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Self-disclosure during the COVID-19 emergency: Effects of narcissism traits, time perspective, virtual presence, and hedonic gratification

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ABSTRACT

During the COVID-19 emergency, people must face the invisible threat of uncertain death and comply with social distancing and other related protective measures. But social networking sites (SNSs) like WeChat have emerged as alternative contexts where people can maintain self and obtain gratification, despite the disclosure of self to others often being a challenging issue. To examine the effect of personality factors on people's self-disclosure on SNSs, we develop a model based on the time perspective theory and the socioemotional selectivity theory. We suggest that people's narcissism traits and two types of time perspective (i.e. future and present-hedonistic) have positive effects on their self-disclosure. In addition, we propose that virtual presence and hedonic gratification mediate the effects of both future time perspective and present-hedonistic time perspective. We obtain a sample of 516 WeChat users in China and take ex-ante and post-hoc measures to deal with common method variance. By means of partial least squares-structural equation modelling (PLS-SEM) methods, we validate both our measurement model and the structural model, so we confirm all the hypothesized causal paths in the proposed model. Our study broadens the boundaries of the time perspective theory and the socioemotional selectivity theory, and offers new insights for addressing some of the effects of the COVID-19 pandemic.

1. Introduction

The COVID-19 pandemic causes deaths and in-person social distancing, as well as damages business (Pejić-Bach, 2020). Virtual contacts are conducive to satisfying individual needs, supporting public functions, and providing online solutions for enterprises (Pejić-Bach, 2020). More particularly, honest sharing of personal information, emotions and even health concerns might be helpful in coping with the pandemic crisis at the personal (and even economical) level (Harari, 2020). However, an increasing number of users are lowering their disclosure on SNSs, and thus decreasing their connections on SNSs (Ma et al., 2020). Therefore, self-disclosure, *as* a challenging issue, has attracted attention from researchers, managers and practitioners (Kroll et al., 2021; Lyvers et al., 2020; Yuchao et al., 2021).

Narcissism was considered as the focal construct of meta-psychological and clinical thinking (Raskin & Terry, 1988). More recent studies mainly focused on the notable effects of narcissism traits on online behavior within the clinical as well as non-clinical domains. These studies have examined the effects of narcissism traits on self-disclosure (Lee et al., 2020; C. Liu, Ang, & Lwin, 2016; Y. Liu, Ang, & Lwin, 2016), social interactions (Ksinan & Vazsonyi, 2016), self-presentation (Huang & Liu, 2020), and selfie-posting (Shane-Simpson et al., 2020). Remarkably, Freis and Brunell (2021) found that the essential workers who scored highly in narcissism evaluation communicated more about their work during the COVID-19 pandemic. However, we still know little about the effects of narcissism traits on general SNS users' self-disclosure in emergency contexts such as the COVID-19 pandemic.

Time perspectives (TPs) are fundamental cognitive constructs of time (Zimbardo & Boyd, 1999) that can also help us better understand the impact of the COVID-19 crisis on the individual's self-disclosure decisions. On the basis of these constructs, individuals shape their personal cognitive processing (Zimbardo & Boyd, 1999), and they make these processes (e.g. operation, influence, and biasing) relatively stable and

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situationally determined (Zimbardo & Boyd, 1999). Since the 1950s, TPs have been an enduring topic in areas such as social psychology (Gerard & Rotter, 1961), consumption psychology (Pham & Khanh, 2020), mental health (Anagnostopoulos & Griva, 2012), and educational psychology (Andre et al., 2018). However, most studies have focused only on the relationships between TPs and various outcomes in real world situations, including personal relationships (Lang & Carstensen, 2002), impulsive consumption (Unger et al., 2018), healthy coping strategies for trauma (Papastamatelou et al., 2020), and academic performance (Donoso González et al., 2020).

In this study, we investigate the influence of narcissism traits and TPs on WeChat users' self-disclosure during the COVID-19 emergency. In addition, we introduce virtual presence and hedonic gratification into the equation of self-disclosure. This is because virtual presence, a psychological feeling of staying together with virtual social partners in a mediated *place*, is thought to be an essential component of people's immersive experiences on SNSs (Rodríguez-Ardura & Meseguer-Artola, 2019) while the pursuit of hedonic gratification is viewed as a strong motive for behavior choices online (Guido M. van Koningsbruggen et al., 2017), which translates into immediate pleasure or emotion regulation.

We discuss three research questions together: (1) Do individual narcissism traits influence SNS users' self-disclosure in the COVID-19 emergency (as shown in normal circumstances)? (2) Do TPs influence SNS users' self-disclosure? (3) If so, are the effects of TPs mediated by relevant aspects of users' immersive experiences and motivations on SNSs (i.e. virtual presence, and hedonic gratification)? By answering these questions, this paper aims to enrich our current understanding of the outcomes of narcissism traits, time perspective, immersive experiences, and user motivation on online disclosure during the COVID-19 emergency. Also, it seeks to provide managers and practitioners with evidence-based insights about how personalized SNS services and immersive technology, as those facilitated by WeChat, can prompt user self-disclosure during the COVID-19 emergency. For instance, managers and practitioners could tailor SNS services and immersive technology based on user profile (e.g. narcissism traits, and time perspective orientation).

To address these research questions, we propose an integrated conceptual model that stems from the time perspective theory (Zimbardo & Boyd, 1999) and the socioemotional selectivity theory (Carstensen, 1995). In this model: narcissism traits and hedonic gratification activate self-disclosure; future time perspective (FTP) and present-hedonistic time perspective (PHTP) prompt both virtual presence and hedonic gratification; and virtual presence triggers hedonic gratification. The results of our empirical test will support the model and show that narcissism traits have strong and stable effects on SNS users' self-disclosure even in the context of the COVID-19 emergency. FTP and PHTP influence WeChat users' self-disclosure through the mediating function of virtual presence and hedonic gratification. When FTP orientation users and PHTP orientation users get virtual presence feelings and hedonic experiences via SNSs, they are more likely to disclose their information which involves sentiment, self-esteem, emotional state and health.

Finally, we discuss theoretical contributions and applied implications about SNS users' behavior in a public emergency. For theoretical contributions, we innovatively discuss the relationship between users' internal factors (i.e. narcissism traits and TPs) and self-disclosure in emergency circumstances, which expands the theory boundaries of the time perspective theory and the socioemotional selectivity theory to virtual social networks and public emergencies. In addition, our model considers the mediating function of compelling experiences of virtual presence and hedonic gratification on self-disclosure. Furthermore, our findings help managers and retailers to create hands-on solutions to lessen the negative impact of emergencies on people: (1) they could improve the virtual contact quality with immersive technology, thus it would be possible to increase users' self-disclosure and virtual social network quality; (2) they might tailor their products and services according to user motivations and organize specific WeChat groups and community activities to facilitate users to share sentiments, experiences, current consumption behaviors and consumption plans and subsequently foster user shopping communication and consuming behavior; (3) consumers could use SNSs to rebuild their personal social networks and obtain gratification that dismisses the negative emotions related to the COVID-19 emergency.

2. Theoretical considerations

2.1. Narcissism traits

Narcissism is a multifaceted metapsychological construct (Raskin & Terry, 1988; Teicholz, 1978). Emmons (1984) summarized and validated four main facets of narcissism, which were exploitativeness/entitlement, leadership/authority, superiority/arrogance, and self-absorption/self-admiration. In the following decades, scholars focused on how to operationalize the concept and variants of narcissism. They proposed various operational delineations such as a unidimensional construct (Ames et al., 2006), dual-dimensional constructs (Back et al., 2013; Rogoza & Fatfouta, 2019), a continuous spectrum (Krizan & Herlache, 2018), and a hierarchical structure (Crowe et al., 2019). With regards to online behavior, some researchers were inclined to split the construct of narcissism into two subtypes, vulnerable narcissism and grandiose narcissism, and examined their effects. Ksinan and Vazsonyi (2016) found that vulnerable narcissism was related to the preference for online social interactions, whereas Shane-Simpson (2020) observed that grandiose narcissism was associated with selfie-posting. However, very few studies have discussed the relationship between narcissism and self-disclosure in emergency circumstances. Also, we do not know yet whether narcissism has similar effects to those described in normal circumstances.

In this study, we conceive narcissism as a unidimensional construct with four facets, as Emmons suggested (1984). Consistent with this, we adopt Ames's operationalization, which translates into a short narcissism scale (2006).

2.2. The time perspective theory

Zimbardo and Boyd (1999) provided a broad concept of TP in the spheres of individual and societal functioning. In general, individuals unconsciously give order, coherence, and meaning to events by assigning the continual flow of personal and social experiences to temporal categories, or time frames. There are three abstract temporal categories (i.e. prior past, anticipated future and empirical present). Within these time frames, people execute cognitive functions (i.e. encode, store, and recall experienced events) and form expectations, goals, contingencies, and imaginative scenarios.

The Zimbardo Time Perspective Inventory (ZTPI) considers five facets of TPs: (1) a past-negative perspective, through which individuals view the past unenthusiastically; (2) a present-hedonistic perspective, which reflects *here and now* and *devil-may-care* attitudes towards time and life; (3) a future perspective, which is a general future orientation; (4) a past-positive perspective, which means that individuals view the past with warm, sentimental attitudes; and (5) a present-fatalistic perspective, in which individuals feel the future as unchangeable and hopeless (Zimbardo & Boyd, 1999).

Chittaro and Vianello (2013) reported that the past-negative time perspective and the present-fatalistic time perspective were associated with problematic online behaviors. More recently, O'Neill et al. (2020) found that FTP was related with individual psychological resilience, which was viewed as the core component of mental health, and Sobol et al. (2020) observed that optimistic attitudes that involve present orientation or future orientation are conducive to compliance with public health regulations during the COVID-19 pandemic.

The COVID-19 pandemic has changed the surroundings, and

influenced biases of perceiving time and views towards the future (Holman & Grisham, 2020). Based on the previous research findings, we consider that people who have past-negative time perspective orientation or present-fatalistic time perspective orientation deal with crises negatively, while people with FTP orientation and PHTP orientation face crises positively. Therefore, we focus on the FTP and PHTP, and the corresponding effects on online self-disclosure. According to Zimbardo & Boyd's theoretical foundations (1999), FTP-oriented people are inclined to act based on an underlying *top-down* processing. They intend to extend the present into the future and build a future that enables them to transcend immediate compelling stimuli or apparent sources of gratification and thus achieve delayed gratification. In contrast, PHTP-oriented people are often unconsciously engaged with *bottom-up* processing: their actions are influenced by elements or sensory stimuli of the present environment and they are likely to seek current pleasure, novelty and excitement without giving much thought to the consequences (Zimbardo & Boyd, 1999).

2.3. The socioemotional selectivity theory

The socioemotional selectivity theory provides a persuasive explication of the age-related social interaction from the perspective of cognitive function. It proposes that social interaction is mainly compelled by three social motives, which are emotion regulation, development and maintenance of self-concept, and information seeking. These primary motives exert influences throughout life, and the corresponding salience of each motive changes at different life stages (Carstensen, 1995). The interpretation of the future is the fundamental psychological construct that causes differences in motive salience. When individuals perceive the future as open-ended, their social interaction is geared towards information seeking. By contrast, when they feel the future limited, their actions shift to the mode of emotion regulation (Carstensen, 1995). For example, older people often feel they do not have a lot of time left in life, so they hold a narrower vision of their future. Their personal social networks are relatively smaller, and their social partners are most likely to provide emotional comfort. Conversely, younger people usually feel the future is wide open, so they focus more on a far-off future. Their networks are relatively larger, and their social partners are more diverse and deliver more novel information or stimuli (Carstensen et al., 1999).

During the COVID-19 emergency, people must face the invisible threat of an unexpected death or, at the very least, they find that their future is hard to anticipate. Therefore, the COVID-19 epidemic may change a person's view of the future and thus the quality of social support they receive. This is because FTP-oriented people are more likely to feel that their future is limited – as older people do – so their behaviors would shift to the emotion regulation mode. In addition, they might feel obliged to maintain social distancing and even face social isolation or lockdown. Since social partners usually give emotional comfort to each other, FTP-oriented people compelled to minimized physical contact are more likely to prioritize virtual social networks to obtain social support.

3. Research model and hypotheses

We conceive a conceptual model that integrates the effects of narcissism traits and FTP and PHTP on people's self-disclosure on WeChat under the COVID-19 emergency. As shown in Fig. 1, narcissism traits trigger self-disclosure; FTP and PHTP are both drivers of virtual presence (a subjective sense of *actually being* in the virtual environment evoked by a SNS like WeChat) and hedonic gratification (i.e. the immediate pleasure or emotion regulation produced by a SNS such as WeChat); and virtual presence and hedonic gratification mediate the corresponding causal paths to self-disclosure.

Insofar as humans are social creatures, they develop self in social relationships (Carstensen, 1995). Narcissism is the original psychological source for developing self (Raskin & Terry, 1988) and online self-disclosure has shown to facilitate social virtual relationships (J. Wang et al., 2011). Under the COVID-19 pandemic conditions, it is difficult for people to develop real world social relationships because of social distancing and other related measures. We hypothesize that the more noticeable the WeChat users' narcissism traits, the more likely they are to share information that discloses their personal sentiments, self-esteem, emotional states or health situation. Because sharing this information on WeChat is conducive to develop virtual social relationships. Thus, they can attract more WeChat friends' attention, influence others, and maintain self in emergency circumstances. Therefore, we posit that:

H1. Narcissism traits have positive effects on self-disclosure

FTP-oriented people prefer to plan future actions by mentally extending the present into the future (Zimbardo & Boyd, 1999). This involves a *top-down* process that starts with thoughts and flows down to senses. As described in the socioemotional selectivity theory (Carstensen et al., 1999), people who feel they have a limited future are more likely to pursue social interaction for emotion regulation purposes. Also, the emotional qualities of their social partners influence the mental representations they form about their social interactions and their memories. As a result, a FTP orientation has implications for the perception of personal social networks.

Virtual presence is a subjective sense of *being there*, within the virtual environment portrayed by the technology (Biocca, 1999), and is

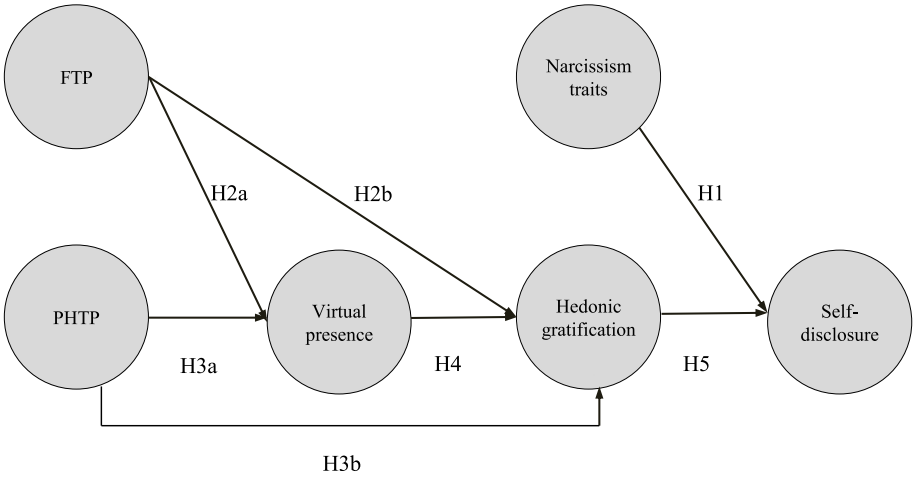

Fig. 1. Research model and hypotheses.

understood as a central component of immersive experiences on SNSs (Rodríguez-Ardura & Meseguer-Artola, 2019). This concept refers to the psychological phenomena of people feeling that they are staying at the mediated *place* evoked by the technology, instead of at the immediate physical place where they truly *are*, and being highly conscious of the importance of their virtual interpersonal relationships.

J. H. Song and Zinkhan (2008) found that online users seek different gratifications when they process digital content. Yu et al. (2018) noted that consumers who pursue online hedonic gratification aim to find something new, emotionally meaningful and symbolically satisfying. In this study, we consider that hedonic gratification is satisfied by means of a SNSs like WeChat when users acquire novel information or plunge into immersive experiences that provide emotion regulation or immediate pleasure.

We assume that during the COVID-19 emergency, some WeChat users feel that their future is limited because of their fear of dying from COVID-19 and their perception of facing an *invisible* tomorrow. As a result of becoming limited FTP-oriented, their social interrelations are primarily emotion-focused, in their hope to achieve emotion regulation via their personal social networks. Since their personal social networks in the physical environment have been chipped away by the coronavirus, they perceive the emotional qualities of the WeChat community as better than usual. Thus, their mental representations about their virtual social partners and their memories of virtual social interactions are more vivid. In turn, this facilitates the formation of a sense of being virtually present on WeChat. In addition, they might use WeChat to obtain novel information, ignore unpleasant thoughts and escape the burden of the ugly reality. Hence, we expect that:

H2a. *FTP has a positive effect on virtual presence*

H2b. *FTP has a positive effect on hedonic gratification*

People with a PHTP orientation tend to seek immediate pleasure and novelty without considering the future (Zimbardo & Boyd, 1999). Their actions are brought about by a *bottom-up* processing in which information travels *up* from stimuli (via senses) to their minds – where mental representations are modeled. We presume that during the COVID-19 epidemic, due to the emergency protective measures (e.g. social distancing, quarantine, and lockdown), PHTP WeChat users are in limited contact with the physical environment, so it becomes harder for them to retrieve sufficient sensory information from their external environment. Accordingly, they shift their attention to the WeChat digital community and the digital stimuli they perceive form more mental representations in their minds than usual. These plentiful representations not only activate the feeling of virtual presence but also provide PHTP users with novel information and the speedy pleasure and delight they usually look for. Thus, we hypothesize that:

H3a. *PHTP has a positive effect on virtual presence*

H3b. *PHTP has a positive effect on hedonic gratification*

Virtual presence is conducive to information constantly being accessed via many different avenues (e.g. audio, visual) from the WeChat community. This feeling of being virtually present leads to the illusion that WeChat users are staying together with their virtual social partners, so they can count on their WeChat partners to get emotional support. As a result, they are more likely to enjoy the comfort of the WeChat community. Hence, we posit that:

H4. *Virtual presence has a positive effect on hedonic gratification*

When FTP and PHTP WeChat users achieve hedonic gratification, they are more likely to share personal or intimate information to strengthen their connections on WeChat, so as to get more emotional comfort and social support. Accordingly:

H5. *Hedonic gratification has a positive effect on self-disclosure*

4. Methodology

4.1. Measures

We used a multi-item questionnaire to capture targeted traits of participants (Appendix A). We adopted the short Narcissistic Personality Inventory (NPI-16) developed by Ames et al. (2006), which considers Emmons' four facets of narcissism (Emmons, 1984), as well as the FTP and the PHTP subscales of ZTPI (Zimbardo & Boyd, 1999, 2021). Also, we used five virtual presence items and four hedonic gratification items that were previously developed by Rodríguez-Ardura and Meseguer-Artola (2018, 2019); and three self-disclosure items validated by Lyvers et al. (2020). In addition, we designed two self-disclosure items based on the specific characteristics of COVID-19 pandemic. Responses to all items were scored on a 7-point gradation, from "strongly disagree" to "strongly agree".

All the measurements were translated into Chinese by two professional translators, who also checked their content validity via back-translation. Then, a bilingual researcher proofread and polished the questionnaire. Next, the questionnaire was pilot tested twice among small samples of 100 and 80 WeChat Chinese users, respectively. The final questionnaire included an additional question at the very beginning ("Do you think the COVID-19 pandemic has made a negative impact on you?") aimed to look at WeChat users' awareness of the COVID-19 impact. Participants were asked to answer "yes" or "no" to this question.

4.2. Sampling and data collection

Sampling and data collection procedures were in sync with the Declaration of Helsinki and had been approved by the ethical committee of the university where the corresponding author develops their research activity. All participants took part in the study anonymously.

Because WeChat is the most prevailing SNS in China, where it has more than 1.2 billion active users (Tencent, 2021), the sample frame was all adults who regularly use WeChat in that country. We collected data with the support of *Wenjuanxing*, a professional online survey platform in China, from June to July 2020. We used snowballing to recruit participants. So initially, we obtained a convenience sample, extracted from personal social networks, and then we attained a complete sample from the interpersonal relationship chains of prior participants. This sampling technique is considered a good solution to the problem of hard-to-reach populations (Handcock & Gile, 2011). In addition, it achieves higher participation rates and reduces costs (Baltar & Brunet, 2012). All respondents were using WeChat at least once per month and were scattered across all provinces in China. We motivated their participation with a reward.

We obtained a final sample that includes 516 qualified responses (Supplement A). According to Hoyle and Gottfredson (2015), the lower bounds for the sample size of Structural Equation Modelling (SEM) is $N = 50$. Our dataset size is significantly larger than 50, therefore it is qualified.

Table 1 shows the demographic structure of the target population

Table 1
Descriptive statistics of the population and the sample.

Variables		Population[a] (%)	Sample (%)
Gender	Male	57.2	57.57
	Female	42.8	42.43
Age	18–24	19.43	19.77
	25–30	28.94	32.17
	31–35	25.66	21.12
	36–40	10.84	9.69
	41–45	10.74	11.82
	>45	4.40	5.43

[a] Source: WALKTHECHAT, December 2019. URL: https://walkthechat.com/.

and the sample. The results of the one-sample Chi-square test are 0.869 and 0.113 for gender and age, respectively. Since these *p*-values are both greater than 0.05, we can deem that the structure of the sample is similar to the structure of the population, and as a consequence it holds representativeness.

4.3. Prevention and assessment of common method variance

We applied ex-ante and post-hoc measures to prevent and detect the influence of common method variance (CMV) on the results (Rodríguez-Ardura & Meseguer-Artola, 2020). The ex-ante measures included: (1) to emphasize the guaranteed anonymity and confidentiality of the participants; (2) to let participants know that there were no correct or incorrect responses, and to ask them for honest answers; (3) to pilot test the questionnaire twice and improve its wording to ensure that the instructions and the questions were all clear.

We used two post-hoc procedures described by Rodríguez-Ardura & Meseguer-Artola (2020) to provide evidence that the potential existence of CMV did not significantly distort the tested relationships in the research model. First, we ran a Harman's single-factor test. Second, because Harman's single-factor test is not accurate enough to detect moderate or small levels of CMV, we also used the correlation matrix technique (Bagozzi et al., 1991).

Harman's single-factor (unrotated) analysis showed that there is no single factor that accounts for more than 50% of the covariance between the items and the constructs (Table 2). The first factor explains just the 26.926% of the total variance, and we need five factors to have more than 50% of the variance explained (59.241%). With respect to the correlation matrix technique, we can see in Table 7 that all correlations between constructs are clearly below the recommended cut-off value of 0.90. All these results support the absence of relevant CMV problems in the data.

5. Results

We applied partial least squares-structural equation modelling (PLS-SEM, or PLS) methods to estimate the relationships between the latent constructs in our research model and the multi-item scales we had used to measure them, and also to test the causal relationships between the constructs. PLS methods do not demand the data to have a multivariate normal distribution and are particularly suitable for testing causal relationship between constructs that are measured with multi-item scales.

5.1. Measurement model

We tested, and ensured, the internal consistency reliability, the individual item reliability, the convergent validity, and the discriminant validity of all the measures.

Table 3 shows that some item loading values of the full scale do not reach the reliability standard (i.e., 0.70). Therefore, we removed all lower FTP items and lower PHTP items (i.e., loading < 0.70). As per the Ames et al.' description (2006), there are two extraction rules: the first rule conceptually defines narcissism as a unidimensional construct with 4 facets; second, it is important to avoid the number of items corresponding to a particular facet exceeding the average. In our research, although there is a total of 11 items with loading > 0.70 reaching the reliability standard, only one of which reflects the facet of "exploitativeness/entitlement". In order to keep the number of items in each facet equal, we selected only one item with the largest loading on the other 3

Table 2
Harman's single-factor (unrotated) analysis of the items (extracted item scale).

Factor	Initial eigenvalues			Extraction sum of squared loadings		
	Total	% of variance	Cumulative %	Total	% of variance	Cumulative %
1	8.445	28.149	28.149	8.078	**26.926**	26.926
2	4.302	14.339	42.488	3.948	13.161	40.087
3	3.241	10.803	53.291	2.846	9.488	49.575
4	2.066	6.886	60.177	1.720	5.732	55.307
5	1.544	5.148	65.325	1.180	3.934	**59.241**
6	1.193	3.977	69.302	0.867	2.889	62.131
…	…	…	…	…	…	…

Table 3
Individual item reliability and convergent validity of the measurement model (full scales).

	Item	AVE	Weight	Loading	Communality
Narcissism traits		0.524			
	NT1		0.070	0.640	0.410
	NT2		0.083	0.745	0.555
	NT3		0.075	0.757	0.572
	NT4		0.095	0.712	0.506
	NT5		0.083	0.691	0.478
	NT6		0.055	0.486	0.236
	NT7		0.085	0.739	0.546
	NT8		0.064	0.553	0.306
	NT9		**0.104**	**0.795**	**0.632**
	NT10		0.080	0.684	0.468
	NT11		0.096	0.776	0.602
	NT12		**0.105**	**0.820**	**0.672**
	NT13		0.089	0.762	0.580
	NT14		0.098	0.748	0.559
	NT15		**0.095**	**0.795**	**0.632**
	NT16		**0.092**	**0.795**	**0.632**
FTP		0.485			
	FTP1		0.137	0.655	0.429
	FTP2		0.096	0.689	0.474
	FTP3		0.054	0.669	0.448
	FTP4		0.123	0.655	0.429
	FTP5		0.119	0.624	0.389
	FTP6		**0.089**	**0.726**	**0.527**
	FTP7		0.057	0.590	0.349
	FTP8		**0.097**	**0.721**	**0.520**
	FTP9		**0.093**	**0.800**	**0.640**
	FTP10		**0.153**	**0.753**	**0.567**
	FTP11		**0.139**	**0.755**	**0.569**
	FTP12		**0.132**	**0.748**	**0.560**
	FTP13		0.145	0.640	0.410
PHTP		0.433			
	PHTP1		0.054	0.430	0.185
	PHTP2		0.095	0.605	0.366
	PHTP3		0.136	0.671	0.450
	PHTP4		0.068	0.480	0.230
	PHTP5		0.113	0.628	0.394
	PHTP6		0.102	0.669	0.447
	PHTP7		**0.114**	**0.737**	**0.543**
	PHTP8		**0.109**	**0.701**	**0.492**
	PHTP9		**0.103**	**0.706**	**0.499**
	PHTP10		0.078	0.613	0.376
	PHTP11		**0.105**	**0.730**	**0.533**
	PHTP12		**0.119**	**0.746**	**0.557**
	PHTP13		**0.118**	**0.772**	**0.597**
	PHTP14		0.095	0.639	0.409
	PHTP15		0.090	0.650	0.423
Virtual presence		0.675			
	VP1		**0.238**	**0.851**	**0.724**
	VP2		**0.253**	**0.856**	**0.732**
	VP3		**0.244**	**0.834**	**0.696**
	VP4		**0.242**	**0.782**	**0.611**
	VP5		**0.241**	**0.783**	**0.614**
Hedonic grat.		**0.807**			
	HE1		**0.283**	**0.892**	**0.796**
	HE2		**0.270**	**0.905**	**0.819**
	HE3		**0.283**	**0.923**	**0.851**
	HE4		**0.278**	**0.873**	**0.763**
Self-disclosure		**0.695**			
	WSD1		**0.254**	**0.875**	**0.765**
	WSD2		**0.263**	**0.839**	**0.704**
	WSD3		**0.244**	**0.843**	**0.711**
	WSD4		**0.218**	**0.801**	**0.642**
	WSD5		**0.220**	**0.807**	**0.652**

facets. Finally, there are 4 items extracted in total. Therefore, our operation process conforms to the extraction standard of Ames et al. (2006).

After the extraction procedure, all first eigenvalues are beyond the cut-off value 1, and all second eigenvalues are lower than 1 (Table 4). In addition, the Cronbach's α values and Dillon-Goldstein's ρ values all exceed the threshold value 0.70, so the internal consistency reliability of the measurement model is acceptable.

In Table 5, all loading values are beyond the threshold 0.70; all average variance extracted (AVE) values and communality values are beyond the cut-off of 0.50. Therefore, the individual item reliability and convergent validity of the measurement model are acceptable.

As suggested by Fornell and Larcker (1981), all loading values of each item on self-constructs are larger than all cross loading values (Table 6), whereas all AVE values (Table 5) are larger than the maximum correlation value of a construct with any other construct (Table 7). All this also means that this measurement model is valid.

5.2. Structural model

We validated the structural model by analyzing the coefficient of determination (R^2). Table 8 shows that all R^2 are within moderate range ($0.25 < R^2 < 0.75$). The R^2 measure of the regressions is one of the primary evaluation criteria for the structural model in SEM (Hair et al., 2011). Since the main goal of the PLS approach is to explain the variance of the endogenous latent variables through other exogenous and endogenous constructs, the coefficient of determination R^2 becomes one of the most important indices to assess the model's quality (Hair et al., 2014). Although the judgment of what R^2 levels can be considered as high, good/moderate, or acceptable depends very much on each specific research discipline, in consumer behavior research values of 0.75, 0.50, or 0.25 can be described as cut-off values for substantial, moderate, or weak levels, respectively (Hair et al., 2011; Henseler & Sarstedt, 2013).

With the bootstrapping technique and using the Benjamini-Hochberg correction, we found that all *p*-values were below their corresponding α correction (Table 9). These results mean that all path relationships are supported.

As Fig. 2 shows, compared with the path coefficient from hedonic gratification to self-disclosure (0.266), the path coefficient from narcissism traits is greater (0.526). This implies that narcissism traits has a stronger direct effect on self-disclosure.

Table 10 shows that FTP has indirect effects on hedonic gratification (0.049) and self-disclosure (0.075); PHTP has indirect effects on hedonic gratification (0.199) and self-disclosure (0.099); and virtual presence has an indirect effect on self-disclosure (0.105).

We performed a multi-group analysis with 300 replacements to discard the influence of gender in the structural model and confirm that all causal paths are not different between gender groups. Table 11 shows that all *p*-values between gender groups are greater than 0.05.

To reject a potential influence of the user's awareness of the COVID-19 impact, we also performed a multi-group T-test (with 300 replacements). In Table 12, all *p*-values between groups are higher than 0.05, which suggests that all causal relations in the measurement model are not different between groups (i.e., between awareness of COVID-19 impact and lack of awareness of COVID-19 impact).

Table 5
Individual item reliability and convergent validity of the measurement model (extracted item scale).

	Item	AVE	Weight	Loading	Communality
Narcissism traits		0.730			
	NT9		0.309	0.843	0.710
	NT12		0.311	0.839	0.703
	NT15		0.280	0.872	0.761
	NT16		0.272	0.863	0.745
FTP		0.621			
	FTP6		0.158	0.714	0.510
	FTP8		0.174	0.751	0.564
	FTP9		0.167	0.825	0.680
	FTP10		0.275	0.807	0.652
	FTP11		0.251	0.814	0.663
	FTP12		0.238	0.812	0.659
PHTP		0.607			
	PHTP7		0.219	0.791	0.626
	PHTP8		0.210	0.716	0.512
	PHTP9		0.199	0.786	0.618
	PHTP11		0.203	0.814	0.663
	PHTP12		0.228	0.787	0.620
	PHTP13		0.227	0.778	0.605
Virtual presence		0.675			
	VP1		0.242	0.855	0.732
	VP2		0.260	0.860	0.740
	VP3		0.246	0.838	0.701
	VP4		0.239	0.776	0.602
	VP5		0.229	0.776	0.602
Hedonic grat.		0.807			
	HE1		0.278	0.891	0.794
	HE2		0.268	0.904	0.818
	HE3		0.285	0.923	0.852
	HE4		0.282	0.875	0.766
Self-disclosure		0.695			
	WSD1		0.254	0.875	0.765
	WSD2		0.264	0.840	0.705
	WSD3		0.246	0.844	0.712
	WSD4		0.217	0.801	0.642
	WSD5		0.217	0.806	0.650

6. Concluding statements

This study suggests that during the COVID-19 emergency, narcissism traits have strong and stable effects on the individual's self-disclosure on SNSs like WeChat. Furthermore, it theorizes and offers evidence that, when a person's FTP orientation or an individual's PHTP orientation is activated, the individual is more willing to experience virtual presence feelings and hedonically enjoy their activities on SNSs and that, in turn, they are more inclined to disclose themselves to other SNS users. Personal preferences for focusing on the *present* or on the *future* are helpful for them to cope with the public emergency of COVID-19, which consist of primarily focusing on emotion regulation and maintaining self via their personal social networks.

These findings mirror recent paper by Freis and Brunell (2021), who observed that trait narcissists communicate more during the COVID-19 pandemic. In addition to this, Tanaka (2019) has showed that age differences are not necessarily a critical factor in determining people's FTP orientation and that future time perspective can be changed by other factors (for example, by means of mental imagery).

Our results, obtained from a sample of 516 WeChat users in China,

Table 4
Internal consistency reliability of the measurement model (extracted item scale).

	Number of items	Cronbach's α	Dillon-Goldstein's ρ	First eigenvalue	Second eigenvalue
Narcissism traits	4	0.877	0.915	2.920	0.516
FTP	6	0.880	0.910	3.760	0.805
PHTP	6	0.870	0.903	3.650	0.631
Virtual presence	5	0.879	0.912	3.380	0.919
Hedonic grat.	4	0.920	0.944	3.230	0.371
Self-disclosure	5	0.890	0.919	3.480	0.443

Table 6
Cross loadings of items (extracted item scale).

	Narcissism traits	FTP	PHTP	Virtual presence	Hedonic grat.	Self-disclosure
NT9	**0.843**	0.104	0.174	0.113	0.134	0.489
NT12	**0.839**	0.012	0.229	0.137	0.101	0.492
NT15	**0.872**	0.120	0.054	0.040	0.008	0.444
NT16	**0.863**	0.126	0.054	0.032	−0.008	0.431
FTP6	0.000	**0.714**	0.180	0.106	0.252	0.030
FTP8	0.102	**0.751**	0.183	0.126	0.268	0.085
FTP9	0.109	**0.825**	0.156	0.122	0.257	0.097
FTP10	0.104	**0.807**	0.268	0.294	0.330	0.118
FTP11	0.032	**0.814**	0.212	0.240	0.330	0.053
FTP12	0.132	**0.812**	0.187	0.230	0.309	0.113
PHTP7	0.223	0.163	**0.791**	0.432	0.348	0.240
PHTP8	0.078	0.208	**0.716**	0.400	0.350	0.143
PHTP9	0.101	0.242	**0.786**	0.389	0.322	0.210
PHTP11	0.145	0.209	**0.814**	0.407	0.317	0.175
PHTP12	0.017	0.198	**0.787**	0.435	0.378	0.104
PHTP13	0.161	0.190	**0.778**	0.450	0.360	0.177
VP1	0.131	0.188	0.496	**0.855**	0.412	0.183
VP2	0.117	0.210	0.506	**0.860**	0.457	0.168
VP3	0.057	0.138	0.506	**0.838**	0.468	0.200
VP4	0.046	0.278	0.352	**0.776**	0.448	0.154
VP5	0.043	0.237	0.343	**0.776**	0.457	0.172
HE1	0.067	0.374	0.396	0.475	**0.891**	0.255
HE2	0.022	0.375	0.374	0.442	**0.904**	0.255
HE3	0.072	0.310	0.421	0.505	**0.923**	0.301
HE4	0.100	0.294	0.408	0.536	**0.875**	0.283
WSD1	0.499	0.060	0.215	0.193	0.250	**0.875**
WSD2	0.498	0.131	0.143	0.153	0.278	**0.840**
WSD3	0.429	0.041	0.212	0.217	0.295	**0.844**
WSD4	0.443	0.085	0.198	0.163	0.198	**0.801**
WSD5	0.396	0.138	0.163	0.162	0.243	**0.806**

are not significantly affected by CMV and further imply that the extracted measurement items of narcissism, FTP and PHTP capture WeChat users' psychological characteristics well. The PLS analyses we conducted on the sample showed that the extracted measurement items are reliable and valid. In addition, gender differences and people's diverse awareness of COVID-19's impact did not significantly influence the causal paths considered in our research model. This leads us to suggest that, under the emergency circumstances of COVID-19, there are no significant differences in self-disclosure behavior on WeChat between males and females and how cognizant they are of the effects that COVID-19 might have on their lives.

Our PLS analyses also revealed that WeChat users' narcissism traits positively influence their self-disclosure behavior during the COVID-19 emergency more than their FTP and PHTP orientations – with mediation of virtual presence and hedonic gratification – and that the direct effect and indirect effect of narcissism traits on hedonic gratification are both 0.

6.1. Theoretical contributions

This study provides convincing evidence of narcissism traits influencing SNS users' self-disclosure. There is a direct correlation between narcissism traits and SNS users' self-disclosure. This result is consistent with a prior finding under the normal circumstances, in which narcissism increased the disclosure of both textual information and visual information (C. Liu, Ang, & Lwin, 2016). This leads us to believe that narcissism is a stable and powerful metapsychological construct that, even within an emergency context, can trigger self-disclosure behavior. Furthermore, we validate that narcissism, as a unidimensional metapsychological construct with four facets, *i.e., exploitativeness/entitlement, leadership/authority, superiority/arrogance, absorption/self-admiration*, is conducive to maintaining self in the emergency context of COVID-19. All this could help us better understand the function and meaning of narcissism traits in hard environments.

We examine the influence force of two cognitive temporal *biases* (i.e., FTP and PHTP) on SNS users' self-disclosure. Interestingly, although there is no obvious intuitive relationship, these causal paths were mediated by virtual presence and hedonic gratification. This result implicates that under the difficult circumstances induced by emergencies and social distancing, people who habitually overemphasize the action-orientation of present-hedonic or minimize the future are more likely to seek immersive experiences in SNSs; they share personal information so that they can improve the quality of *virtual contacts* and attain emotional comfort.

Table 7
Correlation between constructs (full scale and extracted item scale).

	Narcissism traits	FTP	PHTP	Virtual presence	Hedonic grat.	Self-disclosure
Narcissism traits	1.000	0.116	0.134	0.086	0.065	0.562
FTP	0.104	1.000	0.450	0.284	0.412	0.129
PHTP	0.155	0.258	1.000	0.577	0.491	0.225
Virtual presence	0.097	0.255	0.539	1.000	0.546	0.213
Hedonic grat.	0.073	0.376	0.445	0.545	1.000	0.304
Self-disclosure	0.546	0.108	0.223	0.213	0.305	1.000

Above the diagonal, full-scale (i.e. before deleting items with a loading below 0.7) correlations are presented. Below the diagonal, we include extracted-scale (i.e. after deleting items with a loading below 0.7) correlations.

Table 8
Path coefficients (extracted item scale).

			Estimate	Std. error	*t*-value	*p*-value	R^2
Regression 1							0.305
Intercept			0.000	0.037	0.000	1.000	
FTP	→	Virtual presence	0.124	0.038	3.260	0.001	
PHTP	→	Virtual presence	0.507	0.038	13.300	0.000	
Regression 2							0.379
Intercept			0.000	0.035	0.000	1.000	
FTP	→	Hedonic grat.	0.231	0.036	6.340	0.000	
PHTP	→	Hedonic grat.	0.174	0.042	4.170	0.000	
Virtual presence	→	Hedonic grat.	0.393	0.042	9.390	0.000	
Regression 3							0.368
Intercept			0.000	0.035	0.000	1.000	
Narcissism traits	→	Self-disclosure	0.526	0.035	15.000	0.000	
Hedonic grat.	→	Self-disclosure	0.266	0.035	7.570	0.000	

Table 9
Bootstrapping results (500 replacements) (extracted item scale).

			Path coefficients (original)	Path coefficients (bootstrapping)	Std. error	*p*-value (z)	Benjamini-Hochberg α correction
Narcissism traits	→	Self-disclosure	0.526	0.529	0.035	0.000	0.005
FTP	→	Virtual presence	0.124	0.127	0.038	0.001	0.030
FTP	→	Hedonic grat.	0.231	0.227	0.045	0.000	0.025
PHTP	→	Virtual presence	0.507	0.506	0.038	0.000	0.010
PHTP	→	Hedonic grat.	0.174	0.173	0.055	0.001	0.035
Virtual presence	→	Hedonic grat.	0.393	0.396	0.052	0.000	0.015
Hedonic grat.	→	Self-disclosure	0.266	0.264	0.039	0.000	0.020

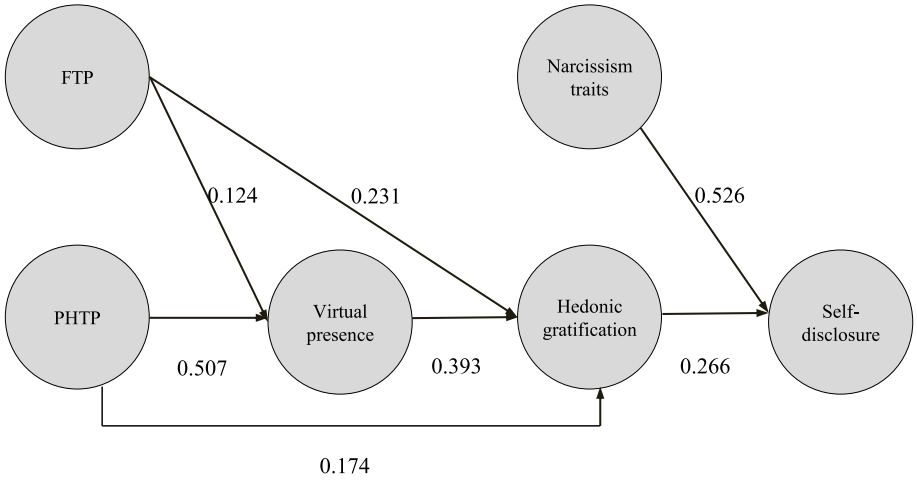

Fig. 2. PLS structural model with path coefficients (extracted item scale).

Table 10
Indirect effects between constructs (extracted item scale).

Relationships			Direct effects	Indirect effects	Total effects
Narcissism traits	→	FTP	0.000	0.000	0.000
Narcissism traits	→	PHTP	0.000	0.000	0.000
Narcissism traits	→	Virtual presence	0.000	0.000	0.000
Narcissism traits	→	Hedonic grat.	0.000	0.000	0.000
Narcissism traits	→	Self-disclosure	0.526	0.000	0.526
FTP	→	PHTP	0.000	0.000	0.000
FTP	→	Virtual presence	0.124	0.000	0.124
FTP	→	Hedonic grat.	0.231	0.049	0.280
FTP	→	Self-disclosure	0.000	0.075	0.075
PHTP	→	Virtual presence	0.507	0.000	0.507
PHTP	→	Hedonic grat.	0.174	0.199	0.373
PHTP	→	Self-disclosure	0.000	0.099	0.099
Virtual presence	→	Hedonic grat.	0.393	0.000	0.393
Virtual presence	→	Self-disclosure	0.000	0.105	0.105
Hedonic grat.	→	Self-disclosure	0.266	0.000	0.266

In sharp contrast, a recent study by Song et al. (2021) reports that Chinese consumers avoid information about the COVID-19 pandemic because of cognitive dissonance and information overload. Our study examines that both paths of cognitive process (*top-down* process associated with FTP, and *bottom-up* process associated with PHTP) positively compel SNS users' sharing behaviors when they cope with the collective concerns raised by the COVID-19 pandemic. Previous research findings suggest that people are more likely to have good physical and mental health if they are prone to self-disclosure under stressful circumstances (S. S. Wang et al., 2014). Our findings extend the boundary of the time perspective theory to SNSs and public emergency contexts, and provide solid evidence and theoretical contribution to help create potential solutions for the short-term or long-term negative impacts of the COVID-19 pandemic.

In agreement with the socioemotional selectivity theory, our findings suggest that environmental factors, here manifested in the form of an invisible threat of an uncertain death, influence SNS users' perception of their future; context stress biases users towards the limited future time perspective. Their behavioral motivations may be primarily emotion regulation instead of information acquisition. In addition, social distancing in the physical environment influences SNS users' mental representations of virtual social networks, and they improve the quality of virtual contacts via self-disclosure. Hence, they attain emotional comfort. These findings extend the socioemotional selectivity theory to the overlap of SNS users' behavior and public emergency; and it facilitates better understanding of the relationships between virtual society, users' internal factors and user behavioral patterns.

6.2. Managerial implications

This study suggests several applications. First, managers and practitioners could improve the virtual contact of consumers by way of immersive technologies, content and services. These immersive value propositions might include interesting gadgetry for self-show, timely interaction, multi-modal techniques, recommended information to inspire anticipative imagination, and so on. All this is conducive to SNS user self-disclosure and virtual social network quality. In addition, managers and practitioners could provide information clues prompting users to shift the limited future perspective to the extended open-ended

Table 11
Multi-group T-test (300 replacements) between gender groups (extracted item scale).

Relationships			Global	Group 1	Group 2	Diff. abs	*p*-value	Sig. 0.05
Narcissism traits	→	Self-disclosure	0.526	0.554	0.479	0.076	0.150	no
FTP	→	Virtual presence	0.124	0.134	0.108	0.026	0.414	no
FTP	→	Hedonic grat.	0.231	0.247	0.203	0.044	0.340	no
PHTP	→	Virtual presence	0.507	0.534	0.476	0.058	0.222	no
PHTP	→	Hedonic grat.	0.174	0.197	0.162	0.035	0.368	no
Virtual presence	→	Hedonic grat.	0.393	0.349	0.423	0.074	0.238	no
Hedonic grat.	→	Self-disclosure	0.266	0.282	0.238	0.045	0.273	no

Table 12
Multi-group T-test (300 replacements) between groups in awareness of the COVID-19 impact (extracted item scale).

Relationships			Global	Group 1	Group 2	Diff. abs	*p*-value	Sig. 0.05
Narcissism traits	→	Self-disclosure	0.526	0.545	0.496	0.048	0.267	no
FTP	→	Virtual presence	0.124	0.139	0.090	0.049	0.253	no
FTP	→	Hedonic grat.	0.231	0.223	0.248	0.025	0.412	no
PHTP	→	Virtual presence	0.507	0.505	0.534	0.029	0.363	no
PHTP	→	Hedonic grat.	0.174	0.180	0.170	0.010	0.465	no
Virtual presence	→	Hedonic grat.	0.393	0.373	0.425	0.052	0.321	no
Hedonic grat.	→	Self-disclosure	0.266	0.240	0.333	0.093	0.129	no

future perspective, making people more willing to accept useful information to deal with the COVID-19 crisis. In this way, it is conducive to regulating the emotional climate in the social network.

Second, retailers and managers could reach their customers and promote products and services in the virtual social network. They may tailor their value propositions according to users' motivations or organize specified WeChat groups and community activities to facilitate user sharing sentiments, experiences, current consumption behaviors and consumption plans. These measures may be alternative business solutions to the negative impact induced by social distancing.

Finally, to cope with emergency situations, it is important for individuals to focus on "here and now" and the "future" and to believe the influence of current cooperative behavior in the future. People could consider SNSs as an alternative context within which they can rebuild their social networks and obtain gratification when they should comply with social distancing guidelines.

6.3. Limitations and further research

This study has a few relevant limitations that offer directions for further research. Although we applied preventative remedies to avoid CMV, and some ex-post statistical test to examine the effectiveness of the ex-ante measures, we cannot completely disregard a potential effect of CMV on our results. If we had used the questionnaire responses along with other measurements (e.g. grading WeChat users' self-disclosure behavior by counting the number of self-disclosure statements in a given period), we would be in a better position to eliminate CMV concerns (Kock et al., 2021). Also, we theorized about the effects of a limited future orientation and emotion regulation, but we did not include specific constructs on in our analyses. In addition to this, we did not consider social media platforms different from WeChat. In future studies, SNS users' self-disclosure could be discussed from broader perspectives, e.g. aging, task contexts and technological environments. Furthermore, user self-disclosure during emergency contexts might be examined under the umbrella of the theories of reasoned action (Fishbein, M., & Ajzen, 1975) and planned behavior (Madden et al., 1992). Additionally, in this study, we extracted narcissism items from the Ames 16-item scale. This scale was considered as a "grandiose narcissism" scale by later researchers (Ksinan & Vazsonyi, 2016). It will be meaningful to investigate the relationships between different traits of narcissism and a diversity of self-disclosure forms.

6.4. Conclusions

Overall, this study offers solid evidence that, during the COVID-19 emergency, people's narcissism traits drive to self-disclosure behavior on a SNSs like WeChat. Also, we show that, during the epidemic, people's optimistic views of time and future (which involve either a focus on the future or a more present-hedonistic attitude) are conductive of virtual presence feelings and hedonic gratification (via SNSs as WeChat) and that this ultimately leads them to be more willing to self-disclose online.

Author contributions

Qian Fu: Conceptualization, Writing – Original draft preparation, Data curation **Inma Rodríguez-Ardura:** supervision, methodology, writing - review & editing **Antoni Meseguer-Artola:** supervision, methodology, writing - review & editing **Peng Wu:** supervision, investigation, resources, funding acquisition.

Code availability

The R code for the analyses in this article is available from the corresponding author upon reasonable request.

Declaration of competing interest

None.

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Appendix A. Constructs and items

Constructs	Original scales	Adapted multi-item measures
Virtual presence	Novak et al. (2000) Qiu and Benbasat (2005)	**(VP1) Using WeChat creates a new world for me, and this world suddenly disappears when I stop browsing.** **(VP2) When I use WeChat, I feel I am in a world created by WeChat pages and resources.** **(VP3) When I use WeChat, the world generated by the pages and resources I explore is more real for me than the "real world".** **(VP4) When I use WeChat, I feel like I am with my friends in the same place.** **(VP5) When I use WeChat, I feel like I am looking at or listening to my friends.**
Present-hedonistic time perspective	Zimbardo and Boyd (1999) Zimbardo and Boyd (2021)	(PHTP1) I believe that getting together with one's friends to party is one of life's important pleasures. (PHTP2) I do things impulsively. (PHTP3) When listening to my favorite music, I often lose all track of time. (PHTP4) I try to live my life as fully as possible, 1 day at a time. (PHTP5) Ideally, I would live each day as if it were my last. (PHTP6) I make decisions on the spur of the moment. **(PHTP7) It is important to put excitement in my life.** **(PHTP8) I feel that it's more important to enjoy what you're doing than to get work done on time.** **(PHTP9) Taking risks keeps my life from becoming boring.** (PHTP10) It is more important to enjoy life's journey than to focus only on the destination. **(PHTP11) I take risks to put excitement in my life.** **(PHTP12) I often follow my heart more than my head.** **(PHTP13) I find myself getting swept up in the excitement of the moment.** (PHTP14) I prefer friends who are spontaneous rather than predictable. (PHTP15) I like my close relationships to be passionate.
Future time perspective	Zimbardo and Boyd (1999) Zimbardo and Boyd (2021)	(FTP1) I believe that a person's day should be planned ahead each morning. (FTP2) If things don't get done on time, I would worry about it. (Reverse item in the original scale) (FTP3) When I want to achieve something, I set goals and consider specific means for reaching those goals. (FTP4) Meeting tomorrow's deadlines and doing other necessary work come before tonight's play. (FTP5) It upsets me to be late for appointments. **(FTP6) I meet my obligations to friends and authorities on time.** (FTP7) I try to plan it out each day rather than take each day as it is. (Reverse item in the original scale) **(FTP8) Before making a decision, I weigh the costs against the benefits.** **(FTP 9) I complete projects on time by making steady progress.** **(FTP10) I make lists of things to do.** **(FTP11) I am able to resist temptations when I know that there is work to be done.** **(FTP 12) I keep working at difficult, uninteresting tasks if they will help me get ahead.** (FTP13) I must hurry to finish the work, because time is limited. (Reverse item in the original scale)
Narcissism traits	Ames et al. (2006) Emmons (1984)	(NT1) I know that I am good because everybody keeps telling me so. (NT2) I like to be the center of attention. (NT3) I think I am a special person. (NT4) I like having authority over people. (NT5) I find it easy to manipulate people. (NT6) I insist upon getting the respect that is due me. (NT7) I am apt to show off if I get the chance. (NT8) I always know what I am doing. **(NT9) Everybody likes to hear my stories. (S/A)** (NT10) I expect a great deal from other people. (NT11) I really like to be the center of attention. **(NT12) People always seem to recognize my authority. (L/A)** (NT13) I am going to be a great person. (NT14) I can make anybody believe anything I want them to. **(NT15) I am more capable than other people. (E/E)** **(NT16) I am an extraordinary person. (S/S)**
Hedonic gratification	Song and Zinkhan (2008) Yu et al. (2018)	**(HE1) I love WeChat.** **(HE2) I feel good when I use WeChat.** **(HE3) Browsing WeChat was truly a joy to me.** **(HE4) While browsing WeChat, I was able to forget my unpleasant problems.**
Self-disclosure	Lyvers et al. (2020)	**(WSD1) What I like and what I dislike about myself.** **(WSD2) What makes me the person I am.** **(WSD3) My worst fears.** **(WSD4) My opinion on somebody (e.g. public figure).** **(WSD5) My health information.**

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chb.2021.107154.

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