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The relationship among psychological distress, well-being and excessive social media use during the outbreak of Covid-19: A longitudinal investigation

Julia Brailovskaia[1] | Juergen Margraf[1] | Sara Ceccatelli[2] | Fiammetta Cosci[2,3]

[1]Mental Health Research and Treatment Center, Department of Clinical Psychology and Psychotherapy, Ruhr-Universität Bochum, Bochum, Germany

[2]Department of Health Sciences, University of Florence, Florence, Italy

[3]Department of Psychiatry and Neuropsychology, Maastricht University, Maastricht, The Netherlands

Correspondence
Prof. Fiammetta Cosci, Department of Health Sciences, University of Florence, via di San Salvi, 12, 50135, Florence, Italy.
Email: fiammetta.cosci@unifi.it

Abstract

Introduction: The corona pandemic has been a life event causing negative consequences on mental health. Mental health consists of positive and negative dimensions. The present longitudinal study investigated how positive and negative dimensions changed over 15 months after the Covid-19 outbreak. Potential changes of excessive social media use (SMU) and its relationship with mental health were also investigated.

Method: Data ($N = 189$) on distress (measured overall and as depression, anxiety, and stress), well-being and excessive SMU were collected at three time points (baseline, BL; 3-month follow-up, FU1; 15-month follow-up, FU2) via online surveys in Italy. Repeated analyses of variance were used to test differences among the three measurement time points. Mediational models were applied.

Results: Distress did not change over time, well-being decreased and excessive SMU increased significantly. The relationship between distress at BL and excessive SMU at FU2 was significant (total effect, *c*: $p < .001$). The relationship between distress at BL and well-being at FU1 (*a*: $p < .001$), and between well-being at FU1and excessive SMU at FU2 (*b*: $p = .004$) was significant. Including FU1 well-being in the model, the relationship between distress at BL and excessive SMU at FU2 was not significant (direct effect, *c'*: $p = .078$). The indirect effect (*ab*) was significant.

Conclusion: Well-being mediated the relationship between baseline stress and excessive SMU. Enhanced stress may reduce well-being which, in turn, increases the risk of excessive SMU. This emphasizes the urgency of programmes that foster well-being, especially during stressful events such as a pandemic.

KEYWORDS
COVID-19, distress, longitudinal, mental health, social media use, well-being

1 | INTRODUCTION

The outbreak of the coronavirus disease 2019 (Covid-19) has been a negative life event for many people. Virus infection, fear of being infected, lockdowns, financial and social problems (Brailovskaia & Margraf, 2020), as well as physical and social distancing have represented the major burdens. An increase in psychological distress (e.g. anxiety, irritability, negative mood and worry) has been observed in the general population (Mansueto et al., 2021; Peng et al., 2021) together with a decrease in happiness and pleasure related to restrictions of daily activities (Mansueto et al., 2021). Allostatic load (i.e. the disequilibrium and imbalance of physiological and psychological systems due to stress) was documented; anxiety and depression were found to be positively associated with it (Peng et al., 2021). Few studies showed an increased tendency of internet addiction during the pandemic (Dong et al., 2020; Sun et al., 2020). Recent research conducted in college students observed that Covid-19 stress was positively associated with tendencies towards excessive social media use (SMU) and that the relationship was mediated by active use and social media flow (Zhao & Zhou, 2021).

Considering that (1) psychopathological dimensions (e.g. depression and social anxiety) and distress have been hypothesized as predisposing factors to excessive internet use (Brand et al., 2016, 2019); (2) distress can contribute to excessive use of online activity (Sun & Zhang, 2020); (3) psychological well-being (i.e. a balance of psychic forces) may buffer the negative effects of distress (Teismann et al., 2022; Truskauskaite-Kuneviciene, Kazlauskas, Ostreikaite-Jurevice, Brailovskaia & Margraf, 2020); (4) the gap in the literature on the relationship among distress, well-being, and SMU; (5) the lack of longitudinal studies on this topic, we aimed at longitudinally assess distress, well-being and SMU during the pandemic. We also tested whether well-being at 3-month follow-up could mediate the relationship between baseline distress and excessive SMU at 15-month follow-up (see Figure 1).
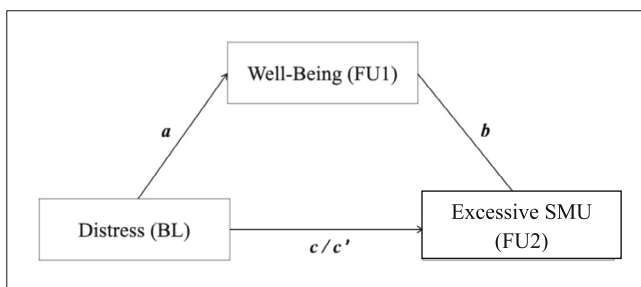

FIGURE 1 Mediation model including distress at baseline (predictor), well-being at 3-month follow-up (FU1) (mediator) and excessive social media use at 15-month follow-up (FU2) (outcome). *Notes: c* = path of predictor to outcome, without inclusion of mediator (total effect); *a* = path of predictor to mediator; *b* = path of mediator to outcome; *c'* = path of predictor to outcome including mediator (direct effect); BL = baseline; SMU=social media use; FU = follow-up.

Key Practitioner Message

- Well-being decreased over 15 months after the Covid-19 outbreak
- Excessive social media use increased over 15 months after the Covid-19 outbreak
- Well-being mediated the relationship between distress and excessive social media use

2 | METHODS

2.1 | Participants

Adult students registered at the University of Florence in the period between April 2020 and July 2021 and having an active institutional email address were eligible for participation. No exclusion criteria were applied. Participation was voluntary and not compensated.

2.2 | Procedure

In April 2020, an invitation including a link leading to the first online survey (BL) was sent to institutional email addresses of students of the University of Florence (Italy) ($n = 3264$). Among them, 231 subjects participated to the survey (response rate 7.08%). In July 2020 (FU1), an email invitation including a link for the second survey was sent to the persons who participated to the BL, among them 204 subjects participated to the survey (response rate 88.31%). In July 2021 (FU2), an email invitation including a link for the third survey was sent to the persons who completed the FU1, among them 189 subjects participated to the survey (response rate 92.64%). Time intervals between data collections were BL and FU1–3 months and BL and FU2–15 months. All participants were provided instruction (i.e. brief description of the study, investigators involved, duration and contents of the survey, timing and number of follow-ups, and guarantee of anonymity) and gave informed consent to participate via an online form. The responsible Ethical Commission approved the implementation of the study (document n. 98).

2.3 | Materials

2.3.1 | Distress

Distress was operationalized by symptoms of depression, anxiety and stress. The Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond, 1995; Bottesi et al., 2015) allowed to assess distress with seven items per subscale, respectively (e.g. depression subscale: 'I couldn't seem to experience any positive feeling at all'; anxiety subscale: 'I felt scared without any good reason'; stress subscale: 'I found it difficult to relax'). The 21 items are rated on a

4-point Likert scale ($0 = did\ not\ apply\ to\ me\ at\ all$; $3 = applied\ to\ me\ very\ much\ or\ most\ of\ the\ time$; current scale Cronbach's $\alpha_{BL} = .895$, $\alpha_{FU1} = .893$, $\alpha_{FU2} = .903$). Higher sum scores indicate more severe distress.

2.3.2 | Well-being

The Positive Mental Health Scale (PMH-Scale; Carrozzino et al., 2021; Lukat et al., 2016) is a short, unidimensional questionnaire aimed at assessing general emotional, psychological and social well-being. The instrument includes nine items rated on a 4-point Likert scale (e.g. 'I enjoy my life'; $0 = do\ not\ agree$, $3 = agree$; current scale Cronbach's $\alpha_{BL} = .924$, $\alpha_{FU1} = .928$, $\alpha_{FU2} = .928$). The higher the sum score, the higher the level of inner factors (e.g. emotional and psychological) of well-being as well as of outer factors (e.g. social support and partnership) (Lukat et al., 2016).

2.3.3 | Excessive social media use

The Bergen Social Media Addiction Scale (BSMAS) (Andreassen et al., 2016; Monacis et al., 2017) assessed the level of excessive SMU. The BSMAS consists of six items (e.g. 'Felt an urge to use social media more and more?') according to the six core addiction dimensions (i.e. salience, tolerance, mood modification, relapse, withdrawal and conflict). Items are rated on a 5-point Likert scale ($1 = very\ rarely$, $5 = very\ often$; current scale Cronbach's $\alpha_{BL} = .833$, $\alpha_{FU1} = .853$, $\alpha_{FU2} = .825$). Higher sum scores indicate higher excessive use of social media.

2.4 | Statistical analyses

Repeated analyses of variance (ANOVAs, within factor design) were calculated to test differences between the three measurement time points on the assessed variables. For all variables, there was a violation of the assumption of sphericity (Mauchly's test). Thus, the Greenhouse–Geisser correction (ε) was applied. Partial eta-squared (η^2_p) was included as the effect-size measure of the main effects and Cohen's $d_{Repeated\ Measures\ (RM)}$ (Morris, 2008) served as effect-size measure of post-hoc comparisons of the measurement time points (BL vs. FU1, BL vs. FU2, FU1 vs. FU2).

Zero-order bivariate correlations assessed the relationship between the investigated variables. Correlation analyses and post-hoc comparisons of the ANOVAs were Bonferroni corrected (level of significance: $p < .05$, two-tailed).

Four mediation models (Process: Model 4) were run with the overall distress variable, depression, anxiety and stress symptoms (BL) as predictor, well-being (FU1) as mediator, and excessive SMU (FU2) as outcome. Age and sex served as covariates. The mediation effect was assessed by the bootstrapping procedure (10,000 samples) that provides percentile bootstrap confidence intervals (95%CI).

A priori calculated power analyses (G*Power programme, version 3.1) indicated that the ANOVAs required the largest sample size of $N = 163$ for valid results (power > .80, $\alpha = .05$, effect size $f = .10$) (Mayr et al., 2007). Thus, the present sample size was sufficient.

ANOVAs revealed no significant differences on demographics and investigated variables between participants who completed all surveys and those who dropped out.

IBM SPSS Statistics 28.0.1.0 and the macro PROCESS version 4.0 (www.processmacro.org/index.html) were used to conduct the statistical analyses.

3 | RESULTS

3.1 | Sample description

The present sample included 189 subjects. Seventy-seven percent was female. Age was 26.10 ± 7.75 years (range: 19–70). Among the participants, 86.8% were students, 12.7% employees and one retired. In addition, 40.2% was single, 47.6% in a romantic relationship and 12.2% married. At BL, no subjects were positive for Covid-19 or had symptoms which can pertain to Covid-19 infection, one subject was recovered from Covid-19 and one subject was in quarantine. At FU1, two subjects were positive for Covid-19, two had symptoms which can pertain to Covid-19 infection, one was recovered from Covid-19 and one was in quarantine. At FU2, four subjects were positive for Covid-19, one had symptoms which can pertain to Covid-19 infection, 15 were recovered from Covid-19 and three were in quarantine.

3.2 | Overtime changes of clinical variables and correlation analysis

There were no significant changes of the overall distress level ($p = .159$), as well as of depression ($p = .411$), anxiety ($p = .298$) and stress ($p = .099$). In contrast, there was a significant change overtime of well-being ($p = .031$). Pairwise comparisons indicated that well-being decreased significantly between BL and FU2 (mean difference [Md] $= .926$, $p = .018$, 95%CI $= .122$–1.730, $d_{RM} = .203$). There was a significant change of SMU ($p = .002$), which significantly increased between BL and FU1 (Md $= -1.143$, $p = .015$, 95%CI $= -2.116$ to $-.170$, $d_{RM} = .213$) and between BL and FU2 (Md $= -1.259$, $p = .003$, 95%CI $= -2.176$ to $-.342$, $d_{RM} = .247$) (Table 1).

The correlation analyses revealed that the overall distress level as well as depression, anxiety and stress at BL was significantly negatively correlated with well-being at FU1. Furthermore, BL overall distress, depression and stress were significantly positively correlated with excessive SMU at FU2. The correlation between anxiety at BL with excessive SMU at FU2 was not significant after Bonferroni correction. Well-being at FU1 was significantly negatively correlated with excessive SMU at FU2 (Table 2).

TABLE 1 Descriptive statistics of the investigated variables and results of the analyses of variance (within-factor ANOVAs).

	Baseline		3-month follow-up		15-month follow-up		Analysis of variance		
	M (SD)	95%CI	M (SD)	95%CI	M (SD)	95%CI	F	p	η^2_p
Overall distress	21.11(13.27)	19.207–23.015	19.89(13.39)	17.967–21.811	21.48 (13.59)	19.526–23.426	1.849	.159	.010
Depression symptoms	6.97(5.49)	6.181–7.756	6.73(5.55)	5.934–7.527	7.19(5.59)	6.388–7.992	.882	.411	.009
Anxiety symptoms	4.71(4.43)	4.078–5.350	4.42(4.49)	3.779–5.068	4.92(4.57)	4.259–5.571	1.215	.298	.013
Stress symptoms	9.43(5.09)	8.698–10.159	8.74(4.94)	8.026–9.445	9.37(5.02)	8.650–10.091	2.331	.099	.025
Well-being	15.84(6.40)	14.923–16.759	15.56(6.60)	14.609–16.503	14.92(6.54)	13.978–15.853	3.555	.031	.019
Excessive social media use	12.57(5.41)	12.180–13.773	13.71(5.77)	12.526–14.258	13.83(5.63)	13.080–14.780	6.153	.002	.032

Notes: N = 189; M = Mean, SD = standard deviation, ANOVAs = analyses of variance, p = significance, effect size: η^2_p.

	(2)	(3)	(4)	(5)	(6)
(1) Baseline overall distress	.910*	.830*	.902*	−.526*	.274*
(2) Baseline depression symptoms		.622*	.751*	−.556*	.281*
(3) Baseline anxiety symptoms			.622*	−.316*	.174
(4) Baseline stress symptoms				−.498*	.259*
(5) 3-month follow-up well-being					−.283*
(6) 15-month follow-up excessive social media use					1

TABLE 2 Zero-order bivariate correlations between the investigated variables.

Notes: N = 189.
*p < .05 (Bonferroni corrected).

TABLE 3 Estimated coefficients of the mediation models with overall distress level, symptoms of depression, anxiety and stress, respectively, at baseline (predictor), well-being at 3-month follow-up (mediator), and excessive social media use at 15-month follow-up (outcome).

	Total effect			Direct effect			Indirect effect		
	c	SE	95%CI	c′	SE	95%CI	ab	SE	95%CI
Predictor									
Baseline overall distress	.112	.029	[.054, .170]	.060	.034	[−.007, .127]	.052	.022	[.009, .096]
Baseline depression symptoms	.304	.071	[.164, .443]	.186	.083	[.022, .350]	.117	.056	[.002, .227]
Baseline anxiety symptoms	.197	.090	[.020, .375]	.080	.092	[−.100, .261]	.117	.045	[.041, .215]
Baseline stress symptoms	.262	.077	[.110, .415]	.121	.088	[−.052, .294]	.141	.054	[.038, .254]

Notes: SE = standard error; CI = confidence interval; all CIs generated with bootstrapping: N = 10.000; c = relationship between predictor and outcome (total effect); c′ = relationship between predictor and outcome after inclusion of mediator in the model (direct effect); ab = combined effect of path a (relationship between predictor and mediator) and path b (relationship between mediator and outcome).

3.3 | Mediation models

Well-being at FU1 significantly mediated the positive relationship between overall distress at BL and excessive SMU at FU2. The basic relationship between distress at BL and excessive SMU at FU2 was significant (total effect, c: p < .001). The relationship between distress at BL and well-being at FU1 (a: p < .001), and the one between well-being at FU1 and excessive SMU at FU2 (b: p = .004) was significant. After the inclusion of well-being at FU1 in the model, the relationship

between distress at BL and excessive SMU at FU2 was not significant (direct effect, c′: p = .078). The indirect effect (ab) was significant.

For the model including depression as predictor, the relationship between depression at BL and excessive SMU at FU2 was significant (total effect, c: p < .001). The relationship between depression at BL and well-being at FU1 (a: p < .001), and between well-being at FU1 and excessive SMU at FU2 (b: p = .011) was significant. After the inclusion of well-being at FU1 in the model, the relationship between depression at BL and excessive SMU at FU2 was significant (direct

effect, c': $p = .026$). The total effect was larger than the direct effect. The indirect effect (ab) was significant (Table 3).

For the model including anxiety as predictor, the relationship between anxiety at BL and excessive SMU at FU2 was significant (total effect, c: $p = .023$). The relationship between anxiety at BL and well-being at FU1 (a: $p < .001$), and between well-being at FU1 and excessive SMU at FU2 (b: $p < .001$) was significant. After the inclusion of well-being at FU1 in the model, the relationship between anxiety at BL and excessive SMU at FU2 was not significant (direct effect, c': $p = .381$). The indirect effect (ab) was significant (see Table 3).

For the model including stress as predictor, the relationship between stress at BL and excessive SMU at FU2 was significant (total effect, c: $p = .001$). The relationship between stress at BL and well-being at FU1 (a: $p < .001$), and between well-being at FU1 and excessive SMU at FU2 (b: $p = .002$) was significant. After the inclusion of well-being at FU1 in the model, the relationship between stress at BL and excessive SMU at FU2 was not significant (direct effect, c': $p = .170$). The indirect effect (ab) was significant (see Table 3).

4 | DISCUSSION

The present longitudinal study shows that distress and well-being are different dimensions following an own course of change and that the interplay between them influences the excessive social media use.

Distress, also when measured as depression, anxiety and stress, did not change significantly overtime, even though the mean level of stress at all measurement time points in our study was remarkably higher than the one reported prior to the pandemic outbreak (e.g. $M = 6.40$, $SD = 3.80$) (Bottesi et al., 2015). An important consequence of the corona pandemic has been the global psychological distress. Multiple researchers found increased prevalence of pandemic-related psychiatric morbidity and psychological distress (Gómez-Salgado et al., 2020; Smith et al., 2020). The higher prevalence of anxiety and stress-related disorders was found also to be purely pandemic related, such as fears that oneself or a loved one will contract the virus and generalized uncertainty about the future (Troyer et al., 2020). The act of quarantining added a facet to mental health deterioration (Smith et al., 2020). For example, anxiety and depression prevalence almost doubled in those who had to quarantine or whose friends and family had to quarantine compared with subjects who did not (Cosci & Guidi, 2021; Lei et al., 2020). Researchers also investigated how the Covid-19 pandemic affected physical activity and the consequences for mental health. Lockdowns limited individuals to engage in physical activity which contributed in increasing psychological distress, for example, stress, anxiety, depressive symptoms and social isolation (Brailovskaia et al., 2021; Violant-Holz et al., 2020).

A significant decrease of well-being over the 15-month period was observed, which is consistent with the literature (Brailovskaia et al., 2022). A significant increase of excessive SMU was also found and might be related to the enhanced online activity, which was used as a proxy of social encounters during the pandemic outbreak (Brand et al., 2016; Dubar et al., 2021).

The negative relationship between stress and well-being is known (Guidi et al., 2021). Chronic stress might have contributed to the decrease of well-being which, in turn, favoured stress increase (Keyes et al., 2002). Baseline stress was positively associated to excessive SMU, which is consistent with the literature (Wong et al., 2020), even though no studies reported longitudinal data. Well-being at 3-month follow-up was negatively associated with 15-month excessive SMU. The literature describes that low well-being is accompanied by dysfunctional coping strategies in stressful situations (Graupensperger et al., 2023; Yehudai et al., 2020). The decrease of well-being could have contributed in overusing tendencies in the present sample.

Psychopathological dimensions (i.e. depression and anxiety) and distress may predispose to excessive internet use (Brand et al., 2016, 2019). In addition, distress can contribute to overuse of online activity (Sun & Zhang, 2020) and well-being might buffer the negative effects of distress (Teismann et al., 2022; Truskauskaite-Kuneviciene et al., 2020). The present results confirm such knowledge and extend it. Indeed, they make clear that the relationship between distress and excessive social media use passes via well-being, which acts as a mediator. Indeed, well-being at 3-month follow-up mediated the relationship between baseline stress and 15-month follow-up excessive SMU. This means that enhanced stress may reduce well-being which, in turn, enhances the risk of excessive SMU. This also may mean that an increase in well-being may reduce the negative effects of distress on SMU, decreasing the risks of an excessive exposure to online activities.

This is the first study verifying a possible mediating relationship of well-being between distress and excessive social media use. Strength of the study is the longitudinal design which covered a period of 15 months during the Covid-19 pandemic. Notwithstanding this, the present research has limitations. The investigated sample is relatively small, young, and includes mostly females. This limits the generalizability of results, even though the power was adequate to conduct the proposed analyses. For the future, it would be worth checking whether the same tendencies occur in people in different age groups (including older people) and with a higher proportion of males. The Covid-19 situation varied between countries and within a country at different time points. The present research is a snapshot for the time period between April 2020 and July 2021 in Italy. Data were assessed via self-report measures which are prone to social desirability and perception mistakes. However, the study was designed to conduct an online survey in the general population, and self-reported measures were the most appropriate tools for this specific purpose. The results on distress may seem to have been inflated by the fact that participants were infected by Covid-19 or in quarantine at the time of the survey. However, the number of subjects infected or in quarantine who completed the survey at the three time points of assessment was actually low; thus, the results seem to be generalizable to the general population.

5 | CONCLUSION

These findings have implications at clinical, research and public health levels. From a clinical point of view, interventions aimed at

empowering individual well-being, like for instance well-being therapy (Fava, 2016), might reduce the negative impact of stress symptoms on overusing tendencies. From a research point of view, interventions aimed at increasing well-being should be implemented in clinical trials to verify their efficacy in populations exposed to stressful conditions and at risk of excessive SMU. Also, studies aimed at disentangling additional possible mediators in the relationship between stress and SMU are warranted. From a public health point of view, there is urgency of programmes empowering citizens' literacy on the relationship among stress, well-being, and SMU, and fostering well-being as strategies to prevent developing SMU when people are exposed to stressful events, such as a pandemic. We now have the background, the knowledge, and the tools to make these steps forward.

AUTHOR CONTRIBUTIONS

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CONFLICT OF INTEREST STATEMENT

There are no conflicts of interest to declare.

DATA AVAILABILITY STATEMENT

The data that support the findings in this study are not publicly available. The data will be made available upon request to the corresponding author.

ORCID

Julia Brailovskaia https://orcid.org/0000-0001-7607-1305
Fiammetta Cosci https://orcid.org/0000-0002-5022-0488

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