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COVID-19, Loneliness and Technological Addiction: Longitudinal Data

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Abstract

The COVID-19 outbreak has been shown to have had a negative impact on mental health: furthermore, lockdown measures may have increased levels of loneliness and addiction. Preliminary studies indicated an increased frequency of gaming and social media use during this time and augmented levels of loneliness likely account for the increase in gaming and social media addiction during lockdown. We conducted a longitudinal study administering a battery of self-report questionnaires at the beginning of lockdown (Stage 1) and three days before the end of the lockdown (Stage 2). Specifically, we measured loneliness feelings, frequency of gaming, and social media use, as well as both gaming and social media addiction. Data were analysed using Structural Equation Modeling. We found that loneliness levels longitudinally predicted both gaming and social media addiction, even when controlling for gaming and social media use at Stage 1. Increased feelings of loneliness, a well-known risk factor for gaming, along with social media addiction, may be a central variable heightening vulnerability to the onset or the maintenance of technological addiction during forced social isolation. Thus, future preventive interventions may want to target this issue.

Keywords: Gaming, Social Network, Addiction, Loneliness, COVID-19, Technology

Résumé

L'éclosion de la COVID-19 a eu un effet nuisible sur la santé mentale. De plus, les mesures de confinement ont intensifié la solitude et les addictions. Les études préliminaires indiquent une augmentation de la fréquence d'utilisation des jeux vidéo et des médias sociaux pendant cette période. Cette hausse est probablement attribuable à l'accroissement de la solitude. Nous avons mené une étude longitudinale à l'aide d'une batterie de questionnaires d'autoévaluation, qui ont été remplis au début du confinement (étape 1) et trois jours avant la fin du confinement (étape 2).

En particulier, nous avons mesuré le sentiment de solitude, la fréquence d'utilisation des jeux vidéo et des médias sociaux, et la dépendance aux jeux vidéo et aux médias sociaux. Nous avons eu recours à la modélisation par équation structurelle pour analyser les données. Nous avons observé que le niveau de solitude est un prédicteur longitudinal de la dépendance aux jeux vidéo et aux médias sociaux, en contrôlant par l'effet de l'utilisation des jeux vidéo et des médias sociaux observée à l'étape 1. Le sentiment accru de solitude, qui est un facteur de risque connu de dépendance aux jeux vidéo et aux médias sociaux, pourrait être une variable centrale de l'accroissement de la vulnérabilité au développement ou à la persistance d'une dépendance à la technologie dans un contexte d'isolement social imposé. Par conséquent, les interventions à venir en matière de prévention pourraient cibler ce problème.

Introduction

COVID-19 outbreak and institutional responses to the pandemic have produced unexpected and undesirable psychological impacts (Brooks et al., 2020). For instance, in 2020, most countries established social distancing measures that encouraged citizens to "stay-home." However, these responses to the outbreak sharply disrupted people's lifestyles, and this shift, according to certain authors, may have been also experienced, depending on the person, as a traumatic event (Velotti, Civilla et al., 2021). The conditions that forced sudden isolation are likely to worsen or elicit pernicious psychological symptoms as depression and anxiety (e.g., Velotti, Rogier et al., 2021).

Several authors have also recently stressed the consequences of the outbreak on addictive behaviours (e.g., Balhara et al., 2020; Kar et al., 2020; King et al., 2020; Sun et al., 2020). Vulnerabilities to substance and alcohol addictions have been seen to increase during the outbreak, and the production of international guidelines to mitigate these negative consequences has been recommended (Mackolil & Mackolil, 2020). Indeed, outbreak and confinement are, for several reasons, likely to worsen addictive behaviours. First, certain predictors of addictions, such as social isolation, boredom and stress, have been worsened by the outbreak, for a significant number of individuals. Also, temporary treatment discontinuity may have facilitated drop-out in patients under treatment for addiction, increasing the risk of relapse. Finally, regarding technological addictions, the greater reliance on digital devices required by the spread of smart working has been likely to worsen the difficulty to trace a meaningful, indicative line between healthy and problematic use of both Internet and Social Networking Services (SNSs). Unfortunately, these considerations remain mostly speculative because of the scarcity of empirical data documenting the phenomena. Anyway, some interesting contributions have been published on the topic. For instance, a Canadian study showed that adolescents increased their alcohol and cannabis intake during the pandemic (Ellis et al., 2020), whereas a study

conducted in Italy reported a higher number of psychiatric emergencies related to cannabis use during the lockdown period compared to the previous year (Capuzzi et al., 2020). Also, the pandemic has proved to be a risk factor for the onset or worsening of behavioural addictions, especially technological addictions (King et al., 2020; Muzi et al., 2021). This fact has been empirically supported by preliminary data demonstrating that the frequency of gaming behaviour and Internet use significantly increased among adolescents during the outbreak (Balhara et al., 2020; Sun et al., 2020). These findings are not surprising as multiple experts largely predicted it (Kar et al., 2020), because most of alternative leisure activities (i.e., activities spent outdoors) were no longer available during the lockdown, and because media use was mostly mediating all social interactions and working activities. Of note, few empirical studies investigated the predictors of technological addictions during lockdown, with most of the contributions instead being commentaries or editorials. An interesting Spanish study, carried out on a population of university students, documented a high percentage increase in SNSs addiction, predicted by and in comorbidity with substance use (Gómez-Galán et al., 2020). In addition, certain authors stressed that gaming and social network use during lockdown should not be pathologized, and that these activities may, in fact, also be considered paradoxically as resilience factors (Király et al., 2020). As a whole, we know that the understanding of the psychological impact of stressful life events is complex, and should encompass the identification of the role played by key associated risk factors.

Regarding technological addictions, one central factor to consider may be loneliness. Indeed, the concern of most experts on the onset and worsening of technological addictions may be linked to the awareness that lockdown increased subjective feelings of loneliness among people (Holmes et al., 2020; Velotti, Rogier et al., 2021).

Loneliness has been pointed out as a central factor explaining the onset and maintenance of certain specific behavioural addictions, especially gaming and social networks addiction (Davis, 2001; Krossbakken et al., 2018; Lemmens et al., 2011; Lou, 2009; Teppers et al., 2013). Regarding social networks, a strong theoretical explanation for this disorder is that an individual with poor social skills would prefer to interact through social networks than through real life (e.g., because of inability to regulate effectively negative emotional states elicited by interpersonal difficulties). Such a person would thus become addicted to the interpersonal rewards provided by social networks' interactions (Clayton et al., 2013; Davis, 2001; Ebeling-Witte et al., 2007; Stritzke et al., 2004). In turn, an exclusive and rigid use of social networks would further complicate the development of meaningful interpersonal abilities and therefore reinforce isolation from interpersonal contexts (McKenna et al., 2002). Similarly, gaming, especially online gaming, is an activity that has been shown to provide strong interpersonal reinforcements and to facilitate avoidance of direct confrontations with others (e.g., using the avatar as a surrogate). It is thus especially rewarding for shy individuals (Krossbakken et al., 2018; Lemmens et al., 2011). For most people with gaming addiction, to be immersed in a virtual world is thought to compensate poor interpersonal satisfactions experienced in real life (Valkenburg & Peter, 2007).

Thus, literature seems to suggest that the use of gaming and social networks during the COVID-19 outbreak may not be pathological per se (and may in fact be paradoxically adaptive) but that the increase in levels of loneliness induced by this condition may account for an increase in the pathological use of both gaming and SNSs. To test these hypotheses, we conducted a longitudinal study on a community sample of adults during the COVID-19-related lockdown. Our focus was the investigation of loneliness levels and both gaming and SNSs addiction.

Method

Participants and Procedure

Immediately after national lockdown because of COVID-19 pandemic, an online survey for adults was disseminated for the purposes of data collection, the temporal period for the study ranging from five to ten days after the start of lockdown. At the start of the survey itself a cover letter was provided to each participant. It described the aims and the scope of the study, and guaranteed that the privacy and anonymity of the subject would have been maintained. After informed consent was provided, each participant was asked to complete several personal questionnaires. Three days before the end of the national lockdown (nearly 60 days after Stage 1), a personal e-mail letter was sent to each participant, asking him or her to complete other personal questionnaires (Stage 2). The Ethics Committee of the University of Rome (Italy) granted approval the project prior to its implementation (N. 27/20).

From the initial 1,323 respondents at Stage 1, a total of 308 participants completed personal questionnaires at Stage 2. Most of the respondents were women (22.7% men) and the total sample had a mean age of 35.51 years (SD = 13.91). Regarding socio-economic status, descriptive analyses showed that 44.3% of participants had either obtained a college degree or had also obtained post-graduate education, and most participants reported to have earned an annual income inferior to 36.000€ (47%). In addition, 36.63% of the sample was single, 36.63% cohabitating with the partner and 26.73% involved in a romantic relationship but not also cohabitating with the partner. Finally, during the lockdown period, 9% of the sample lived completely alone, 28.57% with one person, 23.38% with two people, 28.25% with three people and 10.71% with four or more people.

Measures

At Stage 1, we administrated an initial questionnaire that collected demographic information pertinent to the research (e.g., age, gender) and the following instruments:

The UCLA Loneliness Scale (Boffo et al., 2012; Russell et al., 1978)

This scale was administered to assess the level of perceived loneliness. It is a 20-item personal questionnaire that asks the participant to provide answers through a 4-point Likert-type scale, with the points ranging from 1 (*never*) to 4 (*always*).

The instrument provides a total score as well as three scores corresponding to the three instrument subscales. Those instruments are *intimate others*, *social others* and *affiliative environment*. The scale showed an excellent internal consistency, with the Cronbach alpha value reaching .85.

The Social Media Use Questionnaire (Rosen et al., 2013)

An adapted version of this scale was administered to evaluate several aspects of each participant's relationship with media. Specifically, we use the Subscale of the Technological Dependence, which consisted of three items asking the respondent to answer on a 5-point Likert-type, scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Also, we used six questions related to the frequency of activity on the SNS and three questions related to the frequency of videogames use. These frequency scores are rated on a 10-point Likert-type scale ranging from 1 (*never*) to 10 (*all the time*). These two subscales showed an acceptable internal consistency being .83 for the Social Media subscale and .69 for the Gaming subscale.

At Stage 2, we used the following instruments:

The Internet Gaming Disorder Scale–Short-Form (IGDS9-SF; Pontes & Griffiths, 2015; Monacis et al., 2016)

This instrument was used to assess Internet Gaming Disorder. It is a self-report questionnaire comprised of nine items, asking the participant to answer on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*very often*). In our study, the instrument showed a good internal consistency with a Cronbach value being .89.

The Bergen Social Media Addiction Scale (BSMAS; Andreassen et al., 2012; Monacis et al., 2017)

This scale consists of six items asking the participant to answer questions on a 5-point Likert scale ranging from 1 (*very rarely*) to 5 (*very often*). It provides a total score assessing the severity of social media addiction. The computation of Cronbach alpha indicated that in our study the instrument demonstrated a good internal consistency (.83).

Statistical Analyses

First, we explored the bivariate association between the main variables involved in the study, calculating *r*-Pearson coefficient with the SPSS v.23 software for Windows. Then, to test our hypotheses, we designed and tested a structural equation model using the lavaan package of the R software for Mac. Doing so, we used the Robust Maximum Likelihood Method of Estimation to evaluate the consistency between our model and empirical data. We referred to several goodness of fit indexes. Specifically the Root Mean Square Error of Approximation (RMSEA) and the Comparative Fit Index (CFI). A $.05 < \text{RMSEA} > .08$ (Browne, & Cudeck, 1992)

and a CFI of $>.90$ (Kline, 2010) is generally interpreted as an adequate fit. In addition, we examined the lower and upper boundaries of the 90% confidence interval for RMSEA, with an upper boundary of more than .10, indicating that the model should be rejected (Browne, & Cudeck, 1992). When the model did not obtain an acceptable fit, we turned to accessible modification indexes, suggested by the software, to estimate additional parameters.

Our investigation continued as follows. First, we created our latent variable using, as manifest variables, the scores obtained from the items of the instruments used. For the loneliness latent variable, the scores obtained on the three subscales of the instrument were used as manifest variables. Then, the path model was drawn, specifying the predictive role of loneliness and technological addiction—measured at Stage 1—on both SNSs addiction and IGD—measured at Stage 2. Also, we controlled for the levels of SNSs and videogame use measured at Stage 1 in the prediction of SNSs addiction and IGD, respectively. Finally, as age appeared to be significantly correlated to both outcomes in the exploratory analyses, we decided to insert this variable as a covariate.

Results

Correlations between variables

Results determined through *r*-Pearson coefficient calculation are presented in Table 1.

Structural Equation Model

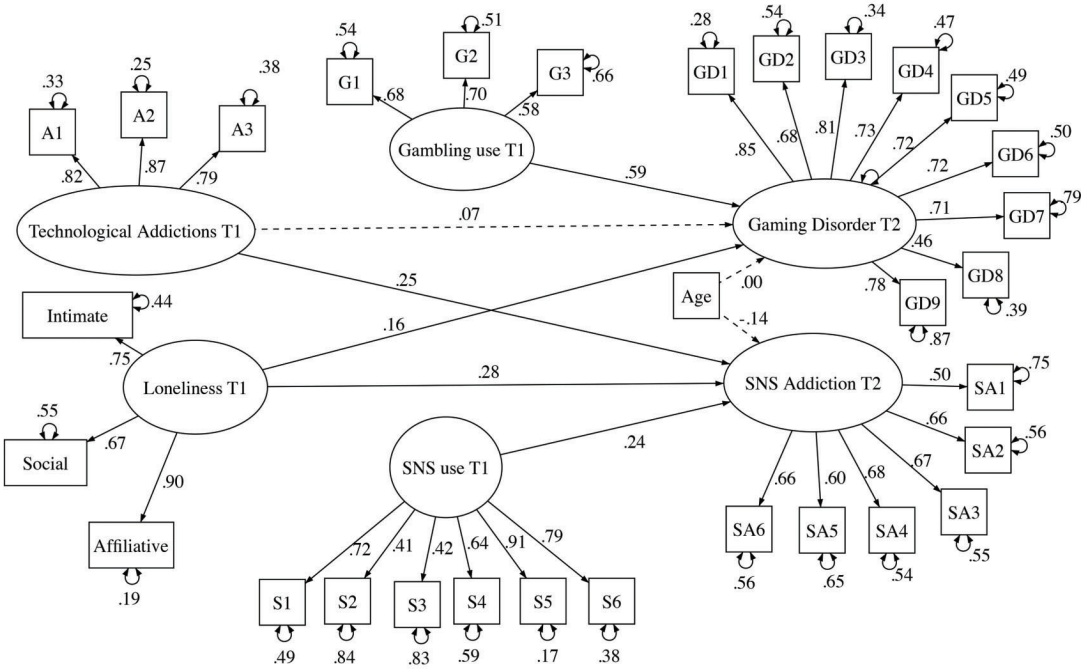
The first model, being positive definite, test brought an acceptable fit according the RMSEA index [.069; 90% CI (.062 to .076)] but not according to the CFI index (.85). Thus, we sought to modify the model, respecifying the estimation of covariance between residual errors of certain manifest variables. Specifically, three additional parameters were estimated to obtain an acceptable fit namely between residuals errors of Items 2 and 3 of the questionnaires on frequency of use of social media at

Table 1
Correlations between main variables of the study

	UCLA	SNS	IGD	IGD	IGD
UCLA T1	-				
SNS T2	.30*	-			
IGD T2	.19*	.25*	-		
Gaming use T1	.14*	.29*	.15*	-	
SNS use T1	.11	.31*	.07	.18*	-

Note: T1: Stage 1; T2: Stage 2; UCLA: UCLA loneliness Scale; SNS: Bergen Social Media Addiction Scale Total Score; IGD: Internet Gaming Disorder Scale–Short-Form; $*p<05$.

Figure 1
Final Model illustrating the longitudinal relationship between loneliness and both SNS addiction and Internet Gaming Disorder.



Note: T1: Stage 1; T2: Stage 2; A: Items of the Media Use Questionnaire on Technological Addiction; G: Items of the Media Use questionnaire on the frequency of videogame use; S: Items of the Media Use Questionnaire on the frequency of use of Social Media; SA: Items of the Bergen Social Media Addiction Scale; GD: Items of the Internet Gaming Disorder Scale–Short-Form; SNS: Social Network Services; solid lines indicate statistically significant paths; dashed lines indicate not statistically significant paths. Values displayed are standardized.

Stage 1, between the first and the second item of the BSMAS and between Item 5 and Item 6 of the IGDS9-SF. These modifications allowed us to obtain a good fit of the model according to both the RMSEA [.056; 90% CI (.049 to .064)] and the CFI (.90) indexes. The final model is illustrated in Figure 1. As illustrated, loneliness levels measured at Stage 1 significantly and positively predicted both SNS addiction, and IGD measured at Stage 2, also when controlling for previous SNS and videogame use. The covariances between the scale at Stage 2 are displayed in Table 2. Also, we should note that covariance between Gaming Disorder or SNS addiction at Stage 2 was equal to .25 (p = .014).

Discussion

The main aim of our study was to shed light on the role played by loneliness in the increase of technological addictions during the COVID-19-related lockdown. To attain our goal, we conducted a longitudinal study investigating loneliness levels as they pertained to both gaming and social network addiction. Our results showed that

Table 2
Covariances between variables

	1	2
1. Loneliness T1	-	
2. Technological addiction T1	.22*	-
3. SNS use T1	.18*	.21*
4. Gaming use T1	.12	.07

Note: $*p < .05$.

loneliness levels at T1 significantly and positively predicted gaming addiction levels at T2, controlling for gaming frequency at T1. We also determined that the same pattern of results was observed in relation to social networks addiction.

First, our study supports previous findings concerning the predictive role of subjective loneliness on both gaming and social network addiction (Krossbakken et al., 2018; Lemmens et al., 2011; Teppers et al., 2013). Also, earlier findings were further confirmed by this study, as it replicated findings observed among sample of adolescents, and providing a longitudinal inquiry of the role played by loneliness in social networks addiction. Thus, our study suggests that conclusions brought by these studies might be considered valid also among adult population (Teppers et al., 2013).

Then, this study highlights the potential negative and unexpected impact of lockdown measures on population mental health. Studies already observed that the increased levels of loneliness experienced during COVID-19 lockdown accurately predicted depression and anxious symptomatology (Velotti, Rogier et al., 2020). Through our research, we illuminated a potential overlooked mental health issue related to COVID-19 outbreak: the heightened risk for onset or worsening of both gaming and social network addictions. Despite the fact that digital literacy has probably acted as a resilience factor during lockdown, individuals experiencing high levels of loneliness appear to be vulnerable to technological addiction (Davis, 2001; Krossbakken et al., 2018; Lemmens et al., 2011; Lou, 2009; Teppers et al., 2013). As experts in the field have stressed (Király et al., 2020), prevention guidelines targeting this issue are needed.

Limitations and futures directions

Despite its yielding these compelling findings, our study also includes a few noteworthy limitations. First, we assessed the level of loneliness after only the first few days of the pandemic lockdown, and loneliness was not evaluated at Stage 2. Therefore, conclusions concerning the subjective loneliness the confinement created remain speculative in nature. Thus, more rigorous methodological planning, allowing the use of more sophisticated analyses, such as the cross-lagged panel analysis, should be carried out in any future studies that aim to replicate our results.

Similarly, validated and reliable measures of both Gaming Disorder and SNSs addiction have been introduced only at Stage 2. Despite that we controlled for the presence of these variables at Stage 1 throughout the SMU questionnaire, we may still not exclude the possibility that certain technological addictions already existing at Stage 1 have been not completely captured by this measure. Also, the SMU questionnaire has not been yet validated in Italian, thus limiting the replicability of our study. These issues limit the soundness of our conclusions. Finally, our study fails to explain why loneliness predicted gaming and social network addiction during lockdown, not investigating the role of potential moderating variables. Past literature suggests that interacting throughout technological media may assume a compensative function to regulate distress related to poor interpersonal functioning (Teppers et al., 2013). However, future research is needed to develop our knowledge of these underlying mechanisms.

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