The prospective effect of purpose in life on gambling disorder and psychological flourishing among university students

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FULL-LENGTH REPORT

ABSTRACT

Background and aims: Gambling disorder (GD) is a mental disorder with a relatively higher prevalence in university students compared to adolescents and adults. Its reciprocity with mental being indicators, such as psychological flourishing, would be expected, but prior to this study had not yet been empirically examined. In addition, the predictive value of purpose in life (PIL) on university students' GD and psychological flourishing also remained unknown. This 1-year longitudinal study was the first to test the potential bidirectional relationships among PIL, self-reported GD symptoms, and psychological flourishing. *Methods:* In this study, a total of 283 university students (39.6% females; age = 18–27 years, $M = 20.47$, $SD = 1.15$) completed an anonymous questionnaire at both baseline and a year later in a follow-up study. *Results:* The results of our cross-lagged analysis did not show the hypothesized reciprocity between GD symptoms and psychological flourishing ($P > 0.05$). However, PIL significantly predicted fewer GD symptoms ($\beta = -0.23$, $P < 0.001$) and higher levels of psychological flourishing ($\beta = 0.30$, $P < 0.001$) in the follow-up study. Moreover, psychological flourishing predicted PIL a year later. *Conclusion:* The findings demonstrate the potential efficacy of purpose/meaning oriented interventions in gambling prevention and in well-being promotion programs.

INTRODUCTION

According to the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (*DSM-5*; American Psychiatric Association [APA], 2013), gambling disorder (GD) is a persistent gambling pattern that impedes individuals' psychological and social functioning. Its nine criteria for GD include increasing wagers, uncontrollability, preoccupation with betting, withdrawal symptoms, gambling to escape from negative emotions, gambling to regain losses, lying about gambling, loss of significant relationship/opportunities, and the borrowing of money. Similar to DSM-5, World Health Organization (WHO, 2019) has reclassified GD as an addictive disorder, rather than an impulse control disorder, in the International Classification of Diseases 11th Revision (ICD-11). According to ICD-11, GD is mainly characterized by loss of control over gambling, priority given to gambling, and continuation of gambling despite negative consequences. A meta-analysis of the literature has reported that 7.89% of university students engage in pathological gambling, which is a significantly higher prevalence compared to both adolescents and adults (Blinn-Pike, Worthy, & Jonkman, 2007). A more recent meta-analysis conducted by Nowak (2018) showed that the high prevalence of probable pathological gambling and problem gambling among university students continues to be high (i.e., 6.13 and 10.23% respectively). Because

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GD is significantly, positively associated with various mental disorders, such as anxiety, depression, substance dependence, and Internet gaming disorder (IGD; Chen, Tong, Wu, Lau, & Zhang, 2018; Hartmann & Blaszczynski, 2018; Lorains, Cowlishaw, & Thomas, 2011; Scholes-Balog, Hemphill, Toumbourou, & Dowling, 2015), more attention should be paid to the psychological antecedents and consequences of gambling behaviors among university students.

Cross-sectional research is commonly used to identify psychosocial factors of GD, including impulsivity (Caldeira et al., 2017; Hartmann & Blaszczynski, 2018; Yang, Zhong, Wu, Li, & Li, 2016), psychopathy (Onyedire et al., 2019), low self-esteem (Kaare, Mottus, & Konstabel, 2009), emotional distress (King, Abrams, & Wilkinson, 2010; Tang, Chua, & Wu, 2011), neuroticism (Tackett, Rodriguez, Rinker, & Neighbors, 2015), and parental gambling problems (King et al., 2010; Winters, Stinchfield, Botzet, & Anderson, 2002). Bishai (2004) found that emerging adults who have reached the legal age for gambling, including university students, have lower level of time preferences (i.e., a greater preference for present utility over future utility) than their older counterparts, which puts them at higher risk for addiction. Among Chinese university students, multiple psychological correlates for GD have been also studied by cross-sectional studies. Risk factors for GD included materialism (Wong, 2010a; Wu, Lai, & Tong, 2015), unfavorable subjective norms (Wu, Lai, Tong, & Yu, 2016), perceived stress (Tang & Oei, 2011; Tang & Wu, 2012b), life dissatisfaction (Wu et al., 2015), and expectancy bias (Tang & Wu, 2010, 2012a), whereas protective factors were higher self-efficacy for refusing to engage in gambling behavior (Wu & Tang, 2012), as well as positive psychology factors, such as gratitude, hope, and mindfulness (Loo, Tsai, Raylu, & Oei, 2014). Although longitudinal designs provide greater levels of confidence in inferring the causal effects of psychological correlates on GD, there has been very limited longitudinal research conducted on GD among university students, and none conducted in Chinese populations.

To our best knowledge, five longitudinal studies on GD have been conducted to date among adolescents and/or young adults, and only two of them targeted to university students. In one of the two conducted among university students, a 4-year longitudinal study found that among the four latent gambling classes (i.e., low gambling class, card gambling class, casino/slots gambling class and extensive gambling class), with only low gambling and extensive gambling clusters were stable over time (Goudriaan, Slutske, Krull, & Sher, 2009). Another study showed that *positive urgency*, defined as acting rashly when feeling good, predicted future gambling behaviors among university students (Cyders & Smith, 2007, 2008). Furthermore, early adolescents' depression levels and impulsivity were found to be significant predictors of problem gambling among adolescents (Lee, Storr, Ialongo, & Martins, 2011) whereas social factors (e.g., stable neighborhood and family harmony) did not predict problem gambling in young adults (Scholes-Balog et al., 2015). Another longitudinal study found that problem gambling predicted new onset of mental disorders,

such as depression and illegal drug use, among young adults (Afifi, Nicholson, Martins, & Sareen, 2016). These findings suggest that GD is a prospective risk factor for other mental disorders, but further research using a cross-lagged model, which is a reliable approach to examine the bidirectional relationship between two variables, is needed to examine the reciprocity between GD and positive mental health, particularly among university students. Moreover, cross-lagged model tests not only the changes of the variables over time but also the autoregressive relationships among the variables (Burkholder & Harlow, 2003). To address the existing research gap, this study aimed to use cross-lagged model to test the reciprocal relationship between GD and psychological flourishing, which is defined as a prosperous psychosocial state manifested by maximum level of wellbeing and mental health combined with both feeling good and functioning well (Huppert & So, 2013; Keyes, 2002).

According to the World Health Organization (WHO), the absence of illness and the presence of a sense of positive self are essential components of health wellbeing (Slade, 2010; WHO, 2004). In this study, GD symptoms was viewed as an indicator of mental "ill-being", whereas psychological flourishing was regarded as an indicator of mental wellbeing (Karademas, 2007). Psychological flourishing involves a favorable overall attitude toward one's self, one's life, as well as one's future, and a sense of having the capability to contribute to one's own and others wellbeing (Diener et al., 2010; Huppert & So, 2013). As expected, previous research has demonstrated that psychological flourishing is associated with positive wellbeing and prosocial behaviors such as volunteerism (Nelson, Layous, Cole, & Lyubomirsky, 2016; Santini et al., 2019). In university students, a higher level of flourishing is associated with less psychological distress, better self-control, a greater number of emotion regulation strategies, and better academic performance (Basson & Rothmann, 2018; Howell, 2009; Peter, Roberts, & Dengate, 2011). Nevertheless, the reciprocal relationship between psychological flourishing and addictive behaviors remains unclear. In a study conducted among university students, Schotanus-Dijkstra, ten Have, Lamers, de Graaf, and Bohlmeijer (2016) found that psychological flourishing significantly predicted incidences of mood disorder and anxiety disorder, but not of substance use disorder among adults. To our knowledge, the current study was the first to test the relationship between psychological flourishing and GD.

In addition to investigating any reciprocal relationship between psychological flourishing and GD, this study also aimed to test the predictive value of purpose in life (PIL) on both psychological flourishing and GD. For an individual, having purpose or meaning in life refers to having a sense of direction in life (Reker, Peacock, & Wong, 1987). Such purpose is regarded as serving as a guide for one's behavior (McKnight & Kashdan, 2009), which benefits an individual's wellbeing by reducing the existential vacuum caused by loss of purpose and meaninglessness (DeWitz, Woolsey, & Walsh, 2009). PIL is particularly important when an individual enters emerging adulthood, because university students, whose plans and goals will greatly affect their overall
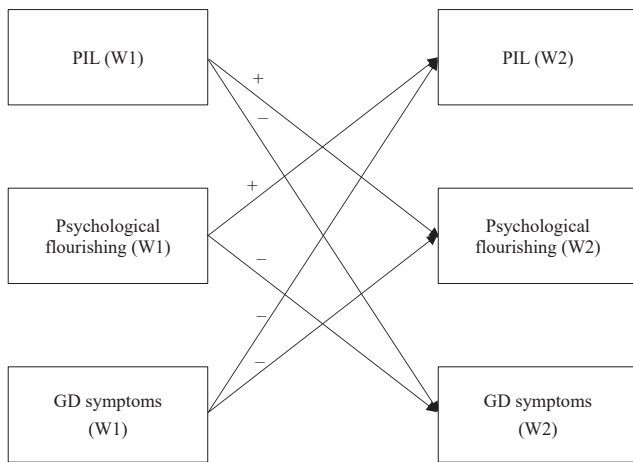
Fig. 1. The conceptual model of the study
Note: GD symptoms: gambling disorder symptoms; PIL: purpose in life; W1 = assessed at the baseline, W2 = assessed at the follow-up;

psychological wellbeing, are at the stage of preparing for their future careers (Bronk, 2013; Hill, Edmonds, Peterson, Luyckx, & Andrews, 2016). In several cross-sectional studies, PIL was found to be a protective factor against "ill-being", such as depression, and Internet-related addictions (Brassai, Piko, & Steger, 2011; Kim, Shin, Scicolone, & Parmelee, 2019; Zhang, Mou, Tong, & Wu, 2018). PIL has also been shown to be associated with a lower rate of mortality and suicide ideation among older individuals (Alimujiang et al., 2019; Heisel & Flett, 2004). Although Chen et al. (2018) found no significant differences in PIL between Chinese nongamblers and recent gamblers, Wu, Lei and Ku (2013) found PIL to be negatively correlated to problem video game playing and to mediate the association between psychological needs and video game playing among Chinese young adults. Given the lack of longitudinal research on the influence of PIL on GD or vice versa, further research was warranted to examine whether PIL prospectively protects university students from GD and whether GD may hinder them from developing a sense of PIL.

Longitudinal research findings generally have supported the protective effects of PIL on subjective/psychological wellbeing among university students (Aghababaei et al., 2016; García-Alandete, 2015). It was reasonable to expect that PIL would help university students psychologically flourish by offering them a sense of direction and meaning in life. Concurrently, psychological flourishing is an optimal mental state that would be thought to facilitate a capacity in emerging adults to search for and come to understand their own life's purpose. However, prior to this study, neither cross-sectional nor longitudinal research had explored the relationship between PIL and psychological flourishing.

In this 1-year longitudinal study, we aimed to fill the existing research gap and empirically test the potential reciprocal relationships among PIL, psychological flourishing, and self-reported GD symptoms in Chinese university students. The findings should contribute to not only a better understanding of the protective value of PIL on mental

health but also the practical implications of adopting purpose-oriented interventions to alleviate GD symptoms among university students by showing the temporal relationships between PIL, psychological flourishing and GD symptoms. Using a cross-lagged panel model, we tested the following three hypotheses (see Fig. 1):

H1. Higher level of psychological flourishing would predict fewer GD symptoms, and vice versa;

H2. Higher sense of PIL would predict fewer GD symptoms, and vice versa; and

H3. Higher sense of PIL would predict higher level of psychological flourishing and vice versa.

METHODS

Participants and procedures

This longitudinal study consisted of a baseline study (Wave 1 [W1]) in April 2016 and a follow-up study (Wave 2 [W2]) in April 2017. Using convenience sampling, we recruited 469 Chinese university student participants from a public university in Macao, China for the baseline study. These participants were invited to take part in the follow-up study at W2 after they voluntarily completed an anonymous, self-administered questionnaire in a quiet classroom with a trained research assistant present at W1. Among the 434 participants who accepted the invitation and provided their email address and/or phone number for further contact, 283 (39.6% males; age = 18–27 years with $M = 20.47$, $SD = 1.15$) were successfully reached 1 year later and then self-administered the same questionnaire in a classroom reserved for the survey with a trained assistant present at W2. The data of these 283 participants collected at W1 and W2 were used in the statistical analyses for hypothesis testing in the present study.

Measures

GD symptoms. The nine diagnostic criteria for GD in the DSM-5 (APA, 2013) were used to assess the number of self-reported GD symptoms. The participants reported whether or not (0 = *no*, 1 = *yes*) they had experienced each symptom (e.g., lying about gambling) over the past year, and a summation score was computed (0–9). Previous studies have reported the satisfactory validities and reliabilities of this 9-item symptom checklist in the Chinese context (Chui, Lee, Mok, & Tsang, 2018; Wu, Lai, & Tong, 2014), and it has also been commonly used in various gambling studies on estimating one's GD symptoms in Chinese populations (e.g., Chen et al., 2018; Nong, Fong, Fong, & Lam, 2020; Tong, Hung, Lei, & Wu, 2018). The Chinese items of these nine DSM-5 criteria used in this study was the same as those in Chen et al. (2018)'s study among Chinese Macao residents. Internal consistency (KR-20) of these items of the current sample was 0.88 (W1) and 0.78 (W2).

Psychological flourishing. The Chinese validated version of the brief flourishing scale developed by Diener et al., (2010) was used to measure psychological flourishing (Tong & Wang, 2017). Participants responded eight items (e.g., "I actively contribute to the happiness and well-being of others") on a 7-point Likert scale, in which 1 = *strongly disagree* and 7 = *strongly agree*. Mean scores were used and a higher mean score represented a higher level of flourishing. The reliability of the scale was 0.91 and 0.89 at W1 and W2, respectively, in this study.

PIL. A 6-item version of the PIL Test (McKenna & West, 2007), adopted from Crumbaugh's (1968) earlier version, was used to assess each participant's sense of PIL. The Chinese items of this scale have been used in previous studies among Chinese samples (Chen et al., 2018; Wu et al., 2013). A sample item was, "I regard my ability to find a purpose or mission in life as___", with response ranging on a Likert scale from 1 = *practically none* to 5 = *very great*. Participants with higher scores had a stronger sense of direction and meaning in life. The reliability of this scale was 0.81 (W1) and 0.78 (W2) for the current sample.

Demographic information. Information about gender (*female* = 0 and *male* = 1) and age (years) of participants was recorded.

Data analyses

SPSS 24 was used to conduct attrition analyses (i.e., chi-square and *t*-test) and preliminary analyses (biserial and Pearson correlations). There were no missing data in both preliminary analyses and model testing. According Blatná (2006), potential outliers were identified by the value of standardized residuals (exceeding 2 [or −2]) as well as the value of Cook's distance (cut-off point = 4/n). They were then examined manually and there was no evidence showing that they were a result of systematic errors. Therefore, none of these cases was removed from the data set. To test our hypotheses regarding the reciprocity of the major variables (i.e., GD symptoms, psychological flourishing, and PIL), a cross-lagged panel model (Kessler & Greenberg, 1981; Newsom, 2015) was proposed as a path model (Fig. 1) and tested by the Lavaan package in R. Maximum likelihood estimation with robust standard errors and a Satorra–Bentler scaled test statistic was used for the data without the assumption of multivariate normality (Rosseel, 2012).

Indexes of model fitness were examined and reported, including: χ^2 test, Tucker-Lewis index (TLI), the root mean square error of approximation (RMSEA), and comparative fit index (CFI; McDonald & Ho, 2002). If the proposed model fit was evaluated as non-satisfactory, model modification including removal of the nonsignificant paths for model parsimony (Bowen & Guo, 2011) and addition of paths based on modification index (MI) (Whittaker, 2012) would be considered for better model-fitting, and the modified model would be re-tested. The variables were standardized, and standardized coefficients were reported.

Ethics

Participants at both W1 and W2 provided their written consent. Each participant had a personal code (Date of birth-Birth order-Family name of mother), so their data of the two waves could be matched. A supermarket coupon (100 MOP, about 12.5 USD) was given to each participant in W1 and W2 surveys, respectively. Ethics approval was obtained from the Ethics Committee of the corresponding author's university.

RESULTS

Attrition analyses

Results of attrition analyses indicated that no significant differences existed between participants who took part in the study at W2 (60.34%) and those who dropped out on all baseline variables: gender, $\chi^2(1) = 0.10$, $P = 0.75$; age, $t(369.28) = 0.85$, $P = 0.39$; GD symptoms, $t(363.56) = -0.24$, $P = 0.81$; psychological flourishing, $t(377.60) = 0.72$, $P = 0.47$; and PIL, $t(466) = 0.88$, $P = 0.38$.

Preliminary analyses (N = 283)

At both W1 and W2, gender had a positive association with GD symptoms ($r = 0.22$ and 0.34 respectively, $P < 0.001$) and a negative correlation with psychological flourishing ($r = -0.17$ and -0.18 respectively $P < 0.01$). Gender also had a negative association with PIL ($r = -0.17$ at both waves, $P < 0.01$). Age showed only significant mild correlations with GD symptoms at W2 only ($r = 0.13$, $P < 0.05$) but not other psychological variables.

The mean, standard deviations, and the range of the psychological variables and their inter-correlation coefficients are shown in Table 1. GD symptoms, psychological

Table 1. Descriptive statistics and correlations among variables

	M	SD	1	2	3	4	5
1. GD symptoms (W2)	1.45	1.97	–				
2. GD symptoms (W1)	0.38	1.24	0.17***	–			
3. Psychological flourishing (W2)	5.25	0.81	−0.29***	−0.13***	–		
4. Psychological flourishing (W1)	5.25	0.87	−0.23***	−0.10***	0.58***	–	
5. PIL(W2)	3.22	0.61	−0.29***	−0.12***	0.71***	0.54***	–
6. PIL (W1)	3.28	0.68	−0.28***	−0.01	0.53***	0.57***	0.63***

Note: *$P < 0.05$, **$P < 0.01$, ***$P < 0.001$, GD symptoms = gambling disorder symptoms, PIL = purpose in life, W1 = assessed at the baseline, W2 = assessed at the follow-up.
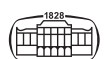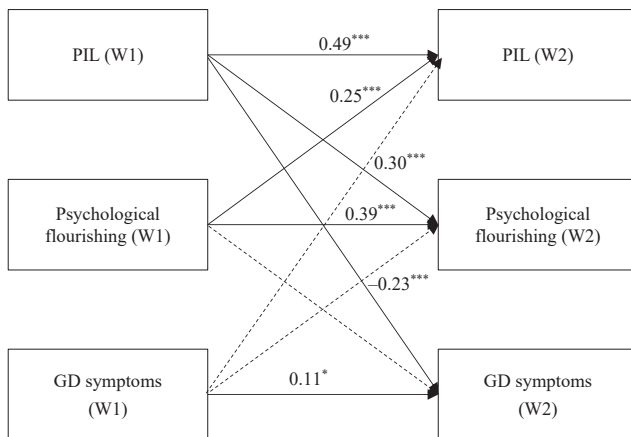
Fig. 2. The resultant model based on the cross-lagged analysis
*: $P < .05$; ***: $P < .001$.

Note: GD symptoms: gambling disorder symptoms; PIL: purpose in life; W1 = assessed at the baseline, W2 = assessed at the follow-up; The three covariances of baseline variables and the three error covariances of the follow-up variables were statistically significant ($P < .05$) except the covariances between (i) PIL and GD, and (ii) psychological flourishing and GD at the baseline.

flourishing, and PIL were significantly correlated in the expected direction ($P < 0.001$). In particular, GD symptoms at W1 was negatively correlated with psychological flourishing at W2 ($r = -0.13$, $P < 0.001$), whereas psychological flourishing at W1 was negatively correlated with GD symptoms at W2 ($r = -0.23$, $P < 0.001$). At both waves, PIL were negatively correlated with GD symptoms (W2), and positively correlated with psychological flourishing (W2; $P < 0.001$).

Cross-lagged path analysis ($N = 283$)

Path analysis for the proposed cross-lagged panel model was conducted first. Given the preliminary analysis results, gender was allowed to predict all psychological variables while age was allowed to predict GD symptoms (W2) in this model. This model showed a marginally satisfactory fit with the data, $\chi^2(6) = 17.03$, $P = 0.009$, CFI = 0.98, TLI = 0.89, RMSEA = 0.08, 90% CI [0.04, 0.13], SRMR = 0.05. After examining MI and each path coefficient's significance/value, we modified the model by removing the nonsignificant path from gender to PIL (W2), which has with the smallest path coefficient among the three non-significant paths related to the demographic variables. Although this path removal did not lead to a significant smaller than the original proposed model ($\Delta\chi^2(1) = 0. 39$, $P = 0.84$), this model's TLI and RMSEA reached the satisfactory levels, with $\chi^2(7) = 16.96$, $P = 0.02$, CFI = 0.98, TLI = 0.91, RMSEA = 0.07, 90% CI [0.03, 0.09], SRMR = 0.05. No model modification was further conducted.

The path coefficients of the resultant model are shown in Fig. 2. All the variables (i.e., PIL, psychological flourishing, and self-reported GD symptoms) at W1 significantly predicted the corresponding variables at W2. PIL at W1 also significantly predicted both psychological flourishing ($\beta = 0.30$, $P < 0.001$) and GD symptoms at W2 ($\beta = -0.23$, $P < 0.001$). Moreover,

psychological flourishing at W1 significantly predicted PIL at W2 ($\beta = 0.25$, $P < 0.001$). However, GD symptoms at W1 was not a significant predictor of psychological flourishing and PIL at W2 while psychological flourishing (W1) did not significantly predict GD symptoms at W2.

DISCUSSION

This longitudinal study was the first to test the reciprocal relationships among PIL, psychological flourishing, and GD. The path analysis results did not support our Hypothesis 1 regarding the bi-directional association between psychological flourishing and GD symptoms. Despite the significant correlations between psychological flourishing and psychological distress, such as depression, reported in previous cross-sectional studies (e.g., Peter et al., 2011), this finding appears to be consistent with some models of ill-being and wellbeing (Headey, Holmstrom, & Wearing, 1985; Slade, 2010), which stipulate that absence of a mental disorder and the presence of mental wellbeing are distinct factors (Slade, 2010), but they may have common predictors (e.g., PIL in our case). Given the lack of longitudinal research between mental wellbeing and behavioral addictions (i.e., GD in our case), our study has provided evidence that they are relatively independent constructs when they are being developed during emerging adulthood. Furthermore, our findings are also consistent with previous studies that demonstrated the protective effects of PIL. For example, PIL was found to be a significant predictor of life satisfaction (subjective wellbeing) among university students (Steger & Kashdan, 2007), while lower level of PIL predicted future alcohol dependence and drug use (Carroll, 1993; Katsogianni & Kleftaras, 2015; Kleftaras & Katsogianni, 2012). Our study added longitudinal evidence to the literature that PIL is a salient predictor of both mental disorders and mental wellbeing.

The second hypothesis was only partially supported. Although GD symptoms did not significantly predict PIL a year later at W2, PIL was able to predict fewer GD symptoms over time in our student sample. The latter finding is consistent with observation by a cross-sectional study on problem video game playing (Wu et al., 2013) and further supported to previous literature findings that PIL is able to protect an individual from development of GD. The latter finding also suggests that purpose/meaning-oriented interventions are potentially effective in GD prevention, especially among emerging adults. Examples of such interventions included the purpose-centered career intervention program and life review intervention program, which effectively facilitate search for meaning in life and sense of PIL among adolescents (Dik, Steger, Gibson, & Peisner, 2011) and adults (Westerhof, Bohlmeijer, van Beljouw, & Pot, 2010). Emerging adults, who must contend with various developmental changes and stressful life events, such as being away from home, having more freedom than before, and struggling with identity formation and identity crises (Arnett, 2007), are extremely vulnerable to developing psychopathological symptoms, such as GD, compared to

individuals to other age groups (Sagoe et al., 2017). Previous research found that PIL can promote emerging adults to adopt adaptive coping strategies when facing stressful life events (Webster, Weststrate, Ferrari, Munroe, & Pierce, 2018; Woo & Brown, 2013). Notably, finding a life purpose, thinking about life's meaning, and identifying one's true goals in life are important developmental tasks during the stage of emerging adulthood (Mayseless & Keren, 2014; Steger, Oishi, & Kashdan, 2009). Our longitudinal findings suggest that searching for or having a sense of PIL can mitigate emerging adults' vulnerability to GD, and future research is needed to empirically examine the cost-effectiveness of purpose/meaning-oriented intervention programs for GD among university students.

In this study, a greater sense of PIL predicted a higher level of psychological flourishing and vice versa, which supported to our Hypothesis 3. PIL has been proven to be positively associated with not only hedonic wellbeing (e.g., positive affect and life satisfaction) but also eudaimonic wellbeing (e.g., self-esteem and vitality) in cross-sectional studies among emerging adults (Ardelt & Ferrari, 2019; Bundick, 2011; Cotton, Hill, Lapsley, Talib, & Finch, 2009; Lee & Oh, 2007; McKnight & Kashdan, 2009). The finding of this study suggests that the association between PIL and positive wellbeing indicators, such as flourishing, is positive and bi-directional. Our findings provide evidence to the potential utility of purpose/meaning-centered interventions (e.g., Dik et al., 2011) for school-based mental health programs in the university context. Moreover, this intervention (e.g., meaning therapy; Wong, 2010b), which is an evidence-based counseling practices that motivate participants to find meaning in life even in the context of their personal problems.

Although DSM-5 provides a standard, empirically based nomenclature for diagnosis of GD and such definitions and criteria are widely accepted by researchers and clinicians in many regions/countries with legalized gambling (including Macao), the diagnostic approach taken by the DSM-5 and its earlier editions is highly debatable (e.g., Follette & Houts, 1996; Nathan & Langenbucher, 1999; Widiger & Clark, 2000). The potential weakness of such approach includes the lack of theoretical underpinning for the classification system, high comorbidity among disorders, and pathologizing normal but unwanted behaviors. Regarding behavioral addiction, the potential overpathologization of common behaviors concerns not only the professionals in the field but also the general public. To avoid overpathologizing these behaviors like gaming and gambling, other assessment components, including significant impairment and/or distress, persistence of the behavioral pattern over time, and existence of primary disorder(s) for exclusion, must be considered in addition to the specific symptoms of a disorder (Kardefelt-Winther et al., 2017). These additional components may be considered in the future research for GDs. In this study, we observed that the probable GD proportion increased from W1 to W2 (5 vs. 14%) based on the cutoff ($\geq$4) suggested by DSM-5 (APA, 2013). To understand the change was an interesting avenue for further investigation

though it may be premature to speculate the factors contributed to such increment given that it was not a focus of the current study.

Other three major limitations of the present study should be noted. Firstly, although there was no significant difference between participants who dropped out and those who took part in the W2 survey with respect to all baseline variables, the attrition of this study was quite high. Secondly, the convenience sampling aspect of the study limits the generalizability of the findings, which may not be extended to the nonstudent population. Thirdly, given our resultant model was resulted from model modification, which is rather exploratory based on its fit with the current data set, further study is warranted for testing its replicability. In spite of its constraints, this study was the first to longitudinally examine the reciprocal relationships among PIL, psychological flourishing (an indicator of wellbeing) and GD symptoms (an indicator of ill-being). The findings provided empirical evidence to support not only the protective effects of PIL against the development of GD but also its facilitating effect on psychological flourishing among university students. Promoting a sense of PIL should therefore be an effective strategy in school-based mental health interventions among university students.

Authors' contribution: MXZ was involved in research conception, questionnaire design, data analysis, and manuscript writing. HMY was involved in literature review, finding interpretation, and manuscript writing. K-KT was involved in data interpretation and manuscript preparation. AMSW is the principal investigator of the project and responsible for the research conception, design, and coordination, data interpretation, and manuscript preparation. All authors contributed to and approved the final manuscript.

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