Journal of Gambling Studies (2021) 37:515–528
https://doi.org/10.1007/s10899-020-09983-w

ORIGINAL PAPER

Gambling Disorder and Childhood Trauma: A Complex Association

Natascha S. Horak[1,2] · Gillian Eagle[2] · Dan J. Stein[1,3] · Christine Lochner[1]

Accepted: 22 September 2020 / Published online: 1 October 2020

Abstract

Gambling disorder (GD) is classified as a behavioural addiction and has some phenotypic similarities with substance use disorders (SUDs). Childhood adversity and life stressors are associated with increased risk for SUDs in adulthood. However, there is limited research investigating the association between childhood trauma, stressors and behavioural addictions such as GD. In this case–control cross-sectional study, 31 adult patients with GD were compared to 31 matched healthy controls (HCs) in terms of exposure to early adversity using the Childhood Trauma Questionnaire (CTQ-SF). In addition, past 12-month stressful life event exposure was assessed using the Life Event Stress Scale (LESS) and investigated as a possible moderator of the relationship between childhood trauma and GD by means of a two-way analysis of variance (ANOVA). Logistic regression analyses were used to test if childhood trauma (CTQ-SF) and its subtypes were significant predictors of a diagnosis of GD. Severity of childhood trauma in general, and on all five subtypes, was significantly higher in GD patients compared to HCs. Childhood trauma was a significant predictor of a diagnosis of GD, with physical neglect being the single trauma subtype to significantly increase odds of GD in adulthood. Stressful life events moderated the relationship between childhood trauma and GD, i.e. childhood trauma was significantly higher in GD patients compared to HCs when LESS was low. The findings support a link between childhood trauma and GD, with current stress as a moderating variable, and may be useful for future individualized therapeutic strategies.

Keywords Gambling disorder · Behavioural addictions · Childhood trauma · Life events · Stress

✉ Christine Lochner
CL2@sun.ac.za

1 SA MRC Unit on Risk and Resilience in Mental Disorders, Department of Psychiatry, Stellenbosch University, Stellenbosch, South Africa

2 Department of Psychology, University of Witwatersrand, Johannesburg, South Africa

3 Department of Psychiatry and Mental Health, University of Cape Town, Cape Town, South Africa

Introduction

Gambling disorder (GD) is a behavioural addiction that has received increased attention in research in recent years. This condition has been categorized as one of the substance-related and other addictive disorders in the Diagnostic and Statistical Manual of Mental Disorders, Version 5 (DSM-5) (American Psychiatric Association 2013a) due to similarities in public health implications, and genetic and phenotypic features (American Psychiatric Association 2013b; Stein et al. 2018).

An increased rate of childhood trauma has been found in substance-abusing populations (for a review, see Edalati and Krank 2016), including in South Africa (Jewkes et al. 2010). The question can be raised whether the experience of childhood trauma (which comprises physical, emotional and sexual abuse, and emotional and/or physical neglect) may also be prevalent in individuals with behavioural addictions such as GD. In one study ($N=271$), for example, emotional abuse during childhood was the strongest predictor of risk for internet addiction in early adulthood (Dalbudak et al. 2014).

In terms of GD, there is some evidence to suggest a link with childhood trauma (Felsher et al. 2010; Hodgins et al. 2010; Petry and Steinberg 2005; Roberts et al. 2017; Sharman et al. 2019). Past research has, however, been limited in that only certain types of trauma and its associations with problematic gambling were investigated, no control groups were utilized and/or no differentiation was made between problem and disordered gambling, resulting in inconsistencies across studies. Further, since childhood trauma has been associated with various psychiatric conditions (e.g. Barrett et al. 2015; Hughes et al. 2016) and is not a unique phenomenon in individuals with GD, it is important to investigate the links between childhood trauma and GD specifically. In addition, specific types of trauma experienced during childhood could have varying degrees of impact on the development of specific types of behavioural addictions like GD. In participants with GD, emotional neglect and physical neglect have emerged as the most frequently endorsed type of childhood trauma, independent of trauma severity (Felsher et al. 2010).

The association between childhood trauma and problem gambling has been shown to be influenced by various other factors such as stress (Bergevin et al. 2006; Lane et al. 2016; Scherrer et al. 2007). Although limited, there is some evidence that stressful life events, such as the death of a family member, divorce, or job loss, may play a role in moderating the relationship between GD and childhood trauma (Roberts et al. 2017). There is thus emerging evidence that the link between childhood trauma and GD may be more complex than previously assumed, warranting further research. Therefore, an investigation of current life stressors as a plausible moderating link between GD and childhood trauma may provide a deeper understanding of these inter-relationships.

Method

Aims and Hypotheses

The present study aimed to compare Childhood Trauma Questionnaire (CTQ-SF) total scores and scores on the five CTQ-SF subscales between GD patients and matched HCs. It was expected that GD patients would report higher severity of childhood trauma compared to HCs (*Hypothesis 1*); that childhood trauma would be a significant predictor of gambling severity in the GD group (*Hypothesis 2*); and that childhood trauma would be a significant predictor of the presence/diagnosis of GD (*Hypothesis 3*). It was expected that some subtypes of childhood trauma may be stronger predictors of the presence of GD than others (*Hypothesis 4*). In addition, it was anticipated that past 12-month stressful life event exposure would moderate the relationship between childhood trauma and GD (*Hypothesis 5)*.

Study Design and Setting

The research study forms part of a larger cross-sectional case–control study conducted under the auspices of the SA MRC Unit on Risk and Resilience in Mental Disorders based at the Universities of Stellenbosch (SU) and Cape Town (UCT). A quasi-experimental, cross-sectional design was chosen for this sub-study. Data collection extended between November 2014 and November 2016 and took place in the Western Cape region of South Africa. Scale scores were compared across two populations, namely patients with GD ($n=31$) and age- and sex-matched healthy controls (HCs) ($n=31$).

Sampling

Purposive sampling was used for the GD group. GD patients were recruited from the South African National Responsible Gambling Programme (NRGP), an addictions treatment centre, Gamblers Anonymous meetings, and the general public via media advertisements. Control group participants were also recruited from the community by means of media advertisements and radio interviews.

GD patients were either assessed at the NRGP offices, at their treatment centre, or at the SA MRC Unit on Risk and Resilience in Mental Disorders at SU, depending on the participant's preference. HCs were assessed at the latter venue. All participants completed the self-report measures individually as part of the first study session after an intake interview.

Age, sex, and level of education were assessed for the purpose of describing the study sample. These variables were considered as possible confounding variables in the analyses. In the case of the GD group, a clinical assessment interview of approximately 90–180 min (with breaks where necessary) was conducted with each potential participant by research assistants with relevant clinical experience. HC participants underwent the same interview, but only screening questions of the GD instruments were administered. HCs were only included if they did not meet criteria for any current DSM IV Axis-I disorder.

Measures

GD patients who were included in the study met DSM-5 criteria for gambling disorder on the Structured Clinical Interview for Pathological Gambling (SCI-PG) (Grant et al. 2004). The interview is based on DSM-IV-TR criteria for pathological gambling (American Psychiatric Association 2000). Excellent inter-rater reliability, test–retest reliability, as well as concurrent and discriminant validity have been found for the diagnosis of GD using the SCI-PG (Grant et al. 2004).

The Yale-Brown Obsessive Compulsive Scale for Pathological Gambling (PG-YBOCS) (Pallanti et al. 2005) was used to assess GD severity. Excellent internal consistency and inter-rater reliability of the scale were found for the PG-YBOCS total score, and evidence was provided for the convergent validity of the measure (Pallanti et al. 2005). The

PG-YBOCS can be considered a reliable and valid instrument to measure the severity of pathological gambling (Pallanti et al. 2005).

The Mini International Neuropsychiatric Interview (M.I.N.I.) Version 5 (Sheehan et al. 2006) was implemented in both the GD and HC groups for diagnostic purposes and to exclude comorbidity. In validation studies (Sheehan et al. 1998), the interrater reliability of the M.I.N.I. ranged between good and very good. Overall, the M.I.N.I. has been found to have good to very good reliability and validity (Sheehan et al. 1998).

A short form of the Childhood Trauma Questionnaire (CTQ-SF) (Bernstein et al. 2003) was used to assess the nature and severity of childhood trauma. The CTQ-SF is a 28-item multidimensional, retrospective, self-report measure of childhood neglect and abuse experiences. Subscales of the CTQ-SF include measures of physical abuse, emotional abuse, sexual abuse, emotional neglect, and physical neglect. Reliability and validity of the CTQ-SF have been well researched (e.g. Dudeck et al. 2015; Grassi-Oliveira et al. 2014; Spinhoven et al. 2014). Most validation studies found good to very good internal consistency of the CTQ-SF for the total scale and its five subscales. Bernstein et al. (2003) provided evidence for the convergent and discriminant validity of the CTQ-SF (Bernstein et al. 2003).

The Life Event Stress Scale (LESS), a sub-component of the Social Readjustment Rating Scale (SRRS) (Holmes and Rahe 1967), was administered to assess the number of past 12-month stressful life events to which the individual had been exposed. Respondents are requested to mark which of the 43 listed life events they have experienced in the past 12 months. Examples of such events include (amongst others) death of a spouse or family member, divorce, serving a jail term, personal injury or illness, marriage, and job loss. Validation studies in various countries and cultures have confirmed the proposed correlation between stress scale scores and illness (Harmon et al. 1970; Komaroff et al. 1968; Rahe et al. 1970).

Data Analysis

All statistical analyses were performed with IBM SPSS Statistics (Version 24). Assumptions were checked for all statistical tests prior to analyses and appropriate adaptations implemented where indicated. An alpha level of 0.05 was used for all statistical tests, unless otherwise specified.

Two-sample Welch's *t*-tests (one-tailed) were used to compare self-reported childhood trauma, i.e. the total score on the CTQ-SF, as well as scores on the five subscales, in the GD group and the HC group (*Hypothesis 1).* To investigate childhood trauma as a possible predictor of the severity of GD, Spearman's rank correlations were used to test for an association between the total CTQ-SF score and the PG-YBOCS score (severity of GD), as well as the five CTQ-SF subscale scores and the PG-YBOCS score, in the GD group (*Hypothesis 2*). Logistic regression analysis was used to assess whether levels of childhood trauma (CTQ-SF Total Score) significantly predicted group membership, i.e. the presence/diagnosis of GD (*Hypothesis 3*). CTQ-SF Total Score was entered into the model as a predictor, group membership (i.e. GD vs. HCs) as the dependent variable, and age, sex, and level of education were entered as possible confounding variables. Due to very small numbers in some of the categories of level of education (e.g. $n=1$ for the category 'no school'), categories were grouped together before the variables were entered into the regression model. Level of education was recoded into a dichotomous variable with the categories 'school education' and 'tertiary education'. Similarly, to test whether some childhood trauma subtypes were stronger predictors of a diagnosis of GD than others (*Hypothesis 4*), a multiple logistic regression analysis was conducted with group membership (GD vs. HCs) as the dependent variable and the five subtypes of childhood trauma (CTQ-SF subscales) as predictors. Past 12-month stressful life events exposure was considered as a possible moderator of the relationship between childhood trauma and GD. Total LESS score (indicating level of past 12-month stress) was included in a two-way ANOVA to test whether stress exposure might moderate the relationship between the total CTQ-SF score and the presence of GD (*Hypothesis 5*). LESS scores were dichotomized into 'LESS low' and 'LESS high' using the median split method.

Results

Participant Demographics

Thirty-one (n = 31) adult patients with a primary diagnosis of GD were compared to 31 age- and sex-matched HCs. Approximately 61% of the GD patients were male and 39% were female. GD patients' ages ranged from 22 to 68 ($M = 47.97$, $SD = 11.06$). For just over half of the GD sample (52%), the highest level of education was Grade 11–12. More than one third of the GD participants were either pensioners (19%) or unemployed (19%). Approximately 58% of HCs were male and 42% were female. Age of HCs also ranged from 22 to 68 ($M = 47.19$, $SD = 11.25$). While largely similar in terms of age and sex, the two groups differed significantly with regards to level of education, with patients less educated than controls.

Descriptive Statistics By Group

The severity of childhood trauma reported by GD patients and HCs, i.e. the number and percentage of participants in each category of childhood trauma, including degree of severity of exposure, is depicted in Table 1.

According to cut-off scores for each CTQ-SF subscale (Bernstein and Fink 1998), approximately 42% of GD patients reported experiencing emotional abuse (≥ 10 points), 45% physical abuse (≥ 8 points), 26% sexual abuse (≥ 8 points), 42% emotional neglect (≥ 15 points) and 55% physical neglect (≥ 8 points). The rates of childhood trauma subtypes reportedly experienced by HC participants are markedly lower than those in the GD group.

Results of Hypothesis Testing

As shown in Table 2, the mean CTQ-SF Total Score of self-reported childhood trauma was significantly higher in the GD group ($M = 46.84$, $SD = 15.18$) than in the HC group ($M = 31.87$, $SD = 8.00$) ($t(46) = 4.86$, $p < 0.001$, $d = 1.23$) (*Hypothesis 1*). Similarly, the mean values of self-reported subtypes of childhood trauma were significantly higher in the GD patient group for all CTQ-SF subscales compared with the HC group (see Table 2). The mean LESS value in the GD group ($M = 224.06$, $SD = 100.02$) was more than twice the mean value in the HC group ($M = 94.54$, $SD = 76.57$). The mean PG-YBOCS score in this GD group was $M = 22.52$ ($SD = 6.55$).

In terms of GD severity, no statistically significant correlation was found between CTQ-SF Total Score and PG-YBOCS scores ($\rho(31) = -0.009$, $p = 0.962$) or any of the five

Table 1 Reported severity of childhood trauma by group: gambling disorder (GD) versus healthy controls (HCs)

CTQ-SF[a] subscales	Degree of childhood trauma [*n*(%)][b]				Cut-off scores[c] [*n*(%)][b]
	None or minimal	Low-moderate	Moderate-severe	Severe-extreme	
Emotional abuse	*[5–8]*[c]	*[9–12]*	*[13–15]*	*[16–25]*	*[≥ 10]*
GD[d]	14 (45.2)	10 (32.3)	5 (16.1)	2 (6.5)	13 (41.9)
HCs[e]	25 (80.6)	3 (9.7)	3 (9.7)	0 (0.0)	5 (16.1)
Physical abuse	*[5–7]*	*[8–9]*	*[10–12]*	*[13–25]*	*[≥ 8]*
GD	17 (54.8)	4 (12.9)	7 (22.6)	3 (9.7)	14 (45.2)
HCs	24 (77.4)	4 (12.9)	3 (9.7)	0 (0.0)	7 (22.6)
Sexual abuse	*[5]*	*[6–7]*	*[8–12]*	*[13–25]*	*[≥ 8]*
GD	19 (16.3)	4 (12.9)	4 (12.9)	4 (12.9)	8 (25.8)
HCs	27 (87.1)	1 (3.2)	2 (6.5)	1 (3.2)	3 (9.7)
Emotional neglect	*[5–9]*	*[10–14]*	*[15–17]*	*[18–25]*	*[≥ 15]*
GD	10 (32.3)	8 (25.8)	10 (32.3)	3 (9.7)	13 (41.9)
HCs	25 (80.6)	6 (19.4)	0 (0.0)	0 (0.0)	0 (0.0)
Physical neglect	*[5–7]*	*[8–9]*	*[10–12]*	*[13–25]*	*[≥ 8]*
GD	14 (45.2)	8 (25.8)	2 (6.5)	7 (22.6)	17 (54.8)
HCs	27 (87.1)	3 (9.7)	1 (3.2)	0 (0.0)	4 (12.9)

[a]*CTQ-SF* Childhood Trauma Questionnaire Short Form

[b]*n*(%) = frequency (percentage of frequency) per group and category

[c][] = range of scores for each degree category of childhood trauma (Bernstein and Fink 1998)

[d]*GD* gambling disorder

[e]*HCs* healthy controls

Table 2 Comparison of clinical data across groups: gambling disorder (GD) versus healthy controls (HCs)

Variable	Gambling disorder (GD)			Healthy controls (HCs)			*p*
Scales/subscales	*n*	*M (SD)*	Range	*n*	*M (SD)*	Range	
Emotional abuse	31	9.52 (3.68)	5–18	31	6.77 (2.94)	5–15	.002
Physical abuse	31	8.10 (3.16)	5–16	31	6.35 (1.82)	5–11	.011
Sexual abuse	31	7.84 (5.27)	5–24	31	5.61 (1.87)	5–13	.033
Emotional neglect	31	12.52 (4.86)	5–23	31	7.26 (3.23)	5–14	< .001
Physical neglect	31	8.87 (3.59)	5–16	31	5.87 (1.59)	5–11	< .001
CTQ-SF[a] total score	31	46.84 (15.18)	27–77	31	31.87 (8.00)	25–53	< .001
LESS[b]	16	224.06 (100.02)	58–393	13	94.54 (76.57)	0–48	.001
PG-YBOCS[c]	31	22.52 (6.55)	10–33	–	–	–	–

[a]*CTQ-SF* Childhood Trauma Questionnaire Short Form

[b]*LESS* Life Event Stress Scale

[c]*PG-YBOCS* Yale-Brown Obsessive Compulsive Scale adapted for Pathological Gambling

All *p*-values are two-tailed

CTQ-SF subscales and PG-YBOCS scores (emotional abuse: $\rho(31)=0.21$, $p=0.256$; physical abuse: $\rho(31)=-0.12$, $p=0.532$; sexual abuse: $\rho(31)=-0.09$, $p=0.639$; emotional neglect: $\rho(31)=0.08$, $p=0.679$; physical neglect: $\rho(31)=-0.24$, $p=0.196$) (*Hypothesis 2*).

The first logistic regression analysis demonstrated that the CTQ-SF Total Score made a significant contribution to prediction ($p=0.001$) (*Hypothesis 3*). Specifically, a 1 unit increase in the CTQ-SF Total Score increased the odds of being part of the GD group approximately 1.2 times (OR = 1.22; 95% confidence interval (CI) [1.09, 1.37]). Age and sex were not significant predictors of group membership, but level of education made a significant contribution to prediction ($p=0.002$) (OR = 37.54; 95% CI [3.88, 363.47]). Education level was therefore considered as a possible confounding variable in relation to prediction.

In investigating trauma subtypes as predictors of GD (*Hypothesis 4*), the second logistic regression analysis demonstrated that physical neglect made a significant contribution to prediction ($p=0.025$). Specifically, a 1 unit increase of the physical neglect score increased the odds of being part of the GD group approximately 1.9 times (OR = 1.88; 95% CI [1.08, 3.27]). Physical neglect was thus found to be a significant predictor of group membership, i.e. of the presence of GD. Emotional neglect did not reach significance at the alpha level of 0.05, but it was shown to be a significant predictor at the alpha level of 0.10 ($p=0.097$) (OR = 1.25; 95% CI [0.96, 1.62]). Since level of education was the only demographic variable shown to be a significant predictor of group membership (GD vs. HCs), it was entered into this model as well. Level of education also made a significant contribution to prediction ($p=0.001$), with lower level of education being associated with increased likelihood of the presence of GD (OR = 55.76; 95% CI [4.71, 660.77]).

All Spearman's rank-order bivariate correlations were significant: Group membership and CTQ-SF Total Score ($\rho=0.60$, $p<0.001$), group membership and LESS ($\rho=0.61$, $p=0.001$), and CTQ-SF Total Score and LESS ($\rho=0.579$, $p=0.001$). To test for a moderation effect (*Hypothesis 5*), it was investigated whether there is an interaction between group membership and past 12-month stressful life events exposure on total childhood trauma, where group membership (GD vs. HCs) and LESS (low vs. high) were the independent variables and CTQ-SF Total Score was the dependent variable. Descriptive statistics for the ANOVA are reported in Table 3.

Group membership and past 12-month stressful life events exposure were significantly associated with self-reported exposure to childhood trauma ($F(1,25)=7.082$, $p=0.01$) (see Fig. 1).

Simple main effects analysis showed that GD patients reported a significantly higher degree of childhood trauma than HCs when exposure to past 12-month stressful life events was low ($p<0.001$). However, there were no differences in the degree of childhood trauma between the GD and HC groups when exposure to current stressful life events was high ($p=0.67$). In other words, LESS only acted as a significant moderator of the relationship between childhood trauma and a GD diagnosis if LESS was low.

Discussion

Consistent with our hypotheses, the study supports a significant role for childhood trauma in GD in adulthood. Childhood trauma did not, however, predict the severity of the gambling problem. Physical neglect was a significant predictor of the presence

Table 3 Descriptive statistics for Two-Way ANOVA

Level of group membership	Level of LESS[c]	*M*	*SD*	*n*(%)[b]
Dependent variable: CTQ-SF[a] total score				
Gambling disorder (GD)	Low	51.80	13.88	5 (17.3)
	High	44.82	12.56	11 (37.9)
	Total[d]	47.00	12.95	16 (55.2)
Healthy controls (HCs)	Low	27.22	2.54	9 (31.0)
	High	42.25	8.62	4 (13.8)
	Total[e]	31.85	8.66	13 (44.8)
Total	Low	36.00	14.58	14 (48.3)
	High	44.13	11.40	15 (51.7)
	Total[f]	40.21	13.45	29 (100.0)

[a]*CTQ-SF* Childhood Trauma Questionnaire Short Form

[b]*n*(%) = frequency (percentage) of sample size per group and level of LESS

[c]*LESS* Life Event Stress Scale

[d]Total = Total of GD participants who completed LESS

[e]Total = Total of healthy controls who completed LESS

[f]Total = Total of sample that completed LESS

of GD. Findings also suggested that current stress acted as a moderator of the relationship between childhood trauma and GD, i.e. there was a significant association between childhood trauma and GD if stress exposure in the past 12 months was low.

Consistent with previous research, childhood trauma, as well as its five subtypes, was significantly higher in the GD patient group compared to the HC group (Felsher et al. 2010; Hodgins et al. 2010, 2012; Lane et al. 2016; Petry and Steinberg 2005; Roberts et al. 2017; Sharman et al. 2019). Our findings contribute to the growing evidence suggesting that there may be similarities in the aetiology of behavioural addictions (such as GD) and SUDs. Since increased rates of childhood trauma have also been reported by patients with putative behavioural addictions (Petry 2016), such as eating disorders (Alvarez et al. 2007), internet addiction (Dalbudak et al. 2014) and sexual compulsivity (McPherson et al. 2013), as well as in SUDs (e.g. Barrett et al. 2015), childhood trauma could be an underlying factor in both behavioural addictions and SUDs. It should be noted that increased rates of self-reported childhood trauma have been found in various psychiatric conditions, suggesting that childhood trauma exposure is not unique to GD. However, further study findings highlight the specific relationship between childhood trauma (including its subtypes) and GD.

Contrary to expectations and previous work, neither childhood trauma in general, nor any of its subtypes, were found to be significant predictors of gambling severity in this study (Felsher et al. 2010; Hodgins et al. 2010; Petry and Steinberg 2005). Future research should focus on other factors that might influence the severity of gambling-related problems which may possibly be addressed in the treatment setting.

In accordance with expectations, results showed that self-reported childhood trauma reliably distinguished between the GD and HC groups, with childhood trauma appearing to be a significant predictor of GD. In other words, childhood trauma can be considered a risk factor for the development of pathological gambling. These results support previous findings of childhood trauma as a risk factor for addictive disorders in general (Brydges et al.

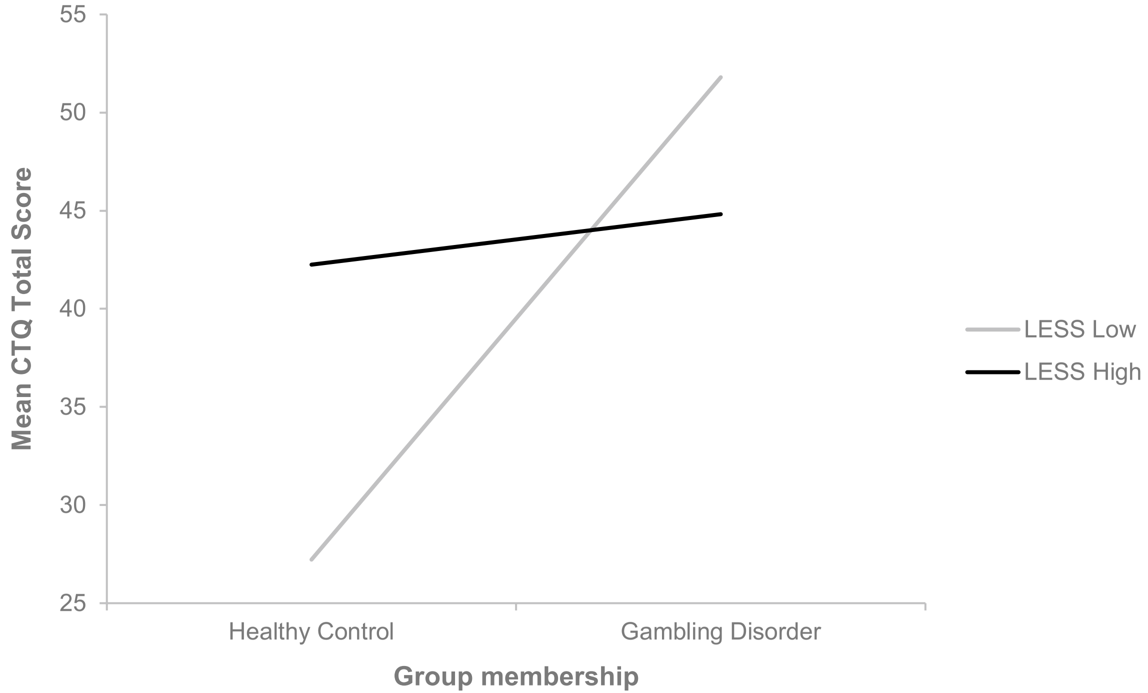

Fig. 1 Interaction plot: mean Childhood Trauma Questionnaire Short Form (CTQ-SF) total score by group membership (GD vs. HCs) by Life Events Stress Scale (LESS) score (Low vs. High)

2015), and pathological gambling specifically (Felsher et al. 2010; Hodgins et al. 2012; Sharman et al. 2019).

Our findings showed that physical neglect was the only specific predictor of a GD diagnosis. A possible explanation for this finding may be that individuals who have been exposed to physical neglect in childhood subconsciously seek material gain or a more glamorous lifestyle in adulthood, things that may be achieved through gambling. A study by Nixon et al. (2012) offers support for this argument, suggesting that some female pathological gamblers who had experiences of physical neglect in childhood described being drawn in by the glitz and glamour of gambling and being admired for winning and consequently having money (Nixon et al. 2012). Further, evidence from neurobiological studies shows that dopamine is released in a brain region called the nucleus accumbens during gambling activities, which reinforces the attractiveness of the rewards (money, in this case) (Berridge 2007). As with other sources of reward, money has been shown to enhance mesolimbic dopamine levels in the human striatum during gambling episodes, suggesting that the accumulation of money is what motivates many gamblers (e.g. Pessiglione et al. 2007). Perhaps this is even more so the case with those gamblers with a history of experiencing physical neglect.

Our findings also suggested a trend towards significance for childhood emotional neglect as a predictor of GD in adulthood. Emotional abuse, physical abuse and sexual abuse were not significant predictors of GD in our study. This may be explained by previous research findings suggesting that abuse has different psychobiological pathways from those found in neglect (McLaughlin and Sheridan 2016). While often overlooked in previous research, childhood neglect appears to play an important role in vulnerability to certain behavioural addictions. Further aetiological research with larger sample sizes is needed to consolidate these findings.

Results demonstrated that there was a significant difference in the degree of childhood trauma between GD patients and HCs when life event stress levels were low. In this instance, childhood trauma significantly predicted the presence of GD. However, when life event stress levels were high, childhood trauma no longer predicted group membership, i.e. the presence or absence of GD. These findings suggest that childhood trauma and high stress levels both contribute to a higher risk of pathological gambling behaviour. When exposure to life stressors is low, the severity of childhood trauma appears to play a more significant role in the development of gambling-related pathology. In conclusion, childhood trauma and current stressful life events both are factors that potentially influence the development of GD. Further, our findings are consistent with findings on childhood trauma and stress sensitization (Hammen et al. 2000; McLaughlin et al. 2010). There is also some evidence to suggest that current stressful life events potentially increase gambling urges (Elman et al. 2010). Therefore, an assessment of recent exposure to stressful life events may help to identify ‘triggers’ for relapse to the addictive behaviour.

Notably, although a positive association was found between reported exposure to childhood trauma and recent life stress, a causal relationship cannot be inferred. It appears that childhood trauma and recent life stress may have a bidirectional influence on each other in the sense that exposure to childhood trauma may be associated with greater risk of exposure to stressful life events and recent exposure may compound the impact of prior exposure in specific ways, but further research is needed to investigate this association—particularly in GD. It seems plausible that high levels of recent life stress may predispose an individual to develop GD, but in turn, GD may also increase the likelihood of being exposed to stressful life events (e.g. experiencing severe financial strain, relational difficulties, etc.), thus the direction of causality in relation to stressful life events is difficult to determine. As is evident from these findings, the association between childhood trauma and GD is complex, warranting exploration in larger samples.

Strengths and Limitations of the Study

One limitation of this study relates to the small sample size. In addition, the scale used to assess past 12-month life stress exposure was only introduced in this study approximately six months after the beginning of data collection. Therefore, only a subset of the GD and HC groups completed this measure. Furthermore, there were notable differences between the GD group and the HC group with regards to level of education. If possible, future work should prioritize matching GD patients with HCs from the same communities in order to control for demographic and environmental factors that may be associated with an increased likelihood of trauma exposure. In addition, although the diagnostic procedures followed in this study ensured that GD was the primary diagnosis within the clinical sample, GD is frequently comorbid with other psychiatric conditions (Sinclair et al. 2015). With a larger study sample, it would therefore be useful to attempt to control for comorbidity in the analyses. Future work should include investigation of the impact of comorbidity on the relationship between childhood trauma and GD.

Despite these limitations, there are also a number of strengths of this study. Previous research on childhood trauma in GD has usually only included individuals with pathological gambling and, in some cases, other patient groups. In this study, a healthy control group was included that was tested under the same study conditions. This allowed for a more accurate comparison of group-related differences in respect of reported exposure to childhood trauma. Furthermore, this study not only tested for associations between childhood trauma and GD, it also examined this association more carefully by exploring both total childhood trauma and specific subtypes as predictors of GD, as well as considering other possible factors that might influence this relationship, i.e. current stressful life events exposure. Previous studies on childhood trauma in GD have often only used childhood trauma in general (no subtypes) as a predictor (e.g. Black et al. 2013; Hodgins et al. 2010). Moreover, the study was supported by the South African Responsible Gambling Foundation (SARGF) and added to the existing literature base, including by exploring associations in a GD population based in the Global South.

Conclusions

Severity of childhood trauma was found to be significantly higher in a GD patient group compared with HCs. Childhood trauma was a significant predictor of a diagnosis of GD, with physical neglect being the single trauma subtype to significantly increase odds of GD in adulthood. Stressful life events moderated the relationship between childhood trauma and GD. The study results highlight the importance of considering trauma history in behavioural addictions, as suggested previously (e.g. Black et al. 2012; Hodgins et al. 2010; McCormick et al. 2012), as well as assessing the possible impact of recent stressful life events on symptomatology. In conclusion, the findings support a link between childhood trauma and GD, with current stress as a moderating variable, and may be useful for future individualized therapeutic strategies.

Acknowledgements We would like to acknowledge Mrs Tali Lanesman, Mr Lian Taljaard, Dr Heidi Sinclair and Mrs Patricia van Zyl for assisting with data collection, as well as Professor Martin Kidd for assisting with the statistical analyses conducted in this research study. The financial assistance of the National Research Foundation (NRF) (reference number: CPRR150622119950) towards this research is hereby acknowledged. Opinions expressed and conclusions arrived at are those of the author and are not necessarily to be attributed to the NRF. The Claude Leon Foundation is acknowledged for providing financial support with respect to participants' travel reimbursements.

Compliance with Ethical Standards

Conflict of interest Christine Lochner has received a research grant from the South African National Research Foundation (NRF). Natascha S. Horak has received a grantholder-linked Masters bursary from the NRF. Gillian Eagle and Dan J. Stein declare that they have no conflict of interest. All authors contributed to the study conception and design. Material preparation, data collection and analysis were performed by Natascha S. Horak and supervised by Gillian Eagle and Christine Lochner. The first draft of the manuscript was written by Natascha S. Horak, and Gillian Eagle and Christine Lochner assisted in refining this and subsequent versions of the manuscript. All authors read and approved the final manuscript.

Ethical Approval The overarching research project involving human participants was approved by the respective Research Ethics Committees at Stellenbosch University (reference number: 14/05/053) and at the University of Cape Town (reference number: 770/2014), and has been conducted in accordance with the ethical standards as laid down in the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. In addition, this study was approved by the Human Research Ethics Committee at the University of Witwatersrand (Protocol number: MCLIN/17/004 IH), authorising the first author (NSH) to conduct this sub-study. Participation in the study was on a voluntary basis. All participants provided informed written consent for participation. Participants were compensated for their time and effort in the form of modest grocery vouchers, and transport was provided where necessary.

References

Alvarez, J., Pavao, J., Baumrind, N., & Kimerling, R. (2007). The relationship between child abuse and adult obesity among California women. *American Journal of Preventive Medicine, 33*(1), 28–33.

American Psychiatric Association. (2013a). *Diagnostic and statistical manual of mental disorders* (5th ed.). Washington, DC: American Psychiatric Association.

American Psychiatric Association. (2013b). *Highlights of changes from DSM-IV-TR to DSM-5*. Retrived January 6, 2015, from https://www.dsm5.org/Documents/changesfromdsm-iv-trtodsm-5.pdf.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders: DSM-IV-TR*. Washington, DC: American Psychiatric Association.

Barrett, E. L., Teesson, M., Chapman, C., Slade, T., Carragher, N., & Mills, K. (2015). Substance use and mental health consequences of childhood trauma: An epidemiological investigation. *Drug and Alcohol Dependence, 146*, e217–e218.

Bergevin, T., Gupta, R., Derevensky, J., & Kaufman, F. (2006). Adolescent gambling: Understanding the role of stress and coping. *Journal of Gambling Studies, 22*(2), 195–208.

Bernstein, D. P., & Fink, L. (1998). *Childhood trauma questionnaire: A retrospective self-report manual*. San Antonio, TX: The Psychological Corporation.

Bernstein, D. P., Stein, J. A., Newcomb, M. D., Walker, E., Pogge, D., Ahluvalia, T., et al. (2003). Development and validation of a brief screening version of the childhood trauma questionnaire. *Child Abuse & Neglect, 27*(2), 169–190.

Berridge, K. C. (2007). The debate over dopamine's role in reward: The case for incentive salience. *Psychopharmacology, 191*(3), 391–431.

Black, D. W., Shaw, M., McCormick, B., & Allen, J. (2013). Pathological gambling: Relationship to obesity, self-reported chronic medical conditions, poor lifestyle choices, and impaired quality of life. *Comprehensive Psychiatry, 54*(2), 97–104.

Black, D. W., Shaw, M. C., McCormick, B. A., & Allen, J. (2012). Marital status, childhood maltreatment, and family dysfunciton: A controlled study of pathological gambling. *Journal of Clinical Psychiatry, 73*(10), 1293–1297.

Brydges, N. M., Holmes, M. C., Harris, A. P., Cardinal, R. N., & Hall, J. (2015). Early life stress produces compulsive-like, but not impulsive, behavior in females. *Behavioral Neuroscience, 129*(3), 300–308.
Dalbudak, E., Evren, C., Aldemir, S., & Evren, B. (2014). The severity of internet addiction risk and its relationship with the severity of borderline personality features, childhood traumas, dissociative experiences, depression and anxiety symptoms among Turkish university students. *Psychiatry Research, 219*(3), 577–582.
Dudeck, M., Vasic, N., Otte, S., Streb, J., Wingenfeld, K., Grabe, H. J., et al. (2015). Factorial validity of the short form of the Childhood Trauma Questionnaire (CTQ–SF) in German psychiatric patients, inmates, and university students. *Psychological Reports, 116*(3), 685–703.
Edalati, H., & Krank, M. (2016). Childhood maltreatment and development of substance use disorders: A review and model of cognitive pathways. *Trauma, Violence, & Abuse, 17*(5), 454–467.
Elman, I., Tschibelu, E., & Borsook, D. (2010). Gender differences in psychosocial stress and in its relationship to gambling urges in individuals with pathological gambling. *The American Journal on Addictions, 19*, 332–339.
Felsher, J. R., Derevensky, J. L., & Gupta, R. (2010). Young adults with gambling problems: The impact of childhood maltreatment. *International Journal of Mental Health and Addiction, 8*(4), 545–556.
Grant, J. E., Steinberg, M. A., Kim, S. W., Rounsaville, B. J., & Potenza, M. N. (2004). Preliminary validity and reliability testing of a structured clinical interview for pathological gambling. *Psychiatry Research, 128*(1), 79–88.
Grassi-Oliveira, R., Cogo-Moreira, H., Salum, G. A., Brietzke, E., Viola, T. W., Manfro, G. G., et al. (2014). Childhood trauma questionnaire (CTQ) in Brazilian samples of different age groups: Findings from confirmatory factor analysis. *PLoS ONE, 9*(1), e87118.
Hammen, C., Henry, R., & Daley, S. E. (2000). Depression and sensitization to stressors among young women as a function of childhood adversity. *Journal of Consulting and Clinical Psychology, 68*(5), 782–787.
Harmon, D. K., Masuda, M., & Holmes, T. H. (1970). The social readjustment rating scale: A cross-cultural study of Western Europeans and Americans. *Journal of Psychosomatic Research, 14*(4), 391–400.
Hodgins, D. C., Schopflocher, D. P., El-Guebaly, N., Casey, D. M., Smith, G. J., Williams, R. J., et al. (2010). The association between childhood maltreatment and gambling problems in a community sample of adult men and women. *Psychology of Addictive Behaviors: Journal of the Society of Psychologists in Addictive Behaviors, 24*(3), 548–554.
Hodgins, D. C., Schopflocher, D. P., Martin, C. R., El-Guebaly, N., Casey, D. M., Currie, S. R., et al. (2012). Disordered gambling among higher-frequency gamblers: Who is at risk? *Psychological Medicine, 42*(11), 2433–2444.
Holmes, T. H., & Rahe, R. H. (1967). The social readjustment rating scale. *Journal of Psychosomatic Research, 11*(2), 213–218.
Hughes, K., Lowey, H., Quigg, Z., & Bellis, M. A. (2016). Relationships between adverse childhood experiences and adult mental well-being: Results from an English national household survey. *BMC Public Health, 16*(1), 222.
Jewkes, R. K., Dunkle, K., Nduna, M., Jama, P. N., & Puren, A. (2010). Associations between childhood adversity and depression, substance abuse and HIV and HSV2 incident infections in rural South African youth. *Child Abuse and Neglect, 34*(11), 833–841.
Komaroff, A. L., Masuda, M., & Holmes, T. H. (1968). The social readjustment rating scale: A comparative study. *Journal of Psychosomatic Research, 12*(2), 121–128.
Lane, W., Sacco, P., Downton, K., Ludeman, E., Levy, L., & Tracy, J. K. (2016). Child maltreatment and problem gambling: A systematic review. *Child Abuse and Neglect, 58*, 24–38.
McCormick, J., Delfabbro, P., & Denson, L. A. (2012). Psychological vulnerability and problem gambling: An application of Durand Jacobs' general theory of addictions to electronic gaming machine playing in Australia. *Journal of Gambling Studies, 28*(4), 665–690.
McLaughlin, K. A., Conron, K. J., Koenen, K. C., & Gilman, S. E. (2010). Childhood adversity, adult stressful life events, and risk of past-year psychiatric disorder: A test of the stress sensitization hypothesis in a population-based sample of adults. *Psychological Medicine, 40*(10), 1647–1658.
McLaughlin, K. A., & Sheridan, M. A. (2016). Beyond cumulative risk: A dimensional approach to childhood adversity. *Current Directions in Psychological Science, 25*(4), 239–245.
McPherson, S., Clayton, S., Wood, H., Hiskey, S., & Andrews, L. (2013). The role of childhood experiences in the development of sexual compulsivity. *Sexual Addiction & Compulsivity, 20*(4), 259–278.
Nixon, G., Evans, K., Grant Kalischuk, R., Solowoniuk, J., McCallum, K., & Hagen, B. (2012). Female gambling, trauma, and the not good enough self: An interpretative phenomenological analysis. *International Journal of Mental Health and Addiction, 11*(2), 214–231.

Pallanti, S., DeCaria, C. M., Grant, J. E., Urpe, M., & Hollander, E. (2005). Reliability and validity of the pathological gambling adaptation of the Yale-Brown obsessive-compulsive scale (PG-YBOCS). *Journal of Gambling Studies / Co-Sponsored by the National Council on Problem Gambling and Institute for the Study of Gambling and Commercial Gaming, 21*(4), 431–443.

Pessiglione, M., Schmidt, L., Draganski, B., Kalisch, R., Lau, H., Dolan, R. J., et al. (2007). How the brain translates money into force: A neuroimaging study of subliminal motivation. *Science, 316*(5826), 904–906.

Petry, N. M. (2016). *Behavioral addictions: DSM-5 and beyond*. New York: Oxford University Press.

Petry, N. M., & Steinberg, K. L. (2005). Childhood maltreatment in male and female treatment-seeking pathological gamblers. *Psychology of Addictive Behaviors, 19*(2), 226–229.

Rahe, R. H., Mahan, J. L., Jr., & Arthur, R. J. (1970). Prediction of near-future health change from subjects' preceding life changes. *Journal of Psychosomatic Research, 14*(4), 401–406.

Roberts, A., Sharman, S., Coid, J., Murphy, R., Bowden-Jones, H., Cowlishaw, S., et al. (2017). Gambling and negative life events in a nationally representative sample of UK men. *Addictive Behaviors, 75*, 95–102.

Scherrer, J. F., Xian, H., Kapp, J. M. K., Waterman, B., Shah, K. R., Volberg, R., et al. (2007). Association between exposure to childhood and lifetime traumatic events and lifetime pathological gambling in a twin cohort. *The Journal of Nervous and Mental Disease, 195*(1), 72–78.

Sharman, S., Butler, K., & Roberts, A. (2019). Psychosocial risk factors in disordered gambling: A descriptive systematic overview of vulnerable populations. *Addictive Behaviors, 99*, 106071. https://doi.org/10.1016/j.addbeh.2019.106071.

Sheehan, D., Janavs, J., Baker, R., Harnett-Sheehan, K., Knapp, E., Sheehan, M., et al. (2006). *Mini International Neuropsychiatric Interview Version 5.0.0 DSM-IV*. Sheehan DV & Lecrubier Y. Retrived November 14, 2014, from https://narr.bmap.ucla.edu/docs/MINI_v5_002006.pdf.

Sheehan, D., Lecrubier, Y., Sheehan, H., Amorim, P., Janavs, J., Weiller, E., et al. (1998). The mini-international neuropsychiatric interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry, 59*, 22–33.

Sinclair, H., Pasche, S., Pretorius, A., & Stein, D. J. (2015). Clinical profile and psychiatric comorbidity of treatment-seeking individuals with pathological gambling in South-Africa. *Journal of Gambling Studies, 31*, 1227–1243.

Spinhoven, P., Penninx, B. W., Hickendorff, M., van Hemert, A. M., Bernstein, D. P., & Elzinga, B. M. (2014). Childhood Trauma Questionnaire: Factor structure, measurement invariance, and validity across emotional disorders. *Psychological Assessment, 26*(3), 717–729.

Stein, D. J., Billieux, J., Bowden-Jones, H., Grant, J. E., Fineberg, N., Higuchi, S., et al. (2018). Balancing validity, utility and public health considerations in disorders due to addictive behaviours. *World Psychiatry, 17*(3), 363–364.