Mitigating COVID-19 related stress: an exploration of the mediating effect of various forms of social support

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Abstract

Background: The COVID-19 pandemic is an ongoing stressor that has severely affected people's lives and mental health. Previous literature has revealed that prolonged measures implemented to slow the spread of the virus, as well as exposure to pandemic related stressors, have led to numerous psychopathologies, including and especially symptoms of trauma- and stressor-related (TSR) disorders. Social support is a well-established buffer of stress and a protective factor following trauma exposure. Some studies have shown its efficacy in dampening psychological problems linked to COVID-19 related stressors. However, only one study has examined the *mediating role* of social support in general, and no study has examined the role of specific sources of support in mediating the association between exposure to COVID-19 stressors and (TSR) symptoms. **Objectives:** The primary aim of the current study was to examine the mediating effect of social support in the relationship between COVID-19 stressors exposure and TSR symptoms. The secondary aim of this study was to assess the differential mediating effect of distinct sources of support (i.e., support from family, friends, a professional and via social media) in this association. **Methods:** 5 913 adults mostly from Canada, France, Italy, the U.S., China, completed a cross-sectional web-based survey on the psychosocial effects of the COVID-19 pandemic between April and May of 2020. TSR symptoms were measured using the 6-item abridged version of the Impact of Event Scale – Revised. Exposure to COVID-19 stressors was assessed using 19 self-reported yes/no questions and social support (SS) variables were assessed using four self-reported questions with a likert-like response format: help and emotional support from friends, family, a mental health professional and support via social media. **Data Analysis:** Simple and parallel mediation analysis were conducted to investigate mediation effects of social support variables (i.e., social support as a composite variable as well

as distinct social support variables). **Results:** Social support in general did not mediate the effect of COVID-19 stressors on TSR symptoms (β =.001; 95% CI = .000 - .003) in our sample. In terms of specific sources of support, support from a professional and support via social media had statistically significant but negligible mediating effects (.003 ≤ βs ≤ .01). Support from friends and family did not mediate the relationship examined. **Discussion:** Social support variables had little to no buffering effect on TSR symptoms in this sample during the pandemic. Studies involving comprehensive social support scales and subscales (rather than single items) are needed to determine the actual role of social support – if any – in these relations. Alternate interpretations, methodological pitfalls, as well as the practical and clinical implications of this finding are addressed. Ways to address such methodological issues in the future are discussed.

Abrégé

Contexte : La pandémie de la COVID-19 est un facteur de stress continu qui a gravement affecté la vie et la santé mentale des personnes. La recension des écrits a révélé que les mesures prolongées mises en œuvre pour ralentir la propagation du virus, ainsi que l'exposition à des facteurs de stress liés à la pandémie, ont conduit à de nombreuses psychopathologies, y compris et en particulier des symptômes liés aux traumatismes et au stress (SLTS). Le soutien social est bien connu comme facteur de protection vis-à-vis du stress et suite à l'exposition à un événement traumatique. Des études ont montré son efficacité pour atténuer les problèmes psychologiques liés au stress lié à la COVID-19. Cependant, une seule étude a examiné le rôle médiateur du soutien social en général, et aucune étude n'a examiné le rôle médiateur de sources de soutien particulières dans l'association entre l'exposition aux facteurs de stress liés à la COVID-19 et les symptômes liés aux traumatismes et au stress (SLTS). **Objectifs** : L'objectif principal de la présente étude était d'examiner l'effet médiateur du soutien social dans la relation entre l'exposition aux facteurs de stress liés à la COVID-19 et les SLTS. L'objectif secondaire de cette étude était d'évaluer l'effet médiateur différentiel de sources de soutien spécifiques (c'est-à-dire le soutien de la famille, des amis, d'un professionnel et via les réseaux sociaux) dans cette association. **Méthodes** : 5 913 adultes, principalement du Canada, de la France, de l'Italie, des États-Unis et de la Chine, ont participé à un sondage en ligne sur les effets psychosociaux de la pandémie de la COVID-19 entre avril et mai 2020. Les SLTS ont été mesurés à l'aide de la version abrégée en 6 items du *Impact of Event Scale – Revised*. L'exposition aux facteurs de stress liés à la COVID-19 a été évaluée à l'aide de 19 questions (oui/non) auto-rapportées et les variables de soutien social (SS) ont été évaluées à l'aide de quatre questions auto-rapportées utilisant un format de répponse de type 'likert': l'aide et le soutien émotionnel provenant des

amis, de la famille, d'un professionnel de la santé mentale et soutien via les réseaux sociaux. **Analyse des données :** Des analyses de médiation simples et en parallèle ont été menées pour étudier les effets de médiation des variables de soutien social (c'est-à-dire le soutien social en tant que variable composée ainsi que des variables de soutien social distinctes). **Résultats** : Malgré un résultat statistiquement significatif, d'un point de vue pratique, le soutien social en général jouait un rôle médiateur négligeable entre les facteurs de stress liés à la COVID-19 et les SLTS ($\beta = 0{,}001$; IC à 95 % = 0,000 - 0,003). De même, en termes de sources de soutien spécifiques, le soutien de la famille et le soutien des amis n'étaient pas des médiateurs significatifs dans la relation examinée. Cependant, le soutien d'un professionnel et via les réseaux sociaux a eu des effets médiateurs statistiquement significatifs mais, en vérité, eux aussi négligeables ($0{,}003 \leq \beta s \leq 0{,}01$). **Discussion** : Les variables de soutien social ont eu peu ou pas d'effet d'atténuation sur les SLTS dans cet échantillon pendant la pandémie. Des études impliquant des échelles globales de soutien social à plusieurs items sont nécessaires pour déterminer le rôle réel du soutien social – le cas échéant – dans ces relations. Des interprétations alternatives, les enjeux méthodologiques, ainsi que les implications pratiques et cliniques de ces résultats sont abordés. Les moyens d'aborder dans le futur les problèmes méthodologiques encourus sont discutés.

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Contribution of Authors

This project is part of a larger study on the traumatogenic impact of COVID-19, coordinated by Marjolaine Rivest-Beauregard, under the supervision of Dr. Alain Brunet. I contributed to the collection and preparation of the data, the translation of the questionnaires, and the conceptualization of this project. Additionally, I conducted the literature review, the statistical analyses, and interpreted the results. Dr. Ram Sapkota contributed to the conceptualization of this project, mentored me with the statistical analyses, and provided revisions to earlier versions of this thesis. Drs. Alain Brunet and Laurence Kirmayer revised the drafts of this thesis and provided conceptual as well as practical feedback.

Chapter I: Introduction

The coronavirus (COVID-19) is a novel acute respiratory disease of deadly potential that emerged in December 2019 in Wuhan, China (Li et al., 2020). The virus quickly spread outside the country, leading the World Health Organization (WHO, 2020) to declare it a pandemic on March 11th, 2020. As of April 4th, 2020, around the time our lab obtained the green light to launch a study (see Brunet et al., submitted), the WHO had reported the global number of confirmed cases to have surpassed a million, resulting in over 280 000 deaths worldwide. Preventative measures such as social distancing, quarantine and social isolation were implemented by governments to slow the rapid progression of the virus throughout the world, and to prevent healthcare systems from being overwhelmed (Ferguson et al., 2020). Along with businesses, school and university closures, the population was asked to stay at home for safety reasons and remote work was encouraged (Wang et al., 2020; Gallacher & Hossain, 2020). With no vaccine in sight, social distancing interventions and quarantine measures were prolonged, heavily disrupting the lives and social support networks of students, employees and individuals worldwide, affecting their mental health.

COVID stressors and risk for mental health problems

Several studies have shown the pathogenic potential tied to the COVID-19 pandemic. Indeed, stress, symptoms of depression and symptoms of anxiety have been reported stemming from COVID-19 related measures, their effects on daily life, the associated uncertainty, and the persistent lack of social interactions (Wang et al., 2020; Cao et al., 2020; González-Sanguino et al., 2020). Qiu and colleagues (2020) conducted a nationwide survey in China during the COVID-19 (N = 52 730); their findings revealed a range of psychological problems, including anxiety and depression. Further, among the commonly documented mental health consequences are traumatic stress symptoms, with rates of post-traumatic stress symptoms ranging from 4.6%

to 96.2% of the sample according to some authors (Bo et al., 2020; Rossi et al., 2020; Sun et al., 2020). Brooks et al. (2020) reviewed the literature on the psychological impact of quarantine and found that most studies reported adverse psychological effects including post-traumatic stress symptoms. These findings are consistent with two meta-analyses that reported increased psychological distress, levels of depression and anxiety in the general population during the COVID-19 pandemic (Salari et al., 2020), as well as increased prevalence of posttraumatic stress symptoms (Cooke et al., 2020).

COVID-19 related stressors such as isolation, confinement, financial worry, losses, COVID-19 symptoms or diagnosis have all been shown to be associated with adverse psychological outcomes, including TSR disorders (Brooks et al., 2020; Cao et al, 2020; Dong et al., 2021; Rossi et al., 2020).

Even though traumatic stress symptoms during the pandemic are particularly prevalent, and even though previous research suggests that the COVID-19 pandemic (as well as the measures implemented to limit the spread of the virus) might be perceived as a traumatic event (Bridgland et al., 2021; Kira et al., 2021), exposure to the pandemic does not fit within predominant post-traumatic stress disorder (PTSD) models (Brewin et al., 1996; Ehlers & Clark, 2000) nor the diagnostic criteria of the Diagnositc and Statistical Manual – fifth edition (DSM-5) of the American Psychiatric Association (APA, 2013). Indeed, even though it is considered traumatic for some, the pandemic is not considered traumatic for all. As such, a framework of trauma- and stressor-related (TSR) symptoms will be adopted in this study.

Trauma- and stressor-related disorders

TSR disorders is a diagnostic category introduced in the DSM-5 (APA, 2013), which includes both PTSD and adjustment disorders (AD). According to the DSM-5, TSR disorders are presumed to develop as a direct consequence of exposure to a stressor. The stressor is considered

traumatic if it involved a direct or indirect threat to life or sexual abuse (PTSD Criterion A), in which case the TSR symptoms fall within the realm of PTSD. Exposure to a non-traumatic stressor such as a divorce, job loss, or experiencing important financial difficulties (which are stressors associated with the pandemic) can elicit similar TSR symptoms leading however to an, allegedly less severe, adjustment disorder (AD).

In Canada, 75.9% of Canadians were exposed to one or more traumatic events in their lifetime and 9.2% developed PTSD (Van Ameringen et al., 2008). Regarding AD, it is characterized by the experience of a stressful but non-life-threatening event and the development of maladaptive emotional or behavioural symptoms. Only some population-based studies have examined its prevalence and nationwide estimates vary between less than 1% and 2% in the general population, although this low proportion is attributed to limitations in diagnostic measures used (Glaesmer et al., 2015; Gradus, 2017). Exposure to COVID-19 stressors has resulted in numerous cases of TSR disorders, and although authors have raised concern about a potential increase in PTSD, various forms of AD are likely much more prevalent (Brunet et al., submitted). Whatever the specific type of response, a lot can be done to mitigate or prevent the development of TSR disorders. Among important resilience and protective factors of TSR disorders is social support. Indeed, part of what may explain variations in people exposed to traumatic events and people developing TSR disorders are protective factors. As such, it is important to understand factors such as social support that may prevent the development of disorders in individuals exposed to traumatic stressors. Considering that the pandemic largely disrupted the traditional networks of social support, we wondered if social support would still have its typical buffering effect in the association between COVID-19 stressors exposure and TSR symptoms.

Social support

Social support is defined as "support accessible to an individual through social ties to other individuals, groups, and the larger community" (Lin et al., 1979, p. 109). In addition to the distinction made between emotional, informational and practical assistance (Thoits, 2010), the research literature distinguishes *perceived* social support and *received* social support. Perceived social support is defined as the availability of the support and the satisfaction with it (Sarason et al., 1990), while received social support refers to the quantity of supportive behaviors that occurred (Haber et al., 2007). Importantly, social support has been theorized as an important stress buffer (Cobb, 1976; Cohen & Wills, 1985). According to the stress-buffering hypothesis, social support plays a protective role against the harmful effects of stress on mental health.

Social support has long been associated with the mitigation of PTSD in the literature, but findings on the strength and direction of this relationship are inconsistent. Two important theories have been proposed concerning the effect of social support on PTSD. The *social causation model* claims that social support buffers against PTSD; the *social selection model* states that PTSD decreases social support resources (Wang et al., 2021). Even though studies have found confirming evidence for both theories, findings on the association between social support and PTSD remain incongruous. For instance, Monson, Brunet and Caron (2015) found that perceived social support was not lower in individuals suffering from PTSD; their sample consisted of 2 433 individuals from Montreal with or without a diagnosis of PTSD. Conversely, another study examined perceived social support and PTSD symptomatology among male veterans (N = 2 000) after their deployment. The findings revealed a significant negative association between PTSD (at Time 1) and perceived social support 5 years later (at Time 2; King et al., 2006). A meta-analysis by Wang and colleagues (2021) of longitudinal studies revealed that social support (perceived and received) and PTSD reciprocally influenced each

other over time with comparable effect sizes, thus providing evidence for both models. Moreover, Kaniasty and Norris (2008), in a sample of 557 victims of natural disaster in Mexico, found supporting evidence for the social causation model (i.e., that more support leads to less PTSD) in the earlier phase following a disaster (6 to 12 months), evidence for the social selection model (i.e., that more PTSD leads to less social support) in the later months following an event (18 to 24 months), and evidence for both models at midpoint (6 to 12 months post-disaster).

Perceived social support specifically may play a more important buffering role on symptoms of trauma than received support. Indeed, it has been proposed that perception of support availability is more consistently buffering than actual support received (Wang et al., 2021). To support that, a meta-analysis showed that perceived social support reported by first responders showed higher effect sizes than received social support in moderating the impact of traumatic events, suggesting that the effectiveness of social support fluctuates by one's subjective perception of whether the support satisfies one's needs (Prati & Pietrantoni, 2010). Further, Lee (2019) gathered data from 545 firefighters from six cities in Korea and found that firefighters with high levels of perceived social support reported less severity of PTSD symptoms. This implies that perceived social support may act as a resilience factor in buffering the effects of trauma on PTSD symptoms. Perceived social support is well-established overall as a protective factor in times of stress (Shorey & Lakey, 2011) and understanding its role as a resilience factor for overcoming the nefarious impact of trauma and stress on TSR symptoms is of great importance.

Finally, lack of social support is a known risk factor for poor outcomes following trauma (Olff, 2012), and research on past pandemics and disasters have confirmed that (Arnberg et al., 2012; Chigwedere et al., 2021). Indeed, several disasters studies have shown that received and

perceived social support functioned as protective resources that benefited trauma victims' mental health (Joseph, 1999; Kaniasty, 2005; Norris et al., 2002).

Social support and trauma during the COVID-19

The COVID-19 pandemic is no exception when it comes to disasters studies: social support has also been shown to be a protective factor here. A study by Song and colleagues (2020) examining the relationship between social support and trauma during the COVID-19 pandemic in a sample of 14 825 health care workers found that individuals with lower levels of social support were at an increased risk of exhibiting posttraumatic stress symptoms (PTSS). However, health care workers represent a unique population and conclusions may not be generalizable to the rest of the population. A review by Hong et al. (2021) examining PTSS in the general population during the coronavirus pandemic also found social support to be among the protective factors, while a review by d'Ettorre et al. (2021) showed that lack of social support was a predictor of PTSS. However, in both reviews it was not specified whether the support in question was perceived or received, and the latter only concerns health care workers, which once again may limit the generalizability of the findings. Though, these studies confirm the close relation between social support and PTSS in the context of the COVID-19 pandemic. In fact, one study with an international sample of 7 048 participants found that COVID-19-related stressful events were associated with more PTSD symptoms than were other stressful events (i.e., non-COVID-19 related stressful events), and that lack of social support predicted additional symptoms of PTSD (Olff et al., 2021). However, this study only included one dichotomous question item for social support (i.e., yes or no as possible responses) and it is unclear which kind of support was assessed (e.g., perceived or received). Finally, a few more studies found associations between perceived social support and decreased risk of mental health problems like anxiety, depression and PTSS (C. Liu et al., 2020; González-Sanguino et al., 2020; X. Liu et al., 2020).

In sum, past literature suggests that social support buffers COVID-19 related traumatic stress. However, to our knowledge, only one study has examined the mediating role of social support in the association between COVID-19 stressors exposure and TSR disorders. Indeed, a study of 85 participants found that perceived social support mediated the association between COVID-19 exposure and PTSD symptom severity, but in childhood trauma-exposed individuals (Seitz et al., 2021). Otherwise, studies failed to examine mediation in the association between COVID-19 stressful events and symptoms of trauma. Further research with larger samples is needed to elucidate the potential links between COVID-19 stressors, social support and TSRS. Importantly, previous studies failed to examine the mediating role of different sources of support in this association. As such, there also is a need to explore whether the strength of the buffering effect varies according to the type and source of social support the impact of different types of social support (Mossakowski & Zhang, 2014). Indeed, this is especially critical considering that individuals had to quarantine themselves and practice social distancing. The unique circumstances of the COVID-19 pandemic have certainly affected the number and types of social support individuals can access. For instance, seeking support through social media is especially prominent during the pandemic, with limited access to people and with widespread access to technology (He et al., 2021; Rivest-Beauregard et al., submitted).

Social support from distinct sources.

Just as an important distinction is to be made between perceived and received support, it is also important to consider the differential effect of support received from different sources, as it may lead to different psychological outcomes (e.g., more, or less buffering effect).

Family and friends. In general, studies have found perceived support from family and friends to be helpful against symptoms of depression and anxiety (e.g., Mohd et al., 2019; Bostean, Andrade & Viruell-Fuentes, 2019), including during the COVID-19 pandemic (Liu,

Shao, & Zhang, 2020). A meta-analysis examining the strength of the relationship between social support and PTSD symptoms following traumatic events among children and adolescents concluded that only a small effect size was found between social support and PTSD, and that the effect sizes between peer support and family support were also small (Allen et al., 2021).

Regarding support received from family in the context of the COVID-19 specifically, Reeves and colleagues (2021) found that support from family increased ratings of distress as well as mediated the relationship between COVID-19 worries and mental health outcomes in a sample of 1041 medically vulnerable Canadians (i.e., individuals with a medical condition or aged 70 years and older). Findings pertaining to support from family during the COVID-19 are inconsistent as some studies have found social support from this source to be associated with lower levels of traumatic stress or PTSD symptoms (Li et al., 2020; Liu et al., 2020; Tselebis et al., 2020), whereas others have found that it did not diminish psychological symptoms among which PTSD symptoms (e.g., Moore & Lucas, 2020).

Regarding support received from friends in the context of the current pandemic, Rogers & Ockey's (2020) results reveal that U.S. adolescents (N = 407) who perceived changes in their relationships with family and friends (e.g., less perceived support from friends) had elevated symptoms of depression and anxiety, but nothing is said on symptoms of traumatic stress. Liu and colleagues (2020) addressed the role of social support on PTSD specifically and found that perceived social support from friends was not associated with lower levels of PTSD whereas support from family was.

However, there is a scarcity of studies examining the role of perceived support from friends and family on symptoms PTSD and/or AD, particularly during the COVID-19 pandemic. To our knowledge, only one study examined the effects of perceived family support on

psychological distress during the COVID-19 (i.e., depressive, anxiety and PTSD symptoms). Indeed, in a sample of 2 232 pregnant women, Wang et al. (2021) found that perceived family support was negatively significantly associated with PTSD symptoms (and other psychological outcomes). In fact, they found that the risk of PTSD in women with less perceived family support was almost 7 times higher than that of women with sufficient perceived family support. Nonetheless, they did not investigate the mediating role of social support from these sources in the relationship between COVID-19 stressors and TSR symptoms. In fact, to our knowledge, no previous study has.

Social media. Levaot, Greene and Palgi (2020) examined the role of social media following large-scale community fires in Israel in a convenience sample of 212 adults. The results they obtained showed that offering or receiving help via social media predicted higher post-traumatic growth, but that offering or receiving help via social media was not significantly associated with post-traumatic stress symptoms. In the context of the COVID-19 pandemic, He et al. (2021) looked at media exposure to COVID-19 and acute stress. Findings reflected increased acute stress due to media exposure, moderated by perceived social support, wherein individuals with lower perceived support suffered from stronger impacts of media exposure. Zhong, Huang and Li (2020) found that social media usage was related depression as well as secondary trauma among 320 people in Wuhan. They went on to explain that social media usage was beneficial to them when they received informational, emotional, and peer support. However, in excess, it led to mental health problems. This matches unpublished findings by our team in a convenience sample of nearly 6 000 individuals (Rivest-Beauregard et al., submitted). In contrast, Drouin and colleagues (2020) found that social media usage for both social support and information seeking was associated with increased anxiety among 260 parents in the United

States; though they did not look at trauma symptoms. Similarly to studies concerning support from friends and family, no studies examined the mediating role of social media support on the association between COVID-19 stressors and TSR symptoms.

Professional support. While reviewing the literature, we came across no studies pertaining to professional support and its effects on trauma symptoms during the COVID-19 pandemic. We found one study examining specific internet-based treatments (i.e., cognitive-behavioral therapy and eye movement desensitization and reprocessing) and their efficacy in reducing traumatic symptoms for ongoing trauma from the COVID-19 circumstances (Perri et al., 2021). The results of this study revealed that both treatments diminished traumatic symptoms by 55% and that effects were maintained at follow-up. Conversely, another study we found by Peng and colleagues (2021) showed that professional psychological support was not associated with post-traumatic growth amidst frontline nurses in Wuhan, China, whereas support from family and friends was. As such, findings are scarce and incongruous on whether professional support help mitigate the effects of COVID-19 stressors on TSR symptoms. Further, no study has specifically examined mediation of professional support in this association.

Current study: Objectives, Hypotheses and Conceptual Models

The primary objective of this study was to assess the mediating effect of social support in the association between COVID-19 stressor exposure and TSR symptoms in a large sample, which to our knowledge, is the first study to do so. Our secondary objective was to examine whether distinct sources of support (i.e., family, friends, a professional and social media) would have a differential mediating effect on the relationship between COVID-19 stressors and TSR symptoms.

The primary hypothesis for the current study is that social support mediates the association between COVID-19 stressors and TSR symptoms (see Figure 1 below for

hypothesized model). Our secondary hypothesis is that the traditional and most common sources of support (i.e., support from family and friends) will have the strongest mediating effect (see Figure 2 below for hypothesized model).

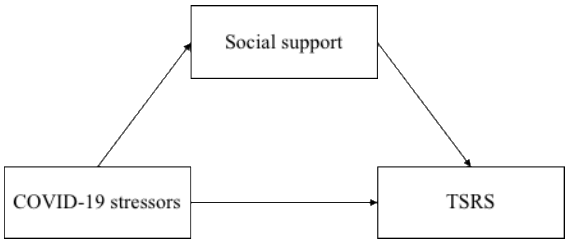

Figure 1. Mediation model for the primary hypothesis

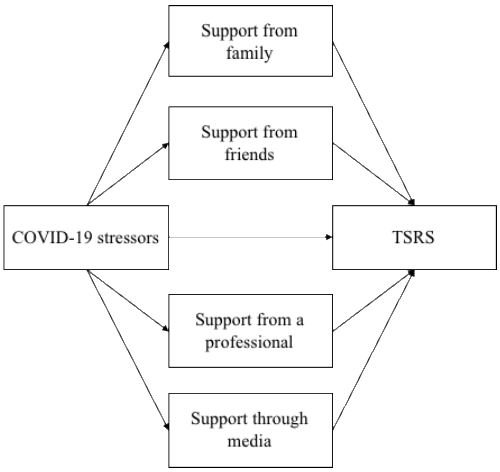

Figure 2. Parallel mediation model for the secondary hypothesis

Chapter II: Methodology

Design

This is a cross-sectional online survey on COVID-related stressors, TSR symptoms and social support in a convenience sample drawn from the general population of multiple countries.

Participants

Participants for this study were gleaned from another study described elsewhere (Brunet et al., submitted). In a nutshell, participants were drawn from a large convenience sample recruited through snowball sampling via email to social, professional, and academic associations and individuals (e.g., university alumni, health workers, psychologists). A Gmail account specifically created for this study was used to send out all email communications. In addition, an advertisement on social media (i.e., Facebook, Twitter) was posted on the social media Facebook and Twitter pages of the Psychological Trauma Laboratory as well from volunteers' accounts. Participants were eligible if they were 18 years or older, consenting, had been exposed to the pandemic and had sufficient digital literacy to be reached by email and to complete the online survey. The final sample consisted of 5 913 adults from Canada, France, Italy, the United States, China, and a very small group from other miscellaneous countries. The sociodemographic characteristics of the sample are presented in Table 1.

Procedure

Participants completed an online survey between April and May 2020 (04/19/2020 to 05/26/2020) on their experience of the COVID-19 pandemic and its psychosocial impacts. Participants were also invited to describe in writing their worst COVID-related experience.

Participants provided informed consent and completed the 15 minutes survey hosted on the *SurveyMonkey* web platform (see privacy statement; SurveyMonkey, 2019). Potential

participants were asked via email or otherwise to click on the survey link if they wished to participate in the survey. By clicking on the link, participants were directed to an online consent form. To start the survey, participants had to agree to the consent form and confirm that they were 18 years or older. Participants were invited to complete the survey themselves according to their language of preference (i.e., English, French, Mandarin, Spanish, Italian) in one sitting. The survey instruments were translated and linguistically and culturally adapted for each country by local collaborators in accordance with instruments translation and cross-cultural adaptation guidelines (e.g., Sousa & Rojjanasrirat, 2011). Briefly, the original questions were translated into the target language (forward translation) by bilingual and bicultural translators whose first language is the target language of the questions. Translated versions of the questionnaires were then compared and verified by senior bi-lingual researchers involved in the project. Ethics approval for the main project, and including this one, was obtained from the Douglas Mental Health University Institute (#IUSMD-20-13) by the senior study investigator, Dr. Brunet.

Outcome measures

Trauma- and stressor-related symptoms. TSR symptoms during the past 7 days were assessed using the abridged 6-item version of the Impact of Event Scale – Revised (IES-6; Thoresen et al., 2010). The IES-6 measures the severity of some transdiagnostic symptoms of intrusion, avoidance, and hyperarousal in response to a stressor, or a potentially traumatic event, that may be observed across all *TSR disorders* (DSM-5; APA, 2013), including PTSD, AD, and grief reaction over the past week. The 6 items are rated on a 5-point scale, with the severity of responders' symptoms ranging from 0 (not at all) to 4 (extremely). Severity scores are obtained by summing all items together, yielding a total score ranging between 0 and 24. Higher scores are associated with increased severity of symptoms.

COVID-19 stressors. Exposure to COVID-19 stressors was measured using a set of 19 self-reported dichotomous questions developed by the team of researchers (from the five countries) involved in this study. Questions inquired about social isolation (i.e., separation from loved ones, confinement and quarantine), experiencing COVID-19 symptoms (e.g., *Have you been diagnosed with the COVID-19?*), a significant other experiencing COVID-19 symptoms (e.g., Has a significant other in your household received a positive diagnosis for the COVID-19?), receiving medical care because of the COVID-19 (e.g., *Were you hospitalized because of the COVID-19?*), loss (i.e., of a job or a loved one), and finally, financial hardship (e.g., *Did you experience any material hardship as a result of the COVID-19?*). For each question participants were asked if they had been exposed to the described event with responses scored dichotomously as Yes (1) or No (0). A total hardship score was obtained by summing all items (unweighted), yielding a score ranging between 0 and 19, where higher scores indicate higher levels of exposure to COVID-related stressors.

Social support. Perceived social support (which will be referred to as social support from now on) was assessed using four self-report questions. These questions were created by the researchers involved in this study as time limitations and the desire to diminish participation fatigue led us to choose a restricted number of questions over longer pre-existing validated questionnaires. Three social support items *i) I get the emotional help and support I need from my family, ii) I get the emotional help and support I need from my friends, and iii) I get the emotional help and support I need from a professional* were scored on an 8-point scale ranging from (0 = N/A) 1 (very strongly disagree) to 7 (very strongly agree). Social support received through social media was assessed with the item *I maintain closeness and receive the support*

that I need through social networks and messaging apps. This item was scored on a 5-point scale ranging from 0 (never) to 4 (very often). All social support items were scored individually.

Data Preparation

The data were entered into an SPSS data spreadsheet, which was checked for inaccuracies in data entry and corrected. Subsequently, the dataset was examined for missing values. Little's (1988) MCAR (Missing Completely at Random) test was used to assesses whether missing values are independent of their variable or other variables' values. Data were imputed using the VIM (Visualization and Imputation of Missing values) package for the statistical software R (Templ & Kowarik 2010; Huang et al., 2017). VIM allows for visualization and exploration of missing data patterns and helps in the selection of an adequate imputation method. In this study, we selected the k-Nearest-Neighbor (kNN) imputation method with $k = 5$ (Troyanskaya et al., 2001). The kNN method replaces missing values with imputed values based on the average of measured values from its closest k neighbors. This method offers a few advantages such as its capacity to predict both discrete and continuous values, as well as the fact that it does not require the creation of a predictive model for each variable with missing data (Troyanskaya et al., 2001).

Test of assumptions

Assumptions for conducting regression analyses were tested. Variables of interest were first examined for normality of distribution using histograms and normal plots, followed by skewness and kurtosis statistical tests. To ensure that the data is not influenced by extreme values, Mahalanobis Distance was calculated to examine multivariate outliers across variables (De Maesschalck, Jouan-Rimbaud, & Massart, 2000; Mahalanobis, 1936). This test considers the correlation in the data, the variance of each variable and the covariance between variables. Any

value in the dataset with a Mahalanobis Distance with $p > .001$ was considered a multivariate outlier (Tabachnick and Fidell, 2007). Further, multicollinearity between the predictor variables was evaluated using the variance inflation factor (VIF). Independence of error terms was assessed using the Durbin-Watson test. Finally, linearity and homogeneity of error variance (or homoscedasticity) between predictor variables and the outcome variable were evaluated using residual vs. fitted values plot.

Data analysis

Descriptive statistics, including the frequency, percentage (*%*), mean and standard deviation (*SD*) were calculated to analyze sociodemographic characteristics of the sample. Pearson's correlations were calculated to determine the associations between variables of interest. Mediation analysis was used to test the conceptual models (see Figures 1 and 2) which examined interrelationships between COVID-19 stressors, social support variables (i.e., support from family, friends, a professional, and through social media) and TSR symptoms.

Mediation is the process by which some variables exert influences on other variables through intervening variables, or *mediator* variables (Preacher & Hayes, 2008). Mediation hypotheses conjecture how, or by what means, an independent variable (*X*) affects a dependent variable (*Y*) through one or more potential mediators (*M*). In Figure 1, we consider a model with social support as a composite mediating variable (*M*) in the association between COVID-19 stressors (*X*) and TSR symptoms (*Y*). As such, a simple mediation analysis using Model 4 of Hayes' (2013) PROCESS Macro was conducted to test our primary hypothesis (i.e., that social support mediates the relationship between COVID-19 stressors and TSR symptoms).

Meanwhile, parallel mediation can involve more than one mediator (Hayes, 2013). Indeed, two or more variables are hypothesized to mediate the relationship between *X* and *Y*. In

the case of this study, we posit how COVID-19 stressors (*X*) affect TSR symptoms (*Y*) through social support as separate mediating variables (M_1, M_2, M_3, M_4), as conceptualized in Figure 2. Hence, parallel mediation analysis using Model 4 of Hayes' (2013) PROCESS Macro was conducted to test our secondary hypothesis (i.e., that 'traditional' sources of support have more important mediating effect in the relationship between COVID-19 stressors and TSR symptoms).

Specific indirect effects for separate social support variables, as well as indirect effects for social support as a composite variable calculated using 5 000 bootstrapped samples with a 95% confidence interval, were used to analyze the mediating model's significance. Bootstrap methods were used as they allow to examine consistency and strength of results by resampling and refitting mediation models and effects (Efron & Tibshirani, 1994). They also allow to obtain robust confidence intervals for specific indirect effects by repeating the process thousands of times (Hayes, 2013). Indirect effect estimates were considered significant if the confidence intervals did not contain zero.

Both models controlled for sociodemographic variables (age, sex, ethnicity, employment status etc.). The significance level was adopted at the classic threshold of $\alpha = .05$, in a two-sided test. No correction for multiple testing was applied since this investigation had an exploratory purpose. All descriptive analyses were performed using the SPSS (version 23) software (IBM Corp., Armonk, NY), and mediation analyses were carried out using PROCESS macro version 3.5 for SPSS (Hayes, 2013).

Chapter III: Results

Sample characteristics

A total of 5 440 participants with complete data were included in the analysis. The sample mostly comprised Caucasian (72.8%), female (79.2%) and highly educated individuals (85.9%). See Table 1 for the details. The mean (*Me*) and standard deviation (*SD*) for TSR symptoms as measured by the IES-6 was 11.24 and 5.85 respectively, for combined social support variables *Me* = 15.30 and *SD* = 4.20.

Characteristics of the data

Survey completion rate, which was defined as the ratio of participants who completed the survey to the number of prospective participants who opened the survey's hyperlink, was 92%. An inspection of the data showed that less than 5% of the responses were missing from most variables (65%), so they were imputed. Little's MCAR test resulted in $\chi^2 = 15480.5$, $df = 13558$, $p < .001$, indicating that the data was not missing completely at random.
Histograms revealed that the data was normally distributed, as data depicted typical 'bell curves', confirmed by examination of normal plots showing data centered along the straight line. Based on Tabachnick and Fidell's (2013) recommendations, ranges of ±3 for skewness and ±8 for kurtosis were considered acceptable in assessing the normality of the distributions. Analyses showed that the normality assumption was not violated as skewness ranged between -0.5 and 1.7, and kurtosis ranged between 0.5 and 6.4. With regards to multivariate outliers, any value in the dataset with a Mahalanobis Distance with $p > .001$ was considered a multivariate outlier. The threshold value of .001 was suggested by Tabachnick and Fidell (2007). Based on this recommendation, 43 data points were considered multivariate outliers and were thus removed from analyses. Examination of residual versus fitted values plot revealed no issues regarding

homoscedasticity and linearity as most of the residuals were scattered around the zero point and showed a straight-line relationship with the predicted outcome variable scores (see Figure 5; Pallant, 2010). Multicollinearity between predictor variables was not a concern either, as VIF values ranged between 1 and 1.3, and the rule of thumb states that VIF ≤ 4 indicates absence of multicollinearity between predictor variables (Hair et al., 2010). The Durbin – Watson (DW) statistic revealed DW = 1.38. As $0 < DW < 2$ signifies positive dependency between error terms. Error terms were not found to be independent, which signifies that their correlation may be providing explanatory information as opposed to the independent variables. Hence, dependence of error terms was added to the limitations of this study.

Main results

Table 2 presents the correlations between the main study variables. Results from the simple mediation analysis revealed that social support does not mediate the relationship between COVID-19 stressors and TSR symptoms. First, we tested the total effect of COVID-19 stressors on TSR symptoms (*c'* in Figure 3; $\beta = .24$, $p < .001$). Second, social support (composite variable combining four types of social support) was introduced as a mediator, creating a path from COVID-19 stressors to social support (*a* in Figure 3 below; $\beta = .03$, $p = .031$) and a path from social support to TSR symptoms (*b* in Figure 3; $\beta = .05$, $p < .001$). Following recommendations by Preacher and Hayes (2004), the 95% bias corrected bootstrap confidence intervals (CI) were calculated to assess if the indirect effect was significantly different from zero by using 5 000 bootstrapped samples. The bootstrapped indirect effect of COVID-19 stressors on TSR symptoms via social support (*c* in Figure 3; $\beta = .001$; 95% CI = .000 - .003) was not significant, as the CI contains the value zero. This means that social support in general (i.e., as a composite variable) does not significantly mediate the association between COVID-19 stressors and TSR

symptoms. Further, the overall model was significant, with $F(1, 5\ 498) = 347$, $p < .05$ and $R^2 = .06$. Thus, this model only explained 6% of the variance in TSR symptoms, a rather modest proportion.

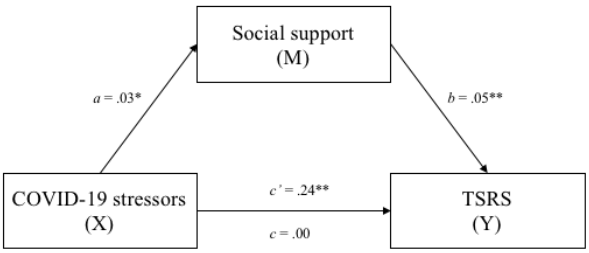

Figure 3. Mediation model for social support as a composite variable in the relationship between COVID-19 stressors and TSR symptoms.

Note: All presented effects are standardized; c' is the coefficient for the total effect of COVID-19 stressors on TSR symptoms; c is the coefficient for the indirect effect of COVID-19 stressors on TSR symptoms via social support. *$p < .05$; **$p < .001$

Next, to examine the direct and indirect effects and relationship between COVID-19 stressors, specific types of support and TSR symptoms, parallel mediation analyses were conducted with each source of support (i.e., family, friends, a professional, social media) as a mediator. With parallel mediation, it is possible to test each suggested mediator while accounting for the shared variance between them (Hayes, 2013). Figure 4 below shows the effects obtained between the variables of the model.

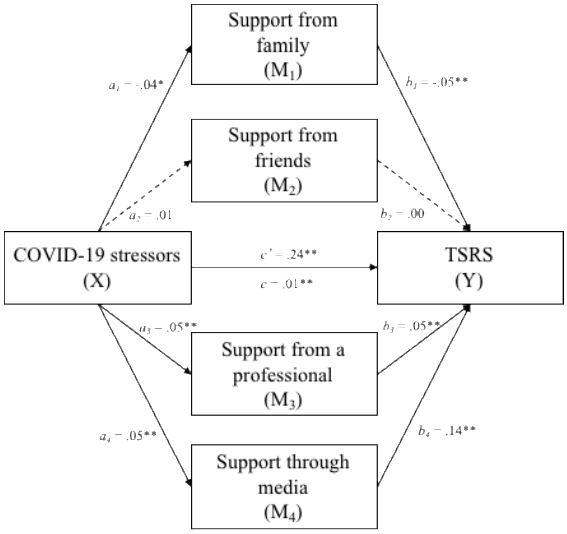

Figure 4. Parallel mediation model for social support variables in the relationship between COVID-19 stressors and TSR symptoms.

Note: All presented effects are standardized; a_n denote the coefficients of the effects of COVID-19 stressors on social support variables; b_n denote the coefficients of the effects of social support variables on TSR symptoms; *c'* is coefficients of the total effect of COVID-19 stressors on TSR symptoms; *c* is the coefficient of the indirect effect of COVID-19 stressors on TSR symptoms via social support variables. *: $p < .01$; **: $p < .001$

The direct effect of COVID-19 stressors on TSR symptoms (c') is positive and significant (β = .24, $p < .001$). The direct effects of COVID-19 stressors on support through social media (a_4; β = .05, $p < .001$) and support from a professional (a_3; β = .05, $p < .001$) are positive and significant, whereas the path to support from friends is not significant (a_2; β = .01, $p = .566$). The direct effect of COVID-19 stressors on support from family is negative and significant (a_1; β = -.04, $p = .004$). Furthermore, the direct effects of support through social media to TSR symptoms (b_4; β = .14, $p < .001$), support from family to TSR symptoms (b_1; β = -.05, $p < .001$), support from a professional to TSR symptoms (b_3; β = .05, $p < .001$) were all

significant, whereas the direct effect of support from friends to TSR symptoms was not (b_2; β < .001, p = .852).

The bootstrapped indirect effect of COVID-19 stressors on TSR symptoms through support via social media (β = .007; 95% CI = .003 - .011) and support from a professional (β = .003; 95% CI = .001 - .005) were significant, whereas the indirect effects of COVID-19 stressors on TSR symptoms through support from family (β = .002; 95% CI = .000 - .004) and support from friends were not significant (β < .001; 95% CI = .000 - .001) were not significant.

The overall model was significant, with $F(1, 5\ 498) = 347$, $p < .05$ and $R^2 = .06$, indicating that this model with separate social support variables explained 6% of the overall variance in TSR symptoms as well, leaving 94% of the symptom variance to be explained by other factors.

Chapter IV: Discussion

Summary of findings.

The current study aimed to examine the mediating effect of social support in general, as well as of separate sources of support, in the association between exposure to COVID-19 stressors and TSR symptoms in a large adult sample.

Primary objective: The mediating role of social support in general

The first hypothesis was that social support in general would mediate the effect COVID-19 stressors exposure on TSR symptoms. Results from the simple mediation analysis revealed that experiencing COVID-19 stressors positively predicted TSR symptoms, which is consistent with past research (e.g., Bo et al., 2020; Sun et al., 2020). Further, our findings revealed that experiencing COVID-19 stressors positively 'predicted' social support in general (i.e., all types of social support combined), which suggests that the higher the number of COVID-19 stressors individuals were exposed to, the higher their perceived social support. This matches studies' findings that exposure to COVID-19 stressors led to increased perceived social support (e.g., Zheng & Zhang, 2020; El-Zoghby et al., 2020).

Likewise, we found that social support positively 'predicted' TSR symptoms, such that the more individuals perceived availability of social support and were satisfied with it, the more they developed TSR symptoms. This suggests that perceived social support was not effective in buffering and appeared to have even led to increased TSR symptoms. However, it is not possible to determine the causal direction of this finding due to the study's cross-sectional design. Individuals with greater distress and TSR symptoms may have sought and received support in response resulting in the observed correlation. However, the possibility that social support may increase distress or TSR symptoms is in line with the "reverse buffering effect" theory which

proposes that social support may strengthen rather than weaken the positive association between stressors and negative psychological outcomes (Hobman et al., 2009). Indeed, even though social support may be beneficial for people, additional or excessive support may be harmful to them. This could be because it may hinder people's self-competence, self-efficacy and self-reliance in dealing with stress and trauma (Liu et al., 2021). Also, it may be a consequence of negative sharing which could emphasize stressors or serve as remembering the trauma (Liu et al., 2021). Indeed, Xi and colleagues (2020) found that social support was significantly positively associated with PTSD among 607 survey respondents, 3 months after the Jiuzhaigou earthquake. They proposed that getting support could keep reminding people of the traumatic event, resulting in increased traumatic symptoms. As well, it is possible that poorer mental health may reduce the buffering effect of social support (Liu et al., 2021), which could explain why individuals with higher initial distress did not benefit as much from higher social support.

Finally, and more importantly, we found that social support did not significantly mediate the association between COVID-19 stressors exposure and TSR symptoms, which fails to support our primary hypothesis. The scarcity of research on the mediating effects of social support in the examined relationship during the COVID-19 pandemic makes it difficult to make sense of these results. However, a study on the mental health of grocery store workers during the COVID-19 pandemic (N = 842) found that social support was not predictive of mental health outcomes (Janson, Sharkey & Del Cid, 2021).

Secondary objective: The mediating role of distinct sources of social support

Our second hypothesis was that 'traditional' forms of social support, namely support from friends and family, would mediate the effects of COVID-19 stressors exposure on TSR symptoms. The parallel mediation analysis showed that COVID-19 stressors were negatively

associated with support from family. This suggests that the greater the number of COVID-19 stressors experienced by individuals, the less they perceived availability of family support and the less satisfied they were with it. This may be explained by the finding that family is often itself the cause of distress during the pandemic; as such, people may be reluctant to turn to family members for support (Günther-bel et al., 2020).

Even though the coefficients were weak (e.g., $\beta = -.05$), we also found that higher perceived support from family was associated with less TSR symptoms, which indicates that individuals who perceived and were satisfied with support from family members had less TSR symptoms. This is consistent with findings from several studies that social support from family is correlated with lower levels of PTSD or traumatic stress symptoms (Liu et al., 2020; Tselebis et al., 2020; Li et al, 2020). In contrast, findings from Reeves et al. (2021) revealed that support from family was associated with increased ratings of distress in a sample of 1041 medically vulnerable Canadians. As well, Moore and Lucas (2020) conducted an online cross-sectional study involving a sample of 213 participants, which suggests that social support from family was not significant in diminishing psychological distress. However, neither paper examined TSR symptoms: the former assessed anxiety and depression, while the latter evaluated distress using the Psychological Distress Scale.

In addition, we found that COVD-19 stressors exposure was not significantly associated with support from friends, that support from friends did not significantly correlate with TSR symptoms, and importantly, that support from friends was not a mediator in the relationship we examined. These results are consistent with findings by Liu and colleagues (2020) that social support from friends was not associated with lower levels of PTSD in 898 young adults from the United States. Conversely, Zheng & Zhang (2020) found that COVID-19 stress in Chinese adults

was associated with increased support from friends, and Liu and colleagues (2021) mentioned above, that social support from friends was not significantly correlated with posttraumatic stress symptom mitigation.

Moreover, COVID-19 stressors positively 'predicted' both support through social media and support from a professional. In turn, both support through social media and support from a professional were positively associated with TSR symptoms: higher perceived support through these means signified more TSR symptoms. Other findings from our team (Rivest-Beauregard et al.; 2021) using the sample of the current study shed light on part of these results, as we found that support through social media increased because of COVID-19 stressors exposure. However, we found that when social media was used to connect and seek emotional support, it reduced psychological distress and traumatic stress symptoms, whereas when it is used to seek information, it was further distressing. In fact, Zhong et al. (2020) found that seeking support through social media (informational or emotional) led to elevated levels of not only stress, but also vicarious trauma and secondary traumatic stress among 320 Wuhan residents. Further, whereas we found that COVID-19 stress was associated with increase professional support, a review of 59 studies on the mental health impact of the COVID-19 pandemic on healthcare workers and interventions to help them revealed that health care workers reported low interest in professional (Muller et al., 2020). This article may be the only paper on this topic that we can compare our results to.

Finally, our findings regarding mediation of support via social media, support from a professional, and family did not indicate a substantial effect. The coefficients were extremely low ($\beta s \leq .01$), which implies that even though statistical significance was achieved for support via media and support from a professional, the magnitude of the effects was insignificant. We

did not confirm our secondary hypothesis that 'traditional' sources of support (i.e., perceived support from friends, family and a professional) would mediate the effects of COVID-19 stress on TSR symptoms. Our results imply that support from family and support from a professional may not represent good sources of support during the COVID-19 pandemic and may not be effective in substantially buffering the effects of COVID-19 stress on TSR symptoms. This is in opposition with results obtained by Reeves and colleagues (2021) which revealed that support from family mediated the relationship between COVID-19 worries and mental health outcomes in a sample of more than 1000 Canadians. Wang et al. (2021) found that perceived family support was negatively associated with PTSD symptoms among pregnant women during the COVID-19 pandemic, and Shalaby et al. (2021) found significantly lower odds of PTSD among individuals with higher support from friends and family (N = 1079). Outside the COVID-19 pandemic, a meta-analysis looking at social support and PTSD in children and adolescents concluded that the effect size for relationship between family support and PTSD is small (Allen et al., 2021). Regarding professional support, no study has investigated mediation of this source of support in the relationship between COVID-19 stress and TSR symptoms. When it comes to support via social media, confirming findings from our team reported above, Pahayahay and Khalili-Mahani (2020) qualitatively analyzed 685 responses regarding social media during the pandemic and concluded that social media was important for coping if it provided support and connection while avoiding excess of sensational and false information dissemination. Since social media support was found both to increase psychological distress and to diminish it (e.g., Levaot et al., 2020; Gao et al., 2020; Drouin et al., 2020), it might explain the overall '0 sum' we found in buffering the effects of COVID-19 stress on TSR symptoms. To our knowledge, no

prior research has examined mediation of perceived support via social media that could help us shed light on the significance of our findings.

In sum, research on mediation of separate sources of support in the association between COVID-19 stressors and TSR symptoms is scant, which impedes elucidations. As well, our findings may be due to limitations in our study's methodology which are listed below.

Limitations

Results from the present study should be interpreted with caution for several reasons. First, recruitment through social media as well as the online distribution of our survey introduced a sampling bias, wherein participants who utilize this technology to a lesser degree may have not been included. Further, individuals with more severe symptoms may be indisposed or may be unwilling (especially given that avoidance is a cardinal symptom of trauma- and stress-related disorders) to complete the questionnaire. The use of convenience or snowball sampling may also limit the generalizability of the current findings, as it may lead to biased selection and representation. For example, the current sample was mostly female, Caucasian and highly educated individuals, which limits the generalizability of the findings. Indeed, for istance, what if the "reverse buffering effect" is specific to our sample, as it is comprised of 85% of university-level education individuals who may have access to more resources and almost 80% of women who tend to seek out help for mental help problems more than men. It is worth asking ourselves if the results would have remained the same had the sample been representative of the general population.

Second, measures of exposure to COVID-19 stressors, social support and TSR symptoms were based on self-report questionnaires, which may be different than findings from clinical diagnostic interviews. Indeed, this may limit the validity of the data due to under- or over-reporting because of social desirability. Also, social support was assessed using four single-item

questions (e.g., I get the emotional help and support I need from a professional). These may not encapsulate the quality, frequency and adequacy of the support received, nor consist in a sufficient measure of a construct like social support. For instance, the Multidimensional Scale of Perceived Social Support (MSPSS; Zimet et al., 2012) measures perceived support from 3 sources (family, friends and a significant other), and each subscale includes 4 items, for a total of 12 items. Another point worth addressing regarding the measurement of the social support construct is the combination of these single-item questions to create a 4-item scale measuring social support as a whole. This presents numerous pitfalls and future research should consider using a validated social support measure instead, or conduct and present analyses of (convergent) validity between the newly created scales and existing social support scales.

Moreover, we did not assess whether the support and help received was considered supportive or counter-supportive, whereas counter-supportive interactions are more tightly linked to symptoms of traumatic stress than supportive interactions (Guay et al., 2011). Additionally, we did not measure both perceived (i.e., the satisfaction with and the availability of the support; Sarason et al., 1990) and received support (the quantity of supportive behaviors received; Haber et al., 2007), contrary to Wills and Shinar's (2000) recommendations. As well, the combination of questionnaires in different languages is not without its faults. Even though the back-translation procedure used for the 5 languages of the questionnaire corresponds to cross-cultural adaptation, the metric properties of the different questionnaires may not match those of the original version. Lastly, qualitative questions would have strengthened the validity and captured more of the experience of participants with regards to social support (Miller, 2011).

Furthermore, the data collected only cover a limited period during the pandemic and quarantine situation (i.e., beginning of April, during the first wave of the pandemic). The

emergence of multiple waves, as well as the duration of each wave may have resulted in different profiles and findings dependent upon the time of data collection. The limited period during which we collected data does not allow us to examine changes in the relationships between study variables over time. Moreover, the characteristics of the pandemic changed over time; new variants were detected in several countries (e.g., UK, Brazil) and vaccination programs started after we collected our data, which may have also affected the levels of distress as well as the impact of social support. For instance, Tandt et al. (2021) found that COVID-19 distress and depression worsened during the second wave of the pandemic, while Shevlin and colleagues (2021) found that COVID-related PTSD reduced between waves 2 and 3 of the pandemic.

Finally, although mediation analysis was used, causal relations and directionality between COVID-19 stressors, social support variables and TSR symptoms cannot be confirmed due to this study's cross-sectional design. Indeed, even though mediation infers temporal precedence of predictor and mediator variables over the outcome, cross-sectional studies generally preclude conclusions about causal direction. For example, it is not possible to establish whether receiving more social support in general results in more TSR symptoms, or whether participants with initially elevated TSR symptoms seek and receive more support. In addition, pre-pandemic baseline data on the psychological state of participants is lacking (i.e., IES scores). Hence, it was not possible to uncover whether COVID-19 stressors were solely the cause of TSR symptoms and of seeking additional social support in our sample. Unfortunately, we did not inquire about other stressful or traumatic events, which limits our ability to identify the contributors to distress levels.

Strengths

Despite its limitations, the present study did have some strengths. The most noteworthy strengths are its size (N = 5 913) and response rate (92% among people who opened the survey

link) which provided strong statistical power. To our knowledge, no previous study has looked at exposure to COVID-19 stressors, multiple sources of social support, and TSR symptoms in individuals from more than 5 different countries.

Importantly, the inclusion and assessment of multiple sources of social support (i.e., friends, family, a professional and social media) allowed for further analyses and comparisons of both specific and combined sources of social support, allowing for further insights into the relationship between social support and TSR symptoms, in the context of the COVID-19 pandemic as well as in general. We also assessed exposure to 19 different COVID-19 stressors (e.g., quarantine, confinement, financial difficulties, COVID-19 diagnosis and more).

Finally, robust statistical analysis was used. Indeed, we conducted simple mediation analysis as well as parallel mediation analysis. Further, we used Knn imputations for missing variables and we assessed for covariates (which were not included in the final model as they did not affect the overall model significantly).

Future directions

Considering the study limitations, numerous steps can be taken to improve our study and thus the robustness of our results.

Firstly, future studies utilizing standardized interviews may provide more accurate results as well as further information regarding the intricate mechanisms underlying the association between COVID-19 stressors exposure, social support and traumatic stress symptoms.

Secondly, future studies should evaluate the psychological impact of COVID-19 stressors over time and during different stages of the pandemic, as well as compare traumatic stress reactions considering different infection waves and following vaccination programs. As such, a longitudinal study may provide more detailed and stronger results.

Another potential avenue for future research lies in the use of qualitative investigations. Indeed, to further understand the unique needs and experiences of individuals in times of stress such as the COVID-19 pandemic, questions should investigate the hindering factors to receiving adequate support, people's methods of communicating their needs, what consists in helpful vs. harmful support and more.

Moreover, the current study mainly focused on the mediating role of social support. However, previous research has also highlighted the importance of other positive psychological variables such as resilience, optimism and self-efficacy in buffering the negative effects of stressful events, during the COVID-19 pandemic and otherwise (Sherr et al. 2021, Georgieva et al., 2021; Finck et al., 2018). Whether such variables would mediate the association between COVID-19 related stress and traumatic stress symptoms warrants investigations.

Furthermore, to address the limitations regarding our study's single item question to assess the construct of social support, comprehensive social support scales may serve to better encapsulate the construct and the experience of individuals. Scales could be used to investigate emotional vs. instrumental support, support matching, frequency and quality of support, different sources of support and so on. Numerous adequate scales could have been used if time was not as issue when conducting our study like the Duke Social Support Index, the Sarason's Social Support Questionnaire and the Multidimensional Scale of Perceived Social Support (DSSI; Koenig et al., 1993; SSQ; Sarason et al., 1983; MSPSS; Zimet et al., 2012).

There is still much to be elucidated about the relationship between COVID-19 stress, social support variables and TSR symptoms, and it is an exciting and important avenue of research that should be addressed considering some of the recommendations described above.

Chapter V: Conclusions and Implications

This large online survey of COVID-19 related stress examined the potential mediating effect of social support on trauma and stress-related symptoms. Contrary to our primary hypothesis, we found that social support in general did not mediate the association between exposure to COVID-19 stressors and TSR symptoms. Our secondary hypothesis was also not confirmed: social support from friends and family did not mediate the relationship between exposure to COVD-19 stressors and TSR symptoms. However, support via social media and support from a professional were found to significantly mediate the association between exposure to COVID-19 stressors and TSR symptoms. However, the beta coefficients were very small, indicating that the mediating effect of these sources of support was modest. It is likely that statistical significance was achieved due to high statistical power conferred by our large sample size.

This study extends previous research by providing a first examination of the potential mediating role of social support variables in relationship between COVID-19 stressors and TSR symptoms. We identified methodological limitations in the present study that can be addressed in future studies, and provided detailed recommendations were offered to address each limitation described above (i.e., changes to be made in an ideal context such as a more comprehensive scale).

If replicated, these negative findings raise the possibility that although social support usually functions as a buffer, it may not provide beneficial effects in the context of a pandemic like the COVID-19, where social distancing and other circumstances have prevented physical closeness. Indeed, our lack of significant and substantial results raises questions about the quality and nature of social support itself in the context of the COVID-19 pandemic. The COVID-19

pandemic's unique characteristic, such as the fact that it has been a chronic and universal stressor, may undermine the protective effects of social support. Each individual is dealing with their own set of challenges and consequently, may not be able to be as present with their loved ones. Studies of social support may have underestimated the importance of physical contact, and social distancing and quarantined may have resulted in kinds of distress that social support is less able to buffer. If this were the case, it would be important for policy makers to consider the impact of public health strategies implemented to reduce the spread of the virus in preparing for ongoing and novel COVID-19 variants and infection waves, as well as future pandemics or large-scale disasters. Indeed, such policies may help prevent the spread of a COVID-19 pandemic, at the expense of loneliness, social isolation and a potential adverse mental health pandemic.

Indeed, policy planners and treatment providers need to prepare to address the likely proliferation of adjustment disorders and other trauma- and stressor-disorders worldwide, as pandemic stressors such as health-related stressors, job loss, and work-related stressors fall very much in line within the risk factors for these disorders.

We found that, although modestly, social media mediated the effect of COVID-19 stressors on TSR symptoms. Regardless of the validity of our findings regarding the general mediating effect of social support, our results confirm the need to develop interventions fostering positive use of social media, while reminding the population of the negative impacts of its overconsumption. Social media seem to have the potential to positively impact people's traumatic emotional levels and their mental health in general when used to connect with loved ones, while preventing overflow of news. Social media may represent the most relevant and

powerful source of support in time of social isolation and distancing, but further means to help people connect in a way that may not also be detrimental should be considered.

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Appendix A – Invitation e-mails and Social Media Posts

ENGLISH VERSION

SOCIAL MEDIA POST #1:

Help us understand the effects of the COVID-19 pandemic! We need YOU to complete a 5-minutes survey!

The Douglas-McGill Laboratory on Psychological Trauma is recruiting adults to complete a short online survey aiming to understand the circumstances in which the COVID-19 pandemic can be stressful vs. traumatic. You will be asked to answer questions about yourself, the coronavirus, and your emotional reactions to the pandemic. This will take 5 min. of your time.

To begin, please click on the link below:

[insert link to the survey]

SOCIAL MEDIA POST #2:

Can a global pandemic be traumatic? In order to know, we need YOUR help!

Calling **adults** to complete a **short online survey** on COVID-19 and trauma exposure.

{Pictures of COVID-19/trauma/brain}

The Douglas/McGill Laboratory on Psychological Trauma is recruiting adults to complete a short online survey aiming to understand the circumstances in which the COVID-19 pandemic can be stressful vs. traumatic. You will be asked to answer questions about yourself, the coronavirus, and your emotional reactions to the pandemic. This will take 5 min. of your time.

To begin, please click on the link below:

[insert link to the survey]

INVITATION E-MAIL:

Good day,

My name is _____ and I am a research assistant in the Douglas-McGill laboratory on Psychological Trauma, directed by Prof. Alain Brunet.

The Douglas/McGill Laboratory on Psychological Trauma is recruiting adults to complete a short online survey aiming to understand the circumstances in which the COVID-19 pandemic can be stressful vs. traumatic. You will be asked to answer questions about yourself, the coronavirus, and your emotional reactions to the pandemic. This will take 5 min. of your time.

To begin, please click on the link below:

[insert link to the survey]

VERSION FRANÇAISE

SOCIAL MEDIA POST #1:

Aide-nous à mieux comprendre la pandémie du COVID-19 !

On a besoin de TOI pour compléter un sondage de 5 minutes!

Le laboratoire de recherche sur les psychotraumatismes recrute des adultes (18 ans et plus) pour compléter un court questionnaire en ligne afin de comprendre les circonstances dans lesquelles la pandémie du COVID-19 peut être stressante ou traumatique. Tu auras à répondre à des questions à propos de toi-même, le coronavirus, et tes réactions émotionnelles à la pandémie. Ça ne devrait prendre que 5 minutes de ton temps.

Pour commencer, clique sur le lien ci-dessous :

[Insérer lien pour le sondage]

SOCIAL MEDIA POST #2:

Une pandémie peut-elle s'avérer traumatique ? Pour le découvrir, nous avons besoin de VOTRE aide !

Nous sommes à la recherche d'**adultes** afin de compléter **un court sondage en ligne** sur leur expérience de la crise de la COVID-19.

{Pictures of COVID-19/trauma/brain}

Le laboratoire de recherche sur les psychotraumatismes recrute des adultes (18+) pour compléter un court questionnaire en ligne afin de comprendre les circonstances dans lesquelles la pandémie du COVID-19 peut être stressante ou traumatique. Vous aurez à répondre à des questions à propos de vous-même, le coronavirus, et vos réactions émotionnelles face à la pandémie. Cela ne prendra que 5 minutes de votre temps.

Pour commencer, veuillez cliquer sur le lien ci-dessous :

[Insérer lien pour le sondage]

INVITATION E-MAIL :

Bonjour,

Nous sommes à la recherche de personnes adultes pour compléter un court questionnaire en ligne afin de comprendre les circonstances qui peuvent rendre la pandémie du COVID-19 stressante ou traumatisante. Vous aurez à répondre à des questions à propos de vous-même, le coronavirus, et vos réactions émotionnelles à la pandémie. Cela ne devrait prendre que 5 minutes de votre temps.

Pour commencer, veuillez cliquer sur le lien ci-dessous :

Sincèrement,

(full name and title)

Laboratoire de recherche sur les psychotraumatismes
Institut en Santé Mentale Douglas
Université McGill

CHINESE VERSION

SOCIAL MEDIA POST #1:

帮助我们了解COVID-19全球大流行病的影响！我们需要您完成5分钟的调查！

道格拉斯-麦吉尔心理创伤实验室正在招募成年人来完成一项简短的在线调查问卷，其目的是希望了解COVID-19大流行病在何种情况下会产生压力或带来创伤。您将被邀请来回答有关您自己、冠状病毒、以及您对大流行病的情绪反应的问题。这将会占据您5分钟的时间。

开始请点击以下链接：

[insert link to the survey]

SOCIAL MEDIA POST #2:

全球大流行病会造成创伤吗？为了知道，我们需要您的帮助！

呼吁**成年人们**完成一项有关COVID-19和创伤暴露的**简短在线调查**。

{Pictures of COVID-19/trauma/brain/something appealing}

道格拉斯-麦吉尔心理创伤实验室正在招募成年人来完成一项简短的在线调查问卷，其目的是希望了解COVID-19大流行病在何种情况下会产生压力或带来创伤。您将被邀请来回答有关您自己、冠状病毒、以及您对大流行病的情绪反应的问题。这将会占据您5分钟的时间。

开始请点击以下链接：

[insert link to the survey]

INVITATION E-MAIL:

您好，

我的名字是_____ 我是一名在Alain Brunet教授带领的道格拉斯-麦吉尔心理创伤实验室的研究助理。

道格拉斯-麦吉尔心理创伤实验室正在招募成年人来完成一项简短的在线调查问卷，其目的是希望了解COVID-19大流行病在何种情况下会产生压力或带来创伤。您将被邀请来回答有关您自己、冠状病毒、以及您对大流行病的情绪反应的问题。这将会占据您5分钟的时间。

开始请点击以下链接：

[insert link to the survey]

ITALIAN VERSION

SOCIAL MEDIA POST #1

Aiutaci a comprendere gli effetti della pandemia COVID-19! Abbiamo bisogno di VOI per completare un sondaggio di 5 minuti!
Il Laboratorio Douglas-McGill sul Trauma Psicologico sta reclutando adulti per completare un breve sondaggio online che ha come obbiettivo la comprensione delle situazioni in cui la pandemia COVID-19 può essere stressante vs. traumatica. Vi è chiesto di rispondere a delle questioni su voi, sul coronavirus, e su le vostre reazioni emotive a la pandemia. Questo prenderà 5 minuti del vostro tempo.
Per iniziare, si vi prega di cliccare sul link sotto:

[insert link to the survey]

SOCIAL MEDIA POST #2

Una pandemia globale può essere traumatica? Per sapere, abbiamo bisogno del VOSTRO aiuto!
Chiamando **adulti** per completare un **breve sondaggio online** sul COVID-19 e su l'esposizione del trauma.

{Pictures of COVID-19/trauma/brain/something appealing}

Il Laboratorio Douglas-McGill sul Trauma Psicologico sta reclutando adulti per completare un breve sondaggio online che ha come obbiettivo la comprensione delle situazioni in cui la pandemia COVID-19 può essere stressante vs. traumatica. Vi è chiesto di rispondere a delle questioni su voi, sul coronavirus, e su le vostre reazioni emotive a la pandemia. Questo prenderà 5 minuti del vostro tempo.
Per iniziare, si vi prega di cliccare sul link sotto:
[insert link to the survey]

INVITATION E-MAIL:

Buona giornata,
Mi chiamo _____ e sono un assistente di ricerca del Douglas-McGill laboratorio sul Trauma Psicologico, diretto da Prof. Alain Brunet.
Il Laboratorio Douglas-McGill sul Trauma Psicologico sta reclutando adulti per completare un breve sondaggio online che ha come obbiettivo la comprensione delle situazioni in cui la pandemia COVID-19 può essere stressante vs. traumatica. Vi è chiesto di rispondere a delle questioni su voi, sul coronavirus, e su le vostre reazioni emotive a la pandemia. Questo prenderà 5 minuti del vostro tempo.
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Appendix B – Study questionnaires

English

Tell us a bit about your experience

Take a moment to consider your global experience of the COVID-19 crisis up until now. Then answer the questions below by selecting the option that best describes what you experienced of the COVID-19 crisis so far. (Note that you will get an opportunity to describe that experience at length a little later in the survey, if you wish).

If an item does not apply to you, select "not at all".

Please answer the following questions with YES or NO with respect to your EXPERIENCE WITH THE COVID-19 CRISIS SO FAR.

Scale: 0(No) 1(Yes)

1. **So far**, have you been separated from your loved ones for at least 14 consecutive days?
2. Did you travel to or from your home country since the beginning of the COVID-19 crisis?
3. Have you been confined? (socially isolated)
4. Have you been quarantined? (cannot go out)
5. Have you experienced any COVID-19 symptoms?
6. Has a significant other in your household experienced any such symptoms?
7. Have you been tested for the COVID-19?
8. Has a significant other in your household been tested for the COVID-19?
9. Have you received a positive diagnosis for the COVID-19?
10. Has a significant other in your household received a positive diagnosis for the COVID-19?
11. Do you know anyone who has been diagnosed with the COVID-19, other than the individuals in your household?
12. Are you part of an at-risk group for the COVID-19? (e.g.: 65 years and over, etc.)
13. Have you received medical care because of the COVID-19?
14. Have you been hospitalized because of the COVID-19?
15. Have you been at the intensive care unit because of the COVID-19?
16. Have you lost a loved one due to the COVID-19?
17. Have you lost lose your job because of the COVID-19?
18. Have you experienced any material hardship (not having enough food, money, shelter, etc…) as a result of the COVID-19?
19. Have you received financial support from the government, organizations, or your employer?
20. If you answered yes to the previous question, did you find it helpful?

Scale: 0(not at all) 1(slightly) 2(somewhat) 3(moderately) 4(extremely)

1. Up until now, did you worry that you or someone you love would get the COVID-19?

2. Up until now, did you worry that a significant other in your household would get the COVID-19?
3. As part of your work, are you potentially exposed to infected individuals or objects?
4. Up until now, if you were confined, to what extend was this experience difficult?
5. Up until now, if you were quarantined, to what extend was this experience difficult?

Please indicate how strongly you agree with the following statements

Since the beginning of the COVID-19 crisis AND UP UNTIL NOW:

Scale: 0(not at all) 1(slightly) 2(somewhat) 3(moderately) 4(extremely) (N/A)

21. Up until now, did you worry that you or someone you love would get the COVID-19?
22. Up until now, did you worry that a significant other in your household would get the COVID-19?
23. As part of your work, are you potentially exposed to infected individuals or objects?
24. Up until now, if you were confined, to what extend was this experience difficult?
25. Up until now, if you were quarantined, to what extend was this experience difficult?

Please indicate how strongly you agree with the following statements.

Scale: 0(Very strongly disagree) 1(Strongly disagree) 2(Mildly disagree) 3(Neutral) 4(Mildly agree) 5(Strongly agree) 6(Very strongly agree) 7(N/A)

1. I get the emotional help and support I need from my family
2. I get the emotional help and support I need from my friends, colleagues, and neighbours
3. I get the emotional help and support I need from a professional

Peritraumatic Distress Inventory

Take a moment to consider your global experience of the COVID-19 crisis. Then answer the items below by selecting the number that best describes what you experienced DURING YOUR WORST MOMENT of the COVID-19 crisis. If an item does not apply to you, select “not at all”

During my worst moment of the COVID-19 crisis so far:

Scale: 0(not at all) 1(slightly) 2(somewhat) 3(very true) 4(extremely true)

1. During my worst moment of the COVID-19 crisis so far, I felt helpless
2. During my worst moment of the COVID-19 crisis so far, I felt sadness and grief
3. During my worst moment of the COVID-19 crisis so far, I felt frustrated or angry

4. During my worst moment of the COVID-19 crisis so far, I felt afraid for my safety
5. During my worst moment of the COVID-19 crisis so far, I felt guilt
6. During my worst moment of the COVID-19 crisis so far, I felt ashamed of my emotional reactions
7. During my worst moment of the COVID-19 crisis so far, I felt worried about the safety of others
8. During my worst moment of the COVID-19 crisis so far, I had the feeling I was about to lose control of my emotions
9. During my worst moment of the COVID-19 crisis so far, I had difficulty controlling my bowel and bladder
10. During my worst moment of the COVID-19 crisis so far, I was horrified by what happened
11. During my worst moment of the COVID-19 crisis so far, I had physical reactions like sweating, shaking, and pounding heart
12. During my worst moment of the COVID-19 crisis so far, I felt I might pass out
13. During my worst moment of the COVID-19 crisis so far, I thought I might die

Impact of Event Scale-6

Below is a list of difficulties that people sometimes have after stressful life events. Please indicate how distressing each difficulty has been for you DURING THE PAST 7 DAYS with respect to the COVID-19 crisis.

How much were you distressed or bothered by these difficulties?

Scale: 0(not at all) 1(a little bit) 2(moderately) 3(quite a bit) 4(extremely)

1. During my worst moment of the COVID-19 crisis so far, things kept making me think about the COVID-19.
2. During my worst moment of the COVID-19 crisis so far, I thought about the COVID-19 when I didn't mean to.
3. During my worst moment of the COVID-19 crisis so far, I tried not to think about the COVID-19.
4. During my worst moment of the COVID-19 crisis so far, I was aware that I had a lot of feelings about the COVID-19, but I didn't deal with them.
5. During my worst moment of the COVID-19 crisis so far, I had trouble concentrating because of the COVID-19.
6. During my worst moment of the COVID-19 crisis so far, I felt watchful and on-guard.

Please describe your worst experience with the COVID-19 crisis so far.

Would you allow us to share your experience anonymously on social media, other platforms, or during events?

Yes No

Sociodemographic Questions

1. What city do you live in?

2. What country do you live in?

3. Were you born in the country where you are currently living?

4. How many individuals do you currently live with?

   0 1 2 3 4 5 6 or +

5. What type of housing do you live in?
   Single room (alone) Single shared room 1 bedroom apartment 2 bedroom apartment
   3 bedroom apartment 4 bedroom apartment House

6. How do you self-identify? Please check all that apply.

   Native American/First Nation; Caucasian; Black/African American; Latino/Hispanic; Asian; Other (please specify).

7. What is your marital status?

   Single Co-habiting/Married Separated/Divorced Widowed

8. How many children do you have (select)?
   0 1 2 3 4 5 +6

9. Are you currently pregnant?

   No or N/A Yes (please specify how many weeks)

10. How many years of completed schooling?
    7 or - 8 9 10 11 12 13 14 15 16 16 or +

11. What is your occupation? Please select the option that resemble your current occupation the most. If you have lost your occupation due to COVID-19, or if you are retired, please indicate your occupation before the COVID-19 crisis.
    (1) Unemployed (2) Student (3) Homemaker (4) Manual labor worker (e.g. construction, factory worker, manual work, etc.) (5) Clerical and sale worker (6) Intellectual and scientific professional worker (e.g. administrator, lawyer, director, office worker, researcher, professor, enginerr, etc.) (7) Health professional

worker (e.g. mental health worker, nurse, psychologist, physician, health-related researcher, etc.) (8) Business owner or self-employed (9) Military personnel (10) retired (11) Other (Please, specify)

12. If you are a health care worker, please specify your profession.

13. What is your year of birth? (yyyy)

14. What is your gender?
    Male Female Other/Won't disclose

15. In what language did you complete this survey?

Media Use

We are interested in knowing more about your usage of social media.

In the past month, how often have you experienced the following situations?

Scale: 0(never) 1(rarely) 2(sometimes) 3(often) 4(Very often)

1. I maintain closeness and receive the support that I need through social networks (Facebook, Instagram, Youtube, etc) and messaging apps (Whatsapp, Telegram, SMS, etc.)
2. I looked for and shared information and news on COVID-19 on traditional media (print, television, etc.), on the Internet or on social networks (Facebook, Instagram, Youtube, etc.)

Before we say goodbye…

We plan on 'checking in' with you up to 4 times in the next 6 months. Do you agree to be recontacted by e-mail in the future for short follow-ups? (You can opt out at any time)

Yes No

Please provide your email address. Note that this information will be kept confidential and separate from your responses to this questionnaire:

_____

It would be very helpful to us to know more about your experience with our survey and to get your feedback.

1. How did you hear about this survey?
   (1) Social Media
   (2) Family or friends
   (3) E-mail from organization, group, or institution
   (4) Online article

2. Did you appreciate your experience with this survey?
   Yes No (Please specify in order to help us improve)

3. Is there anything we did not ask about in this survey that you find is missing?
   _____

4. Would you recommend this survey to a friend or a family member?
   Yes No

In the past month, how often have you experienced the following situations?

Very often Often Sometimes Rarely Never

I maintain closeness and receive the support that I need through social networks (Facebook, Instagram, Youtube, etc) and messaging apps (Whatsapp, Telegram, SMS, etc.)

I looked for and shared information and news on COVID-19 on traditional media (print, television, etc.), on the Internet or on social networks (Facebook, Instagram, Youtube, etc.)

Table 1. Sample characteristics

	M(range)	*SD*
Age (years)	42.22	15.24
Peritraumatic distress[1]	17.53	10.56
Trauma- and stressor-related symptoms[2]	11.24(0-24)	5.85
Social support variables		
Social support in general	15.30(0-25)	4.20
Support via social media	2.88(0-4)	1.03
Support from friends	4.94(0-7)	1.71
Support from family	5.20(0-7)	1.72
Support from a professional	2.29(0-7)	2.40
COVID-19 stressors	3.66	2.10
	N	%
Country of Residence		
France	1 036	17.52
Canada	1 946	32.91
Italy	1 094	18.50
USA	1 302	22.02
China	336	5.68
Other	199	3.37
Gender		
Man	1 173	19.84
Woman	4 681	79.16
Other/ won't disclose	59	1.00
Marital Status		
Single	2 156	36.46
Cohabitating/ married	3 278	55.43
Separated/ Divorced/ Widowed	479	8.10
Ethnicity		
Caucasian	4 306	72.82
Black	68	1.15
Hispanic	316	5.34
Asian	617	10.43
Mixed	123	2.08
Other	483	8.17
Occupation[3]		
Stay home occupations	676	11.43
Essential workers	2 717	45.95
Non-essential workers	1 578	26.69
Other	942	15.93
Education		
Pre-University	837	14.16

Undergraduate level	2 064	34.91
Graduate level	3 012	50.94

Note. N = 5 913 (n = 5 621 for trauma-related variables).
[1]Peritraumatic Distress Inventory score. [2]Impact of Event Scale (6-items version) score.
[3]Occupation categories were divided as follow: Stay home occupation included unemployed, homemaker, and retired. Essential workers included manual workers, professionals, health professionals, and military. Non-essential workers included students, non-essential retail/trade workers, and non-essential business owners.

Table 2. Pearson's correlations among the main study variables

	1	2	3	4	5	6	7
1. COVID-19 stressors	-						
2. TSR symptoms	.24**	-					
3. Social support combined	.03*	.06**	-				
4. Support through social media	.06**	.15**	.35**	-			
5. Support from family	-.04**	-.04**	.65**	.08**	-		
6. Support from friends	.01	-.01	.69**	.10**	.49**	-	
7. Support from a prof.	.06**	.07**	.64**	.06**	.04**	.10**	-

* Correlation is significant at the .05 alpha level (2-tailed test).

** Correlation is significant at the .01 alpha level (2-tailed test).

Figure 5. Residual vs fitted plot of predicted values