



Social Media as Source of Information, Stress Symptoms, and Burden Caused by Coronavirus (COVID-19)

A Cross-National Investigation of Predictors

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Abstract: This cross-national study investigated the extent of social media use (SMU) as a source of information about COVID-19, and its relationship with the experienced burden caused by the pandemic. Representative data from eight countries (France, Germany, Poland, Russia, Spain, Sweden, the UK, the USA) were collected online (end of May to the beginning of June 2020). Of the overall 8,302 participants, 48.1% frequently used social media (SM) as a COVID-19 information source (range: 31.8% in Germany, to 65.4% in Poland). In the overall samples and in all country-specific samples, regression analyses revealed the experienced burden caused by COVID-19 to be positively associated with SMU and stress symptoms. Furthermore, stress symptoms partly mediated the relationship between SMU and the burden. The results emphasize the significant association between the use of SM as a source of information, individual emotional state, and behavior during the pandemic, as well as the significance of conscious and accurate use of SM specifically during the COVID-19 outbreak.

Keywords: COVID-19, social media use as an information source, stress symptoms, burden

The outbreak of the coronavirus disease 2019 (COVID-19; severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) has significantly changed everyday life across the globe. To slow down the spread of the pandemic (World Health Organization, 2020b), many governments declared a national lockdown starting March 2020 (World Health Organization, 2020a). The governmental measures to reduce physical contact (the introduction of so-called “social distancing”) include bans on public gathering and travel, temporary closure of schools, universities, and non-essential businesses, increased work-from-home orders and virtual-schooling, canceling of large-group and events, and total “stay-at-home” orders (Sohrabi et al., 2020). The wearing of face masks and the maintaining of distance from other people in public places are mandatory in many countries (e.g., Gershman, 2020; Gouvernement, 2020; McMurtry, 2020).

The extraordinary situation caused by the COVID-19 outbreak and the restrictions on daily life to slow down the virus spread have produced wide-ranging reactions in the population. Some people perceive them as a heavy psychological burden. They feel emotionally overwhelmed by the current situation and tend to a negative response characterized by uncertainty, anxiety, hopelessness, and frustration. They are afraid of the present situation and worry about their future life. Other individuals experience the current COVID-19 situation as less burden which contributes to a more emotionally adaptive response, including making the best of the current situation and trying to maintain a daily routine as far as possible (Brailovskaia & Margraf, 2020b). The way people perceive and deal with the current COVID-19 situation impacts their mental and physical health as well as their willingness to adhere to governmental measures and rules such as wearing face masks and

maintaining distance (Galea et al., 2020). Therefore, it is both important and urgent to investigate factors that can predict the level of burden experienced by the pandemic. This knowledge may be used to identify persons at risk for the experience of high burden and to reduce it.

To identify already published findings considering this issue, in June 2020, a systematic literature search in PubMed and PsycINFO databases and on Google Scholar was conducted using a combination of search keywords such as “COVID-19,” “pandemic,” “catastrophe,” “governmental measures,” “social distance/distancing,” “burden,” “mental health,” “physical health,” “predictor,” “risk factor,” and “protection.” In the following, the main results of the studies found in the search are presented. Overall, there were about 500 hints during the search. After the exclusion of duplicate publications and publications that did not focus on COVID-19 or other global pandemics, about 40 publications remained.

The global need for “social distance” resulted in a de facto increase in the use of social media (SM), as people were increasingly isolated from in-person social contacts and turned to substitute virtual social platforms such as Facebook, Instagram, and Twitter (Drouin et al., 2020; Gao et al., 2020; Zhong et al., 2021). Notably, there is a current controversial debate about the relationship between the use of SM, well-being, and individual behavior. While some researchers warn against the potential negative impact of intensive social media use (SMU; e.g., Rozgonjuk et al., 2021), other researchers emphasize that the association between SMU and well-being should not be overestimated and pathologized (Billieux et al., 2015; Carbonell & Panova, 2017). They explain their concern by, for example, the often weak evidence for the relationships of online activity that is often gained from cross-sectional studies which do not allow true conclusions on causality (Orben et al., 2019; Orben & Przybylski, 2019). The associations of SMU can be interpreted bidirectionally (Orben, 2020a), as long as the findings are not replicated by longitudinal and experimental research (Kraemer et al., 1997). Some studies did not find a significant association between SMU and well-being (Berryman et al., 2018; Coyne et al., 2020). Furthermore, the lack of an established theoretical background for the mechanisms that could explain the potential impact of SMU on well-being and behavior has been repeatedly criticized (Orben, 2020a; Orben et al., 2020).

Despite the controversial debate about the potential impact of SMU, it is important to acknowledge that the intensity of SMU enhanced since the outbreak of the pandemic (Boursier et al., 2020; Drouin et al., 2020). SMU provides the possibility to interact with friends and family, to perceive social support, and to escape feelings

of loneliness (Verduyn et al., 2017) which is specifically relevant in the current COVID-19 situation that requires bans on gathering and physical isolation (Gottlieb & Dyer, 2020). Furthermore, social platforms are often used as a source of information (Brailovskaia, Schillack, et al., 2020; Bridgman et al., 2020; Iordache & Pribeanu, 2016), especially when updates are not sufficiently provided by official governmental sources via television reports, print media, and official governmental online sites (Allington et al., 2020; Lin et al., 2020; Srivastava et al., 2020). The current COVID-19 situation is extraordinarily in many ways and its further duration and course are unclear. This evokes the strong need to be permanently up to date about all topics associated with the pandemic. SM seems to satisfy this need as they are a source of permanently available news (Garfin et al., 2020; Goel & Gupta, 2020).

While the official governmental sites allow a rather passive consumption of filtered information, SM (such as Facebook, Twitter, and Instagram) enables the users to actively participate in the creation, modification, and sharing of the content (Boyd & Ellison, 2007). As a consequence, SM in general and in the specific case of COVID-19 provide a lot of ongoing information, but also unfiltered misinformation amplified by emotions (Kouzy et al., 2020). Fake news articles and videos that exaggerate and falsify the official information – currently the information about COVID-19 – rapidly spread on SM via a viral process through – for example, re-tweets on Twitter, and liking and re-sharing of updates on Facebook (Apuke & Omar, 2021; Bridgman et al., 2020; Budhwani & Sun, 2020; Erku et al., 2021; Hussain, 2020). Many individuals believe the information presented on SM and re-share it without critically questioning its truthfulness. The falsified information can interfere the spread of officially verified information and cause wide-ranging negative consequences (Budhwani & Sun, 2020; González-Padilla & Tortolero-Blanco, 2020; Pennycook et al., 2020). For example, the sharing of fake news about the uselessness of governmental anti-COVID-19 measures, such as wearing of face masks and maintaining “social distance,” can result in a decrease of adherence to the measures and thus to a further spread of the pandemic (see Gandhi & Rutherford, 2020; Sunjaya & Jenkins, 2020).

Earlier studies on epidemics and extraordinary societal situations emphasized that enhanced exposure to such misinformation can negatively impact mental health (Garfin et al., 2015; Thompson et al., 2017). Similar findings were reported by current research on COVID-19 (Xiong et al., 2020). The intensity of SMU during the pandemic outbreak was described to be positively associated with sleep disturbances (Cellini et al., 2020). Moreover, it could foster symptoms of stress, depression, and anxiety (Drouin et al., 2020;

Gao et al., 2020; Zhong et al., 2021). Note that individuals who intensively use media in times of terrorist attacks were described to report similar or even higher acute stress symptoms and fear than people who were directly exposed to the attacks (Holman et al., 2014, 2020). The enhanced stress levels and the fear of missing new information, however, can foster further exposure to the media which can create a vicious circle of media use and stress feeding into each other (Garfin et al., 2015). In addition, SMU enables an almost unlimited social exchange with a large audience about the provided (mis)information and the feelings it evokes. The mutual sharing of crisis-related content on SM can contribute to emotional contagion and, therefore, a rapid spread of stress symptoms, fear, worry, hopelessness, and uncertainty (Erku et al., 2021; Gao et al., 2020; Kramer et al., 2014; Malecki et al., 2020; Ni et al., 2020). Based on prior research, it can be hypothesized that enhanced exposure to SM as a source of information about the current COVID-19 situation may contribute to negative emotions, particularly enhanced levels of stress symptoms. This could cause further negative consequences, as demonstrated in a recent longitudinal study, where stress symptoms were found to positively predict the experience of the psychological burden caused by the current COVID-19 situation (Brailovskaia & Margraf, 2020b). Notably, psychological burden negatively impacts mental health. It fosters the development of mental disorders and enhances existing symptoms (Bäuerle et al., 2020). Moreover, the experience of burden can reduce the level of adherence to the governmental measures that should reduce the pandemic spread (Bridgman et al., 2020). However, adherence to the measures is one of the most important factors that can reduce the pandemic spread (Eikenberry et al., 2020). Thus, the identification and the modification of factors that foster the experience of burden can protect mental health and contribute to the pandemic fight.

Considering the prior research and the importance of understanding predictors of burden experienced by the current COVID-19 situation, the present study had two primary aims. Recent research emphasized the need to differentiate between various types of media (especially digital technology) when assessing its relationship with well-being and behavior (Orben, 2020b). Against this background, first, the extent different forms of media, specifically SM, are used as a source of information about the current COVID-19 situation should be explored across a range of eight countries:

Research Question 1 (RQ1): Is the extent of SMU as a source of COVID-19 information lower, higher, or similar to the use of other forms of media (i.e., newspaper articles, news reports on television, and official governmental online sites) across different countries?

Second, the degree to which the use of SM as an information source and stress symptoms predict the level of burden experienced by COVID-19 should be examined. In a recent cross-national study that was published after the preparation of the present work, both the use of SM as a COVID-19 information source and stress symptoms positively predicted the level of experienced burden. Notably, in that study, the use of other information sources such as print media and television reports was not significantly related to the stress symptoms (Brailovskaia et al., 2021). Against this background, it is hypothesized that intensive use of SM as a COVID-19 information source might contribute to higher stress response and therefore greater experience of burden:

Hypothesis 1 (H1): It is assumed that the burden caused by COVID-19 is positively associated with the use of SM as a COVID-19 information source (H1a) and stress symptoms (H1b).

Hypothesis 2 (H2): Stress symptoms are assumed to mediate the relationship between SMU and burden.

Note that due to the cross-sectional design of the present study, no true conclusions on causality can be drawn. Only hypothetical assumptions are possible.

The extent of the COVID-19 spread and the governmental measures to control it vary widely among countries. Thus, the response to the present research question and the results may differ cross-nationally. Brailovskaia et al. (2021) who found a positive relationship between SMU, stress symptoms, and COVID-19 burden investigated samples from Germany and Italy. Both samples included mostly young and female student participants which limits the generalizability of the findings. Notably, students belong to the main group of users of SM (Marino et al., 2018). Therefore, to gain a broader cross-national picture and to better evaluate the impact of the COVID-19 situation, it is important to investigate further countries in parallel and to focus on more population-representative samples. Using the framework of previous comparisons of countries with different welfare systems (Scholten et al., 2018; Scholten, Velten, Neher, et al., 2017), participants from eight countries with quite different case numbers of COVID-19 were investigated: France (FR), Germany (GE), Poland (PL), Russia (RU), Spain (ES), Sweden (SV), the UK (UK), and the USA (US) (see Scholten et al., 2018; Scholten, Velten, Neher, et al., 2017). Table 1 presents the COVID-19 statistics of the eight countries up to June 5, 2020. The figures are based on the information provided by Hasell et al. (2021) who receive data from the COVID-19 Data Repository by the Center for Systems Science and Engineering (CSSE) at Johns Hopkins University (JHU, USA).

Table 1. Demographic variables and COVID-19 statistics (overall, all samples separately)

| | All | FR | GE | PL | RU | ES | SV | UK | US |
|---|------|---------|---------|--------|---------|---------|--------|---------|-----------|
| Gender (female, %) | 53.3 | 58.2 | 51.7 | 54.1 | 55.4 | 51.3 | 51.5 | 52.1 | 52.1 |
| Age groups (%) | | | | | | | | | |
| 18–24 years | 8.7 | 9.4 | 7.6 | 9.5 | 8.4 | 6.6 | 7.0 | 10.4 | 10.0 |
| 25–34 years | 16.9 | 14.5 | 13.9 | 17.8 | 21.1 | 14.3 | 21.3 | 18.2 | 13.9 |
| 35–44 years | 16.4 | 15.2 | 14.5 | 18.9 | 19.9 | 21.2 | 9.2 | 16.8 | 15.2 |
| 45–54 years | 18.1 | 18.2 | 19.0 | 15.1 | 17.3 | 20.5 | 18.7 | 17.8 | 18.2 |
| 55 years and older | 39.9 | 42.7 | 44.9 | 38.7 | 33.4 | 37.4 | 43.9 | 36.8 | 42.7 |
| Marital status (%) | | | | | | | | | |
| Single | 24.1 | 22.7 | 26.6 | 19.8 | 16.6 | 23.2 | 33.4 | 27.6 | 22.5 |
| Romantic relationship, not married | 16.5 | 22.9 | 14.0 | 18.6 | 11.5 | 19.7 | 21.6 | 16.0 | 8.4 |
| Married | 46.8 | 42.3 | 44.2 | 49.9 | 56.9 | 47.5 | 35.0 | 44.5 | 54.4 |
| Widowed, divorced | 12.5 | 12.2 | 15.2 | 11.7 | 14.9 | 9.6 | 10.1 | 11.9 | 14.7 |
| Social Status (%) | | | | | | | | | |
| Lower class | 5.3 | 7.4 | 7.5 | 3.6 | 2.8 | 4.4 | 5.3 | 3.1 | 8.9 |
| Working class | 22.4 | 19.7 | 18.9 | 16.3 | 18.9 | 31.5 | 21.4 | 34.8 | 15.8 |
| Lower middle class | 26.0 | 26.9 | 24.8 | 32.8 | 38.2 | 20.7 | 14.0 | 29.7 | 19.5 |
| Middle middle class | 36.5 | 32.9 | 38.9 | 36.1 | 35.9 | 37.1 | 46.4 | 27.6 | 38.7 |
| Upper middle class | 8.7 | 11.4 | 8.9 | 8.4 | 3.6 | 6.3 | 11.9 | 4.8 | 15.5 |
| Upper class | 1.1 | 1.7 | 0.9 | 2.7 | 0.7 | 0.1 | 1.1 | 0.2 | 1.6 |
| Living environment (%) | | | | | | | | | |
| Large city | 42.3 | 28.7 | 35.1 | 48.9 | 77.2 | 38.9 | 48.3 | 25.4 | 38.1 |
| Small city | 34.9 | 40.0 | 36.5 | 36.4 | 19.6 | 40.8 | 32.2 | 34.8 | 39.3 |
| Rural community | 22.8 | 31.3 | 28.4 | 14.6 | 3.2 | 20.4 | 19.6 | 39.8 | 22.6 |
| COVID-19 statistics, status: June 5, 2020 | | | | | | | | | |
| Confirmed cases | | 192,450 | 184,924 | 25,410 | 449,256 | 240,978 | 43,441 | 264,150 | 1,904,544 |
| Deaths | | 29,114 | 8,658 | 1,137 | 5,520 | 27,134 | 4,639 | 38,505 | 112,574 |

Note. All: $N = 8,302$, France (FR): $N = 1,010$, Germany (GE): $N = 1,020$, Poland (PL): $N = 1,018$, Russia (RU): $N = 1,040$, Spain (ES): $N = 1,011$, Sweden (SV): $N = 1,001$, UK (UK): $N = 1,197$, USA (US): $N = 1,018$; due to rounding, the sum of the frequencies is not always 100%. Figures considering COVID-19 are based on information provided by Hasell et al. (2021).

On June 5, 2020, there were more than 6,782,000 reported COVID-19 cases and more than 397,000 deaths due to COVID-19 worldwide (Hasell et al., 2021). The countries investigated in the current study were placed as following in the ranking from most to least cases, based on their total COVID-19 case numbers: USA (> 1,904,000 cases), Russia (> 449,000 cases), UK (> 264,000 cases), Spain (> 240,000), France (> 192,000 cases), Germany (> 184,000), Sweden (> 43,000), and Poland (> 25,000 cases) (see Table 1). The research question and hypotheses are investigated across all eight countries, as well as within each country-specific sample to assess potential differences in the result patterns.

Methods

Procedure and Participants

The overall sample is comprised of 8,302 participants from eight countries: France: $N = 1,010$, Germany: $N = 1,020$,

Poland: $N = 1,018$, Russia: $N = 1,040$, Spain: $N = 1,011$, Sweden: $N = 1,001$, UK: $N = 1,197$, and USA: $N = 1,005$. Table 1 displays the demographics by country and overall. Data were collected within 10 days between the end of May and the beginning of June 2020. Data collection was conducted by an independent social marketing and research institute via population-based online-panel surveys, in the national language of each country, respectively. Participants were recruited from the general population of adults, aged 18 years and above. Gender, age, and region stratification were used to achieve representativeness of the samples. Participation was compensated by panel-specific tokens that can be converted into a voucher or monetary payments. The present study was approved by the responsible Ethics Committee and preregistered with AsPredicted.org on May 25, 2020 (<https://aspredicted.org/e7a9g.pdf>). All participants were provided instruction and gave informed consent to participate via an online form. The dataset used in the present study will be made available from the corresponding author on reasonable request.

Measures

Demographics

Participants' demographics, including gender, age group, marital status, social class, and living environment are provided in Table 1.

COVID-19 Specific Media Use

Participants rated the frequency of their use 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-type scale (1 = *not at all*, 7 = *intensively*).

Burden Caused by COVID-19

The experience of the psychological burden caused by COVID-19 was measured using five items ("I am burdened by the current social situation"; "I feel restricted in my everyday life"; "I am afraid of the current situation"; "I feel socially isolated"; "I am worried about my future life") that are rated on a 7-point Likert-type scale (1 = *I do not agree*, 7 = *I totally agree*; scale reliability: overall: Cronbach's $\alpha = .820$, country-specific: $\alpha = .777$ (FR) to $.858$ (SV)). Higher sum scores indicate a higher level of burden. The test of measurement invariance revealed full configural invariance for the five items. Therefore, the resulting pattern between samples can be compared (Tucker et al., 2006).

Stress Symptoms

The stress scale of the Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995) assessed stress symptoms as a state across seven items (e.g., "I found it hard to wind down"; "I tend to over-react to situations"; "I felt that I was rather touchy"), rated on a 4-point Likert-type scale (0 = *did not apply to me at all*; 3 = *applied to me very much or most of the time*). The DASS-21 is an international well-established instrument. Considering its strong measurement invariance, it is recommended to be used in cross-cultural studies (Scholten, Velten, Bieda, et al., 2017). Scale reliability in the present study was overall: $\alpha = .905$, country-specific: $\alpha = .877$ (ES) to $.919$ (US). Higher sum scores indicate higher stress symptoms.

Statistical Analyses

Statistical analyses were conducted using SPSS 23 and the macro Process version 2.16.1 (www.processmacro.org/index.html; Hayes, 2013). After descriptive analyses, the extent of SMU was compared with the extent of use of newspaper articles (print media), news reports on television,

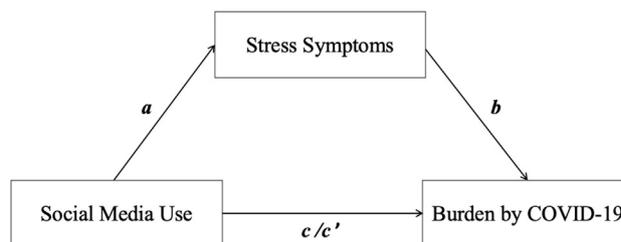


Figure 1. Mediation model with social media use as source of COVID-19 information (predictor), stress symptoms (mediator), and burden caused by COVID-19 (outcome). c = path of predictor to outcome, without inclusion of mediator (total effect); a = path of predictor to mediator; b = path of mediator to outcome; c' = path of predictor to outcome including mediator (direct effect).

and official sites of the federal government and authorities as the source of COVID-19 information by calculating dependent t -tests. Cohen's d was included as an effect size measure.

In the next step, a three-step hierarchical regression analysis assessed the relationship between the burden caused by COVID-19 and the other investigated variables. Step 1 included gender (coded: 0 = woman, 1 = man), age group, marital status, social status, and living environment as control variables; Step 2 included the use of newspaper articles (print media), news reports on television, official sites of the federal government and authorities and SM as a source of COVID-19 information; stress symptoms were included in Step 3. There was no violation of the multi-collinearity assumption (all values of tolerance $> .25$, all variance inflation factor values < 5 ; Urban & Mayerl, 2006).

Next, a mediation model was calculated (Process: model 4). The model included SMU as a source of COVID-19 information as a predictor, stress symptoms as a mediator, and burden caused by COVID-19 as an outcome; gender, age group, marital status, social status, and living environment were included as covariates. The association between SMU and stress symptoms was denoted by path a ; path b denoted the link between stress symptoms and burden. The combined effect of path a and path b represented the indirect effect (ab). The basic relationship between SMU and burden was denoted by path c (the total effect), while the relationship between SMU and burden after the inclusion of stress symptoms in the model was denoted by path c' (the direct effect). The mediation effect was assessed by the bootstrapping procedure (10,000 samples) that provides accelerated confidence intervals (CI 95%). P_M (the ratio of indirect effect to total effect) was considered as the mediation effect measure. Figure 1 illustrates the model.

All calculations were conducted with both the overall sample ($N = 8,302$) as well as separately with the eight country-specific samples.

Table 2. Descriptive statistics of the investigated variables (overall, all samples separately)

| | All | FR | GE | PL | RU | ES | SV | UK | US |
|--|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| <i>M (SD)</i> | | | | | | | | | |
| Burden by COVID-19 | 4.08 (1.47) | 3.99 (1.36) | 3.45 (1.41) | 4.12 (1.49) | 4.76 (1.40) | 4.53 (1.31) | 3.82 (1.50) | 3.94 (1.41) | 4.00 (1.52) |
| Stress symptoms | 5.88 (5.14) | 5.15 (4.92) | 4.55 (4.77) | 7.24 (5.31) | 7.25 (5.18) | 6.60 (4.96) | 4.68 (4.69) | 5.91 (5.09) | 5.57 (5.38) |
| COVID-19 specific media use | | | | | | | | | |
| Newspaper | 2.65 (1.91) | 2.49 (1.77) | 3.16 (2.00) | 2.75 (1.84) | 2.40 (1.87) | 2.67 (1.94) | 2.84 (1.94) | 2.23 (1.80) | 2.72 (2.00) |
| Television | 4.42 (2.01) | 4.33 (1.82) | 4.62 (1.90) | 4.52 (2.13) | 4.62 (2.18) | 4.97 (1.93) | 4.12 (1.93) | 4.18 (1.90) | 3.99 (2.11) |
| Official sites | 3.43 (1.97) | 2.91 (1.83) | 3.50 (1.92) | 3.39 (1.98) | 4.10 (2.09) | 3.77 (2.05) | 3.13 (1.86) | 3.15 (1.86) | 3.56 (1.94) |
| Social media | 3.39 (2.06) | 3.04 (2.00) | 2.64 (1.85) | 4.22 (2.01) | 3.90 (2.19) | 4.04 (2.04) | 3.05 (1.92) | 3.02 (1.90) | 3.28 (2.01) |
| Frequency of ratings (%): Newspaper | | | | | | | | | |
| 1 | 45.9 | 47.4 | 33.9 | 39.6 | 52.0 | 45.5 | 40.8 | 58.3 | 47.0 |
| 2–3 | 21.5 | 23.3 | 21.9 | 25.8 | 21.9 | 22.3 | 22.0 | 17.5 | 18.3 |
| 4–5 | 21.8 | 22.0 | 28.5 | 24.6 | 16.8 | 21.2 | 24.5 | 16.0 | 21.6 |
| 6–7 | 10.8 | 7.3 | 15.7 | 10.0 | 9.2 | 11.0 | 12.8 | 8.1 | 13.1 |
| Frequency of ratings (%): Television | | | | | | | | | |
| 1 | 14.5 | 12.1 | 12.1 | 15.0 | 15.3 | 9.4 | 17.4 | 13.5 | 21.4 |
| 2–3 | 15.6 | 16.6 | 11.7 | 16.6 | 14.7 | 12.2 | 14.9 | 19.4 | 18.1 |
| 4–5 | 35.3 | 43.0 | 39.5 | 29.8 | 26.6 | 30.5 | 41.9 | 40.3 | 30.4 |
| 6–7 | 34.6 | 28.3 | 36.8 | 38.6 | 43.4 | 48.0 | 25.9 | 26.7 | 30.0 |
| Frequency of ratings (%): Official sites | | | | | | | | | |
| 1 | 25.7 | 35.7 | 24.3 | 26.2 | 18.3 | 21.6 | 27.9 | 28.7 | 23.0 |
| 2–3 | 24.8 | 24.5 | 24.0 | 26.7 | 19.2 | 22.5 | 29.8 | 27.7 | 24.0 |
| 4–5 | 31.7 | 30.0 | 34.6 | 29.1 | 32.3 | 32.0 | 29.6 | 31.6 | 34.7 |
| 6–7 | 17.7 | 9.8 | 17.1 | 18.0 | 30.2 | 23.9 | 12.8 | 12.0 | 18.3 |
| Frequency of ratings (%): Social media | | | | | | | | | |
| 1 | 29.6 | 37.3 | 43.4 | 15.1 | 24.0 | 18.3 | 33.8 | 33.4 | 30.7 |
| 2–3 | 22.3 | 21.3 | 24.7 | 19.4 | 18.6 | 20.4 | 24.4 | 26.5 | 22.8 |
| 4–5 | 29.0 | 27.4 | 22.5 | 34.7 | 28.0 | 33.7 | 29.0 | 27.2 | 29.9 |
| 6–7 | 19.1 | 14.0 | 9.3 | 30.7 | 29.4 | 27.6 | 12.9 | 12.9 | 16.6 |

Notes. All: $N = 8,302$, France (FR): $N = 1,010$, Germany (GE): $N = 1,020$, Poland (PL): $N = 1,018$, Russia (RU): $N = 1,040$, Spain (ES): $N = 1,011$, Sweden (SV): $N = 1,001$, UK (UK): $N = 1,197$, USA (US): $N = 1,018$; $M =$ Mean, $SD =$ Standard Deviation; due to rounding, the sum of the frequencies is not always 100%.

Results

Table 2 presents the descriptive statistics of the investigated variables, overall and respectively for each country.

Overall, most participants frequently used news reports on television as a source of COVID-19 information (range “4” to “7”: 69.9%), about a half-used frequently official sites of the federal government and authorities (range “4” to “7”: 49.4%) and SM (range “4” to “7”: 48.1%), and about one third frequently used newspaper articles (print media) (range “4” to “7”: 32.6%). A similar trend was found in most samples separated by country. Most divergent results were found in Germany (frequent SMU: 31.8%) and Poland (frequent SMU: 65.3%).

More specifically, considering the mean usage frequency, for the overall sample, t -tests revealed that participants tended to use SM less frequently than news reports on television as source of COVID-19 information, $t(8,301) = -34.175$, $p < .001$, Cohen’s $d = -0.503$, and more

frequently than newspaper articles (print media), $t(8,301) = 25.552$, $p < .001$, $d = 0.374$. No significant differences were found between the use of SM and of official federal sites, $t(8,301) = -1.556$, $p = .120$. Country-specific analyses revealed the same result pattern in France, Sweden, and the UK. In Poland, Spain, Russia, and the USA, the findings were similar for the use of news reports on television and newspaper articles (print media). However, in Poland and Spain, SMU was higher than the use of official federal sites, PL: $t(1,017) = 10.658$, $p < .001$, $d = 0.415$; ES: $t(1,010) = 3.388$, $p = .001$, $d = 0.133$. In contrast, in Russia and in the USA, SMU was slightly lower than the use of official federal sites, RU: $t(1,039) = -2.469$, $p = .014$, $d = -0.095$; US: $t(1,004) = -3.877$, $p < .001$, $d = -0.144$. In Germany, SMU was lower than the use of news reports on television, $t(1,019) = -23.532$, $p < .001$, $d = -1.059$, newspaper articles (print media), $t(1,019) = -6.214$, $p < .001$, $d = -0.271$, and official federal sites, $t(1,019) = -11.360$, $p < .001$, $d = -0.454$.

Table 3. Hierarchical regression analysis (all samples; outcome: burden caused by COVID-19)

| | β | 95% CI | Adjusted R^2 | Changes in R^2 |
|---|---------|----------------|----------------|------------------|
| Step 1, $F(5, 8,296) = 24.444, p < .001$ | | | .050 | |
| Gender | -.121** | [-.419, -.295] | | |
| Age group | -.111** | [-.145, -.094] | | |
| Marital status | .051** | [.040, .110] | | |
| Social status | -.109** | [-.176, -.118] | | |
| Living environment | -.120** | [-.265, -.185] | | |
| Step 2, $F(9, 8,292) = 46.153, p < .001$ | | | .126 | .076 |
| Newspaper articles | .050** | [.022, .056] | | |
| Television | .107** | [.062, .094] | | |
| Official sites | .088** | [.049, .082] | | |
| Social media | .182** | [.115, .145] | | |
| Step 3, $F(10, 8,291) = 51.195, p < .001$ | | | .297 | .170 |
| Stress symptoms | .441** | [.121, .132] | | |

Notes. All: $N = 8,302$. Gender: 0 = woman, 1 = man; β = standardized coefficient beta; CI = Confidence Interval. ** $p < .01$.

Table 3 shows the results of the hierarchical regression analysis calculated in the overall sample.

Female gender, lower age, marital status, lower social status, and the living environment (living in a large city) were significant predictors of burden in Step 1. In Step 2, all forms of media use served as significant positive predictors of burden. However, SMU was the strongest positive predictor in this step. In Step 3, stress symptoms were a significant positive predictor of burden (see Table 3).

Table 4 provides a simplified overview of the hierarchical regression analysis calculated, respectively, in each country-specific sample.

The proportion of variance explained by the predictors showed a remarkable range between the investigated countries. The highest proportion was in the USA (35.7%), and the lowest was in Spain (21.4%) (see Table 4). SMU and stress symptoms were significant positive predictors of burden in all samples. Use of newspaper articles served as significant positive predictor of burden in seven countries (exception: FR), use of news reports on television served as significant positive predictor in six countries (exception: GE, UK), and use of official governmental sites served as significant positive predictor in five countries (exception: FR, PL, ES). SMU was the strongest positive predictor in Step 2 in France ($\beta = .123$, 95% CI [.040, .128], $p < .001$), Germany ($\beta = .175$, 95% CI [.087, .181], $p < .001$), Spain ($\beta = .103$, 95% CI [.002, .107], $p < .001$), the UK ($\beta = .183$, 95% CI [.093, .178], $p < .001$), and the USA ($\beta = .201$, 95% CI [.105, .199], $p < .001$).

Table 5 displays the results of the mediation analyses.

In the overall sample, stress symptoms partly mediated the positive relationship between SMU and burden caused by COVID-19. The basic relationship between SMU (predictor) and burden (outcome) was significant (see Table 5, total effect, c). The association between SMU and stress

symptoms (mediator) ($a:b = .355$, $SE = .028$, 95% CI [.301, .409], $p < .001$), as well as the relationship between stress symptoms and burden ($b:b = .134$, $SE = .003$, 95% CI [.128, .139], $p < .001$) were also significant. The relationship between SMU and burden remained significant after the inclusion of stress symptoms in the model. However, the total effect was higher than the direct effect (see Table 5, direct effect, c'). The indirect effect was significant (see Table 5, indirect effect, ab , and effect size, P_M). The country-specific analyses revealed a similar result pattern in Germany, Poland, Russia, Sweden, the UK, and the USA. In France and Spain, the direct effect (see Table 5, c') was not significant, revealing a full mediation effect of stress symptoms on the relationship between SMU and burden.

Discussion

In the last years, the use of social media became an essential part of everyday life (Brailovskaia & Margraf, 2020a). During the COVID-19 pandemic, its impact further increased (Gao et al., 2020). Present findings provide one of the first cross-national data addressing the frequency of SMU as a source of COVID-19 information and its relationship with the burden caused by the current extraordinary situation.

Cross-national statistics assessed in the year 2019 – before the outbreak of COVID-19 – revealed reports on television to be the most popular source of news, closely followed by online media, including social networking sites such as Facebook, Instagram, and Twitter. Print media were the most unpopular source of information (Newman et al., 2019). As shown by the present results, this relative ranking remains consistent during the time of COVID-19

Table 4. Simplified presentation of hierarchical regression analyses for the eight countries (outcome: burden caused by COVID-19)

| | FR | GE | PL | RU | ES | SV | UK | US |
|----------------------------|------|------|----|------|------|------|------|------|
| Step 1 | | | | | | | | |
| Gender | -X | -X | -X | -X | -X | -X | -X | |
| Age group | -X | -X | | | | | -X | -X |
| Marital status | | | | X | | | | |
| Social status | -X | -X | | -X | -X | -X | -X | -X |
| Living environment | -X | | | -X | -X | | | -X |
| Step 2 | | | | | | | | |
| Newspaper articles | | X | X | X | X | X | X | X |
| Television | X | | X | X | X | X | | X |
| Official sites | | X | | X | | X | X | X |
| Social media | X | X | X | X | X | X | X | X |
| Step 3 | | | | | | | | |
| Stress symptoms | X | X | X | X | X | X | X | X |
| Overall adjusted R^2 (%) | 30.7 | 25.5 | 25 | 24.9 | 21.4 | 30.6 | 30.7 | 35.7 |

Notes. France (FR): $N = 1,010$, Germany (GE): $N = 1,020$, Poland (PL): $N = 1,018$, Russia (RU): $N = 1,040$, Spain (ES): $N = 1,011$, Sweden (SV): $N = 1,001$, UK (UK): $N = 1,197$, USA (US): $N = 1,018$; gender: 0 = woman, 1 = man; -X/X = $**p < .01$ and $*p < .05$.

Table 5. Estimated coefficients of the mediation models with social media use (predictor), stress symptoms (mediator), and burden caused by COVID-19 (outcome)

| | Total effect | | | Direct effect | | | Indirect effect | | | Effect size | | |
|-------------------------|--------------|------|--------------|---------------|------|---------------|-----------------|------|--------------|-------------|-------|---------------|
| | <i>c</i> | SE | 95% CI | <i>c</i> | SE | 95% CI | <i>ab</i> | SE | 95% CI | P_M | SE | 95% CI |
| All ($N = 8,302$) | | | | | | | | | | | | |
| Burden | .124 | .008 | [.108, .139] | .076 | .007 | [.062, .090] | .048 | .004 | [.040, .056] | .384 | .032 | [.324, .451] |
| France ($N = 1,010$) | | | | | | | | | | | | |
| Burden | .083 | .023 | [.039, .128] | .039 | .020 | [-.001, .078] | .045 | .012 | [.023, .068] | .536 | .241 | [.299, 1.060] |
| Germany ($N = 1,020$) | | | | | | | | | | | | |
| Burden | .102 | .022 | [.058, .146] | .082 | .020 | [.042, .122] | .020 | .011 | [.000, .041] | .196 | .107 | [.007, .428] |
| Poland ($N = 1,018$) | | | | | | | | | | | | |
| Burden | .077 | .023 | [.032, .122] | .043 | .021 | [.002, .084] | .034 | .011 | [.014, .056] | .444 | .600 | [.199, 1.072] |
| Russia ($N = 1,040$) | | | | | | | | | | | | |
| Burden | .151 | .020 | [.112, .190] | .112 | .019 | [.075, .149] | .039 | .008 | [.023, .056] | .257 | .057 | [.158, .384] |
| Spain ($N = 1,011$) | | | | | | | | | | | | |
| Burden | .054 | .020 | [.015, .094] | .028 | .018 | [-.008, .064] | .027 | .009 | [.010, .045] | .492 | 7.634 | [.202, 1.658] |
| Sweden ($N = 1,001$) | | | | | | | | | | | | |
| Burden | .145 | .025 | [.096, .195] | .087 | .023 | [.042, .131] | .059 | .013 | [.033, .085] | .403 | .094 | [.250, .619] |
| UK ($N = 1,197$) | | | | | | | | | | | | |
| Burden | .079 | .022 | [.037, .122] | .047 | .019 | [.010, .083] | .033 | .012 | [.011, .056] | .412 | .218 | [.169, .811] |
| US ($N = 1,005$) | | | | | | | | | | | | |
| Burden | .179 | .024 | [.133, .226] | .102 | .021 | [.060, .144] | .078 | .014 | [.052, .106] | .432 | .076 | [.302, .601] |

Note. SE = Standard Error; CI = Confidence Interval; all CIs generated with bootstrapping: $N = 10,000$.

across the investigated countries, even while they are differently affected by the virus. In the current study, online media use was less popular than news reports on television but more popular than newspaper articles (print media). The use of online media was divided into the use of SM and official sites of federal government and authorities. Overall and in most of the investigated countries, their

use frequency did not, or did only slightly, differ. Only in Germany, SM was the least popular COVID-19 information source, preferred by only about one-third of the participants (see Research Question 1).

In the next step, potential predictors of the burden caused by COVID-19 were investigated. Notably, in the available literature, the relationship between overall SMU

and well-being is often considered critically. While some research emphasizes the positive effect of social support perceived on social platforms such as Facebook (e.g., Kim & Lee, 2011; Nabi et al., 2013; Verduyn et al., 2017), other studies describe SMU to foster stress, depression, and anxiety symptoms, as well as addictive tendencies (e.g., Brailovskaia & Margraf, 2020a; Marino et al., 2018; Woods & Scott, 2016). In several experimental and longitudinal studies, the reduction or a complete waving of SMU significantly reduced depression and anxiety symptoms and increased life satisfaction (Brailovskaia, Ströse, et al., 2020; Hunt et al., 2018; Tromholt, 2016). In contrast, other research did not find significant associations between SMU and well-being (Berryman et al., 2018; Coyne et al., 2020). Furthermore, it has been emphasized that overall the effects of digital technology use are assessed for an only relatively short time interval, and therefore, conclusions on its potential negative effects and its associations with well-being might be premature (Vuorre et al., 2021).

In the present study, the focus was on the use of SM as a source of COVID-19 information. Therefore, conclusions about other forms of SMU and overall digital technology cannot be drawn. As expected, the use of SM as an information source was positively associated with the burden (confirmation of H1a). This finding is in line with recent research from countries such as Canada, Germany, and Italy that described a potential negative effect of misinformation and fake news provided on SM on the users' emotional state and mental health (Brailovskaia et al., 2021; Bridgman et al., 2020; Gottlieb & Dyer, 2020; Srivastava et al., 2020).

Even though the main focus of the current study is on the role of SM, the other forms of media were also included in the analyses. Previous research described governmental communication across different channels to be of great importance for the public reaction in crises (Carter et al., 2015; Cismaru et al., 2011; Drury et al., 2009; Siegrist & Zingg, 2014). In the present study, the use of newspaper articles, news reports on television, and official governmental sites was positively associated with the burden caused by COVID-19. Thus, it can be assumed that all three sources that are typically used for offline and online governmental communication can contribute to psychological burden. However, SM that provides user-generated, mostly unfiltered information (Boyd & Ellison, 2007) seem to have the strongest effect on the burden experience. This finding supports recent research that reported SMU as an information source in times of crisis to foster a negative emotional state (Gao et al., 2020).

As expected, in all samples, the burden caused by the current COVID-19 situation was positively associated with stress symptoms (confirmation of H1b). This finding corresponds to the results of a recent study from Germany (Brailovskaia & Margraf, 2020b).

As revealed by the regression analysis, SMU as a source of COVID-19 information was the strongest statistical predictor of burden in the overall sample. Also, it was the only source of COVID-19 information that showed a significant effect in all eight country-specific regression analyses. In five of the eight country-specific calculations (France, Germany, Spain, the UK, and the USA), SMU was again the strongest statistical predictor of burden. As revealed by additionally calculated correlation analyses, SMU was also the only source of COVID-19 information that was significantly positively linked to stress symptoms in all eight countries without exception. Moreover, three further mediation analyses were additionally calculated in each country-specific sample that included, respectively, use of newspaper articles, use of reports on television, and use of official governmental sites as sources of COVID-19 information as a predictor. Some of the models showed a weak significant effect. However, the results revealed that only the mediation model that included SMU as a predictor was consistently significant in all eight countries without exception (confirmation of H2). These results correspond to Brailovskaia et al. (2021) who investigated mostly young students samples from Germany and Italy: In both countries, SMU was the only source of COVID-19 information that was significantly positively linked to stress symptoms and it was also the source that showed the strongest association with COVID-19 burden.

The gain of information – especially in extraordinary, uncertain, and alarming situations – belongs to the most important human needs (Mai, 2016; Naumer & Fisher, 2010). Based on the present results and findings of available research (Brailovskaia et al., 2021), it may be assumed that information about the current COVID-19 situation that is uncertain, extraordinary, and alarming in many ways can evoke a negative emotional state regardless of the information source. However, the extent and consequences of the negative emotions could depend on the form of the presentation of the information that is due to the form of the media that is used as an information source. This conclusion is supported by a recent study from Canada: Exposure to information provided on SM was positively linked to misperceptions regarding facts about COVID-19 while the inverse was true for news online sites (Bridgman et al., 2020).

The following considerations may at least partly explain the presented results. Intensive SMU was described to foster stress, depression, and anxiety symptoms (Appel et al., 2016; Brailovskaia & Margraf, 2020a). It can contribute to the development of addictive tendencies, insomnia and suicide ideation and behavior (Bányai et al., 2017; Brailovskaia et al., 2019; Brailovskaia, Teismann, et al., 2020). These effects can flow through the cognitive and emotional overload by unfiltered (mis)information provided

on SM (Garfin et al., 2015; Ng et al., 2018; Schmitt et al., 2018; Thompson et al., 2017). News and information about the spread and threat of COVID-19 are updated daily and shared on SM in text and graphics. In contrast to other information sources (i.e., newspaper articles, television reports, official governmental sites), this happens often without conscious verification of their accuracy (Pennycook et al., 2020). This contributes to the rapid spread and circulation of misinformation, fake news, and conspiracy beliefs that foster stress symptoms (Gao et al., 2020). The stress symptoms can enhance the experience of burden (Brailovskaia & Margraf, 2020b).

Considering the present findings that reveal similar result patterns across eight countries, it seems urgent to stress that each active (that is re-/sharing of content) user of SM is responsible for the spread of the online information and should consider its accuracy (Pennycook et al., 2020). A critical review of information provided on SM before sharing and liking by each user – additionally to a strict regulatory of fake news by the official SM operators – could reduce stress symptoms and experience of burden. It is important to call public attention to this issue as many people are not aware of the potential negative impact of an unregulated SMU for themselves and others (Gottlieb & Dyer, 2020; Srivastava et al., 2020). Probably, it could be made a topic of discussion when planning further governmental intervention steps to combat COVID-19, because a high level of burden can, over the longer term, negatively impact mental and physical health. Moreover, it is assumed to reduce compliance with health-protective behavior recommended or advised by the government and, therefore, to decrease the success of measures to reduce the pandemic spread (Allington et al., 2020).

Despite the timeliness of the present study, the following limitations should be considered. First, the cross-sectional design of the current study does not allow conclusions regarding causality. Therefore, the true causal direction of the found associations between the use of SM as an information source, stress symptoms, and burden caused by the current COVID-19 situation remains unclear (see Orben, 2020b). To draw true causal conclusions about the investigated relationships, the present research design should be extended by studies that establish a temporal sequence of cause and effect, and by experimental studies (Kraemer et al., 1997). For example, participants of longitudinal investigations that include several measurement time points might be advised to consciously reduce their time spent on SM (Brailovskaia, Ströse, et al., 2020), or/and they might be involved in mindfulness practice that can reduce stress symptoms (Zarotti et al., 2020). If such experimental studies reveal a decrease of COVID-19 burden, a causal conclusion about the investigated relationships would be possible. Furthermore, in the present study, the use of

newspaper articles, television reports, and official governmental sites as a source of COVID-19 information was significantly linked to the experience of burden. Therefore, future studies could include the experimental manipulation of the use frequency of these information sources to assess their potential causal impact on the COVID-19 burden.

Second, the present results are a snapshot of the COVID-19 situation in the eight investigated countries in summer 2020. The replication of the current study in periodic time intervals and the inclusion of further countries, for example from Asia and Africa, could ensure their stability and generalizability and prevent premature conclusions on the potential negative effect of SMU (Vuorre et al., 2021).

Third, in the current study, only the frequency of media use as a COVID-19 information source was measured. Previous research emphasized that to understand the impact of SMU, it is important to focus separately on the different nuances of online activity (Orben et al., 2020). Thus, the assessment of how participants use SM (active, passive – that is consumption of shared content), and how they evaluate the information provided on the different forms of media (e.g., as credible, supportive, confusing) is suggested for future studies.

In addition, future research should focus on further reasons for SMU during the pandemic such as the search for social support and positive emotions (Brailovskaia, Schillack, et al., 2020). This can provide further knowledge about mechanisms that underly the association between media use and experience of the burden caused by COVID-19, and thus contribute to the development of theoretical models in the context. For instance, it could be that individuals who use SM to perceive social support by close friends and family members might experience less burden and an enhancement of their well-being. Moreover, in the present study, only a partial mediation effect of stress symptoms on this relationship was found. Future studies are advised to investigate further potential mediators and moderators such as level of education, mental health-related factors (e.g., depressive symptoms), and personality traits (e.g., Big Five) that can reinforce the relationship, as well as those that can weaken it. Moreover, factors that can contribute to the intensive use of SM as a COVID-19 information source should be investigated. For example, earlier research reported that anxiety symptoms often foster excessive use of SM (Marino et al., 2018). Thus, future studies should consider whether this is also true in the current COVID-19 situation. Furthermore, even though available research emphasized the potential negative impact of SM activity on user's emotional state and well-being (Brailovskaia, Schillack, et al., 2020; Marino et al., 2018; Rozgonjuk et al., 2020), due to the cross-sectional design of the present study, we cannot exclude alternative constellations of the investigated variables. Therefore, future

experimental studies should investigate the mediation model that includes stress symptoms as a predictor, burden as mediator, and use of SM as COVID-19 information source as an outcome, as well as the model that includes burden as a predictor, stress symptoms as mediator, and SMU as outcome. The gained findings could contribute to the identification of individuals who are at specific risk for intensive SMU as an information source, the experience of stress and burden.

Fourth, gender, age, and region stratification was used to achieve representativeness of the present data. To further enhance the representativeness, future research is suggested to include more variables for the stratification such as level of education and income. Furthermore, as shown in Table 3, demographics (e.g., gender, age, and social status) were significantly related to the experience of COVID-19 burden. While in the present study, they served only as control variables, future studies are suggested to specifically focus on the association between demographic variables and the experience of the burden by COVID-19.

In conclusion, the present cross-national study reveals that across countries, television reports are mostly preferred as a source of information about COVID-19, followed by online media and print media. The use of SM as an information source might be a predictor of the burden caused by the current COVID-19 situation. Stress symptoms that could be fostered by misinformation and fake news provided on SM could mediate the link between SMU and burden. Therefore, more responsible regulation of information provided on SM is urgent to enhance compliance with precautionary health measures, and therefore to reduce the spread of COVID-19.

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Conflict of Interest

The authors declare that they have no conflicts of interest in relation to this article.

Publication Ethics

The present study was approved by the responsible Ethics Committee and pre-registered with AsPredicted.org on May 25, 2020 (<https://aspredicted.org/e7a9g.pdf>). All participants were provided instruction and gave informed consent to participate via an online form.

Open Data

The dataset used in the present study will be made available from the corresponding author on reasonable request.

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