Age-related physical and psychological vulnerability as pathways to problem gambling in older adults

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Background: To inform clinical treatment and preventative efforts, there is an important need to understand the pathways to late-life gambling disorder. *Aims:* This study assesses the association between age-related physical health, social networks, and problem gambling in adults aged over 65 years and assesses the mediating role of affective disorders in this association. *Methods:* The sample comprised 595 older adults (mean age: 74.4 years, range: 65–94 years; 77.1% female) who were interviewed using a structured questionnaire to assess physical frailty, geriatric pain, loneliness, geriatric depression, geriatric anxiety, and problem gambling. *Results:* Pathway analysis demonstrated associations between these variables and gambling problems, providing a good fit for the data, but that critically these relationships were mediated by both anxiety and depression symptoms. *Conclusions:* This study indicates that late-life problem gambling may develop as vulnerable individuals gamble to escape anxiety and depression consequent to deteriorating physical well-being and social support. When individuals develop late-life problem gambling, it is recommended that the treatment primarily focuses upon targeting and replacing avoidant coping approaches.

Keywords: gambling, older adults, women, anxiety, depression

INTRODUCTION

It has been widely observed that older adult populations have lower prevalence rates of disordered gambling than their younger counterparts (Subramanian et al., 2015). However, older adults with a gambling disorder often experience higher levels of psychological and physical comorbidity compared with younger adults (Chou & Afifi, 2011; Hong, Sacco, & Cunningham-Williams, 2009; Van der Maas et al., 2017). In particular, anxiety and depression result in more complex treatment requirements for this population in contrast to younger treatment-seeking adults (Kerber, Black, & Buckwalter, 2008). Furthermore, older adult problem gamblers show lower probabilities of recovery and higher probabilities of severe adverse consequences of gambling problems associated with limited social support and fixed (and often) limited income (Pietrzak, Molina, Ladd, Kerins, & Petry, 2005; Wiebe & Cox, 2005). Improving the understanding of the causal pathways toward late-life gambling disorder can help inform improvements in clinical treatment and preventative efforts (Subramanian et al., 2015).

From a clinical perspective, disordered gambling can be understood in terms of motivational pathways (Lee, Chae, Lee, & Kim, 2007). Several core motivations for gambling might be operative in older adult populations. Recent increases in the availability of gambling products and services (including online gambling), combined with age-related physical deterioration, means that gambling may represent one of the few leisure pursuits that are available and highly accessible to older adults (Alberghetti & Collins, 2015; Erickson, Molina, Ladd, Pietrzak, & Petry, 2005; Pattinson & Parke, 2016; Pietrzak & Petry, 2006). For some individuals, old age is associated with retirement from employment and declining social networks and purpose in life (Alberghetti & Collins, 2015). Consequently, they are motivated to gamble as a replacement for occupational and social interactions that foster well-being (Hope & Havir, 2002; Tira, Jackson, & Tomnay, 2013; Zaranek & Lichtenberg, 2008). Older adults often use gambling as an activity for ameliorating resultant negative emotional states (Grant, Kim, Odlaug, Buchanan, & Potenza, 2009; Martin et al., 2011; Stansbury, Beecher, Schumacher, Martin, & Clute, 2015), in particular, to escape the negative experience of social isolation (Botterill, Gill, McLaren, & Gomez, 2016; Piscitelli, Harrison, Doherty, & Carmichael, 2017; Shaffer, 2003).

For the majority of older adults who gamble regularly, there are few negative outcomes. In fact, there are some potential positive outcomes including stimulation and excitation as well as socializing in an environment where they feel safe and comfortable (Alberghetti & Collins, 2015; Cousins, Witcher, & Moodie, 2002; Zaranek & Chapelski, 2005). However, older adults whose gambling involves

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emotional escape are more likely to develop disordered gambling patterns and encounter gambling-related harms (Ariyabuddhiphongs, 2012; Cookman & Weatherly, 2015; Van der Maas et al., 2017).

In addition, older adults may experience specific age-related physical and social problems that increase the anxiety and depressive symptoms, which can motivate gambling as the means to ameliorate negative mood states. In older adult gambling populations, Van der Maas et al. (2017) observed that disordered levels of gambling were specifically associated with depression and anxiety. As older adults experience reduced physical health and mobility, often due to incidence of medical conditions such as arthritis, they can lose a sense of their own agency and control over their well-being (Creighton, Davison, & Kissane, 2017; Vink, Aartsen, & Schoevers, 2008). Deteriorating physical status by age-related medical conditions such as arthritis is often associated with chronic pain (Dragioti, Levin, Bernfort, Larsson, & Gerdle, 2017) that can presage the onset of depression and anxiety (Lindstrom, Andersson, Lintrup, Holst, & Berglund, 2012; Tang et al., 2015).

Physical frailty and chronic experiences of pain can limit engaging in leisure and social pursuits, which in turn can increase the probability of experiencing loneliness in an older adult (Aylaz, Akturk, Erci, Ozturk, & Aslan, 2012). Loneliness, isolation, and the resultant anxiety and depression are common experiences in older adults (Creighton et al., 2017; Patten, 2001). Essentially, as older adults experience a loss of independence resulting from social and physical transition, the probability of mood-related disorders increases. Older adults' ability to address depressive symptoms can be restricted by reduced social support and networks, alongside physical limitations (Aylaz et al., 2012), heightening hopelessness, tension and anxiety (Creighton et al., 2017; Wolitzky-Taylor, Castriotta, Lenze, Stanley, & Craske, 2010), motivating behaviors, such as gambling, that offer distraction, social interaction, and opportunities for positive emotional experiences.

As affective symptoms often covary, it is probable that both anxiety and depression have a similar role in mediating the impact of social and physical decline on problem gambling in older adult populations. However, although depressive and anxiety symptoms are very strong predictors of each other, in older adult populations they are often predicted individually by different variables (Heesterbeek, van der Aa, van Rens, Twirsk, & van Nispen, 2017). Therefore, in this exploratory attempt at modeling the pathways to older adult problem gambling, it is possible that depression and anxiety are predicted by different exogenous variables.

Furthermore, there is scope to consider that depression may predict anxiety. Deterioration of physical health in old age is related to depression (Aylaz et al., 2012). More specifically, recent qualitative research has indicated that when older adult problem gamblers experienced negative outcomes in relation to transitioning into older adulthood such as depression, they often engage in avoidant rather than adaptive coping behavior (Pattinson & Parke, 2016, 2017). These participants stated that they felt that their physical decline was inevitable, and that the negative outcomes would continue, because they did not have the resources to address the problems and to improve their social and physical circumstances (Pattinson & Parke, 2017).

In addition, there is clear evidence demonstrating that non-adaptive coping with depression that emerges from physical disability can exacerbate the negative outcomes of the physical disability (Heesterbeek et al., 2017). In older adults, it has been observed that passive coping and experiences of helplessness, in terms of not possessing the resources to address the source of the problem, can ultimately lead to the emergence of anxiety symptoms (Maser & Cloninger, 1990; Scharloo et al., 1998), whereas active, problem-focused coping to address depression is related to more positive outcomes (Martin, Kliegel, Rott, Poon, & Johnson, 2008). Put simply, older adults who develop depressive symptoms in response to deterioration in physical health, and subsequently engaged in avoidant coping seeking temporary emotional escape, may experience anxiety as a result.

This study sought to evaluate a proposed theoretical model of how physical deterioration and social isolation might promote the development and maintenance of late-life problem gambling. It was hypothesized that loneliness covaries with physical frailty and chronic pain, and in turn increases the likelihood of depression and anxiety symptoms and thereby motivating problematic patterns of gambling behavior. By path analysis, older adults were surveyed to identify the indirect effects of reductions in physical and social well-being on problem gambling, mediated by level of depression and anxiety symptoms.

METHODS

Participants

Participants were recruited by poster and through local organizations across Greater London and the East Midlands region of Great Britain, including healthcare facilities, community centers, and church societies. To ensure a suitable proportion of high-frequency gamblers, the third author also was provided permission to directly sample from multiple commercial gambling premises in various locations across Great Britain. All participants were 65 years of age or older, with no restrictions on maximum age, and had gambled at least once within the previous 12-month period.

Of 692 individuals initially recruited, 97 were excluded from further analysis as they submitted incomplete data, leaving 595 participants in the final sample. This reduction of the sample by approximately 16% did not affect the relative proportion of individuals who reported experiencing at least some level of problem gambling (18.4% in the initial sample vs. 16% in the final sample). Three-quarters of the sample were female (77.1%) and the mean age was 74.4 years ($SD = 8$), with the minimum and maximum age of 65 and 94 years, respectively. Finally, 44.9% of the final sample were currently living with their spouse or domestic partner, with the remainder either divorced, single, or widowed.

Procedure

After informed consent was provided, participants were screened for cognitive impairment using the Clock Drawing Test (Shua-Haim, Koppuzha, & Gross, 1996), because such impairment may limit the participants' capacity to provide informed consent to complete the study. It remained important to seek consent before administering the Clock Drawing Test as a precursor, to validate the consent provided and continue with subsequent data collection. Questionnaires were completed with assistance from the researcher in a one-to-one format.

Measures

Problem gambling. The nine-item Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001) was used to assess problem gambling, because the scale was specifically developed to be used in general populations. This self-report instrument enables participants to respond on a 4-point scale ("*never*," "*sometimes*," "*most of the time*," or "*almost always*") and can identify patterns of problem gambling. The PGSI includes items such as "*When you think of the last 12 months, have you bet more than you could really afford to lose?*" and "*When you gambled, did you go back another day to try and win back the money you lost?*" The PGSI is regarded as having high convergent validity and internal consistency, effectively measuring a single underlying problem gambling factor (Holtgraves, 2009). For this study, the PGSI had high internal consistency (Cronbach's α = .83).

Physical frailty. The 7-point Canadian Study of Health and Aging Clinical Frailty Scale (Rockwood et al., 2005) was used to assess physical frailty. This scale uses descriptors to classify level of illness and physical vulnerability, ranging from 1 ("*very fit*") to 7 ("*severely frail and completely dependent on others for activities for daily living; or terminally ill*"). The instrument is recognized as having high convergent and construct validity (Fried, Ferrucci, Darer, Williamson, & Anderson, 2004; Jones, Song, Mitniski, & Rockwood, 2004).

Geriatric pain. The 12-item Geriatric Pain Measure Short Form (GPM SF-12; Blozik et al., 2007) was used to assess current levels of chronic pain and physical discomfort that the participants were experiencing in older adulthood. Items in the GPM SF-12 reflect the multiple dimensions of pain including its intensity and impact of pain on physical activity, in addition to the impact on mood and independence. Participants are required to provide dichotomous answers (yes/no) to 12 items, such as "*Do you or would you have pain with moderate activities such as moving a heavy table, pushing a vacuum cleaner, bowling or playing golf?*" and "*Have you cut down the amount of time you spend on work or doing activities because of pain?*" The scale is a shorter version of the 24-item GPM and has high levels of convergent validity and reliability within community and nursing-home dwelling older adults (Blozik et al., 2007). The GPM SF-12 demonstrated high internal consistency in this study (Cronbach's α = .91).

Loneliness. The six-item De Jong Gierveld Loneliness Scale (De Jong Gierveld & van Tilburg, 2006) was used to assess the two-factor construct of loneliness, comprising both emotional components (e.g., "*I often feel rejected*") and social components (e.g., "*There are plenty of people I can rely on when I have problems*"). Participants are required to respond in one of three ways ("*yes*," "*more or less*," or "*no*") to six statements, with several items reverse-scored. Previous research demonstrates very high congruent validity and internal consistency with the longer 11-item version of the scale (De Jong Gierveld & van Tilburg, 2006). Equally, assessment of internal consistency in this study demonstrated strong internal reliability (Cronbach's α = .81).

Geriatric depression. The 15-item short version of the Geriatric Depression Scale (GDS; Sheikh & Yesavage, 1986) was used to assess geriatric depression. Given the anticipated physical limitations and adaptations in older adult populations, the GDS omits somatic criteria from its assessment of depression (Nyunt, Fones, Niti, & Ng, 2009). The scale consists of 15 dichotomous items (Yes/No) including questions such as "*Do you feel that your life is empty?*" and "*Do you feel pretty worthless the way you are now?*" The short version GDS has demonstrated strong psychometric properties in meta-analytic evaluations (Wancata, Alexandrowicz, Marquart, Weiss, & Friedrich, 2006). With respect to this study, internal consistency for the GDS was observed to be adequate (Cronbach's α = .79).

Geriatric anxiety. The 20-item Geriatric Anxiety Inventory (GAI; Pachana et al., 2007) was used to assess anxiety level within the geriatric population. The scale includes items, such as "*My worries often overwhelm me*" and "*I can't help worrying about even trivial things.*" Participants are required to either *Agree* or *Disagree* with each of the statements presented. The GAI has been demonstrated to have excellent convergent and discriminant validity and internal consistency (Gould et al., 2014). Furthermore, Rozzini et al. (2009) demonstrated that the scale had high test–retest reliability ($r = .86$) and interrater reliability ($r = .89$). The GAI is recognized as a stable and valid measure of anxiety severity in older adult populations (Kneebone, Fife-Schaw, Lincoln, & Harder, 2016). The GAI was observed to have high internal consistency within this study (Cronbach's α = .91).

Data analysis

Path analysis was used to evaluate the mediating role of anxiety and depressive symptoms in the association between psychological vulnerability, physical vulnerability, and problem gambling behavior in older adults (Figure 1). Goodness-of-fit was assessed through χ^2 test. Comparative fit was assessed using the comparative fit index (CFI), Tucker–Lewis Index (TLI), and root mean square error of approximation (RMSEA). In this path analysis, an acceptable goodness-of-fit was considered in the model that produced a non-significant χ^2, and CFI and TLI of 0.95 or more, and a RMSEA of less than 0.06 (as recommended in Browne & Cudeck, 1993). After meeting these criteria, standardized regression coefficients representing the direct and indirect effects within the model were reported.
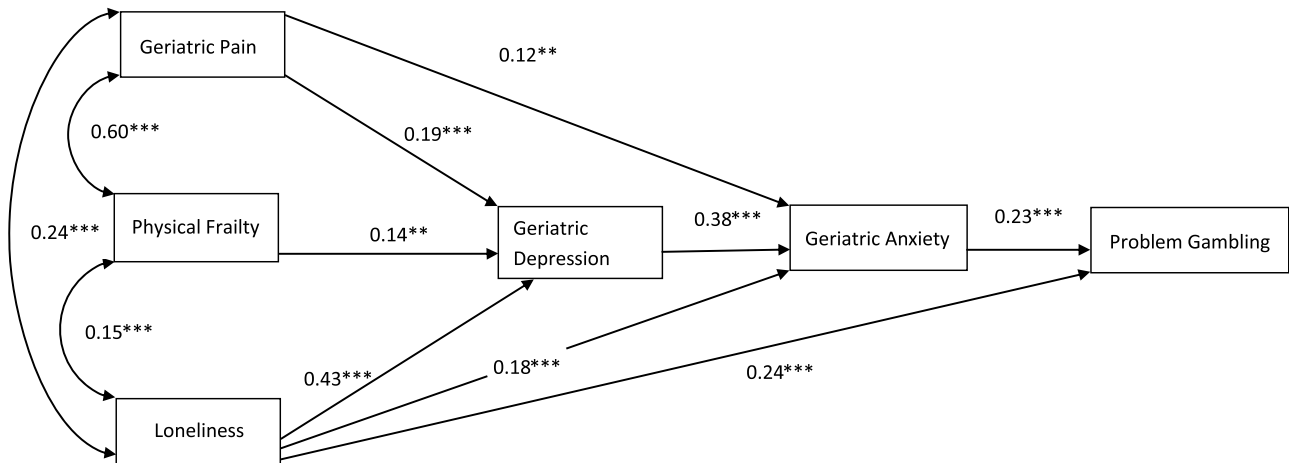
Figure 1. Path model of associations between age-related physical and social vulnerabilities, affective state, and problem gambling behavior.
***$p < .001$, **$p < .01$

Ethics

All procedures performed in this study involving human participants were in accordance with the ethical standards of the research team's university Ethics Committee and with the 1975 Helsinki Declaration. As noted above, all participants were informed about the study and all provided informed consent.

RESULTS

Descriptive statistics

Problem gambling, to at least some extent, was observed in 16% of the participants, with 8.4% experiencing a few criteria of problem gambling, and 4.1% and 3.5% experiencing moderate and severe problem gambling criteria, respectively. In terms of anxiety levels, 36.3% recorded no symptoms of anxiety, 38.2% experienced at least some symptoms of anxiety, and 25.5% were categorized as experiencing anxiety. With respect to depression symptoms, 75.3% did not experience depressive symptoms to any extent. However, 17.8% were observed to have mild levels of depressive symptoms, 4.7% experienced moderate symptoms, and 2.2% experienced severe levels. With respect to loneliness, 34.4% experienced no loneliness with 66.6% reported to be experiencing loneliness to at least some

degree. Regarding the physical state of the participants, 35.5% identified as experiencing no physical pain. However, 15.8% reported mild pain, 24.2% reported moderate pain, and 24.5% reported severe pain. Finally, 36.3% were categorized as experiencing physical frailty to at least a moderate extent.

As expected using clinical psychological and physical data, not all observed scores were normally distributed across the sample, with anxiety and problem gambling having a skewness >1.51 and kurtosis >1.76. However, the direct, indirect, and total effects of all variables were bias-corrected bootstrapped based on 10,000 samples to address violations of assumed normality of data (Fritz & MacKinnon, 2007).

There were no statistically significant differences between males and females in terms of any of the physical or psychological factor (at the $p < .05$ level). However, scores of clinical frailty ($r = .44$, $p < .001$) and geriatric pain increased with age ($r = .22$, $p < .001$). In contrast, this was not the case for loneliness, depression, anxiety, or problem gambling ($p > .05$). There were several bivariate correlations across all variables (Table 1).

Path analysis

Given the explorative nature of the study, in the initial model, all associative direct relationships between the age-related physical and social vulnerabilities and the outcome

Table 1. Correlations, means, standard deviations, and Cronbach's αs for model variables

Variable	1	2	3	4	5	6	Mean	SD
Clinical frailty	–						3.19	1.63
Geriatric pain	0.602**	*0.91*					13.76	13.99
Loneliness	0.236**	0.152**	*0.81*				1.82	1.94
Geriatric depression	0.364**	0.347**	0.497**	*0.79*			3.08	3.02
Geriatric anxiety	0.200**	0.276**	0.382**	0.507**	*0.91*		5.19	6.75
Problem gambling	0.069	0.102*	0.326**	0.276**	0.32**	*0.83*	0.82	3.09

Note. Significant correlations are indicated by *$p < .05$ and **$p < .01$. Italicized values on the diagonal represent Cronbach's αs.

variable of problem gambling, and indirect associative relationships via depression level and resulting anxiety level, were estimated. The initial path model inclusive of all paths from frailty, geriatric pain and loneliness, and depression and anxiety level to problem gambling provided a good fit for the data: $\chi^2(1) = 2.48$, $p = .115$, RMSEA = 0.050, TLI = 0.974, CFI = 0.998.

However, not all coefficients for the paths between age-related physical vulnerabilities and affective disorders and problem gambling were statistically significant. Clinical frailty did not have a direct effect on anxiety ($p = .06$) or problem gambling level ($p = .16$). In addition, the coefficient showing the direct effect on geriatric pain on problem gambling was not statistically significant ($p = .59$). Furthermore, depression did not have a statistically significant coefficient in relation to problem gambling ($p = .12$). In the interests of developing a parsimonious model reflecting the associative relationships between age-related physical and social vulnerabilities, affective disorders, and problem gambling behavior, statistically non-significant paths were removed from the model and re-estimated.

The final modified path model (Figure 1) fitted the data well, i.e., $\chi^2(4) = 7.39$, $p = .117$, RMSEA = 0.038, TLI = 0.985, CFI = 0.996. Bootstrapping was used to address the skewness and kurtosis anticipated with clinical data, and derived bias-corrected 95% confidence intervals (CIs) for the associations. Table 2 shows the beta coefficient estimates and confidence intervals for the pathways. None of the 95% CI contained zero, therefore enabling rejection of the null hypothesis as relationships could be considered to be statistically significant.

Direct and indirect effects

Examination of the direct effects demonstrated that of the proposed age-related vulnerability variables, only loneliness was directly associated with level of problem gambling ($\beta = 0.24$, $p < .001$). In addition, depression was not observed to have a direct effect on problem gambling as was initially hypothesized. However, anxiety was a statistically significant predictor of problem gambling level in the sample ($\beta = 0.23$, $p < .001$). The relatively weak, yet highly statistically significant, effects of clinical frailty ($\beta = 0.01$, $p < .01$) and geriatric pain ($\beta = 0.04$, $p < .001$) on problem gambling were mediated by depression and anxiety. Furthermore, the effect of depression level ($\beta = 0.09$, $p < .001$) on problem gambling was mediated by the level of anxiety.

DISCUSSION

In this study, an exploratory study was carried out into how age-related physical and social vulnerabilities, mediated by negative affective states, lead to late-life problem gambling behavior. The hypothetical model had significant empirical support in terms of comparative fit and is suggested as a theoretical account of how late-life problem gambling might develop in the older adult population. This model proposes that the experience of negative affective states of anxiety and loneliness has a highly and statistically significant direct effect on levels of problem gambling in older adults (Piscitelli et al., 2017; Van der Mass et al., 2017), but, that in addition, the power of geriatric pain and loneliness to promote gambling harms are mediated by the motivation to escape negative mood states, particularly anxiety (Grant et al., 2009) and loneliness (Pietrzak & Petry, 2006).

For older adults, who may feel vulnerability in relation to physical limitations and reduced social support, commercial gambling often provides a readily accessible, safe environment to engage in leisure activity (Zaranek & Chapelski, 2005). Indeed, previous research has observed that for many older adults, gambling is associated with positive outcomes that include socialization and rewarding stimulation (Cousins et al., 2002; Desai, Maciejewski, Dausey, Caldarone, & Potenza, 2004). However, when older adults are also motivated to gamble in order to reduce tension and forget their worries, the probability of experiencing gambling-related harm increases significantly (Van der Maas et al., 2017). Gambling affords (at least initially) distraction from worries and tension by inducing states of physiological and emotional arousal through monetary risk. It is likely that monetary risk-taking and expenditure are more likely to be conservative and limited, if an individual's objective is to socialize with peers and/or to have a financially profitable session, than if the objective of the activity is to narrow attention through risk-taking.

There was no significant direct effect of depression level on problem gambling behavior. This may initially be interpreted as unexpected, given the repeated observed covariation of negative effect, escape motivations, and problem gambling in the research literature (Grant et al., 2009; Van der Maas et al., 2017; Wood & Griffiths, 2007). This could indicate that motivation for gambling in older adults is not strongly driven by seeking stimulation to

Table 2. Direct, indirect, and total effects of age-related physical and social vulnerabilities, affective state, and problem gambling behavior

	Direct effect			Indirect effect			Total effect		
	β	95% CI	p	β	95% CI	p	β	95% CI	p
Physical frailty	–	–	–	0.01	[0.01–0.02]	***	0.01	[0.01–0.02]	***
Geriatric pain	–	–	–	0.04	[0.02–0.09]	***	0.04	[0.02–0.09]	***
Loneliness	0.24	[0.16–0.31]	***	0.08	[0.04–0.14]	***	0.31	[0.24–0.39]	***
Depression	–	–	–	0.09	[0.05–0.15]	***	0.09	[0.05–0.15]	***
Anxiety	0.23	[0.12–0.36]	***	–	–	–	0.23	[0.12–0.36]	***

Note. Standardized regression coefficients, corresponding bootstrapped 95% confidence intervals (CIs).
***$p < .001$.

address hypoarousal and dysphoric states, but more specifically concerns the releasing of tension and anxiety through aroused distraction. However, depression level does appear to have an important mediating role in the development of late-life problem gambling, given its strong association with anxiety level within the proposed model of this paper.

Physical deterioration, age-related pain, and experiences of loneliness are strongly associated with depression in older adults. Loneliness induced depression in older adults who suffer from functional and economic limitations can create feelings of hopelessness, reflecting an external locus of control (Aylaz et al., 2012; Creighton et al., 2017). In essence, older adults who are experiencing depressive states and are limited in their scope to adapt and address their problem in response to age-related restrictions are likely to experience stress, given they see little opportunity to make positive changes and anticipate their stressors to increase as they age further. Therefore, in response to real and perceived limited opportunities to adapt and address their loneliness and depressive state through positive action, their use of persistent gambling to alleviate stress and anxiety becomes significantly more understandable. The retained model supports the theoretical proposition that the use of avoidant coping such as seeking temporary emotional escape from depressive symptoms, rather than addressing the source of the problem, can extend and exacerbate the stressful experience and in turn, increase anxiety levels (Heesterbeek et al., 2017; Martin et al., 2008; Maser & Cloninger, 1990; Scharloo et al., 1998).

Clinical implications

This study indicates that late-life problem gambling may develop as a result of attempting to escape anxiety consequent to deteriorating physical well-being and social support and the depressive states that can emanate from physical and social decline. Further studies might aim to assess whether isolated, older individuals with physical frailty problems experience their gambling as being mood-modulating and as a behavior that alleviates stress and dysphoria. In addition, the findings of this study suggest that larger-scale studies investigate gambling to alleviate stress as a therapeutic target in the individuals with broader clinical and health challenges involving physical frailty and isolation.

Research literature supports the proposition that affective disorders in older adults often have higher severity and negative outcomes, as a result of the increased probability of hopelessness (Creighton et al., 2017). From a practical perspective, it may also be important for primary care practitioners/physicians and/or professional clinicians to seek more in-depth information about the quality of older individuals' broader physical challenges (frailty and pain) and social support when they present with gambling problems, alongside their gambling motivations. In addition, interventions could be developed that encourage adaptive and positive action to alleviate negative mood states as alternatives to gambling, with consideration given to their specific age-related restrictions, such as physical mobility. As noted previously by Alberghetti and Collins (2015), this approach is already engaged in by several clinical services specific to older adults, such as the Addiction Services of Thames Valley (UK), whose volunteers facilitate social events and interaction across peers, as a direct replacement for gambling. It appears appropriate to encourage clinical and community services to advocate for the creation and facilitation of opportunities for older adults to engage in social interaction in safe and stimulating environments because currently, there appears to be insufficient opportunities available (Pattinson & Parke, 2016).

Limitations

It is acknowledged that the path model presented in this study is based upon cross-sectional data and limits any temporal analysis of causative relationships. Further studies with longitudinal designs would help validate the proposed transitional pathway from age-related physical and social decline to problem gambling through affective disturbance. Furthermore, because the data collection procedure employed within this study included the use of promotional posters highlighting the study, alongside verbally addressing large groups of potential participants simultaneously, it was not possible to provide any accurate record of response rates. Fundamentally, the sample must be recognized as a convenience sample and not one that is representative of the research population, despite the sample being highly varied in terms of demographics and gambling behavior. Therefore, it also remains a possibility that depression level may be observed to have a direct association with problem gambling in future replication studies, with larger and more representative samples.

CONCLUSIONS

Despite the aforementioned limitations, this study provides a significant novel contribution to understanding pathways that account for the development and maintenance of problem gambling in older adult populations. The pathway model emphasizes the strong association between anxiety level and loneliness and late-life problem gambling behavior, indicating that disordered gambling may emerge from attempts to alleviate negative mood states. Additionally, deterioration in physical well-being and depression also have a significant (albeit indirect) effect on problem gambling in older adult populations.

REFERENCES

Alberghetti, A., & Collins, P. A. (2015). A passion for gambling: A generation-specific conceptual analysis and review of gambling among older adults in Canada. *Journal of Gambling Studies, 31*(2), 343–358. doi:10.1007/s10899-013-9425-2

Ariyabuddhiphongs, V. (2012). Older adults and gambling: A review. *International Journal of Mental Health and Addiction, 10*(2), 297–308. doi:10.1007/s11469-011-9325-6

Aylaz, R., Akturk, U., Erci, B., Ozturk, H., & Aslan, H. (2012). Relationship between depression and loneliness in elderly and examination of influential factors. *Archives of Gerontology and Geriatrics, 55*(3), 548–554. doi:10.1016/j.archger.2012.03.006

Blozik, E., Stuck, A. E., Niemann, S., Ferrell, B. A., Harari, D., Renteln-Kruse, W. V., Gillmann, G., Beck, J. C., & Clough-Gorr, K. M. (2007). Geriatric pain measure short form: Development and initial evaluation. *Journal of the American Geriatrics Society, 55*(12), 2045–2050. doi:10.1111/j.1532-5415.2007.01474.x

Botterill, A., Gill, P. R., McLaren, S., & Gomez, R. (2016). Marital status and problem gambling among Australian older adults: The mediating role of loneliness. *Journal of Gambling Studies, 32*(3), 1027–1038. doi:10.1007/s10899-015-9575-5

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Newbury Park, CA: Sage.

Chou, K. L., & Afifi, T. O. (2011). Disordered (pathological or problem) gambling and Axis I psychiatric disorders: Results from the National Epidemiologic Survey on alcohol and related conditions. *American Journal of Epidemiology, 173*(11), 1289–1297. doi:10.1093/aje/kwr017

Cookman, M. L., & Weatherly, J. N. (2015). Investigating possible effects of ethnicity and aging on gambling as an escape. *Journal of Gambling Studies, 32*(2), 499–509. doi:10.1007/s10899-015-9555-9

Cousins, S. O., Witcher, C. S., & Moodie, J. (2002). *High quality aging or gambling with health. The lifestyles of elders who play bingo*. Calgary, AB: Alberta Gaming Research Institute. Retrieved from http://dspace.ucalgary.ca/jspui/bitstream/1880/1627/1/Cousins_bingo.pdf

Creighton, A. S., Davison, T. E., & Kissane, D. W. (2017). The correlates of anxiety among older adults in nursing homes and other residential aged care facilities: A systematic review. *International Journal of Geriatric Psychiatry, 32*(2), 141–154. doi:10.1002/gps.4604

De Jong Gierveld, J., & van Tilburg, T. G. (2006). A 6 item scale for overall emotional and social loneliness: Confirmatory tests of survey data. *Research on Aging, 28*(5), 582–598. doi:10.1177/0164027506289723

Desai, R. A., Maciejewski, P. K., Dausey, D. J., Caldarone, B. J., & Potenza, M. N. (2004). Health correlates of recreational gambling in older adults. *Journal of American Psychiatry, 161*(9), 1672–1679. doi:10.1176/appi.ajp.161.9.1672

Dragioti, E., Levin, L. A., Bernfort, L., Larsson, B., & Gerdle, B. (2017). Insomnia severity and its relationship with demographics, pain features, anxiety, and depression in older adults with and without pain: Cross-sectional population based results from the PainS65+ cohort. *Annals of General Psychiatry, 16*(1), 15. doi:10.1186/s12991-017-0137-3

Erickson, L., Molina, C. A., Ladd, G. T., Pietrzak, R. H., & Petry, N. M. (2005). Problem and pathological gambling are associated with poorer mental and physical health in older adults. *International Journal of Geriatric Psychiatry, 20*(8), 754–759. doi:10.1002/gps.1357

Ferris, J., & Wynne, H. (2001). *The Canadian Problem Gambling Index: Final report*. Ottawa, ON: Canadian Centre on Substance Abuse.

Fried, L. P., Ferrucci, L., Darer, J., Williamson, J. D., & Anderson, G. (2004). Untangling the concepts of disability frailty, and comorbidity: Implications for improved targeting and care. *Journal of Gerontology Series A, Biological Sciences and Medicine, 59*(3), M249–M254. doi:10.1093/gerona/59.3.M249

Fritz, M. S., & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science, 18*(3), 233–239. doi:10.1111/j.1467-9280.2007.01882.x

Gould, C. E., Segal, D. L., Yochim, B. P., Pachana, N. A., Byrne, G. J., & Beaudreau, S. A. (2014). Measuring anxiety in late life: A psychometric examination of the Geriatric Anxiety Inventory and Geriatric Anxiety Scale. *Journal of Anxiety Disorders, 28*(8), 804–811. doi:10.1016/j.janxdis.2014.08.001

Grant, J. E., Kim, S. W., Odlaug, B. L., Buchanan, S. N., & Potenza, M. N. (2009). Late-onset pathological gambling: Clinical correlates and gender differences. *Journal of Psychiatric Research, 43*(4), 380–387. doi:10.1016/j.jpsychires.2008.04.005

Heesterbeek, T. J., van der Aa, H. P., van Rens, G. H., Twirsk, J. W., & van Nispen, R. M. (2017). The incidence and predictors of depressive and anxiety symptoms in older adults with vision impairment: A longitudinal prospective cohort study. *Ophthalmic & Physiological Optics, 37*(4), 385–398. doi:10.1111/opo.12388

Holtgraves, T. (2009). Evaluating the Problem Gambling Severity Index. *Journal of Gambling Studies, 25,* 105–120. doi:10.1007/s10899-008-9107-7

Hong, S. I., Sacco, P., & Cunningham-Williams, R. M. (2009). An empirical typology of lifetime and current gambling behaviors: Association with health status of older adults. *Aging & Mental Health, 13*(2), 265–273. doi:10.1080/13607860802459849

Hope, J., & Havir, L. (2002). You bet they're having fun! Older Americans and casino gambling. *Journal of Aging Studies, 16*(2), 177–197. doi:10.1016/S0890-4065(02)00043-9

Jones, D., Song, X., Mitnitski, A., & Rockwood, K. (2004). Operationalising a Frailty Index from a standardised geriatric assessment. *Journal of the American Geriatrics Society, 52*(11), 1929–1933. doi:10.1111/j.1532-5415.2004.52521.x

Kerber, C. S., Black, D. W., & Buckwalter, K. (2008). Comorbid psychiatric disorders among older adult recovering pathological gamblers. *Issues Mental Health Nursing, 29*(9), 1018–1028. doi:10.1080/01612840802274933

Kneebone, I. I., Fife-Schaw, C., Lincoln, N. B., & Harder, H. (2016). A study of the validity and the reliability of the Geriatric Anxiety Inventory in screening for anxiety after stroke in older inpatients. *Clinical Rehabilitation, 30*(12), 1220–1228. doi:10.1177/0269215515619661

Lee, H. P., Chae, P. K., Lee, H. S., & Kim, Y. K. (2007). The five-factor gambling motivation model. *Psychiatry Research, 150*(1), 21–32. doi:10.1016/j.psychres.2006.04.005

Lindstrom, V., Andersson, K., Lintrup, M., Holst, G., & Berglund, J. (2012). Prevalence of sleep problems and pain among the elderly in Sweden. *Journal of Nutrition Health & Aging, 16*(2), 180–183. doi:10.1007/s12603-011-0356-2

Martin, F., Lichtenberg, P. A., Templin, T. N., Martin, F., Lichtenberg, P. A., & Templin, T. N. (2011). A longitudinal study: Casino gambling attitudes, motivations, and gambling patterns among urban elders. *Journal of Gambling Studies, 27*(2), 287–297. doi:10.1007/s10899-010-9202-4

Martin, P., Kliegel, M., Rott, C., Poon, L. W., & Johnson, M. A. (2008). Age differences and changes of coping behavior in three age groups: Findings from the Georgia centenarian study. *International Journal of Aging and Human Development, 66*(2), 97–114. doi:10.2190/AG.66.2.a

Maser, J. D., & Cloninger, C. R. (1990). *Comorbidity of anxiety and mood disorders*. Washington, DC: American Psychiatric Press.

Nyunt, M. S., Fones, C., Niti, M., & Ng, T. P. (2009). Criterion-based validity and reliability of the Geriatric Depression Screening Scale (GDS-15) in a large validation sample of community-living Asian older adults. *Aging & Mental Health, 13*(3), 376–382. doi:10.1080/13607860902861027

Pachana, N., Byrne, G., Siddle, H., Koloski, N., Harley, E., & Arnold, E. (2007). Development and validation of the Geriatric Anxiety Inventory. *International Psychogeriatrics, 19*(1), 103–114. doi:10.1017/S1041610206003504

Patten, S. B. (2001). Descriptive epidemiology of a depressive syndrome in a Western Canadian community population. *Canadian Journal of Public Health, 92,* 392–395.

Pattinson, J., & Parke, A. (2016). Gambling behaviour and motivation in British older adult populations: A grounded theoretical framework. *Journal of Gambling Issues, 34,* 55–76. doi:10.4309/jgi.2016.34.4

Pattinson, J., & Parke, A. (2017). The experience of high-frequency gambling behavior of older adult females in the United Kingdom: An interpretative phenomenological analysis. *Journal of Women & Aging, 29*(3), 243–253. doi:10.1080/08952841.2015.1138047

Pietrzak, R. H., Molina, C. A., Ladd, G. T., Kerins, G. J., & Petry, N. M. (2005). Health and psychosocial correlates of disordered gambling in older adults. *The American Journal of Geriatric Psychiatry, 13*(6), 510–519. doi:10.1097/00019442-200506000-00010

Pietrzak, R. H., & Petry, N. M. (2006). Severity of gambling problems and psychosocial functioning in older adults. *Journal of Geriatric Psychiatry and Neurology, 19*(2), 106–113. doi:10.1177/0891988706286508

Piscitelli, A., Harrison, J., Doherty, S., & Carmichael, B. A. (2017). Older adults' casino gambling behaviour and their attitudes toward new casino development. *International Journal of Aging and Human Development, 84*(4), 415–430. doi:10.1177/0091415016677973

Rockwood, K., Song, X., MacKnight, C., Bergman, H., Hogan, D. B., McDowell, I., & Mitniski, A. (2005). A global clinical measure of fitness and frailty in elderly people. *Canadian Medical Association Journal, 175,* 488–495. doi:10.1503/cmaj.050051

Rozzini, L., Chilovi, B., Peli, M., Conti, M., Rozzini, R., Trabucchi, M., & Padovani, A. (2009). Anxiety symptoms in mild cognitive impairment. *International Journal of Geriatric Psychiatry, 24*(3), 300–305. doi:10.1002/gps.2106

Scharloo, M., Kaptein, A. A., Weinman, J., Hazes, J. M., Willems, L. N. A., Bergman, W., & Rooijmans, H. G. (1998). Illness perceptions, coping and functioning in patients with rheumatoid arthritis, chronic obstructive pulmonary disease and psoriasis. *Journal of Psychosomatic Research, 44*(5), 573–585. doi:10.1016/S0022-3999(97)00254-7

Shaffer, H. J. (2003). A public health perspective on gambling: The four principles. *AGA Responsible Gaming Lecture Series, 2,* 1–27.

Sheikh, J. I., & Yesavage, J. A. (1986). Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. *Clinical Gerontologist, 5*(1–2), 165–173. doi:10.1300/J018v05n01_09

Shua-Haim, J., Koppuzha, G., & Gross, J. (1996). A simple scoring system for clock – Drawing in patients with Alzheimer's disease. *Journal of the American Geriatric Society, 44*(3), 335–335. doi:10.1111/j.1532-5415.1996.tb00931.x

Stansbury, K. L., Beecher, B., Schumacher, M., Martin, F., & Clute, M. A. (2015). Social service providers' perspectives on casino gambling in older adult clients. *Journal of Gambling Issues, 30,* 57–72. doi:10.4309/jgi.2015.30.11

Subramanian, M., Wang, P., Soh, P., Vaingankar, J. A., Chong, S. A., Browning, C. J., & Thomas, S. A. (2015). Prevalence and determinants of gambling disorder among older adults: A systematic review. *Addictive Behaviors, 41,* 199–209. doi:10.1016/j.addbeh.2014.10.007.

Tang, N. K., McBeth, J., Jordan, K. P., Blagojevic-Bucknall, M., Croft, P., & Wilkie, R. (2015). Impact of musculoskeletal pain on insomnia onset: A prospective cohort study. *Rheumatology, 54*(2), 248–256. doi:10.1093/rheumatology/keu283

Tira, C., Jackson, A. C., & Tomnay, J. E. (2013). Pathways to late-life problematic gambling in seniors: A grounded theory approach. *Gerontologist, 54*(6), 1035–1048. doi:10.1093/geront/gnt107

Van der Maas, M., Mann, R. E., McCready, J., Matheson, F. I., Turner, N. E., Hamilton, H. A., Schrans, T., & Ialomiteanu, A. (2017). Problem gambling in a sample of older adult casino gamblers: Associations with gambling participation and motivations. *Journal of Geriatric Psychiatry and Neurology, 30*(1), 3–10. doi:10.1177/0891988716673468

Vink, D., Aartsen, M. J., & Schoevers, R. A. (2008). Risk factors for anxiety and depression in the elderly: A review. *Journal of Affective Disorders, 106*(1–2), 29–44. doi:10.1016/j.jad.2007.06.005

Wancata, J., Alexandrowicz, R., Marquart, B., Weiss, M., & Friedrich, F. (2006). The criterion validity of the Geriatric Depression Scale: A systematic review. *Acta Psychiatrica Scandinavica, 114*(6), 398–410. doi:10.1111/j.1600-0447.2006.00888.x

Wiebe, J. M., & Cox, B. J. (2005). Problem and probable pathological gambling among older adults assessed by the SOGS-R. *Journal of Gambling Studies, 21*(2), 205–221. doi:10.1007/s10899-005-3032-9

Wolitzky-Taylor, K. B., Castriotta, N., Lenze, E. J., Stanley, M. A., & Craske, M. G. (2010). Anxiety disorders in older adults: A comprehensive review. *Depression & Anxiety, 27*(2), 190–211. doi:10.1002/da.20653

Wood, R. T. A., & Griffiths, M. D. (2007). A qualitative investigation of problem gambling as an escape-based coping strategy. *Psychology and Psychotherapy: Theory, Research and Practice, 80*(1), 107–125. doi:10.1348/147608306X107881

Zaranek, R. R., & Chapleski, E. E. (2005). Casino gambling among urban elders: Just another social activity? *Journals of Gerontology: Social Sciences, 60*(2), S74–S81.

Zaranek, R. R., & Lichtenberg, P. A. (2008). Urban elders and casino gambling: Are they at risk of a gambling problem? *Journal of Aging Studies, 22*(1), 13–23. doi:10.1016/j.jaging.2007.11.001