMU and stress symptoms (mediator) (*a:* $p = .003$), and the relationship between stress symptoms and burden (*b:* $p < .001$) were also significant. After the inclusion of stress symptoms in the model, the link between SMU and burden was not significant (direct effect, *c':* $p = .118$). The indirect effect was significant (*ab*), $b = 0.177$, SE = 0.069, 95% CI [0.047, 0.317]. The same result patter was found in the model that included burden at FU as outcome: total effect, *c:* $p = .024$; *a:* $p = .003$; *b:* $p < .001$; direct effect, *c':* $p = .163$; indirect effect (*ab*), $b = 0.127$, SE = 0.051, 95% CI [0.033, 0.234].

In Italy, stress symptoms partly mediated the positive link between SMU and burden (see Fig. 1c). The basic association between SMU and burden was significant (total effect, *c:* $p < .001$). The relationship between SMU and stress symptoms (*a:* $p < .001$), and the link between stress symptoms and burden (*b:* $p < .001$) were also significant. After the inclusion of stress symptoms in the model, the association between SMU and burden remained significant (direct effect, *c':* $p = .005$), but was weaker than before the inclusion. The indirect effect was significant (*ab*), $b = 0.146$, SE = 0.042, 95% CI [0.066, 0.230].

5. Discussion

To slow down the spread of Covid-19, a large proportion of social interaction was transferred into the online world in the last months.
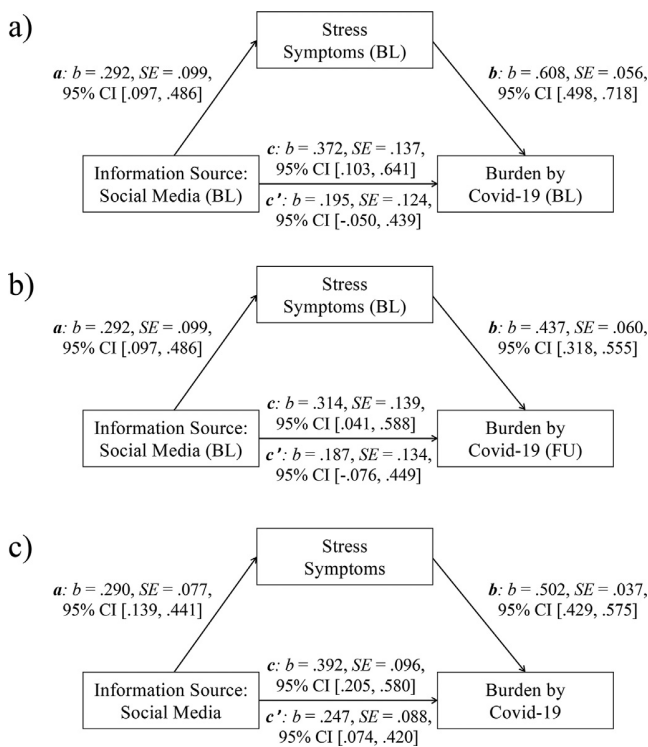
Fig. 1. Mediation model including social media as Covid-19 information source (predictor), stress symptoms (mediator), and burden caused by Covid-19 (outcome): a) German sample: all variables assessed at baseline; b) German sample: social media and stress symptoms assessed at baseline, burden assessed at follow-up; c) Italian sample: all variables assessed at the same measurement time point.

Notes. c = path of predictor to outcome, without inclusion of mediator (total effect); *a* = path of predictor to mediator; *b* = path of mediator to outcome; *c'* = path of predictor to outcome including mediator (direct effect); BL = baseline; FU = follow-up.

Consequently, the use of SM increased. Platforms such as Facebook and Twitter became significant sources and the main place of discussion of Covid-19 information (Cellini et al., 2020; Gao et al., 2020). In contrast to other information sources such as print media, television or official governmental sites, the content presented on SM is user-generated. This makes it prone to fake news and misinformation that can rapidly spread via sharing processes (Depoux et al., 2020).

The present study provides cross-sectional and longitudinal findings of the relationship between SMU as Covid-19 information source, stress symptoms and burden caused by the pandemic from Germany and Italy.

About 50% of the participants in Germany and about 60% of the participants in Italy, frequently used SM as Covid-19 information source. In both countries, SM were used more frequently than print sources and less frequently than official sites and news reports on television. Interestingly, only SMU as Covid-19 information source was significantly positively associated with stress symptoms (confirmation of Hypothesis 1a). Furthermore, burden caused by Covid-19 was positively associated with SMU (confirmation of Hypothesis 1b) and with stress symptoms (confirmation of Hypothesis 1c). Stress symptoms served as a mediator of the relationship between SMU and burden in cross-sectional and longitudinal analyses (confirmation of Hypothesis 2). The findings can be at least partly explained as following.

Previous research emphasized that intensive SMU can negatively impact mental health and contribute to the experience of stress (Brailovskaia and Margraf, 2017, 2020a; Twenge and Campbell, 2019). Emotional and cognitive overload by the steady updated unfiltered information and the permanent availability of social interaction on SM

were outlined as important reasons for this finding (Chen and Lee, 2013; Schmitt et al., 2018). The overload effect can be enhanced when the provided (mis)information refers to traumatic events such as terroristic attacks or environmental catastrophes (Thompson et al., 2017), or – as emphasized by present findings – extraordinary situations such as Covid-19 outbreak. Thus, the consume of (mis)information that is shared on SM in text and graphics often without verification of its accuracy can evoke stress symptoms. Individuals with enhanced stress symptoms perceive the current Covid-19 situation as a high burden (Brailovskaia and Margraf, 2020b). They experience hopelessness and frustration and are not able to adequately react to the introduced governmental measures and changes of daily life that are necessary to fight the pandemic. Their depression and anxiety level can increase (Bueno-Notivol et al., 2020).

Negative impact of intensive SMU such as reduction of life satisfaction, increase of depression, anxiety, insomnia, addictive tendencies, and suicide ideation has been reported by earlier research (Brailovskaia et al., 2020b; Marino et al., 2018). The present findings reveal similar result patterns in two different countries. They emphasize a potential negative effect of SMU specifically in the current extraordinary Covid-19 situation. SM may be used for strategic communication by government and authorities to stress the need for adherence to the introduced measure to reduce the Covid-19 spread, or to reassure the population (Allington et al., 2020; Garfin et al., 2020). However, it can also be used to spread fake news, misinformation and conspiracy theories that demoralize the population, negatively impact their mental and physical health and reduce the success of the fight with the pandemic (Orso et al., 2020; Pennycook et al., 2020). In contrast to other Covid-19 information sources that were investigated in the present study, SM content is generated and shared by the users. Therefore, everyone who engages in SMU is responsible for the provided information. To prevent the negative consequences of SMU, it is important to call public attention to the need of an accurate and conscious online behavior especially during the pandemic. Active users of SM who upload, share and comment the online content should consider its accuracy. For example, previously to re-/sharing and liking information, they can verify its accuracy on official governmental sites. They also can admonish people who share misinformation and contact the responsible SM operators. Passive users of SM who prefer to only observe the content generated by other users (e.g., reading of updates and comments) should be aware of the fact that the information they consume can be misleading and cause psychological processes that negatively impact their health and behavior. Thus, information provided on SM should be critically reviewed previously to drawing (emotional-driven) conclusions.

So far, the negative impact of intensive SMU is not addressed in governmental interventions to combat Covid-19. Making it a topic of discussion when planning further governmental measures, can be an important step for the protection of mental and physical health and the increase of adherence to the measures to reduce the Covid-19 spread.

Following limitations of the present study should be considered. First, the mostly female and relatively young composition of both samples limits the generalizability of present findings. Second, only individuals from Germany and Italy – two European countries – were included in the present investigation. Future studies should replicate current findings in other (non-European) countries. Third, previous research described a positive association between intensive SMU in general and stress symptoms (Brailovskaia et al., 2019; Chen and Lee, 2013; Vanman et al., 2018). Since the pandemic outbreak, time spent on SM increased (e.g., Gao et al., 2020). Therefore, it could be hypothesized that this also fosters the individual stress level and contributes to the experience of burden. However, in the current study, only the usage frequency of SM as Covid-19 information source was assessed. Thus, even though, the search for information belongs to the main reasons for SMU (e.g., Brailovskaia et al., 2020a), the present findings allow only the conclusion that SMU as Covid-19 information source can foster the stress level and the experience of burden by the current situation. To draw a conclusion about the level of SMU in general of the considered

sample, to investigate the hypothesized effect of SMU in general and to compare it with the specific effect of SMU as Covid-19 information source, a more detailed assessment of the online activity (e.g., which platforms are used, how much time is daily spent online, which are the main usage reasons, is the use rather passive or active) is suggested for future studies.

Fourth, the low internal consistency of the burden measure in the Italian sample might reduce the reliability of the present results. Fifth, the present findings emphasize the positive association between SMU as Covid-19 information source, stress symptoms, and the experience of burden. Available research on Covid-19 (e.g., Barzilay et al., 2020; Taylor et al., 2020) and research that was conducted before the pandemic outbreak (e.g., Levitan et al., 2019; Robinson, 2008) reported that the experience of psychological burden can result in dysfunctional coping-strategies that negatively impact the individual and can contribute to social conflicts, such as problematic alcohol use, over-eating, and aggressive behavior. Based on this background, it can be hypothesized that people who engage in intensive use of SM to stay up to date about the Covid-19 situation tend to enhanced stress levels and experience an increased level of burden which fosters dysfunctional behavior. However, no behavioral measures were assessed in the current study. Thus, it cannot for certain be concluded that participants with the highest SMU are also the ones who engage the most in dysfunctional coping-strategies. To investigate this hypothesis, future research is suggested to extend the present study by the inclusion of functional (e.g., providing of social support to other people, keeping the daily routine) and dysfunctional coping-strategies (e.g., alcohol use, aggressive behavior).

In conclusion, the present cross-national study reveals that the use of SM as Covid-19 information source can foster the experience of burden instantaneously and up to three months later. Stress symptoms mediate the association between SMU and burden. The call for public attention to these associations and to the need for a more responsible and conscious use of SM is urgent. It can enhance adherence with precautionary measures, and therefore reduce the spread of Covid-19 and protect mental and physical health.

Author statement contributors

Julia Brailovskaia, Fiammetta Cosci and Jürgen Margraf conducted the study design. Julia Brailovskaia wrote the first draft of the manuscript and conducted statistical analysis. Julia Brailovskaia conducted literature searches. Julia Brailovskaia, Fiammetta Cosci and Giovanni Mansueto conducted data collection. Julia Brailovskaia conducted data preparation. Fiammetta Cocsi, Giovanni Mansueto and Jürgen Margraf reviewed and edited the first draft. All authors contributed to and have approved the final manuscript. All authors state their compliance with the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Declaration of competing Interest

None.

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