Disentangling the effects of empathy components on Internet gaming disorder: A study of vulnerable youth in China

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Background and aims: Previous research shows that empathy can be one of the potential protective factors for Internet gaming disorder (IGD), yet the complex relationships between multidimensional factors of empathy and IGD remain understudied. Thus, a major question moving forward is to resolve the mixed empirical data by examining the specific contributions of empathy components. In this study, we disentangle the effects of cognitive component (i.e., perspective taking) and affective component (i.e., empathic concern and personal distress) on IGD symptoms and propose affect-oriented mediation pathways between them. *Methods:* We surveyed a large sample ($N = 3,348$) of Chinese vocational school students, one of the most vulnerable groups to online gaming addiction. *Results:* Our structural equation modeling results revealed that only personal distress, but not empathic concern or perspective taking, positively predicted IGD symptoms. However, empathic concern and personal distress were negatively and positively predicted gaming motive of escape from reality, respectively, which in turn predicted IGD symptoms. Furthermore, we found an indirect effect of perspective taking on IGD through empathic concern and then gaming motive of escape from reality. *Discussion and conclusion:* The findings underscore the importance of separating the affective and cognitive components to understand the complex relationships between the empathy and IGD, and support our theorizing of the affect-oriented mediation mechanism.

Keywords: empathy, escape from reality, gaming addiction, IGD, youth

INTRODUCTION

Gaming is becoming people's favorite online activity, especially in China. The number of online gamers in China has been mounting from 336 to 422 million in the past 5 years – a 25% increase (China Internet Network Information Center [CINIC], 2018). Among those gamers, over 55% are from high school, technical secondary school, technical school, and junior college (CINIC, 2016). Excessive and prolonged online gaming, however, may lead to various negative consequences, such as poor academic achievement (Rehbein, Kleimann, & Mößle, 2010), low well-being and high loneliness (Lemmens, Valkenburg, & Peter, 2011), and lack of real-life relationships (Allison, von Wahlde, Shockley, & Gabbard, 2006). The fifth edition of *Diagnostic and Statistical Manual for Mental Disorders* (DSM-5; American Psychiatric Association [APA], 2013) has labeled Internet gaming disorder (IGD) as a potential behavioral addiction for further investigation. Proposed symptoms of IGD include preoccupation, withdrawal symptoms, tolerance, loss of control, loss of interest in non-gaming activities, conflicts, deception, mood modification, and various negative consequences. Such repetitive impairing behavioral pattern is often conceptualized under the umbrella term "problematic Internet use (PIU)" or "Internet addiction," which encompasses all potentially problematic Internet

activities (e.g., gaming, social networking, and gambling; Fineberg et al., 2018). Recently, the World Health Organization (WHO) also recognized gaming disorder as a new mental health condition in the 11th edition of its *International Classification of Diseases* (WHO, 2018). It remains controversial if (Internet) gaming disorder should be considered as a mental disorder, but its inclusion as a mental disorder in the diagnostic classification systems is generally supported by both clinical evidence and public health needs (King et al., 2018; Rumpf et al., 2018). Extensive research from various fields has been conducted aiming to curb and alleviate the negative effects of Internet gaming (Kuss, 2013).

An emerging line of research examines the protective effect of empathy on Internet-related addictions. Yet, the empirical results are mixed (e.g., Collins & Freeman, 2013; Gentile et al., 2011; Liau et al., 2015), and limited research has studied the mechanism of the relationship between empathy and IGD. Thus, a major question moving forward is to resolve the mixed empirical findings. We propose a

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possible solution by examining the unique contributions of cognitive and affective empathy components on IGD simultaneously. Deriving from self-regulation literature, we also explicate a new affect-oriented pathway from empathy to IGD. To test our proposal, we conducted a large study ($N = 3,348$) in nine Chinese vocational schools, which contain the largest proportion of vulnerable online gamers, and structural equation modeling (SEM) was employed to test our hypotheses.

Empathy and its components

Basically, empathy can be defined as "*the reactions of one individual to the observed experiences of another*" (Davis, 1983, p. 113). It consists of both cognitive and affective components (Davis, 1994). The cognitive component of empathy involves the cognitive ability to understand the other's feelings such as perspective taking, whereas affective component concerns the emotional responses to the emotional state of others, such as empathic concern and personal distress (Baron-Cohen & Wheelwright, 2004).

Perspective taking – also cognitive role-taking or cognitive empathy – refers to the cognitive ability to understand the other's psychological point of view; it is based on a person's knowledge of the other's situation, character, values, and desires (Baron-Cohen & Wheelwright, 2004; Davis, 1994). Empathic concern refers to "*other-oriented emotion elicited by and congruent with the perceived welfare of a person in need*" (Batson, 2018, p. 59), while personal distress – also sympathetic pain or empathic distress – concerns self-oriented feelings of personal anxiety and unease in tense interpersonal settings (Batson, 2018), for example, seeing how upset your friend is (Batson, Early, & Salvarani, 1997). Although some research treats empathy, perspective taking, and personal distress as distinct concepts (e.g., Eisenberg & Okun, 1996; Eisenberg, Wentzel, & Harris, 1998), empathy has been regarded as a multidimensional construct in prior and this study (e.g., Christov-Moore et al., 2014; Davis, 1983) and shown to play an important role for effective social interactions (e.g., Busby & Gardner, 2008; De Wied, Branje, & Meeus, 2007).

Empathy and IGD

In general, a number of studies have found that individuals who suffered from PIU are less empathic (e.g., Jiao, Wang, Peng, & Cui, 2017; Lachmann et al., 2018; Melchers, Li, Chen, Zhang, & Montag, 2015; Wang, Ge, Zhang, Liu, & Luo, 2014). Its protective effect may be attributed to the resultant better social competence and relations, which are negatively associated with PIU (Caplan, 2002; Engelberg & Sjöberg, 2004; Whang, Lee, & Chang, 2003). Despite the consistent empirical evidence on the negative relationship between empathy and PIU, the findings on empathy and IGD are not very uniform, but mixed in the existing studies. To the best of our knowledge, there are six published studies of IGD or problem gaming in relation to empathy. Two studies found a negative association between empathy and gaming addiction symptoms (Che et al., 2017; Zhang et al., 2016). In addition, Tejeiro, Gómez-Vallecillo, Pelegrina, Wallace, and Emberley (2012) clustered a Spanish

adolescent sample and found that the problem players group (vs. the social players group) reported a significantly lower score on empathy. Similarly, Gentile et al. (2011) studied a sample of Singaporean youth and demonstrated that the starts group (becoming pathological gamers during the study) reported a significantly lower score of empathy in comparison with the never pathological group (remained as non-pathological gamers) in a two-year longitudinal study. In contrast, Liau et al. (2015) found that, after controlling for gender and initial level of pathological gaming, empathy was not one of the significant predictors to pathological gaming in a regression model. In a similar vein, a study comparing empathy levels among gaming players found no significant differences among problematic gaming players, non-problematic gaming players, and non-gaming players groups (Collins & Freeman, 2013).

The inconsistent findings may be due to the use of different operational definitions, measurement tools, and components to assess individuals' empathy level. For example, Gentile et al. (2011) and Liau et al. (2015) and used the same data set in which two measures of empathy were used, and the former found no relationship between pathological gambling and empathy (assessed by a subfactor in Personal Strengths Inventory-II of Liau, Tan, Li, & Khoo, 2012), whereas the latter showed a significant relationship between pathological gambling and empathy (measured by Children's Empathic Attitudes Questionnaire of Funk, Fox, Chan, & Curtiss, 2008). Moreover, although empathy is a multidimensional construct, and thus the cognitive and affective components should be measured separately in theory, a single construct of empathy was always used in prior studies (e.g., Che et al., 2017; Collins & Freeman, 2013; Zhang et al., 2016), resulting in limited research effort looking into correlations among the empathy components and IGD. It would be beneficial to examine the relative explanatory power of an empathy component on IGD after controlling for the other components in order to understand which and how empathy components may be involved in IGD development and remission. Hence, the primary goal of this study is to disentangle the empathy components to see which one/s contribute/s to the prediction of IGD.

Self-regulation and the affective pathway to IGD

In addition to the direct effects, a few previous studies attempt to demonstrate possible indirect effects of empathy on IGD via depression (Zhang et al., 2016) and perceived self-efficacy (Che et al., 2017), but they only used a single construct of empathy. On shedding light from self-regulation literature, the second purpose of this study is to propose a new affect-oriented pathway from empathy components to IGD.

Deficient self-regulation (i.e., a diminished conscious control over one's behavior) has been proposed to explain the development of Internet-related addictions (LaRose, Lin, & Eastin, 2003), given that both preoccupation and loss of control over the online activity are salient symptoms of the disorders. Self-regulation is closely related to emotional and social competence (McKown, Gumbiner, Russo, & Lipton, 2009), while empathy is an important aspect of emotional competence, specifically in social context, and hence is

considerably relevant for the quality of social functioning (Eisenberg et al., 1998). There is also evidence showing empathy is positively related to effortful control (Eisenberg & Okun, 1996; Rothbart, Ahadi, & Hershey, 1994). Therefore, we reasoned that empathic individuals may be optimally regulated in general.

Comparing with cognitive empathy components, we reasoned that affective components may be more related to IGD. Negative moods are consistently associated with IGD (Cheng, Cheung, & Wang, 2018), and mood modification is probably the most commonly reported IGD symptom (Wu, Chen, Tong, Yu, & Lau, 2018). Specifically, higher levels of personal distress may be associated with poor or deficient self-regulation (Eisenberg & Okun, 1996). Failure to attend to the thoughts and feelings of another may make individuals vulnerable to rumination of and getting overwhelmed by their own distress (Posner & Rothbart, 2000). It may in turn hamper their self-regulation processes (e.g., selecting, monitoring, and evaluating game use as a coping strategy for their negative mood alleviation) and hence contribute to the onset and persistence of IGD. Such notion is supported by evidence showing that online gaming players are more socially anxious than non-players (Lo, Wang, & Fang, 2005). Hence, we theorized that personal distress – the affective component of empathy – has a positive association with IGD symptoms (*Hypothesis 1*).

Personal distress is associated with egoistic motivation to alleviate one's own aversive state (Eisenberg, 2010). Among gamers, those with higher levels of personal distress may tend to be more motivated to escape from reality, as a way to make themselves feel better. Supporting this, emotion-focused coping, such as venting, distraction, and avoidance, was found to be related to lower empathy (Carlo et al., 2012). Distraction and escape are not only related to more time spent on online gaming (van Ingen & Matzat, 2018), but also explained the largest variance of IGD after general motivation (Wu, Lai, Yu, Lau, & Lei, 2017). The closest clue for understanding the mechanism behind why personal distress might predict IGD is from Király et al. (2015) who demonstrated that gaming motive of escape explained the positive effect of general psychiatric distress on problematic online gaming. Collectively, the above findings provide a basis for theorizing that the motive of escape from reality can act as a mediator for an affect-oriented pathway between personal distress and IGD. This mediation effect was tested in this study (*Hypothesis 2*).

Empathic concern, an affective component of empathy, has been demonstrated as a desirable indicator of social competence (e.g., Riggio & Taylor, 2000) and antecedent of prosocial behaviors (see Eisenberg & Miller, 1987). We therefore hypothesized its negative association with IGD symptoms (*Hypothesis 3*). Contrary to self-oriented feelings of personal distress, individuals with higher levels of other-oriented emotions, empathic concern, are believed to be less likely to experience the gaming motive of escape from reality. People predisposed to sympathy – similar to empathic concern in a sense of experiencing other-oriented concern – are believed to be well-regulated, prone to general emotional intensity, and predisposed to experience positive emotion (Eisenberg et al., 1998). Thus, people with high

empathic concern are likely to regulate their emotion and behavior with positive and constructive strategies (e.g., prosocial behaviors; Berry et al., 2018), rather than avoidance and escape (e.g., gaming) if socially tense stressors are present. Thus, we hypothesized that the motive of escape from reality would mediate the affect-oriented pathway from empathic concern to IGD symptoms (*Hypothesis 4*).

The ability of cognitive perspective taking is essential for experiencing other-oriented emotion of empathic concern. Eisenberg et al. (1998) have proposed that perspective taking may engender sympathy, in which he or she experiences other-oriented concern. Empirically, studies reported a strong correlation of over .50 between perspective taking and empathic concern (e.g., Melchers et al., 2015). We therefore argued that cognitive perspective taking is an antecedent of empathic concern (Batson, 2018), which in turn predicts gaming motive of escape from reality and then IGD. It was hypothesized that the negative association between perspective taking and IGD symptoms would be mediated by empathic concern and escape from reality (*Hypothesis 5*).

The present study

In short, by surveying a large sample, this is the first study examining how empathy may mitigate IGD in China youth. We aimed to (a) simultaneously test the complex relationships between the cognitive and affective components of empathy and IGD, and (b) suggest the affect-oriented mediation mechanisms via gaming motive of escape from reality. The findings not only fill out the existing research gap but also provide practical insights for empathy intervention on IGD prevention among Chinese vocational school students.

METHODS

Participants and procedure

Participants were recruited from vocational schools in Mainland China. School principals and teachers from 22 schools attended a conference for vocational school educators in late 2017. Among the vocational schools, nine from Anhui, Gansu, Guizhou, Hubei, Inner Mongolia, and Zhejiang were interested in participating in this study (response rate = 41%). A convenience sample of 7,998 potential student participants were invited by an online survey link to take part in the study. After signing an online informed consent, 4,849 participants completed our online self-administered survey using their computers or mobile devices on a voluntary basis (response rate = 61%). We embedded six bogus items (e.g., "For this question, please select '*strongly agree*'") in our survey to identify careless responses (Maniaci & Rogge, 2014; Meade & Craig, 2012). We only included those who answered four or more bogus items correctly and completed our survey in not less than 15 min; therefore, our final sample was 3,348 participants (1,589 females, 47.46%; $M_{age} = 18.20$, $SD_{age} = 2.05$, age range = 15–24 years).

Measures

Empathy. The empathy component from the Prosocial Personality Battery (Penner, 2002), with a 5-point Likert response scale (ranging from 1 = *strongly disagree* to 5 = *strongly agree*), was used to measure three subfactors of empathy, namely perspective taking, empathic concern, and personal distress. The measure was translated and back-translated by separate Chinese–English bilinguals. It consists of 12 items: perspective taking (5 items, Cronbach's α = .80, after removing two items with negative item-total correlations), empathic concern (4 items, Cronbach's α = .66, after removing two items with negative item-total correlations), and personal distress (3 items, Cronbach's α = .63, after removing one item with negative item-total correlations). Sample items include "I sometimes try to understand my friends better by imaging how things look from their perspective" (perspective taking), "When I see someone being taking advantage of, I feel kind of protective toward them" (empathic concern), and "When I see someone who badly needs help in an emergency, I go to pieces" (personal distress). A confirmatory factor analysis was employed to evaluate the revised three-structure model and rendered a good fit: $\chi^2(11) = 150.41$, $p < .001$, comparative fit index (CFI) = 0.97, standardized root mean squared residual (SRMR) = 0.02, root mean square error of approximation (RMSEA) = 0.08.

Escape from reality. The 4-item subscale from the Chinese version of Demetrovics et al.'s (2011) Motive for Online Gaming Questionnaire (Wu et al., 2017) was used to tap the gaming motive of escape from reality (α = .91). Participants indicated the frequency of playing online games because of the escape motive on a 5-point scale (ranging from 1 = *almost never/never* to 5 = *almost always/always*). Sample item includes "I play online games because gaming helps me to forget about daily hassles."

Internet gaming disorder (IGD). The nine diagnostic criteria for IGD listed in the DSM-5 (APA, 2013) were used to evaluate participants' IGD severity. Participants were asked whether each of nine symptoms could describe their own situation in the past 12 months (0 = *no*, 1 = *yes*). Its internal consistency (KR-20) was .89. As suggested by Ko et al. (2014), the cut-off point at 4/5 was also used to identify probable IGD cases.

Data analysis

Since observed indicators of the IGD variable are binary in nature, weighted least squares means and variance adjusted estimator for SEM were employed to test the hypothesized model. All analyses were conducted using the lavaan package in R (Rosseel, 2012). Evaluation of model fit was based on CFI, SRMR, and RMSEA. A model with CFI > 0.90, SRMR < 0.08, and RMSEA < 0.08 is considered as having acceptable fit to the data (Hair, Black, Babin, Anderson, & Tatham, 2010). To test the indirect effect of the three theorized paths, we conducted a bootstrap analysis in which bias-corrected confidence intervals were constructed by drawing 5,000 random samples with replacement from the full sample.

Ethics

After participants had read the study purpose and rights of participation and withdrawal and signed the online informed consent for this study, they completed an anonymous online survey using a questionnaire website named WenJuanXing (www.wjx.cn). Since there are no sensitive questions and potential harms to the participants, and it is not practically possible to have all parents informed – many of the participants lived in school dorm and might only go home every several weeks or months – we only obtained school principals' and teachers' approval, which is in line with the practice of the China Education Panel Survey (2014). The research procedures met the requirements of the Declaration of Helsinki. Ethical approval was obtained from the affiliated University of Hong Kong.

RESULTS

Preliminary analyses

According to DSM-5 criteria, 13.47% of the cases were classified as probable IGD. Descriptive statistics are presented in Table 1. The results of bivariate correlations were basically in line with the current hypotheses. For instances, IGD was negatively correlated with perspective taking and empathic concern, $r(3,348) = -.10$ and $-.08$, respectively,

Table 1. Summary of means, standard deviations, and intercorrelations for the measures ($N = 3,348$)

		M (SD)	1	2	3	4	5	6
1.	Age	18.20 (2.05)	.12***	.09***	.05**	−.02	−.12***	−.11***
2.	Gender[a]	–	–	.13***	.09***	.03	−.22***	−.20***
3.	Perspective taking	3.55 (0.65)		.80	.70***	.13***	−.16***	−.10***
4.	Empathic concern	3.50 (0.66)			.66	.21***	−.10***	−.08***
5.	Personal distress	2.98 (0.70)				.63	.12***	.10***
6.	Escape from reality	2.13 (0.91)					.91	.34***
7.	Internet gaming disorder	1.61 (2.49)						.89

Note. The reliability coefficients are found along the diagonal line. *SD*: standard deviation.
[a]Male = 1, Female = 2.
**$p < .01$. ***$p < .001$.

$p < .001$, and positively correlated with personal distress and motive of escape from reality, $r(3,348) = .10$ and $.34$, respectively, $p < .001$. Furthermore, motive of escape was correlated with empathic concern negatively and personal distress positively, $r(3,348) = -.10$ and $.12$, respectively, $p < .001$. Perspective taking and empathic concern were positively correlated, $r(3,348) = .70$, $p < .001$.

Hypothesized SEM testing

SEM results showed that our proposed model fitted the data well, $\chi^2(162) = 2,066.57$, $p < .001$, CFI $= 0.97$, SRMR $= 0.06$, RMSEA $= 0.06$. Standardized factor loadings ranged from 0.51 to 0.92, with $p < .001$ (Table 2). As shown in Figure 1, IGD was positively predicted by personal distress, $\beta = 0.10$, $p < .001$, 95% confidence interval (CI) [0.05, 0.15], but not by perspective taking, $\beta = -0.30$, $p = .546$, 95% CI [−27.29, 0.52], and empathic concern, $\beta = 0.21$, $p = .675$, 95% CI [−0.44, 33.47]. Furthermore, motive of escape positively predicted IGD, $\beta = 0.40$, $p < .001$, 95% CI [0.36, 0.43], while being negatively and positively predicted by empathic concern, $\beta = -0.21$, 95% CI [−0.26, −0.16], and personal distress, $\beta = 0.21$, 95% CIs [0.14, 0.26], ps $< .001$. Finally, perspective taking positively predicted empathic concern, $\beta = 1.02$, $p < .001$, 95% CI [0.97, 1.08].

Next, we tested the significance of the three indirect paths: (a) from personal distress, via motive of escape from reality, to IGD; (b) from empathic concern, via motive of escape from reality, to probable IGD; and (c) from perspective taking, via empathic concern, to motive of escape from reality, to IGD. The results of bootstrap analyses showed that the indirect effects of all three hypothesized paths were significant:

Table 2. Unstandardized and standardized factor loadings

Parameter estimates	Unstandardized loading (*SE*)	Standardized loading
PT → Item P1	1.00	0.90
PT → Item P2	7.39 (0.98)***	0.78
PT → Item P3	6.41 (0.84)***	0.66
EC → Item C1	1.00	0.62
EC → Item C2	1.25 (0.03)***	0.75
PD → Item D1	1.00	0.90
PD → Item D2	0.56 (0.04)***	0.51
EFR → Item E1	1.00	0.77
EFR → Item E2	1.21 (0.04)***	0.90
EFR → Item E3	1.21 (0.04)***	0.90
EFR → Item E4	1.14 (0.03)***	0.83
IGD → Item I1	1.00	0.83
IGD → Item I2	1.00 (0.02)***	0.83
IGD → Item I3	1.04 (0.02)***	0.87
IGD → Item I4	1.01 (0.02)***	0.84
IGD → Item I5	1.10 (0.02)***	0.92
IGD → Item I6	1.03 (0.02)***	0.85
IGD → Item I7	1.09 (0.02)***	0.90
IGD → Item I8	0.97 (0.02)***	0.80
IGD → Item I9	1.04 (0.02)***	0.87

Note. SE: standard error; PT: perspective taking; EC: empathic concern; PD: personal distress; EFR: escape from reality; IGD: Internet gaming disorder.
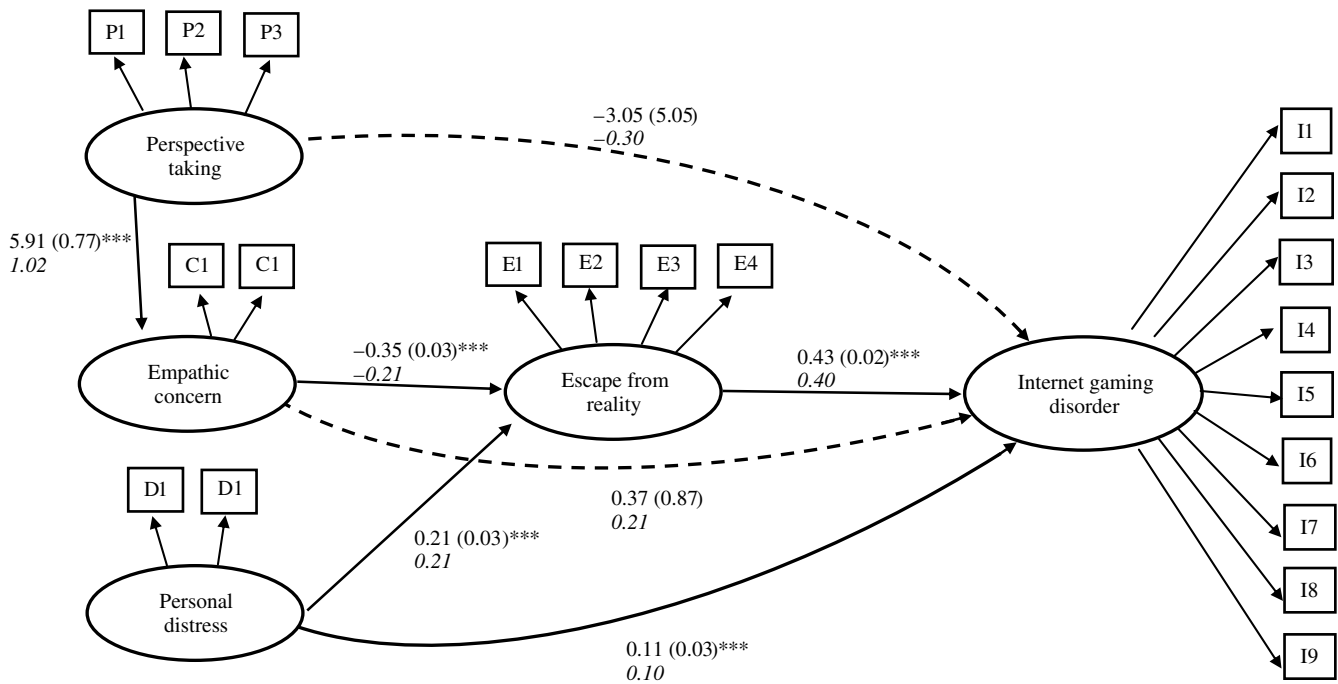***$p < .001$.

(a) $\beta = 0.08$, $p < .001$, bias-corrected bootstrap 95% CI [0.06, 0.11]; (b) $\beta = -0.09$, $p < .001$, bias-corrected bootstrap 95% CI [−0.11, −0.07]; and (c) $\beta = -0.09$, $p < .001$, bias-corrected bootstrap 95% CI [−0.11, −0.07]. Overall, the predictors explained 20% of total variance in IGD.

Robustness checks

We also tested whether our proposed model was reliable across a couple of robustness checks. We first adjusted for age and gender in our SEM analysis. The change of fit indices was minimum, CFI $= 0.95$, SRMR $= 0.07$, RMSEA $= 0.06$, and the significance and direction of all path coefficients did not change. Since the present data set was collected from nine schools, as an additional robustness check, we repeated our SEM analysis with school effect controlled using eight dummy variables of "schools" in each path as predictors. The significance and direction of each coefficient remained the same, and the model fit was nearly identical, CFI $= 0.96$, SRMR $= 0.06$, RMSEA $= 0.06$.

DISCUSSION AND CONCLUSIONS

Research examining the effects of empathy components on IGD simultaneously is scant. Empirically, this study first adds to a small group of studies that look into the effect of empathy on online gaming addiction. The analyses reported herein provide empirical evidence that perspective taking and empathic concern may have a protective effect, whereas personal distress and gaming motive of escape from reality may have a damaging effect against IGD. In particular, the SEM results showed that personal distress, but not empathic concern or perspective taking, had a direct effect on IGD symptoms. The results also confirmed that there were indirect effects of personal distress and empathic concern on IGD symptoms through gaming motive of escape from reality. The indirect effect of the cognitive component, perspective taking, was also shown.

The overall results provide strong support for our proposed affect-oriented mediation model. Theoretically, adolescents characterized by deficits in self-emotion regulation are probably more prone to regulate their negative emotion, including personal distress in our case, by indulging activities such as online gaming that may make them feel better immediately (Tice, Bratslavsky, & Baumeister, 2001). Similar to the mechanism for PIU (Mo, Chan, Chan, & Lau, 2018), online gaming may provide a mean for escaping from negative moods and problems in the reality; thus, it is reasonable that individuals who have high gaming motive of escape from reality are poorly self-regulated (see Cheng et al., 2018), supporting the mediating role of gaming motive of escape from reality. As for the empathic concern pathway, some indirect evidence shows that people who are more likely to experience empathy and sympathy – not personal distress – may sometimes well-regulated (Eisenberg, 2010). It is also well-documented that individuals' ability to regulate their behavior is a major determinant of social outcomes (McKown et al., 2009). Together, these echo our findings that the other-oriented emotion of empathic concern negatively

Figure 1. Structural equation model testing the effect of perspective taking, empathic concern, and personal distress on Internet gaming disorder via motive of escape from reality. *Note.* $N = 3,348$. CFI = 0.97, SRMR = 0.06, RMSEA = 0.06. Unstandardized (not italicized) and standardized (italicized) coefficients with standard errors in parentheses are presented. Dashed lines represent a non-significant relationship ($p > .05$). ***$p < .001$

predicts gaming motive of escape from reality, which in turn predicts IGD, as mentioned above.

It is prudent to outline several caveats, which may drive future research directions. First, due to negative total-item correlations, emphatic concern and personal distress were measured by only two items, respectively. Future studies may use other measures of empathy to test the replicability of the findings. Second, we tested the affect-oriented pathways and proposed self-regulation as an underlying explanation, but no self-regulation variable is involved in our analyses. Although empathy has been shown to be positively associated with effortful control (e.g., Rothbart et al., 1994), and Seay and Kraut (2007) reported some preliminary results that self-regulation and problematic online gaming are negatively correlated, it is advisable to include the underlying explanatory variable of self-regulation in future research. Furthermore, although this study is correlational in nature, and thus no causality can be derived from the data, our findings are consistent with a number of studies proposing that empathy and/or motive of escape from reality lead/s to pathological video gaming or IGD (e.g., Gentile et al., 2011; Wu et al., 2017). Our work helps build toward the goal that empathy can be protective to IGD. Based on the present research, it will be intriguing to carry out intervention or experimental studies, manipulating different components of empathy (e.g., Konrath, 2017; Malti, Chaparro, Zuffianò, & Colasante, 2016) and testing its influence on online gaming and IGD. Finally, this study entirely targeted on the higher vulnerable group of adolescents to IGD; it is equally important to examine our proposed model in different age groups (e.g., Wu et al., 2018). Psychological constructs are always influenced by culture, in which IGD is not an exception (Cheng et al., 2018);

future research studying cultural variations will enrich the model and provide insights into the specific social and cultural conditions under, which it may work.

To conclude, empathy is a negative correlate of IGD, and potential motivational mediators, including escape from reality, should be noted. Our findings provide empirical support to the salient role of affects (i.e., personal distress and empathic concern) in the two pathways of IGD. Given that IGD has imposed a serious public health threat (e.g., 13.47% in our sample), our investigation is timely and shows that empathy is a new, yet potentially important variable, which may help mitigate the condition of online gaming addiction and thus its adverse effects to the society. We hope that this study – in addition to future work examining the causal effect of empathy on gaming addiction – helps provide conceptual and empirical basis for developing personalized, adaptive interventions for IGD.

Authors' contribution: Dr. BPHH was responsible for the study concept and design, participated in the data collection, conducted the data analysis, interpreted the findings, and was involved in the manuscript writing and revision. Prof. AMSW was responsible for the study concept and data interpretation and was involved in the manuscript writing and revision. Prof. NP was the principal investigator of the project. She was responsible for obtaining the funding and participated in the study design, data collection, and

manuscript revision. All authors had full access to all data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. All authors contributed to and approved the final version of the manuscript.

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