Lockdown loneliness and social media compulsive use during the COVID-19 pandemic in China: A serial mediation model

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Abstract: During the COVID-19 epidemic, social media was the main way for people to communicate with others. While social media brings convenience to all people, it also has its dark side. This study examined the link between the psychological characteristics of the general public at the time of blockade and compulsive social media behavior based on the I-PACE theory and compensatory internet use theory. During the first outbreak of COVID-19, 416 participants between the ages of 18 and 40 in China were recruited using an online survey in social media platform for this research. Findings highlight that users who feel high loneliness may tend to use social media compulsively. Results also indicated that social interaction anxiety and FoMO serially mediate the link between lockdown loneliness and compulsive use. This research demonstrated that higher social presence could increase lonely users' tendency of compulsive use. Higher social presence can improve the risk of compulsive social media usage when individuals in FoMO state. During the COVID-19 pandemic, individual in higher boredom proneness may positively affect the association between lockdown loneliness and compulsive use. The results can provide a potential way to understand compulsive social media usage and prevent individuals' negative emotions from contributing to unhealthy social media usage. The results of this study provide a range of references for social media users, social media platform providers, and governments to use social media effectively and sustainably during the global COVID-19 pandemic and post-pandemic period.

Keywords: *Lockdown loneliness; Compensatory internet use theory; Social interaction anxiety; FoMO; Social presence; Trait boredom proneness; Compulsive use*

1. Introduction

Several countries have already paid a serious medical and economic cost due to the 2019 coronavirus disease (COVID-19) epidemic [1]. Due to the COVID19 epidemic, China are experiencing high treatment costs and health systems are already overwhelmed [2]. In addition, the Chinese government has implemented measures, including confinement and social evacuation rules, to curb the spread of the virus and relieve pressure on hospital systems [3]. During confinement or social evacuation, people are forced to stay inside and are unable to communicate with friends, neighbors, students, colleagues, etc. Joyce and Brown

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[4]. According to Jayathilake, Daud [5], the mental health problems of individuals during the implementation of lockdown measures should not be underestimated. This is because mental health problems under blockade are related to the social media use of people.

Prolonged social isolation by COVID-19 lockdown increases the adverse effects of loneliness and uncertainty on physical and mental illness, increasing feelings of isolation [3], depression [6], uncertainty about reintegration [7], and sadness [8]. As a result of social isolation, people's social comparison processes are automatically activated, triggering them to rely heavily on peer approval to make themselves feel better and reduce uncertainty [8]. The isolation of individuals may increase when all physical social contacts are blocked and cut off, which may exacerbate the problem of compulsive social media use [9]. In the context of crisis events (e.g., terrorist attacks, health risks, etc.), the important connecting role of social media is emphasized; however, high levels of social isolation can exacerbate problematic social media use [10]. Therefore, in the context of COVID-19, it is necessary to understand the psychological mechanisms underlying the compulsive use of social media. Despite research on the possible effects of past pandemics and the emergence of new quantitative studies, the impact of socially isolated psychology on compulsive social media use associated with COVID-19 has not, to our knowledge, been confirmed.

The purpose of this paper is to elucidate the impact of blocked isolation on compulsive social media use during the COVID-19 epidemic. In addition, this study examined how social interaction anxiety and fear of missing out (FoMO) serially mediated the association between lockdown loneliness and compulsive use. Finally, the boundary conditions of lockdown loneliness and compulsive use were demonstrated. Due to the unprecedented nature of COVID-19, the existing literature has so far failed to consider contextual factors contributing to psychological problems and to explain the causes and psychological mechanisms of compulsive social media use during lockdown. Therefore, this investigation is timely and important because it will help social media managers and government understand the mental health of people and provide relevant support for those individuals.

1.1 Lockdown loneliness

Social isolation is divided into objective and perceived social isolation. Loneliness is identical to perceived social isolation, which is defined as the feeling that accompanies a person whose social needs are not met by the quantity or, especially, the quality of his social contacts [11]. According to recent research conducted during the COVID-19 epidemic, there were two distinct types of loneliness reported: "chronic loneliness" (frequent or constant feelings of isolation) and "lockdown loneliness" (in those 7 days, I feel lonely). In addition to causing disease-related suffering and fatalities, the COVID-19 pandemic has had severe negative economic and sociopsychological effects. During the COVID-19 epidemic, lockdowns and social isolation have raised the risk of loneliness. Therefore, lockdown loneliness is worthy of attention, which is characterized as the fact that during the COVID-19 epidemic and other emergency situations involving forced social isolation and lockdowns, many individuals felt alone and lonely [10].

COVID-19 lockdowns, in which people are compelled to isolate themselves physically and socially in response to the pandemic, have been blamed for the rise in loneliness that has occurred throughout the outbreak [12]. Loneliness, which has been linked to negative effects on physical and mental health, has increased as a consequence of these preventive measures, which have cut off people from their usual sources of social connection, contact, and support [13]. Moreover, social alienation and isolation caused by COVID-19 may result in sociopsychological impairment, hence increasing the chance of loneliness among the most vulnerable and high-risk populations, notably those who are socially, cognitively, and economically disadvantaged [14]. For coping the loneliness from lockdown, people use social media [2], problematic internet use [15], escapism in adolescents [16] and alcohol consumption [8].

1.2 Lockdown loneliness and compulsive use

Compulsive use behavior defined that an abnormality that controls the behavioral consumption of individuals who cannot rationally manage their daily performance by Hirschman [17]. Scholars have connected compulsive use behavior to a variety of mental and physical issues, including negative emotion, interpersonal conflict, and a decline in job performance [18-20]. Prior researches explored that compulsive use include compulsive technology use [21], compulsive drug use [22], compulsive alcohol use [23], compulsive use of social media [24], compulsive internet use [25], compulsive YouTube usage [26]. The current study focuses social media compulsive.

Several studies indicate that loneliness has grown throughout the pandemic due to the spread of

COVID-19 [6, 27]. Kardefelt-Winther [28] indicated as shown in the compensatory internet usage theory, if individuals have psychosocial problems in the actual world, they may utilize mobile phones or virtual networks to escape negative feelings.(i.e., loneliness).The loneliness people who were quarantined lack communication with other persons prefer compulsive social media usage to escape their bad emotions [15].

In addition, the Interaction of Person-Affect-Cognition- Execution(I-PACE) model for problematic and concluding activities like as gambling, gaming, and social media use may explain the relationship between loneliness and social media compulsive behavior [29]. Individuals in the early phases may sense external cues or internal triggers, such as intense negative or positive feelings in certain circumstances [29]. These impressions may result in emotional and cognitive reactions, such as heightened attention to these stimuli and the desire to behave in a certain manner, such as playing online games or using social media. In later stages of the addiction process, although this shift may be gradual, the above associations may become increasingly strong, leading to habitual behaviors that in some cases may feel automatic [29]. Servidio, Bartolo [30] proposed that the compensatory effect becomes stronger than the gratifying effect in the later stages of the addiction process. Therefore, when people perceive negative emotion such as lockdown loneliness, they may develop the urge to use social media to combat the loneliness in the early stage. In addition, if cue reactivity and craving have developed in response to feelings of lineless, this may lead to a decrease in the ability to control desire in the face of compulsive social media use behaviors. This may result in a reduction in the urge to control in the face of compulsive behavioral cues, which subsequently raises the risk of compulsive social media usage. Thus, we predicted the hypothesis.

H1. Lockdown loneliness are results in compulsive social media use.

1.3 The serial mediating role of social interaction anxiety and FoMO

Social interaction anxiety is an irrational fear of social situations or interactions with others, as well as of being evaluated or scrutinized by others, especially when confronting strangers in public areas [31]. Sequestration policies to prevent and control COVID-19 have led to the isolation of many people from society, which may limit the development of their social networks and social skills [6]. Therefore,

people who perceive lockdown loneliness may increase social interaction anxiety during COVID-19. The desire to decrease anxiety encourages socially anxious persons to minimize their possibilities of generating unfavorable impressions on others [10]. Researchers have showed that lonely and anxious persons significantly engage from on-line connection [32-34]. Because social anxiety is lower while communicating online than when dealing in real life, interacting online rather than face-to-face has shown to be a viable option, providing the urge to engage in a less direct approach. Nonetheless, this group is prone to engage in problematic or obsessive social media use [35].

Fear of missing out (FoMO) is the fear or anxiety that one is isolated from others, excluded, or missing out on experiences that others may receive or enjoy [36]. Higher levels of FoMO are associated with a preoccupation with the psychological desire to connect, relate, and be connected to people [37]. In addition, people with poorer emotional states and life satisfaction are likely to face FoMO [36]. People who suffer from social anxiety may find that attracting attention online is an effective way to reduce their symptoms [36]. Dempsey, O'Brien [3] indicated that depression and anxiety about social situations are thought to be the root causes of a phenomenon called "fear of missing out" (FoMO). FoMO may explain for the link between psychopathology and compulsive social media use via the negative cognitions associated with FOMO [38]. Social media became the popular method for the majority of people to remain connected with others, satisfying their urge to do so [2]. During a blockage, social interaction anxiety develops for those who feel lonely, and the fear of missing out owing to a desire to be connected to them leads to obsessive usage of social media. Therefore, we predicted that:

H2. Social interaction anxiety and the FoMO serially mediate the relationship between lockdown loneliness and compulsive use.

1.4 Moderation of social presence

Social presence is related to the notion of media message richness, which characterizes the amount to which a medium makes distant entities seem close to the communicator [39]. At the same time, Osei-Frimpong and McLean [40] elaborate a comprehensive definition and define social presence as the continuous awareness of the co-presence of the mediated body and access to the mental, emotional, and volitional states of the other person. Cui, Lockee [39] proposed three main levels of social presence: the one we experience directly (the co-presence of the

mediated person), the one we experience indirectly (the other's mental-behavioral accessibility), and the one we experience amongst ourselves (the intersubjective) (mutual social presence). Chang and Hsu [41] indicated that the degree to which different communication technologies are socially present varies, and that this variation is essential in influencing how people interact and treat social presence as a feature of the medium itself. Previous works on social presence have linked to media influences [41], online learning [42], online social brand engagement [40], social media usage [43].

Since the core of social presence is a sense of social connection to people in a mediated environment, it is particularly essential for individuals who feel alone while communicating with others online [44]. As previously noted, the compensatory Internet usage theory posits that lonely people utilize the Internet to compensate for their lack of offline companionship [45]. Existing research indicates that social presence is a significant aspect that enhances online enjoyment [46]. For example, Kim [47] found when people have familiar interaction partners in mediated surroundings, they may overcome feelings of loneliness or isolation and construct socially safe situations. In addition, Han, Min [48] indicated that lonely people enjoy media experiences when they perceive a high level of social presence from the media, suggesting that social presence may enhance lonely people's media exposure. Therefore, this study predict that higher social presence may increase the effect of lockdown loneliness and compulsive social media usage because an elevated degree of social presence can promote support for social interaction.

Reyes, Marasigan [49] has predicted that leveraging social media communication and the fear of missing out (FoMO) on internet-communication networks as a means of evading real-world problems. Abel, Buff [50] also demonstrated that when a person is unable to achieve his or her fundamental requirements, the degree of psychological discomfort rises, and as a sort of compensation, he engages in more Internet activities. This results in the development of compulsion and impedes the potential resolution of distress. When the social presence of social media is higher, individuals may increase the perceived FoMO and then increase the degree of compulsive use of social media. Thus, we predicted:

H3. The relation between lockdown loneliness and compulsive use is moderated by social presence
H4. The relation between FoMO and compulsive use is moderated by social presence.

1.5 Moderation of boredom proneness

Boredom is divided into trait boredom and state boredom. Trait boredom is a stable tendency of individuals to become bored in various contexts [51]. State boredom, in contrast to trait boredom, is characterized by low activation and the attendant presence of discontent and discomfort due to a lack of stimulation [52]. The boredom talked about in everyday life mainly includes states that make people bored such as emptiness and depression [53]. Therefore, the present study focuses on state boredom, i.e., a more stable psychological experience of boredom that occurs in different contexts.

Boredom is a negative psychological state that the individual tries to suppress. Often, this repression takes the form of engaging in risky behaviors. Boredom has been found to be associated with many problematic behavioral outcomes, including impulsive purchase [54], social media overload and fatigue [55], a lack of control [56], emotional eating [57], mobile phone addiction [58] and rule-breaking [59].

During the COVID-19 outbreak, individuals may become bored due to the lack of social stimulation in the real world [52]. As a result, they use the social media to interact with others to alleviate boredom and eventually become addicted to it [60]. This effect was more pronounced for lonely individuals, suggesting that boredom tendencies also play a role in blocking the relationship between loneliness and compulsive use. Studies have shown a significant positive correlation between loneliness and boredom The person attempts to suppress boredom as a bad psychological experience [61]. Frequently, this suppression takes the shape of risky decisions. Numerous undesirable behavioral consequences, such as compulsive behavior, have been demonstrated to be related to boredom proneness [60-62], it might be explained by people's social isolation during the COVID-19 epidemic [63] . High-loneliness individuals expect social contacts to minimize their predisposition for boredom, and social media fulfills this demand with its convenience, speed, and anonymity. Therefore, we proposed the hypothesis:

H5. The relationship of lockdown loneliness and compulsive is positively moderated by boredom proneness.

Figure 1. Conceptual framework
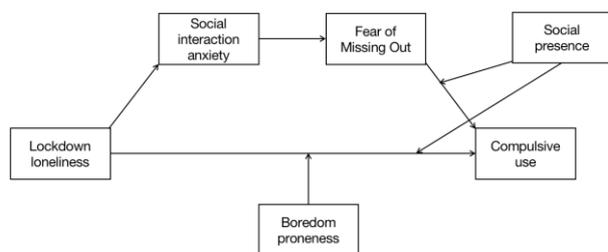
2.   Materials and Methods

2.1   Methods
2.1.1 Participants and procedure

Four hundred and thirty participants were recruited for this research through online survey platform. Each participant would be provided a small monetary reward.After removing questionnaires with invalid responses, 416 questionnaires with a valid response rate of 96.7 percent were authorized.

2.2.2 Measurement

Lockdown loneliness. Lockdown loneliness was measured by Shah, Nogueras [10], which is a 3-item and 5-point scale (1=extremely disagree, 5=extremely agree). An example item is in the following: during the COVID-19 lockdown, I often felt that I lacked companionship. This scale of the Cronbach's alpha was 0.77 (see table 1).

Social interaction anxiety. Social interaction anxiety was examined using 6-item and 5-point scale (1=extremely disagree, 5=extremely agree), which was developed by Leary [64] (Cronbach's alpha=0.87, see table 1). The example item is that "I sometimes feel tense when talking to people of my own sex if I don't know them very well".

FoMO. A short 3-item scale was used to measure the level of fearing of missing out by Dhir, Yossatorn [24] (Cronbach's alpha=0.84, appendix 1). 5-point Likert scale was used ranging from 1 (extremely disagree) to 5 (extremely agree). The sample of items is that "I get worried when I find out my friends are having fun without me during lockdown."

Social presence. This study used a 4-item and 5-point (1=extremely disagree, 5=extremely agree) social presence scale to test the level of social presence, which was indicated by Tang, Wang [65] (Cronbach's alpha=0.82, see appendix 1). It included cognitive social presence, for instance "I can understand others' opinions when using WeChat" and affective social presence, for instance "I feel that people in WeChat deal with me kindly and caringly".

Boredom proneness. This research measured boredom proneness with Chaney and Chang [61] (Cronbach's alpha=0.88, see appendix 1). All items were measured on a 5-point (1=extremely disagree, 5=extremely agree) and 6-item scale. The example item is that "Many things I have to do are repetitive and monotonous".

Compulsive use. To measure compulsive use, this study employed Andreassen, Torsheim [66] (Cronbach's alpha=0.83, appendix 1). It has 4 items, for instance "I become restless or troubled when I have been prohibited from using WeChat". It's based on a 5-point Likert scale, from 1 (extremely disagree) to 5 (extremely agree).

3.   Results

3.1 Participant demographic information

Four hundred fourteen individuals participate our study which include 187 females and 229 males with ages ranging from 18-40 (Mage=29.6, SD=6.8). This study chooses participants aging from18 to 40 because Y generation and Z generation is the main social media users [67]. All of the participants' sociodemographic data are showed in table 1.

Table 1. Demographic information

Gender	Frequency	Percent
Female	187	45
Male	229	55
Age		
18-25	138	33
26-33	131	31
34-40	147	36
Marital status		
Single	336	81
Married	80	19
Educational level		
High school or	197	47
Associate or	211	51
Master's degree	8	2

3.2 Correlation analysis

All study variables' means, standard deviations, and bivariate correlations are included in Table 2. Table 2 demonstrates that the AVE of each construct exceeds its relationship with all other constructions when the AVE is written as its square root.

Table 2. correlation matrix (n = 416)

	Mean	SD	1	2	3	4	5	6
LL	3.630	0.944	0.729					
SIA	3.670	0.871	0.363**	0.731				
FoMO	3.543	1.044	0.329**	0.410**	0.799			
SP	3.703	0.861	0.211**	0.2270**	0.264**	0.730		
BP	3.623	0.872	0.234**	0.206**	0.324**	0.197**	0.740	
CU	3.557	0.917	0.414**	0.459**	0.415**	0.380**	0.372**	0.737

Note. Diagonal blue numbers are AVE square root values; Significant significant correlation at the 0.01 level. LL=Lockdown loneliness, SIA=Social interaction anxiety, SP=Social presence, BP=Boredom proneness, CU= Compulsive use.

3.3 Lockdown loneliness and compulsive use

The association between lockdown loneliness and compulsive use was investigated by correlational analysis. Moreover, gender, marital status, and education level as the control variables. As predicted in H1, the lockdown loneliness significantly affects compulsive use (standard b= .412, p= .000). Control variables are not significant. Supporting H_1.

3.4 Serial mediation of social interaction anxiety and FoMO.

This study examines the mediation effect of social interaction anxiety and FoMO on the association between lockdown loneliness and compulsive use through the method of regression. Age, gender, marital status and education level were controlled as covariates. As Table 3 demonstrated. Firstly, the Model 1 was significant (F = 17.05, P < 0.001, R^2 = 0.17), lockdown loneliness is significantly predicted compulsive use (β =.225, P < 0.001). Secondly, the Model 2 was significant (F = 13.20, P < 0.001, R^2 = 0.14), lockdown loneliness is significantly predicted social interaction anxiety (β = 0.34, P < 0.001). Thirdly, Model 3 was significant (F = 18.23, P < 0.001, R^2 = 0.21). Social interaction anxiety could significantly positively predict FoMO (β = 0.41, P < 0.001). Finally, the Model 4 was also significant (F = 27.69, P < 0.001, R^2 = 0.32). When lockdown loneliness, social interaction anxiety, and FoMO were simultaneously included in the regression equation to predict compulsive use, lockdown loneliness could still significantly predict compulsive use (β = 0.23, P < 0.01), FoMO significantly positively predict compulsive use (β = 0.30, P < 0.001) and Boredom proneness could also significantly positively predict compulsive use (β = 0.19, P < 0.001). Therefore, H_2 is supported.

Hayes (2017) PROCESS v3.3 (Model 6) as the other method to test the serial multiple mediation effect of lockdown on compulsive use through social interaction anxiety and FoMO. The study found that social media anxiety and FoMO serially mediates the relation between lockdown loneliness and compulsive (β=.026; 95%CI [.013,.045]; excluding 0). All the results are showed in table 4. Thus, supporting H_2.

Table 3. Regression analysis

In	Model		Model		Model		Model	
	β	t	β	t	β	t	β	t
L	.	6	.	7	.	4	.	5
SI					.	7	.	6
F							.	4
A	.	-	-	-	-	-	.	.
G	.	.	-	-	.	.	.	.
M	.	-	.	.	-	-	-	-
E	.	.	-	-	.	.	.	1

Note: SIA=Social interaction anxiety,LL=Lockdown loneliness, Gen=Gender, Mar= Marital status, Edu = Education.*P < 0.05. ** P < 0.01. *** P < 0.001.

Table 4. Multiple mediation analysis of loneliness on the compulsive use.

	β	Boot	Boot
LL→SIA→CU	0.	0.065	0.151
LL→FoMO→CU	0.	0.020	0.074
LL→SIA→FoMO→	0.	0.013	0.045

Note: LL: lockdown loneliness SIA: social interactive anxiety FoMO: fear of missing out CU: compulsive use. *P < 0.05. ** P < 0.01. *** P < 0.001.
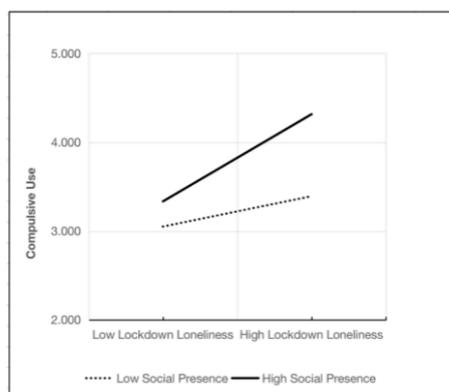
3.5 The moderating role of social presence.

This study examined the moderating role of social presence through Hayes [68] PROCESS macro (Model 1). First, the lockdown loneliness is independent variable, social presence as the moderator, compulsive use as the dependent. The results showed that interactive effect of social presence and lockdown loneliness positively effect compulsive use (β=.195, P < 0.001). As we predicted, social presence positively moderates the effect of lockdown loneliness on compulsive use (β=.350; 95%CI [.268,.433]; excluding 0). However, the moderating effect of low social presence (β=.182; 95%CI [.073,.291]; excluding 0) is lower than high social presence (β=.517; 95%CI [.401,.633]; excluding 0) (see table 5 and figure 2).

In addition, the FoMO is independent variable, social presence as the moderator, compulsive use as the dependent. This study indicated that interactive effect of social presence and FoMO significantly impact compulsive use (β=.169, P < 0.001). As we predicted, social presence positively moderates the effect of FoMO on compulsive use (β=.299; 95%CI [.224,.374]; excluding 0). However, the moderating effect of low social presence (β=.154; 95%CI [.0493,.259]; excluding 0) is lower than high social presence (β=.445; 95%CI [.338,.551]; excluding 0) (see table 5 and figure 3).
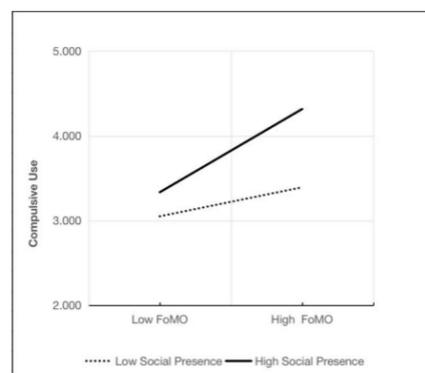
Table 5. Moderation effect results- social presence

	Lockdown loneliness→ Compulsive use				FoMO→ Compulsive use			
	β	S	CI		β	S	CI	
M	.	.	.	.	0	0	0	0
H	.	.	.	.	0	0	0	0
L	.	.	.	.	0	0	0	0

Figure 2. The moderating role of social presence

Note. Independent variable is lockdown loneliness, dependent variable is compulsive use

Figure 3. The moderating role of social presence

Note. Independent variable is FoMO, dependent variable is compulsive use

To exam the moderating effect of boredom proneness, this study conducts the lockdown loneliness as independent variable, boredom proneness as the moderator and compulsive use as the dependent. The results showed that interactive effect of boredom proneness and lockdown loneliness positively effect compulsive use (β=.261, P < 0.001). As we predicted, boredom proneness positively moderates the effect of lockdown loneliness on compulsive use (β=.356; 95%CI [.275,.437]; excluding 0). However, the moderating effect of low boredom proneness (β=.128; 95%CI [.017,.239]; excluding 0) is lower than high boredom proneness (β=.584; 95%CI [.462,.706]; excluding 0) (see table 6 and figure 4).

Table 6. Moderation effect results-boredom proneness

Social loneliness→ Compulsive use				
		SE		UL
Mean	0.35	0.041	0.2	0.43
High	0.58	0.062	0.4	0.70
Low(	0.12	0.057	0.0	0.23

Note: independent variable is lockdown loneliness, dependent variable is compulsive use

Figure 4. The moderating role of boredom presence
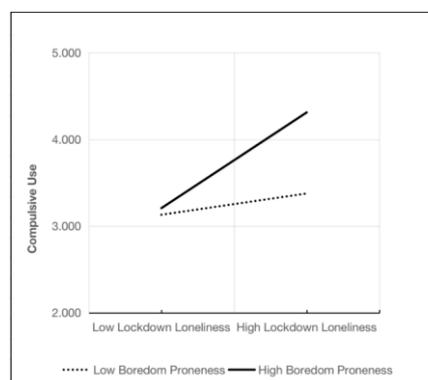
4. Conclusion

The goal of our research was to incorporate social interaction anxiety and FoMO in the test of how lockdown loneliness affects compulsive social media usage. In addition, the boundary condition was found to increase an individual's risk of developing compulsively use social media. All hypotheses were empirically supported, and the observations are noteworthy.

During the COVID-19 epidemic, lockdown loneliness positively affects compulsive social media usage. This result is consistent with prior works [2, 6, 44]. For instance, Wegmann, Oberst [69] indicated that preference for online engagement over face-to-face interaction as a tool to prevent loneliness.The need to connect with people via social media is one of the most compelling reasons for compulsive usage and is also a component of the notion of compensation [69]. Moreover, the results verified the I-PACE model which lockdown loneliness may affect individual's decision to use the social media for gratification, and then will in turn influence compulsive use [29]. Because of the lockdown policy from government, sometimes people cannot have the outdoor activities. Hence, using social media would be one of their important approaches to reducing inner emptiness and lockdown loneliness.

Secondly, social interaction anxiety and FoMO serially mediate the association between lockdown loneliness and compulsive use. That is, lonely individual may feel social interaction anxiety, and then in the FoMO state result in compulsively use social media. It is the same as the self-determination theory model, which stated that FoMO is a negative emotional state caused by unfulfilled social and psychological demands [70]. Individuals who lack these fundamental psychological demands will be unable of appropriate self-regulation. Moreover, according to the ego depletion concept, negative emotions will drain self-regulation resources, which will have a profound effect on the self-regulation system of the person [71]. Therefore, persons with high levels of loneliness may be compelled by psychological discomfort to acquire negative emotional states, such as social interaction anxiety and FoMO. The individual's potential for self-regulation will be greatly compromised by these negative emotional states [36]. Due to their lack of self-control, persons with poor self-regulatory capacity are susceptible to compulsive use. Li, Zhan [9] indicated that loneliness moderates the influence of escape motive on problematic phone usage. In contrast, the present research investigates the alternative findings that the association between lockdown loneliness and compulsive usage is serially mediated by social interaction anxiety and FoMO.

Thirdly, boredom proneness positively moderates the association between loneliness and compulsive use. This finding is consistent with that of Ksinan, Mališ [52] who indicated that people in boredom condition may prefer to use social media. This also corroborates previous research linking boredom proneness and compulsive behavior [72]. Vodanovich [72] showed that boredom-prone people to be more easily influence by negative feelings, and then prefer to use social media compulsively. By contrast, Whelan, Islam [55] explored that Social media fatigue may be caused by a propensity for boredom due to information and communication overload. Because social media fatigue is the next step of obsessive usage since compulsive use. That is the reason why the results is different with our study.

Fourthly, the results showed that relation between FoMO with compulsive use is positively moderated by social presence. Our finding is consistent with the previous studies [73, 74]. For example, Benson, Hand [73] demonstrated that social presence can increase the tendency of compulsive social media use because of higher perceived sociability. When experiencing the fear of missing out, individuals choose to interact through social media. In addition, when consumers think that the media has a strong social presence, they may be more likely to engage in compulsive social media usage.

Finally, people in lockdown loneliness state may use social media compulsively because of higher social presence. It is consistent with Kim, Kim [43], The relationship between loneliness and the use of social media to follow celebrities is moderated by social presence. The results are also consistent with empirical research that has established positive relationships between social presence and social media use [4, 75, 76]. Due to the correlation between social presence and the sense of social connection to people in a mediated environment, the concept is especially significant for lonely persons online. Therefore, social presence may increase the tendency of compulsive use when people feel loneliness.

As with any research, the limitations of this inquiry must be considered when interpreting the pattern of findings. The background of this work is in the COVID-19 pandemic, therefore, this research focus on lockdown loneliness. Changing the type of loneliness, the result of our study will be different. Secondly, our investigation took place in China. Future research could be extended to countries with different cultures. Thirdly, the current study chooses compulsive social media usage as the dependent variable. Further research can examine other dependent variables such as gaming addiction, online-gambling intention, or

compulsive online purchase behavior. The poor-get-poorer model suggests that lonely people who lack social resources offline will be lonelier online, while the poor-get-richer model suggests that lonely people would feel less lonely online [43]. Individuals who feel lonely might have either a favorable or bad connection with people linked online, depending on their social state. This further study must investigate techniques to create a sense of social presence during mediated encounters so that lonely folks may feel connected and get the advantages of coming online.

Consequently, this work contributes to the current body of knowledge in a variety of ways. The current study contributes to the compensatory internet use theory literature by investigating the mechanism of the relation between lockdown loneliness and compulsive use. Previous study indicated that the need for social contact among lonely persons is one of the biggest motivators for regular engagement and is also a component of the compensation theory [10, 69]. Fumagalli, Dolmatzian [27] indicated that Increased online FOMO may boost the impulse to often check the various social media platforms. However, the current study found the mechanism of the association between lockdown loneliness and compulsive social media use to understand the compensatory internet use theory better. Second, it was discovered that boredom propensity is a significant moderator of complusive social media use, which contributes to the boredom literature. The prior studies always use boredom proneness as the independent. People in bored state always prefer to seek stimulation, thus, they may use internet-communication [60], sexual addiction [77] and compulsive buying [78]. However, this research which find that boredom proneness as the moderator to improve the lonely individual tend to use social media compulsively in the current study fulfills the gap. In conclude, the findings improve our knowledge of social presence. Existing research indicates the importance of social presence from a variety of viewpoints. For example, Han, Min [48] found that social presence moderates the links medias use and users' experiences. Social presence was corroborated that can increases positive mediated experiences[4, 40]. However, such little research has examined social presence as a moderator that might enhance the likelihood of compulsive social media use. In this respect, the present study extends to the expansion of the role of social presence.

The ongoing COVID-19 epidemic necessitates consideration of its influence on the psychological and problematic conduct of persons. In the context of the COVID-19 epidemic, it is crucial to investigate the underlying processes of compulsive social media

usage and permit the deployment of more efficient coping techniques. In addition, psychological interventions should be developed promptly to screen isolated individuals for dysphoria, which is an important aspect of healthy social media use during the COVID-19 pandemic. Thirdly, our results supplement the literature on social presence by the moderating role. This study indicated that lonely persons often use social media complusively. Social media designer should control the level of social presence to decrease the risk of compulsive use. Finally, the government should also pay close attention to the mental health problems of the public while introducing segregation policies and reduce negative emotions such as loneliness and boredom tendencies of the public by increasing psychological counseling services.

Acknowledgements

5. References

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Appendix 1. Measurement scales

Constructs and items	Item loadings	Cronbach's alpha	AVE	CR	MSV	ASV
Lockdown loneliness [56]		0.775	0.531	0.773	0.268	0.384
During the COVID- 19 lockdown, I often felt that I lacked companionship.	0.747					
During the COVID- 19 lockdown, I often felt left out.	0.722					
During the COVID- 19 lockdown, I often felt isolated from others.	0.716					
Social interaction anxiety ([61]		0.877	0.534	0.873	0.296	0.394
I feel very nervous when interacting with people.	0.754					
I get nervous when I must talk to a teacher or a boss.	0.750					
I sometimes feel tense when talking to people of my own sex if I don't know them very well.	0.761					
I often feel nervous when calling someone I don't know very well on the telephone.	0.680					
I get nervous when I speak to someone in a position of authority.	0.742					
I often feel nervous when talking to an attractive member of the opposite sex.	0.694					
Fearing of missing out [21]		0.828	0.638	0.841	0.245	0.415
I fear others are having more rewarding experiences than me during lockdown.	0.818					
I fear my friends are having more rewarding experiences than me during lockdown.	0.795					
I get worried when I find out my friends are having fun without me during lockdown.	0.783					
Social presence [62]		0.797	0.533	0.820	0.211	0.307
I can understand others' opinions when using WeChat	0.707					
I can understand others' thoughts when I communicate with them using WeChat	0.703					
Affective social presence						
I feel that people in WeChat deal with me kindly and caringly	0.716					
I feel that there is a sense of human warmth in WeChat	0.790					
Boredom proneness [59]		0.870	0.547	0.878	0.188	0.313
Time always seems to be passing slowly.	0.718					
I often find myself at "loose ends", not knowing what to do.	0.721					
Many things I have to do are repetitive and monotonous.	0.692					
Much of the time I just sit around doing nothing.	0.726					
1.It would be very hard for me to find a job that is exciting enough.	0.792					
It seems that the same things are on television or the movies all the time; it is getting old.	0.784					
Compulsive use [63]		0.853	0.543	0.826	0.296	0.490
Spent a lot of time thinking about WeChat or planned use of WeChat	0.760					
I feel the urge to use WeChat more and more	0.714					
I use WeChat in order to forget about problems in my life.	0.757					
I will become upset or annoyed if I am forbidden to use WeChat.	0.716					