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Psychological distress and internet addiction following the COVID-19 outbreak: Fear of missing out and boredom proneness as mediators

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ABSTRACT

COVID-19 has caused major changes in people's mental health and behavior. This study aimed to investigate whether boredom proneness and fear of missing out acted as mediators between psychological distress and Internet addiction (IA). A cross-sectional survey was conducted in 2020, including 552 youths aged 17–28 years. The recruited participants were asked to complete a series of self-reported questionnaires regarding psychological distress, fear of missing out, boredom proneness and IA. The results indicate that during the COVID-19 pandemic, the reporting rate of IA in young adults was 28.1%, and fear of missing out and boredom proneness played multiple mediation roles in the relationship between psychological distress and IA. Governments and education departments should focus on young people with psychological deficits to prevent them from succumbing to IA.

Introduction

New and recurring infectious diseases have always been a threat to the public health, and the global outbreak of COVID-19 has been the latest challenge (Silva Junior et al., 2020). This public health emergency has severely affected people's physical and mental health, economy, life, and thought processes, creating an environment of worry and panic (Bernabe-Valero et al., 2021; Gale & Roehrle, 2021; Pillay & Barnes, 2020; Zhu et al., 2020). With this context, people's behaviors and lifestyles have also undergone major changes. Studies have shown that during the COVID-19 pandemic, college students spent more time on sedentary activities, visited fewer places, and were more engaged with their smart phones and computers (Huckins et al., 2020). These phenomena will increase the likelihood of developing addictive behaviors, such as substance and behavioral addiction (Alexander & Ward, 2018). Previous studies have shown that after highly stressful events, such as violent incidents, natural disasters, or public health emergencies, participants' substance use and problematic Internet use have increased (Flory et al., 2009; Grieger et al., 2003; Lee et al., 2017). Especially during the COVID-19 pandemic, family isolation and social distancing may have increased the level of stress, anxiety and depression among the common mass (Qiu et al., 2020). The general public is likely to choose easily accessible methods such as smartphones and computers to alleviate the psychological distress caused by COVID-19 (Kardefelt-Winther, 2014; Khantzian, 2013). However, this can lead to excessive dependence on electronic devices. And if people rely too much on these electronic devices, they will become addicted. Thus, it is very important to fully understand the Internet usage of young people during the COVID-19 pandemic.

Psychological distress is widely defined as a state of mood disorder, mainly characterized by symptoms of depression and anxiety (Drapeau et al., 2012). Previous studies have confirmed the relationship between psychological distress and IA (Elhai, Gallinari, et al., 2020), which leads to the assumption that psychological distress can positively predict IA during the COVID-19 pandemic. Due to the impact of COVID-19, one way for young people to change their lifestyles and behaviors during school closures is to increase their Internet use. They may engage in activities related to education, entertainment, and social participation through the Internet. If this kind of Internet behavior is not monitored, it may result in problematic Internet usage behavior (Chen et al., 2021). This behavior is more serious for teenagers with psychological distress, and according to the Interaction of Person-Affect-Cognition-Execution (I-PACE) model, IA behavior can be a result of the interaction between personal susceptibility variables and certain factors in specific situations (Brand et al., 2019). Therefore, external stimuli and related internal triggers that individuals perceive during the COVID-19 pandemic can

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act together and eventually lead to IA. This model also indicates that the occurrence of addictive behavior may be the result of the interaction of a person's core characteristics and several moderating and mediating variables.

Fear of missing out (FoMO) might be a mediating variable between psychological distress and IA. FoMO is defined as an individual's pervasive apprehension that other people might be gaining beneficial experiences in the individual's absence, which is characterized by one's desire to keep in touch with others and be involved in their lives (Przybylski et al., 2013). A strong association between FoMO and problematic Internet usage has been reported (Aygar et al., 2019; Elhai, Yang, et al., 2020). Due to the impact of COVID-19, young people may spend most of their times at home, and individuals with a high level of FoMO will attempt to fulfill their social needs by socializing with others on the Internet (Wolniewicz et al., 2018). Based on the compensatory motivation perspective of self-determination theory (Deci & Ryan, 2000), this unmet need can lead to concerns about the experience of others, especially during the lockdown in the COVID-19 pandemic. It also makes young people with psychological distress more compulsively use the Internet, while attempting to satisfy their inner needs. Studies have also pointed out that the dilemma of self-regulation can cause individuals to experience FoMO, and this dilemma is caused by individuals being unable to the meet their social and personal needs due to the social blockade during COVID-19 (Boustead & Flack, 2021). Another study points out that adolescents with high level of psychological distress were also likely to develop strong FoMO due to feeling social deficits (Oberst et al., 2017). In addition, psychological distress can positively predict IA (Hasan & Abu Jaber, 2020; Liu et al., 2019). Therefore, FoMO mediates the relationship between psychological distress and IA.

Boredom proneness (BP) might also act as a mediating variable between psychological distress and IA. BP is defined as a relatively low arousal and dissatisfaction, and this state is caused by insufficient environmental stimulation (Mikulas & Vodanovich, 1993). This is also known as “trait” boredom, where in the individuals show relatively persistent low arousal to internal and external stimuli and face difficulties in concentrating (Belton & Priyadharshini, 2007; Struk et al., 2017). Previous research has indicated that BP can positively predict problematic Internet use (Chou et al., 2018; Wolniewicz et al., 2020), which can be explained by the perspective of the compensatory Internet use theory (CIUT) (Kardefelt-Winther, 2014). The CIUT suggests that during the COVID-19 outbreak, individuals may become bored due to the lack of social stimulation in the real world. Thus, they use the Internet to socialize with others for relieving the feeling of boredom and eventually become addicted to it. For individuals with high psychological distress, the effect is even more obvious, which indicates that BP also plays a role in the relationship between psychological distress and IA. Therefore, this study proposed the following hypothesis: BP may play a mediating role between psychological distress and IA. Studies have shown that FoMO has a significantly positive correlation with BP, which can be explained by the social isolation that people have been experiencing during the COVID-19 outbreak. Individuals with high FoMO will expect social relationships and activities to relieve BP, with the convenience, speed, and anonymity of the Internet meeting this requirement (Young et al., 2000). Based on the above analysis, we proposed the hypothesis that psychological distress could affect IA through a chain-mediating path involving FoMO and BP. The chain-mediating effect was considered to be more capable of revealing the relationship between predictor variables and outcome variables than a simple mediating effect (Taylor et al., 2008).

Overall, many studies have investigated the relationship between psychological distress and IA. However, there is no relevant research to explore the underlying mechanism of psychological distress influencing IA in the context of the COVID-19 pandemic. Thus, based on previous findings, our study has two research goals: First, the current study is to investigate the incidence of IA among the study participants during the COVID-19 pandemic. Second, this research constructs a comprehensive model (psychological distress could affect IA through a chain-mediating path of FoMO and BP) to demonstrate the relationship between them. This multiple mediation model was displayed in Fig. 1.

Methods

Participants and procedure

This cross-sectional study was conducted between April and June 2020 and used a self-administered questionnaire to collect samples on the Internet. The inclusion criteria were as follows: (1) youth between 17 and 28 years old, (2) young people who can understand the content of the questionnaire without difficulty, and (3) informed consent to participate in the research. The exclusion criteria were as follows: Participants with logical errors or missing too much information in the questionnaire. First, we used Wenjuanxing (similar to SurveyMonkey) to make an electronic version of the questionnaire, and then generated a link to the questionnaire. Then, the researchers sent the questionnaire to WeChat (similar to WhatsApp) and QQ groups (similar to WhatsApp) to recruit participants. Participants could click on the link to complete the questionnaire through communication devices such as smartphones and computers. A total of 580 participants were recruited to participate in this research, and after ruling out questionnaires with invalid responses, a total of 552 questionnaires were accepted with a 95.2% of valid response rate.

Ethical considerations

This study was approved by the Institutional Review Board of the author's university. Before the start of this study, the participants were introduced to the purpose of the study in detail, and were promised that their personal information would be kept strictly confidential. The electronic consent of all participants was obtained before the start of this study.

Measurements

Young's Diagnostic Questionnaire

The IA was measured using Young's IA scale (YIAS), which has an 8-item IA diagnostic scale (binary response format: 1 = “yes”, 0 = “no”) (Young, 1998). The total score ranges from 0 to 8, with a higher score indicating more severe IA. Participants were considered to have IA only if they scored 5 or higher on the questionnaire. The following is an example item: “During COVID-19, have you tried many times to control or stop surfing the Internet without success?”. The scale has also shown good reliability and validity in other studies (Liang et al., 2021), and the Cronbach's alpha for this study was 0.85.

The general health questionnaire scale

Psychological distress was examined using the general health questionnaire scale (Goldberg et al., 1997), and it was a shortened version of the original GHQ questionnaire (Goldberg, 1978). It is a 4-point Likert scale where a higher score indicates a greater severity of psychological distress. It includes 12 items, and the total scores ranges from 0 to 36, which has successfully been conducted in a Chinese sample (Cai et al., 2016). The following is an example item: “Do you have insomnia due to excessive worry?” In previous studies, it has shown acceptable reliability and validity with a Cronbach's alpha ranging from 0.78–0.95 (Jackson, 2007). The internal consistency coefficient of the scale was 0.82.

Fear of Missing Out Scale

The study used a 10-item FoMO scale to measure participants' state of FoMO, which was developed by Przybylski (Przybylski et al., 2013). This is a 5-point Likert self-assessment screening tool and the total score range is between 10 and 50 points, with a higher score indicating a more severe level of FoMO. The following is an example item: “I feel anxious

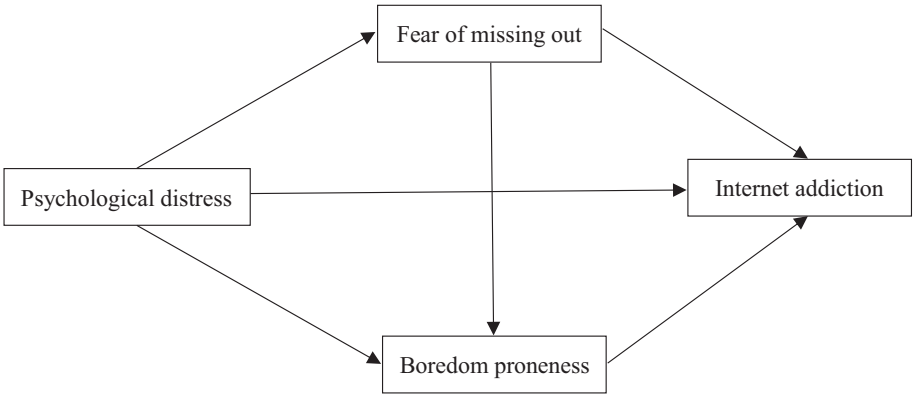

Fig. 1. The conceptional framework of the multiple mediation model.

when I don't know what my friends are doing." Previous studies have shown that the scale has good reliability and validity (Elhai, Levine, et al., 2018; Przybylski et al., 2013). In the present study, the Cronbach's alpha of FoMO scale was 0.93.

Boredom proneness scale-short form

A short BP version of scale (BPS-SF) was used to measure the level of BP in participants. It is an 8-item scale and derived from an original 28-item version of the BP scale (Farmer & Sundberg, 1986; Struk et al., 2017). It uses a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree), with a higher score indicating more obvious BP. The following is an example item: "I have nothing to do most of the time." The BPS-SF has demonstrated sufficient internal consistency (Farmer & Sundberg, 1986), and the Cronbach's alpha of BPS-SF in this study 0.92.

Data analyses

All variables were analyzed using SPSS 24.0 (IBM Crop). This study used descriptive analysis and Pearson correlation analysis to analyze the research variables. The mediation model was tested using multiple linear regression analysis and Hayes's (2013) PROCESS macro (Model 6), and 5, 000 bootstrapped samples were draw from the data, where the 95% bootstrap confidence intervals (CI) not including 0 indicated significance. In this study, $P < 0.05$ was considered statistically significant.

Results

Participant characteristics

Table 1 provides the sociodemographic variables of the participants recruited in this study. The study included a total of 552 participants, including 202 men and 350 women with ages ranging from 17 to 28 (Mean = 22.28 years, SD = 2.17).

Table 1
Demographic characteristics of the participants ($n = 552$).

Variables		n	%
Gender	Male	202	36.6
	Female	350	63.4
Age	17–22	303	54.9
	23–28	249	45.1
Educational level	High school or below	27	4.9
	Undergraduate or college	431	78.1
	Master's degree or above	94	17.0
Self-rated health	Excellent	264	47.8
	Very good	240	43.5
	Not good	48	8.7
Smoking	Yes	50	9.1
	No	502	90.9
Drinking	Yes	110	19.9
	No	442	80.1

Description of internet addiction scale

Table 2 describes the participants' responses on the eight IA scale items. The response rates on most items vary between 20% and 40%, most participants (55.1%) reported that they spent more time on the Internet than they originally planned. Among them, 155 participants selected at least five out of eight items and were identified as addictive Internet users.

Preliminary analysis

The means, standard deviations, and bivariate correlations of all study variables are presented in Table 3. The results showed that psychological distress, IA, FoMO and BP are all positively correlate with each other ($P < 0.01$).

Mediation analyses

This study used the method of regression to test the mediation effect of FoMO and BP on the relationship between psychological distress and IA based on the test method of mediation effect proposed by MacKinnon (2008). We controlled for several covariates, including gender and age for conservative predictions. As the Table 4 displayed. First, the Model 1 was significant ($F = 22.98$, $P < 0.001$, $R^2 = 0.11$), psychological distress and IA are significantly positively correlated ($\beta = 0.33$, $P < 0.001$). Second, Model 2 and Model 3 were both significant ($F = 31.10$, $P < 0.001$, $R^2 = 0.15$; $F = 166.44$, $P < 0.001$, $R^2 = 0.54$). Psychological distress could significantly positively predict FoMO ($\beta = 0.37$, $P < 0.001$), FoMO could significantly positively predict BP ($\beta = 0.67$, $P < 0.001$). Finally, the Model 4 was also significant ($F = 49.20$, $P < 0.001$, $R^2 = 0.31$). When psychological distress, FoMO and BP were simultaneously included in the regression equation to predict IA, psychological distress could still significantly predict IA ($\beta = 0.13$, $P < 0.01$), FoMO

Table 2
Internet addiction scale items and responses.

Items	n	%
1. During COVID-19, have you tried many times to control or stop surfing the Internet without success?	206	37.3
2. Are you always thinking about surfing the Internet or looking forward to it as soon as possible next time?	219	39.7
3. In order to get the satisfaction of surfing the Internet, do you need to keep increasing your online time?	182	33.0
4. When you reduce or stop surfing the Internet, do you feel irritable, depressed, or easy to lose your temper?	150	27.2
5. Do you actually spend more time on the Internet every time than planned?	304	55.1
6. Have you damaged some important relationships or job opportunities by surfing the Internet?	160	29.0
7. Do you lie to your family, friends, or others to conceal your online status?	116	21.0
8. Did you use the Internet as a means to escape problems or eliminate worries?	187	33.9

Table 3
Descriptive statistics and correlation analysis of all study variables ($n = 552$).

Variables	1	2	3	4
1 Psychological distress	1			
2 IA	0.33**	1		
3 FoMO	0.37**	0.48**	1	
4 BP	0.40**	0.52**	0.72**	1
M	12.16	2.76	23.76	27.49
SD	6.31	2.61	9.33	10.75

Note: $^{**}P < 0.01$. IA: Internet addiction; FoMO: Fear of missing out; BP: Boredom proneness.

could significantly positively predict IA ($\beta = 0.22$, $P < 0.001$) and BP could also significantly positively predict IA ($\beta = 0.31$, $P < 0.001$).

And then, this study used Hayes' (2013) PROCESS v3.3 (Model 6) to examine the serial multiple mediation effect of psychological distress on IA through FoMO and BP, which used 5000 bootstrapping samples and computed 95% CI to test the mediation effects. As shown in Table 5, the results found that the three mediating effects were significant. The direct effect of psychological distress on IA was 0.052 (95% CI = (0.020, 0.083); excluding 0), the total effect was 0.137 (95% CI = (0.105, 0.170); excluding 0) and the total indirect effect was 0.085 (95% CI = (0.067, 0.106); excluding 0). Among them, the Ind 1 effect of psychological distress on IA via FoMO was significant (95% CI = (0.017, 0.051)). And the 95% CI does not contain 0, which accounts for the total effect of 24.1%; the Ind 2 effect of psychological distress on IA via BP was significant (95% CI = (0.010, 0.033); excluding 0), which accounts for the total effect of 14.6%; and the Ind 3 effect of psychological distress on IA via FoMO and BP was also significant (95% CI = (0.020, 0.046); excluding 0), which accounts for the total effect of 23.3%.

Discussion

This study indicated that psychological distress was significantly and positively correlated with FoMO, BP and IA, which is consistent with the conclusions drawn from previous studies. Thus, it can be concluded that psychological distress, BP, and FoMO are all influencing factors for IA (Chou et al., 2018; Elhai, Gallinari, et al., 2020; Elhai, Yang, et al., 2020). Individuals with high levels of psychological distress are more likely to report higher levels of FoMO (Elhai, Yang, et al., 2020), have more BP (Constant et al., 2019), and are more vulnerable to problematic Internet use (Elhai, Vasquez, et al., 2018). The present study found that during the COVID-19 pandemic, the reporting rate of young people's IA was 28.1% higher than a survey on adolescent IA (7.7%) before COVID-19 outbreak in China (Shen et al., 2020) and the rate of IA (6.03%) during the spread of COVID-19 in China (Duan et al., 2020). This may have been caused by the difference in survey tools and time, but it is still a concern. The results of this study show that the increase in surfing time during COVID-19 was an important factor influencing young people's IA. Thus, it is necessary to pay more attention to the problem of IA among young people during COVID-19 and its underlying mechanism.

As the goal of this study was, FoMO mediates the relationship between psychological distress and IA. FoMO is characterized by the desire to maintain continuous contact with others, which have been especially noticeable during the COVID-19 pandemic. Because of the impact of relevant social and family isolation measures during the COVID-19 pandemic (Li et al., 2020; Wang et al., 2020). Individuals' social activities were reduced, and people with higher levels of FoMO used Internet more frequently to follow up with what was happening with their friends in order to avoid missing the beneficial experiences in their absence. Consistent with research during COVID-19, the psychological distress experienced during COVID-19 social distancing will drive FoMO due to unmet social needs (Elhai et al., 2021). Because FoMO is a manifestation of hindered self-regulation, individuals who cannot express psychological deficits may rely on others to regulate their psychological distress (Przybylski et al., 2013; Sela et al., 2020; Wegmann et al., 2017). Negative emotions are conceptualized as a byproduct of FoMO, and individuals who experience FoMO may gain social connections through the Internet to gain recognition from others (Przybylski et al., 2013). This confirms the need for relevance (a feeling of closeness and connectedness with others) in self-determination theory, indicating FoMO individuals are more likely to fall into this unsatisfied need, and seek another convenient tool (the Internet) to obtain satisfaction (Deci & Ryan, 2000). This suggests that local governments and related institutions should pay attention to the mental health of young people and prevent the causes of IA. Furthermore, according to the family system theory (Beavers & Hampson, 2000), the family system should play a role in alleviating the IA of adolescents. For example, during the COVID-19 pandemic, family members can spend “family time” together,

Table 5
Multiple mediation analysis of psychological distress on the IA.

Path	Share of the total effect, %	Effect	SE	95%CI
Ind 1	24.1	0.033	0.009	(0.017, 0.051)
Ind 2	14.6	0.020	0.006	(0.010, 0.033)
Ind 3	23.3	0.032	0.007	(0.020, 0.046)
Direct effect	38.0	0.052	0.016	(0.020, 0.083)
Total mediation effect	62.0	0.085	0.010	(0.067, 0.106)
Total effect	–	0.137	0.017	(0.105, 0.170)

Note: Ind1 = Psychological distress → FoMO → IA, Ind2 = Psychological distress → BP → IA, Ind3 = Psychological distress → FoMO → BP → IA. IA: Internet addiction; FoMO: Fear of missing out; BP: Boredom proneness.

Table 4
Regression analyses.

Independent variables	Model 1 (IA)		Model 2 (FoMO)		Model 3 (BP)		Model 4 (IA)	
	β	t	β	t	β	t	β	t
Gender	−0.01	−0.21	−0.07	−1.83	0.06	1.98*	0.01	0.13
Age	0.03	0.77	−0.02	−0.37	0.06	1.97	0.02	0.55
Psychological distress	0.33	8.27***	0.37	9.38***	0.16	5.10***	0.13	3.21**
FoMO					0.67	21.55***	0.22	4.15***
BP							0.31	5.90***
R^2	0.11		0.15		0.54		0.31	
F	22.98***		31.10***		166.44***		49.20***	

Note:IA: Internet addiction; FoMO: Fear of missing out; BP: Boredom proneness.
* $P < 0.05$.
** $P < 0.01$.
*** $P < 0.001$.

including doing household chores, and playing social games and sports together in order to reduce the possibility of young people using the Internet to follow up with what their friends are doing (Király et al., 2020).

The results indicated that psychological distress can also affect IA through BP, which confirmed the hypothesis above. Boredom as a non-optimal state of arousal occurs when there is a mismatch between people's need for arousal and the desired stimulus in the environment (Eastwood et al., 2012). Particularly during the COVID-19 pandemic, some individuals experienced negative emotions resulting from social and family isolation (Li et al., 2020; Wang et al., 2020). When individuals do not feel enough stimuli from the environment to maintain the optimum arousal level (Skues et al., 2016), they will enter a state of BP. Thus, owing to the nature of the Internet, individuals who feel bored are more inclined to seek social activities that excite and satisfy them through the Internet, possibly making them susceptible to IA. Furthermore, according to the I-PACE model, some behavioral disorders including compulsive Internet use, can be caused by the interaction between predisposing factors, moderators of risk, and contextual mediators (Brand et al., 2019). Given this model framework, this study speculates that the impact of COVID-19 on individual mental health may be a predisposing factor, and BP may be a mediating of risk, which together can lead to individual IA. Therefore, this study suggests that young people should actively communicate with friends and relatives when facing psychological distress, instead of relying on the Internet. Adequate sleep, regular physical activity, and self-monitoring of the time spent on the Internet every day are also very important (Király et al., 2020).

The results indicated that psychological distress affected FoMO, which in turn affected IA through the indirect path of BP, confirming the aforementioned hypothesis. This is consistent with previous studies. Individuals with psychological distress may rely on IA because of their unsatisfied basic psychological needs and hindered self-regulation (Gokcearslan et al., 2016; Wong et al., 2014). According to the theoretical model of self-determination theory (Deci & Ryan, 2000), FoMO is a negative emotional state caused by the individual's unmet social and psychological needs. If individuals lack these basic psychological needs, they will be unable to exercise normal self-regulation. Furthermore, based on the ego depletion theory (Baumeister et al., 1998), individual negative emotions will consume self-regulation resources, which will have a huge significantly impact on the individual's self-regulation system. Thus, individuals with high FoMO may produce negative emotional states driven by psychological distress, and the BP as a negative emotional state will have a serious impact on the individual's self-regulation ability. Consequently, individuals with low self-regulation ability will be prone to IA because of the lack of self-control (Molavi et al., 2018).

Practice implications

The COVID-19 pandemic continues to this day, and attention needs to be paid to its impact on the psychology and behavior of youth. It is especially important to explore the underlying mechanisms of IA among youth in the context of the COVID-19 pandemic, and allow more effective nursing interventions to be deployed. In addition, nurses should enlist the cooperation from teachers and parents to screen for IA tendency among youth in a timely manner, which is an important aspect of health promotion during the COVID-19 pandemic.

Limitations

This research has several limitations: First, this study was a cross-sectional study based on a questionnaire survey, and it was impossible to draw a causal relationship between variables. Thus, future research should verify causality based on longitudinal research. Second, in this study, BP and FoMO were the two mediating variables of psychological distress affecting IA. There may be other mediating variables, which need further exploration. Lastly, a larger sample size is needed for future studies.

Conclusion

This study found that IA is a concern during the COVID-19 pandemic. This confirms that psychological distress, FoMO, BP, and the underlying path relationship between them are the influencing factors of IA. Thus, this research can provide a certain reference for the early identification of individuals with IA and the formulation of intervention measures.

Data availability statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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Ethics statement

This study has received approved approval from the Research Ethical Committee of Jilin University.

Declaration of competing interest

The authors have no relevant financial or non-financial interests to disclose.

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