RESEARCH

From trauma to tolerance: Psychological predictors of gambling harm among UK Armed Forces Veterans

Adanma Ekenna[a], Dana Dekel[a], Hilary Engward[b], Lauren Godier-MacBard[b], Christopher Kay[b], Thomas Kersey[b], Matt Fossey[b] and Simon Dymond[a,c]

ABSTRACT

Introduction: Veterans face disproportionately high risks of gambling-related harm, influenced by trauma exposure, emotional dysregulation, and maladaptive coping. However, little is known about how these interconnected psychological traits contribute to gambling harm severity in Veterans. **Methods:** A cross-sectional survey of 184 UK Armed Forces Veterans assessed socio-demographic and military characteristics, gambling engagement, posttraumatic stress disorder (PTSD), adverse childhood experiences (ACEs), impulsivity, intolerance of uncertainty (IU), and psychological flexibility (PsyFlex). Associations with gambling harm severity, measured using the Problem Gambling Severity Index (PGSI), were examined through chi-squared tests, correlations, and stepwise logistic regression. **Results:** Of the sample, 25% scored ≥1 on the PGSI, with 3.3% meeting the threshold for problem gambling. Gambling harm severity was significantly associated with PTSD re-experiencing and avoidance, household dysfunction ACE, negative and positive urgency, inhibitory IU, and low PsyFlex. Regression analysis identified PTSD re-experiencing (OR 2.16), PTSD avoidance (OR 0.27), inhibitory IU (OR 7.96), and prospective IU (OR 0.12) as significant predictors. **Discussion:** The findings underscore the multi-faceted psychological vulnerabilities underlying gambling harm in Veterans, thus supporting the need for trauma-informed, personalized interventions. Targeted screening for IU, impulsivity, and PsyFlex could improve prevention and treatment efforts.

Key words: gambling, impulsivity, intolerance, psychological flexibility, trauma, Veterans

RÉSUMÉ

Introduction : Les vétéran·e·s affrontent des risques démesurément élevés de préjudices causés par les jeux de hasard, en raison de leur exposition aux traumatismes, de leur dysrégulation émotionnelle et de leur maladaptation. Cependant, on sait peu de choses sur l'apport de ces caractéristiques psychologiques interconnectées à la gravité des préjudices causés par les jeux de hasard chez les vétéran·e·s. **Méthodologie :** Un sondage transversal auprès de 184 vétérans des Forces armées britanniques a permis d'évaluer les caractéristiques sociodémographiques et militaires, la participation aux jeux de hasard, le trouble de stress post-traumatique (TSPT), les expériences négatives de l'enfance (ENE), l'impulsivité, l'intolérance à l'incertitude (II) et la flexibilité psychologique (FlexPsy). Les associations avec la gravité des préjudices causés par les jeux de hasard, mesurées à l'aide de l'indice de gravité du jeu excessif (IGJE), ont été examinées à l'aide du test du chi carré, des corrélations et de la régression logistique graduelle. **Résultats :** Au sein de l'échantillon, 25 % ont obtenu ≥1 à l'IGJE, et 3,3 % atteignaient le seuil de problèmes de jeu. La gravité des préjudices causés par les jeux de hasard entretenait un lien significatif avec la réexpérience et l'évitement du TSPT, les ENE provoquant un dysfonctionnement du ménage, l'urgence négative et positive, l'II inhibitoire et une faible FlexPsy. L'analyse de régression a établi que la réexpérience du TSPT (RC 2,16), l'évitement du TSPT (RC 0,27), l'II inhibitoire (RC 7,96) et l'II prospective (RC 0,12) étaient des prédicteurs importants. **Discussion :** Les résultats font ressortir les vulnérabilités psychologiques multidimensionnelles qui sous-tendent les préjudices causés par les jeux de hasard chez les vétéran·e·s, ce qui appuie le besoin de personnaliser les interventions tenant compte des traumatismes. Le dépistage ciblé de l'II, de l'impulsivité et de la FlexPsy pourrait améliorer les efforts de prévention et de traitement.

Mots-clés : flexibilité psychologique, impulsivité, intolérance, jeux de hasard, traumatisme, vétéran·e·s

[a] Centre for Military Gambling Research, Swansea University, Singleton Campus, Swansea, United Kingdom
[b] Veterans and Families Institute for Military Social Research, Anglia Ruskin University, Chelmsford, United Kingdom
[c] Department of Psychology, Reykjavík University, Reykjavík, Iceland

Correspondence should be addressed to Simon Dymond at the Centre for Military Gambling Research, Swansea University, Singleton Campus, Swansea, United Kingdom, SA2 8PP. Email: s.o.dymond@swansea.ac.uk.

LAY SUMMARY

This study looked at why some UK Armed Forces Veterans experience harm from gambling and which psychological factors place them at greater risk. We surveyed 184 male Veterans who had gambled in the past year. They answered questions about their mental health, childhood experiences, impulsivity, ability to handle uncertainty, and how flexible they are in coping with difficult thoughts and feelings. Around 1 in 4 Veterans showed signs of gambling-related harm. Veterans with stronger symptoms of posttraumatic stress disorder, especially intrusive memories and avoidance of reminders, were more likely to experience gambling problems. Those who grew up in unstable or stressful households were also at higher risk. Acting impulsively when feeling strong emotions, as well as feeling distressed by uncertain situations, were further linked with gambling harm. In contrast, Veterans who were more psychologically flexible — that is, those that could manage uncomfortable emotions without being overwhelmed — were less likely to experience gambling problems. Overall, the study shows that gambling harm among Veterans is shaped by past trauma, early adversity, emotional regulation difficulties, and coping styles. These findings highlight the importance of trauma-informed support and treatments that help Veterans build healthier ways of managing distress and uncertainty, such as Acceptance and Commitment Therapy (ACT).

RÉSUMÉ GRAND PUBLIC

Cette étude a évalué pourquoi certains vétérans des Forces armées britanniques éprouvent des préjudices causés par les jeux de hasard et quels facteurs psychologiques les rendent plus à risque. Les auteur·rice·s ont sondé 184 vétérans qui s'étaient adonnés à des jeux de hasard au cours de l'année précédente. Ceux-ci ont répondu à des questions au sujet de leur santé mentale, des expériences de leur enfance, de leur impulsivité, de leur capacité à gérer l'incertitude et de leur flexibilité à composer avec les pensées et sentiments difficiles. Environ un vétéran sur quatre a démontré des signes de préjudices causés par les jeux de hasard. Les vétérans ayant des symptômes plus intenses de trouble de stress post-traumatique, particulièrement les souvenirs intrusifs et l'évitement des souvenirs, étaient plus susceptibles d'éprouver des problèmes de jeu. Les vétérans qui avaient grandi dans des ménages instables ou stressants étaient également plus à risque. Les gestes impulsifs lors de fortes émotions et les sentiments de détresse en cas de situations incertaines étaient également liés aux préjudices causés par les jeux de hasard. En revanche, les vétérans qui démontraient plus de flexibilité psychologique, c'est-à-dire qu'ils pouvaient gérer des émotions désagréables sans se sentir bouleversés, étaient moins susceptibles d'éprouver des problèmes de jeu. Dans l'ensemble, l'étude révèle que les préjudices causés par le jeu chez les vétéran·e·s sont forgés par les traumatismes passés, l'adversité précoce, les difficultés de régulation émotionnelle et les styles d'adaptation. Ces observations font ressortir l'importance d'un soutien tenant compte des traumatismes, de même que des traitements qui aident les vétéran·e·s à trouver des façons plus saines de gérer leur détresse et leur incertitude, telles que la thérapie d'acceptation et d'engagement (TAE).

INTRODUCTION

Gambling disorder is a recognized behavioural addiction[1] characterized by an inability to control impulses or urges to perform actions that provide short-term gratification yet may lead to negative outcomes.[2-5] Gambling harms are the adverse effects from gambling on the health and well-being of individuals, families, communities, and society.[6] Gambling harm severity is typically conceptualized along a continuum — starting with low-risk, then moderate-risk, and then problem gambling — on the Problem Gambling Severity Index (PGSI).[7] However, many population-based studies, including the present investigation, use a binary PGSI cut (0 = no harm; 1+ = any harm) to distinguish the presence versus absence of gambling harm. This operationalization aligns with public health approaches that identify individuals experiencing any degree of harm while acknowledging the broader continuum framework.

As gambling harm emerges as a growing public health concern, Veterans are increasingly recognized as a particularly vulnerable group. Prevalence estimates range from 4.6% for potential problem gambling (PG),[8] and between 4.2%[9] and 2.2% for at-risk and problem gambling (ARPG).[10] ARPG includes individuals in the moderate-risk and problem gambling categories of the PGSI. We have noted that these estimates are higher than in age- and sex-matched non-Veteran groups,[11] and they might be attributable to increased emotional vulnerabilities stemming from emotional suppression and trauma.[12-15] Understanding the psychological factors that contribute to gambling harm in this group is therefore critical for targeted prevention and intervention.

Central to gambling disorder is impulsivity, which often stems from emotion dysregulation and elevated urgency in posttraumatic stress disorder (PTSD),[16] adverse childhood experiences (ACEs),[17] and intolerance of uncertainty (IU).[18] These interrelated factors are linked to risky decision making, increasing vulnerability to gambling as a maladaptive coping strategy,19 especially among Veterans with complex trauma histories.20

Co-occurring PTSD has long been associated with gambling problems among Veterans.[8,21] Veterans are nearly seven times more likely than non-Veterans

to meet the criteria for complex PTSD,[11] and those with a PTSD diagnosis exhibit stronger cognitive distortions related to gambling.22 The bidirectional comorbidity of PTSD and gambling disorder increases vulnerability to distress, suicidal tendencies, greater mental health service use, and gambling as a coping mechanism for negative affect, social pressure, and excitement.[16,23-26] These findings indicate that those with a PTSD diagnosis may be more vulnerable both to initiating gambling and to experiencing harm from gambling.

Beyond PTSD, ACEs further compounds vulnerability to gambling harm. Evidence suggests that childhood trauma, such as abuse, neglect, or household dysfunction, is associated with increased impulsivity and a propensity to engage in high-risk behaviours, including problem gambling.[8,10,27,28] The cumulative impact of early adversity and trauma exposure during military service manifests as heightened mental health vulnerabilities,[29,30] which could present as IU and psychological inflexibility in the current inquiry.

Impulsivity is a predisposition toward rapid, unplanned reactions to internal or external stimuli without regard to the negative consequences of these reactions to the impulsive individual or to others.31 While sensation seeking may drive gambling frequency, other impulsivity facets predict gambling harm.[32] Elevated impulsivity has been associated with gambling disorder[33] and is exaggerated in the presence of trauma[16,34] in the general population[35] and Veterans.[16] The current study seeks to explore impulsivity as a predictor of gambling harm severity among Veterans.

The concept of IU is a dispositional cognitive bias to consider ambiguous and uncertain situations as threatening and distressing resulting in cognitive and behavioural attempts to avoid these events.[36,37] Among non-Veterans, higher IU is positively associated with increased gambling urges and involvement.[19] Studies among Veterans have linked IU to trauma symptoms[38-40] and emotional psychopathology.[40,41] Given the exposure to trauma evidenced by PTSD and ACEs as a proxy in this inquiry, heightened IU may contribute to gambling behaviour among Veterans.

Conversely, psychological flexibility (PsyFlex), the ability to adapt to internal experiences while pursuing meaningful goals,[42] has emerged as a protective factor against trauma symptoms in Veterans.[43-45] PsyFlex has emerged as a key concept in interventions employed in Acceptance and Commitment Therapy (ACT).[46] ACT seeks to enhance PsyFlex through six core processes: acceptance, cognitive defusion, self-as-context, present-moment awareness, values, and committed action. Together, these processes help individuals engage in value-driven behaviours while reducing the dominance of distressing inner experiences on overt actions.[42] Although there is limited evidence of the role of PsyFlex among Veterans who gamble,[47] ACT is known to improve trauma and gambling outcomes.[48] To date, little is known about the predictive role of PsyFlex on gambling harm severity.

In addition to psychological factors, the type of gambling activity could reflect different motivations and risk profiles.[49] Non-strategic gambling is often associated with motivation to escape or avoid emotional distress.[50] In contrast, strategic gambling has been linked to arousal-seeking and sensation-seeking traits.[51] Veterans frequently engage in both forms of gambling.[8,11] The type of gambling might influence the development and maintenance of gambling problems.[49] In older Veteran cohorts as ours, non-strategic gambling forms may predominate due to their accessibility and use as a means of emotional escape, aligning to the affect-regulation pathways such as trauma-related distress, impulsivity, and IU examined in this study. These behavioural distinctions could intersect with gambling harm severity classifications.

Gambling harm severity can be categorized into PGSI scores of 0 and 1+, where ARPG have been used to refer to low-risk and moderate-risk gambling, respectively,[52,53] as adopted in this study. This grouping is particularly relevant for preventive interventions, as the presence of correlates of problem gambling within this group indicates significant risk.[7] Understanding these gradations of gambling harm is essential for identifying individuals at elevated risk.

Building on our previous work,[11,54,55] the current study aimed to explore the role of PTSD, ACEs, impulsivity, IU, and PsyFlex among UK Veterans with past-year experience of gambling. The study aimed to describe types of gambling activities, examine the distribution of these key psychological factors, ascertain their interrelationships and associations with gambling harm severity, and identify significant predictors of gambling harm severity.

METHODS

Participants and ethics

We conducted a cross-sectional online survey. Respondents had to be former members of HM Armed Forces

who were residing in the UK and could provide a verified service number. In the UK, a Veteran is someone who has completed at least one day of paid service. Recruitment was conducted through social media and calls disseminated via national Veterans' organizations. Following completion of an initial survey, participants could consent to complete further questions. Here, we report an analysis of responses obtained by this subset of Veterans who consent to complete the additional survey questions. Of 226 participants reporting recent gambling history, n = 184 provided complete data and were included in the final analysis (mean age = 66.5; SD = 8.7, range 35-82 years). A post-hoc sensitivity analysis using G*Power[56] for binary logistic regression predicting gambling harm severity from the mental health variables with $\alpha = 0.05$ indicated that a sample size of n = 184 has 95.2% power to detect an odds ratio of 0.474 or lower.

Measures

The study assessed socio-demographic characteristics, military demographics, gambling participation and severity, PTSD, ACEs, impulsivity, IU, and PsyFlex among UK Veterans.

For socio-demographic characteristics, respondents reported their age, sex, gender, ethnicity, relationship status, highest qualification, accommodation type, and living situation (e.g., alone, with family).

For military demographics, Veterans provided their service number, enlistment and discharge dates, years served, branch, trade, discharge type, rank at discharge, number of deployments, and deployment locations (n=37; see Supplementary Table 1).

For gambling engagement, Veterans were asked whether they had gambled in the past year and, if they had, to identify one or more of 23 types of gambling activities (see Supplementary Table 2).

For gambling harm severity, the nine-item PGSI measure was used for assessing participants who reported past-year gambling.[7] Respondents rated items such as "Have you bet more than you could really afford to lose?" on a 4-point scale from "Never" (0) to "Almost Always" (3). Total scores on the PGSI range from 0 (indicative of non-problem gambling), 1-2 (low-risk gambling), 3-7 (moderate-risk gambling), and 8+ (problem gambling). For present purposes, we classified participants' PGSI scores as either 0 or 1+ (capturing the combined at-risk/problem gambling categories; ARPG). At-risk and problem gambling (ARPG) describes levels of gambling severity associated with harm, encompassing the moderate-risk and problem gambling ranges of the PGSI. Dichotomizing PGSI scores as either 0 or 1+ captures the full spectrum of gambling harms. Internal consistency of the PGSI was excellent ($\alpha = 0.900$).

The PTSD Checklist for DSM-5 (PCL-5)[57] is a 20-item self-report measure assessing symptoms of PTSD based on DSM-5 criteria. PTSD symptoms were assessed across four clusters: re-experiencing (e.g., distressing memories or flashbacks), avoidance (of trauma-related stimuli), negative alterations in cognition and mood (e.g., guilt, emotional numbing), and hyper-arousal (e.g., irritability, sleep and concentration problems).[2] Respondents rated each of the 20 items on a scale from 0 (not at all) to 4 (extremely), with scores ranging from 0 to 80. Scores greater than 33 indicated clinically significant PTSD.[58-60] In this study, the PCL-5 was used as both a continuous measure and to explore associations between specific PTSD symptom clusters and gambling harm severity. The reliability was excellent ($\alpha = 0.964$).

The 10-item Adverse Childhood Experiences (ACE-10) questionnaire[61] was used to screen for exposure to 1) emotional, physical, and sexual abuse, 2) emotional and physical neglect, which were classified as direct maltreatment, and 3) five household dysfunctions classified as indirect trauma. Higher scores indicate exposure to a higher number of adverse childhood experiences. Internal consistency was reliable ($\alpha = 0.799$).

The Short Urgency-Premeditation-Perseverance-Sensation Seeking-Positive Urgency Impulsive Behavior Scale (S-UPPS-P)[62] was administered during the baseline session to measure impulsivity. The S-UPPS-P is a 20-item self-report inventory that uses a four-point Likert scale to assess five subscales of impulsive personality (negative urgency [NU], lack of perseverance, lack of premeditation, sensation seeking, positive urgency [PU]). Higher scores indicate more impulsive behaviour. Each subscale demonstrated reliable internal consistency in the present study (NU α =.824, lack of perseverance α = .666, lack of premeditation α =.818, sensation seeking α =.570, PU α =.804).

The Intolerance of Uncertainty Scale – 12 (IUS-12)[36] was used to assess individuals' dispositional responses to uncertainty: prospective IU (intolerance

of uncertainty, i.e., desire for predictability) and inhibitory IU (paralysis in the face of uncertainty). Higher scores indicate greater intolerance of uncertainty. In the present study, the scale demonstrated excellent internal consistency ($\alpha = 0.893$).

The PsyFlex questionnaire[42] is a six-item self-report measure of psychological flexibility that was used to assess the extent to which individuals can stay open, present, and engaged with their values despite difficult thoughts and feelings. Higher scores reflect greater PsyFlex. Internal consistency was reliable ($\alpha = 0.864$).

Statistical analysis

Descriptive statistics were calculated for all variables, including frequencies and percentages for categorical variables, as well as means with standard deviations for continuous measures. Tests of normality were conducted on continuous variables, and those not normally distributed were log-transformed to meet assumptions for parametric testing. Chi-squared tests of independence were used to examine associations between categorical predictors and gambling harm severity (PGSI: 0 vs. 1/1+). Interrelationships between variables were assessed with Pearson's correlations. Binary logistic regression was then conducted to identify significant predictors of gambling harm severity, using both transformed and categorical variables as appropriate. All statistical tests were performed at $\alpha = 0.05$. All statistical analyses were conducted using JASP, version 0.19.3 (JASP Team, Amsterdam, Netherlands).

RESULTS

Socio-demographic characteristics

Table 1 shows the socio-demographic profile of the sample. All respondents identified as male, most (71.7%) were aged between 55 and 74 years, resided in England (84%), were white (98%), and reported having completed secondary (high school) education up to GCSE A*-C level (21%). Veterans were married in their first and only marriage (25.5%) and lived with a spouse or partner (71.2%) and owned their homes (64.7%). Half of respondents were retired, with 24.5% in full-time employment. Most found employment within three months after service, and most reported their military qualifications were recognized occasionally

Table 1. Socio-demographic characteristics of the sample

Variables	N	%
Age (y)		
35-54	14	7.6
55-74	132	71.7
75-85	38	20.7
Sex		
Male	184	100
Female	0	0
Gender		
Male	183	99.5
Female	1	0.5
Residence		
England	155	84.2
Northern Ireland	2	1.1
Scotland	16	8.7
Wales	11	6.0
Ethnicity		
White	180	97.9
Mixed or multiple ethnic groups	2	1.1
Black, Black British, Caribbean or African	1	0.5
Other	1	0.5
Highest educational qualification		
No formal qualification	23	12.5
Entry certificate	6	3.3
GCSE D-G	18	9.8
GCSE A*-C	38	20.7
AS/A level	18	9.8
Certificate of HE	31	16.8
Bachelor's degree	30	16.3
Master's degree	17	9.2
Doctorate	3	1.6
Relationship		
Single	13	7.1
In a relationship	11	6.0
Co-habiting	5	2.7
Married-first and only marriage	47	25.5
Married-second or later marriage	4	2.2
Separated	18	9.8
Divorced	12	6.5
Widowed	1	0.5
Other	73	39.7

(*Continued*)

Table 1. Continued

Variables	N	%
Other relationship		
Divorced, co-habiting with a partner	1	
Unspecified	72	
Home arrangement*		
Live alone	41	22.3
Children under 18	18	9.8
Children over 18	23	12.5
Spouse/partner	131	71.2
Other family	4	2.2
Non-family	3	1.6
Other home arrangements	2	1.0
Accommodation		
Owner occupied flat or house	119	64.7
Rented from local authority	26	14.1
Privately rented flat or house	19	10.3
Domestic/family	12	6.5
Other	5	2.7
Sheltered housing	2	1.1
Independent living	1	0.5

* Multiple options selected.

(Supplementary Table 1). More than half of the respondents were not receiving state benefits, and most monthly incomes ranged between £1,000 and £1,500. Overdrafts were the most common debt type, with most owing between £1,000 and £5,000 (Supplementary Table 2).

Military demographics

Table 2 shows the military demographic characteristics of the sample. About one-third of respondents (33.2%) had served between one and 10 years. The overall mean length of service was 17.4 years (SD = 10.1). Most respondents served in the British Army or British Army Reserves and were discharged at the rank of non-commissioned officer. Nearly half had been discharged for more than 30 years (Mean = 30.8 [13.1]). The most common trades were combat support and combat roles. Most respondents had been deployed between one and 10 times (Mean = 7 [6.7]), with the most frequent operational tour length being four to six months. Common deployment locations included Northern Ireland, the Falkland Islands, and Cyprus (Supplementary Table 3).

Table 2. Military demographics

Variables	N	%
Service years		
1-10	61	33.2
11-20	44	23.9
21-30	55	29.9
>30	24	13.0
Service branch*		
Army/Army Reserves	120	65.2
Royal Navy/Marines	43	23.4
RAF/RAF reserves	38	20.7
Rank at discharge		
NCOs/other ranks	169	91.8
Commissioned officers	15	8.2
Years since discharge		
1-10	17	9.2
11-20	24	13.0
21-30	59	32.1
>30	84	45.7
Type of discharge		
Medical	11	6.0
At own request (PVR)	51	27.7
End of engagement	94	51.1
Administrative/compulsory/redundancy	19	10.3
Other	9	4.9
Trade		
Combat roles	41	22.3
Combat support	49	26.6
Technical and mechanical trades	21	11.4
Medical and health services	19	10.3
Administration and support	17	9.2
Supply and logistics	20	10.9
Navy/maritime roles	10	5.4
Other specialized roles	6	3.3
Undisclosed	1	0.5
Deployment frequency		
0	5	2.7
1-10	141	76.6
11-20	27	14.6

(*Continued*)

Table 2. Continued

Variables	N	%
20+	4	2.2
Undisclosed	7	3.8
Average operational tour length		
<1-3 weeks	5	2.7
1-3 months	21	11.4
4-6 months	75	40.8
7-12 months	31	16.8
Other	52	28.3
Deployment locations		
Northern Ireland	91	49.5
Falkland Islands	52	28.3
Cyprus	49	26.6
Bosnia	35	19.0
Second Gulf War (2003-2011)	33	17.9
Hong Kong	31	16.8
Belize	28	15.2
Singapore	25	13.6
Kosovo	19	10.3
Kenya	15	8.2
Oman	12	6.5
I was never deployed	10	5.4

* Multiple options selected.

Gambling engagement and severity

Table 3 shows that National Lottery tickets (90.2%) and National Lottery online (52.7%) were the most common activities reported out of a list of 24 activities (Supplementary Table 4). Most respondents engaged in non-strategic gambling activities only, while 20% had a mixed preference (Table 3). The mean PGSI score was 0.98 (2.70), and when dichotomized, 138 (75%) respondents scored 0, while 46 (25%) respondents scored 1 or higher.

Psychological Variables

Table 4 presents the descriptive statistics of all psychological variables, which were divided into low and high groups based on the sample median scores and the diagnostic cut-off for PTSD. The mean PTSD score was 16.86 (19.40), with 19% of the sample reporting symptoms suggestive of PTSD. The mean ACE score was 2.20 (2.37). Overall, 62 (33.7%) of respondents reported no ACEs, while 49 (26.6%) reported four or more. The remaining reported one (17.4%), two (12.0%), or three (10.3%) ACEs. Additionally, 46.7% reported direct maltreatment (abuse or neglect), and 38.6% reported household dysfunction (Table 4). Sensation seeking had the highest mean score at 10.37 (2.84), with 39.7% having high scores, followed by NU

Table 3. Gambling activities and severity

Variables	N	%
Gambling activity*		
Tickets for National Lottery	166	90.2
Tickets for National Lottery online	97	52.7
Tickets for other charity lotteries	74	40.2
Tickets for other charity lotteries online	37	20.1
Tickets for National Lottery in person	37	20.1
National Lottery scratch cards	33	17.9
Betting on sports and/or racing online or in app	29	15.8
National Lottery online instant win games	16	8.7
Betting on sports and/or racing in person	13	7.1
Other forms of gambling	13	7.1
Fruit and/or slots in person	11	6
Bingo played at a venue	9	4.9
Other scratch cards	7	3.8
Tickets for other charity lotteries in person	6	3.3
Other online instant win games	6	3.3
Casino games online or in app	5	2.7
Betting on outcome events online	5	2.7
Bingo played online or in app	4	2.2
Private betting, e.g., with friends	3	1.6
Casino games played in a casino	2	1.1
Fruit and/or slots online or in app	1	0.5
Football pools	1	0.5
Gambling activity category		
Strategic gambling only	4	2.2
Non-strategic gambling only	143	77.7
Mixed preference	37	20.1
Gambling severity (PGSI)		
Non-problem gambling (0)	138	75.0
Low-risk gambling (1-2)	22	12.0
Moderate-risk gambling (3-7)	18	9.8
Problem gambling (8-27)	6	3.3

* Multiple options selected.

Table 4. Mean, standard deviations, and chi-squared tests for associations between PGSI binary categories and psychological predictors

Variable	Category	N (%)	Mean (SD)	95% CI	PGSI (0)	PGSI (1/1+)	χ^2	*p*
PTSD (0-80)	No PTSD (<33)	49 (81.0)	16.86 (19.40)	[14.04-19.68]	118 (79.2)	31 (20.8)	7.35	0.007
	PTSD (≥33)	5 (19.0)			20 (57.1)	15 (42.9)		
ACE (0-10)	Direct maltreatment	86 (46.7)	2.20 (2.37)	[1.85-2.54]	61 (70.9)	25 (29.1)	1.43	0.232
	No direct maltreatment	98 (53.3)			77 (78.6)	21 (21.4)		
	No indirect trauma	113 (61.4)			93 (82.3)	20 (17.7)	8.33	0.004
	Indirect trauma	71 (38.6)			45 (63.4)	26 (36.6)		
Lack of premeditation (4-16)	Low (<13)	109 (59.3)	7.10 (2.44)	[6.74-7.45]	76 (69.7)	33 (30.3)	3.97	0.046
	High (≥13)	75 (40.8)			62 (82.7)	13 (17.3)		
Negative urgency (4-16)	Low (<11)	97 (52.7)	8.94 (3.32)	[8.45-9.42]	76 (87.4)	11 (12.6)		
	High (≥11)	87 (47.3)			62 (63.9)	35 (36.1)	13.44	<0.001
Sensation seeking (4-16)	Low (<9)	111 (60.3)	10.37 (2.84)	[9.96-10.78]	57 (78.1)	16 (21.9)	0.61	0.434
	High (≥9)	73 (39.7)			81 (73.0)	30 (27.0)		
Positive urgency (4-16)	Low (<13)	107 (58.2)	7.49 (2.85)	[6.51-7.14]	64 (83.1)	13 (16.9)	4.65	0.031
	High (≥13)	77 (41.8)			74 (69.2)	33 (30.8)		
Lack of perseverance (4-16)	Low (<13)	94 (51.1)	6.83 (2.17)	[6.51-7.14]	71 (78.9)	19 (21.1)	1.42	0.233
	High (≥13)	90 (48.9)			67 (71.3)	27 (28.7)		
Inhibitory IU (5-25)	Low (<9)	101 (54.9)	10.11 (4.81)	[9.41-10.81]	87 (86.1)	14 (13.9)	14.82	<0.001
	High (≥9)	83 (45.1)			51 (61.4)	32 (38.6)		
Prospective IU (7-35)	Low (<18)	97 (52.7)	18.86 (5.81)	[18.02-19.71]	76 (78.4)	21 (21.6)	1.23	0.268
	High (≥18)	87 (47.3)			62 (71.3)	25 (28.7)		
PsyFlex (5-60)	Low (6-30)	58 (31.5)	36.79 (11.54)	[35.12-38.47]	104 (82.5)	22 (17.5)	12.12	<0.001
	High (31-60)	126 (68.5)			34 (58.6)	24 (41.4)		

PGSI = Problem Gambling Severity Index; ACE = adverse childhood experiences; IU = intolerance of uncertainty.

with a mean of 8.94 (3.32), with 47.3% having high scores. Positive urgency scored a mean of 7.49 (2.85), with 41.8% having high scores, while lack of premeditation had a mean of 7.10 (2.44), with 40.8% having high scores. Lack of perseverance (48.9% having high scores) had the lowest mean at 6.83 (2.17). IU scores averaged 10.11 (4.81) for inhibitory IU (45.1% having high scores) and 18.86 (5.81) for prospective IU (47.3% having high scores). PsyFlex had a mean score of 36.79 (11.54), with 68.5% having high scores.

Interrelationship among psychological variables

Pearson's correlations showed some strong associations among the variables (Supplementary Table 6). Negative urgency demonstrated strong positive correlations with

PTSD negative alterations (r = 0.61) and PTSD hyper-arousal (r = 0.58), and with inhibitory IU (r = 0.62). Positive urgency was strongly correlated with NU (r = 0.69). Inhibitory IU also showed a strong positive correlation with PTSD negative alterations (r = 0.59) and PTSD hyper-arousal (r = 0.55), while prospective IU was strongly associated with inhibitory IU (r = 0.66). In contrast, PsyFlex was strongly negatively correlated with PTSD negative alterations (r = -0.61), PTSD hyper-arousal (r = -0.55), inhibitory IU (r = -0.55), and NU (r = -0.50), highlighting its inverse relationship with emotional dysregulation and trauma-related symptoms. Some moderate associations were also observed between ACEs and PTSD hyper-arousal, PTSD avoidance, and PTSD negative alteration (r = 0.36 to 0.39).

Psychological variables associated with gambling harm severity

Table 4 presents the associations between categories of psychological variables and PGSI scores. Having higher PTSD scores showed a significant association with PGSI scores, χ^2 (1) = 7.35, p = 0.007. The household dysfunction of the ACE domain showed a significant association with PGSI scores, χ^2 (1) = 8.33, p = 0.004. Participants with household dysfunction were more likely to report higher PGSI scores (36.6%) than those without it (17.7%).

For impulsivity traits, significant associations with gambling harm severity were found for lack of premeditation, χ^2 (1) = 3.97, p = 0.046, PU, χ^2 (1) = 4.65, p = 0.031, and NU, χ^2 (1) = 13.44, p <0.001. High NU was linked to higher PGSI scores (36.1%) than low NU (12.6%). Inhibitory IU was significantly related to gambling severity, χ^2 (1) = 14.82, p <0.001, with 38.6% of those with high inhibitory IU reporting higher PGSI scores compared to 13.9% of those with low scores.

Psychological flexibility was inversely related to gambling harm, χ^2 (1) = 12.12, p <0.001. Those with low PsyFlex scores were more likely to report gambling harm (41.4%) than those with high scores (17.5%).

Predictors of gambling harm severity

Stepwise logistic regression was conducted to examine the contribution of the psychological factors to gambling harm severity (Table 5). In Step 1, χ^2 (5) = 22.1, p <0.001, significant predictors were PTSD avoidance, OR = 0.36, p = 0.022, and PTSD negative alterations in cognition/mood, OR = 2.22, p = 0.022. In Step 2, the inclusion of impulsivity sub-scales improved the model, χ^2 (10) = 31.3, p <0.001, Nagelkerke R^2 = 0.239, with PTSD avoidance remaining significant, OR = 0.33, p = 0.017, and NU approaching significance, OR = 5.00, p = 0.058. In Step 3, the addition of IU and PsyFlex further improved explanatory power, χ^2 (13) = 41.5, p <0.001, Nagelkerke R^2 = 0.308. Significant predictors in the final model were PTSD re-experiencing, OR = 2.16, p = 0.024, PTSD avoidance, OR = 0.27, p = 0.008, inhibitory IU, OR = 7.96, p = 0.011, and prospective IU, OR = 0.12, p = 0.039. Other variables were non-significant. Thus, the stepwise model identified unique predictors of PTSD symptoms (re-experiencing and avoidance, respectively) and IU (inhibitory and prospective) associated with increased risk of harm from gambling.

DISCUSSION

This study explored the psychological correlates of gambling harm severity in a sample of UK Veterans. The findings highlight associations between higher PGSI scores and PTSD, ACEs, indirect maltreatment, NU, PU, inhibitory IU, and reduced PsyFlex. Additionally, PTSD re-experiencing, PTSD avoidance, inhibitory IU, and prospective IU were significant positive predictors of gambling harm severity.

PTSD symptoms were identified as significant positive predictors of gambling harm severity, consistent with previous research involving Veterans in many contexts.[9,11,13,63] While PTSD hyper-arousal has been reported,[8] our findings highlight re-experiencing and avoidance as the primary PTSD-related predictors of gambling harm, possibly due to their role in emotional suppression and dissociative gambling.[50] According to this position, harmful gambling may be maintained, at least in part, through negatively reinforced reductions in the frequency or occurrence of trauma-related distress, emotions, and cognitions.[11] Gambling may then take on a coping function, one used to ameliorate the impact of re-experiencing some of these painful emotions and reminders. Such gambling could then readily appear dissociative or immersed and removed from the original conditions that first promoted it. Moreover, the strong correlation between PTSD, impulsivity, and IU supports established links between PTSD, risk, impulsivity, and sensation seeking.[38,64,65] These associations may partly explain some of the factors responsible for the acquisition of harmful gambling-based coping. Together, these findings reinforce the complex and multi-faceted relationship between trauma-related symptoms and the

Table 5. Hierarchical logistic regression of the predictors of gambling harm severity (PGSI 0/1+) from mental health factors

	Step 1			Step 2			Step 3		
	OR	95% CI for OR	*p*	OR	95% CI for OR	*p*	OR	95% CI for OR	*p*
PTSD re-experiencing	1.61	[0.89-2.91]	0.115	1.68	[0.91-3.06]	0.094	2.16	[1.11-4.23]	**0.024**
PTSD avoidance	0.36	[0.15-0.87]	**0.022**	0.33	[0.13-0.86]	**0.017**	0.27	[0.10-0.74]	**0.008**
PTSD negative alterations	2.22	[1.12-4.40]	**0.022**	1.67	[0.78-3.57]	0.174	1.43	[0.63-3.24]	0.384
PTSD hyper-arousal	1.03	[0.52-2.03]	0.940	0.91	[0.45-1.83]	0.803	0.75	[0.35-1.62]	0.465
ACE	1.24	[0.73-2.11]	0.418	1.24	[0.71-2.17]	0.449	1.25	[0.70-2.25]	0.446
UPPS-P lack of premeditation				2.24	[0.50-10.00]	0.294	2.07	[0.41-10.34]	0.378
UPPS-P negative urgency				5.00	[0.96-26.01]	0.058	3.33	[0.59-18.68]	0.180
UPPS-P sensation seeking				1.75	[0.39-7.78]	0.461	2.92	[0.59-14.36]	0.190
UPPS-P positive urgency				0.77	[0.19-3.12]	0.708	0.56	[0.13-2.33]	0.434
UPPS-P lack of perseverance				1.73	[0.43-7.00]	0.443	1.03	[0.25-4.24]	0.967
Inhibitory IU							7.96	[1.63-38.81]	**0.011**
Prospective IU							0.12	[0.02-0.93]	**0.039**
PsyFlex							0.39	[0.10-1.44]	0.197
Model summary									
χ^2 (df)			22.1 (5)			31.3 (10)			41.5 (13)
p			<0.001			<0.001			<0.001
Nagelkerke R^2			0.173			0.239			0.308

PTSD = posttraumatic stress disorder; ACE = adverse childhood experience; UPPS-P = impulsivity; IU = intolerance of uncertainty; PsyFlex = Psychological flexibility.

Journal of Military, Veteran and Family Health
doi:10.3138/jmvfh-2025-0098 | | (|)
This advance access version may differ slightly from the final published version

onset and maintenance of harmful gambling among Veterans.

This study found that indirect maltreatment/household dysfunction ACEs were associated with greater gambling harm severity. These findings align with previous research linking household instability to increased risk of ARPG.[17,66] Literature on ACEs suggests that forms of indirect maltreatment, including parental separation, emotional neglect, and household substance misuse, contribute to an unstable early environment that may predispose individuals to heightened impulsivity that leads to maladaptive coping strategies such as gambling.[8,10,27,28,61,67] Our findings on the correlation between PTSD and ACEs alongside this evidence reinforce the cumulative impact of early life adversity and the layered trauma often observed in military and Veteran populations.

Both negative and positive urgency were associated with greater gambling harm severity in this study. This finding supports existing evidence that ARPG may be driven not only by impulsive attempts to escape negative emotional states, but also by impulsive efforts to enhance or prolong positive affect.[68] While the link between NU and gambling harm has been well documented in the general population,[69-71] recent research has increasingly highlighted the role of PU in community samples[72] and among Veterans.[63] These findings are consistent with the classification of impulsivity as a core characteristic of gambling disorder in the DSM-5,[2] except for the sensation seeking component, which only drives involvement in gambling.[32] Collectively, this body of evidence underscores the multi-faceted role of urgency-related impulsivity facets in the development and maintenance of gambling-related harm.

This study found that both inhibitory and prospective IU are significant positive predictors of gambling harm severity. Although research on IU and gambling among Veterans is limited, evidence from the general population suggests that individuals who struggle with uncertainty often cope by engaging in behaviours that provide immediate rewards, such as gambling.[18,73] Furthermore, Zhou et al.[19] demonstrate that impulse control difficulties have a positive and significant effect on gambling urge and involvement. To our knowledge, this study is the first to establish a direct link between IU and gambling harm severity specifically within a Veteran population.

Psychological flexibility was found to be a protective factor against gambling harm severity. Although research using the PsyFlex measure in gambling is limited, studies have demonstrated that ACT interventions, which include PsyFlex, can reduce gambling behaviour by targeting experiential avoidance and increasing value-driven behaviour.[46] This therapeutic approach is grounded in findings that individuals with gambling problems often exhibit deficits in response inhibition and cognitive flexibility.[74,75] Given its protective role, PsyFlex may serve as a useful screening or treatment target to build resilience in Veterans.

The current study is the first to describe IU and PsyFlex in the context of gambling among Veterans in the UK. This contribution adds depth to understanding individual-level psychological mechanisms driving gambling harm in this population. Like all cross-sectional studies, however, it is limited in its ability to determine causality. Furthermore, reliance on self-reported measures may introduce recall bias. The sample, while meaningful, may not be fully representative of the wider UK Veteran population, limiting the generalizability of findings. Possible selection bias may have occurred due to recruitment through social media and Veterans' organizations,[76] leading to a more engaged, less impaired, and older, male sample. The age profile (mean age of 66.5 years) is however representative of the profile of approximately half of UK Veterans.[77] Findings are limited to male Veterans and future research should seek to replicate trends with female Veterans. The absence of psychiatric confounders — particularly alcohol use disorder, which is highly comorbid with gambling — risks overstating the impact of the present set of variables on gambling harm.[55] Finally, the identified problem gambling rates were low (3.3%) and thus the effects detected may have been driven by low- and moderate-risk gambling scores.

Implications

The clinical implications of these findings underscore that the pathways to gambling harm are complex, often rooted in early life adversity, and compounded by later psychological vulnerabilities. This finding reinforces the necessity of a multi-faceted, trauma-informed approach to intervention for Veterans, such as in the Op Courage services of the NHS.[78] Screening for impulsivity and IU subtypes, as well as PsyFlex, may enhance gambling treatment plans by addressing deep-seated psychological mechanisms, rather than gambling behaviour alone.

From a policy perspective, the results support continued investment in integrated and personalized intervention strategies,[79] with a greater emphasis on identifying and targeting individual-level psychological traits that may exacerbate gambling-related harm among vulnerable populations like Veterans.[80]

Conclusions

This study identifies PTSD symptoms, ACEs, impulsivity, IU, and reduced PsyFlex as significant contributors to at-risk gambling among UK Veterans. Findings support trauma-informed, targeted interventions like ACT and emphasize the need for integrated strategies addressing both early adversity and current psychological vulnerabilities. Future research should explore the embedding of these factors into screening tools, early intervention programs, and Veteran-specific service pathways to inform more precise, preventative policy and clinical responses.

AUTHOR INFORMATION

Adanma Ekenna is a public health researcher and quantitative data manager for the Veterans' Habit project at Swansea University School of Psychology. She holds a medical degree and a master's in public health, as well as a master's in health care management. Formerly, she worked on health systems strengthening and immunization data projects in Nigeria. In the Veterans' Habit study, she helped produce data-driven insights to support Veterans with gambling harm.

Dana Dekel is a researcher at Swansea University School of Psychology who focuses on mental health, self-harm, and gambling-related harms in Veterans. She has a BSc in criminology and criminal justice and an MSc in business management, plus extensive experience in mixed-methods research on mental health across vulnerable populations. Previously, she worked in the Swansea University School of Medicine on funded mental health and WHO-linked projects.

Hilary Engward is Associate Professor of Applied Social Science and Deputy Director of the Veterans and Families Institute for Military Social Research at Anglia Ruskin University. She leads research into Veteran and family well-being, including how Veteran families manage chronic health conditions, and she writes widely on Veteran support, health, and professional training for carers and services.

Lauren Godier-MacBard is Associate Professor and Women and Equalities Research Lead at the Veterans and Families Institute for Military Social Research at Anglia Ruskin University. She specializes in research on women in the military and military-Veteran communities, including their health, well-being, and experiences of interpersonal and sexual violence, often using mixed-methods designs.

Chris Kay is a Senior Research Fellow at Anglia Ruskin University within the Veterans and Families Institute for Military Social Research. From 2014 to 2023, he conducted longitudinal research on recovery support programs for wounded, injured, and sick service personnel, exploring how Veteran behaviours affect their families and close relationships.

Thomas Kersey is a researcher at the Veterans and Families Institute for Military Social Research at Anglia Ruskin University. His work focuses on the lived experiences of UK Armed Forces Veterans, with expertise in chronic pain, well-being, and the transition to civilian life. He completed his PhD on Veterans' narratives of chronic pain, using qualitative and narrative-based methods to understand long-term health challenges. His research contributes to improving support pathways and developing evidence to inform Veteran-focused health and social care services.

Matt Fossey is Professor of Public Services Research and Director of the Veterans and Families Institute. With an early career as a mental health social worker, he later helped shape national UK mental health services, including the IAPT program. He now leads research on Veterans' health, social care, and well-being, influencing policy and practice through national and international working groups. He is a co-investigator on a major public health grant (via NIHR) investigating social determinants of health across greater Essex.

Simon Dymond is Professor of Psychology and Behaviour Analysis at Swansea University, Director of the Centre for Military Gambling Research, and Co-director of the Gambling Research, Education and Treatment (GREAT) Network Wales. His research spans neurobehavioural studies on gambling, fear and avoidance learning, and gambling disorder treatment, as well as epidemiological analyses of gambling harm in vulnerable groups.

ACKNOWLEDGEMENTS

We thank the Veterans service charities and gambling harm treatment providers for their support with recruitment and the participants for giving up their time. The data described in this article are openly available in the Open Science Framework at https://osf.io/pgkrh/?view_only=1c598215f1c44d7ab3d4490cdd6819f5.

DISCLOSURES

The authors have nothing to disclose.

CONTRIBUTORS

Conceptualization: S Dymond and M Fossey

Methodology: S Dymond and M Fossey

Formal Analysis: A Ekenna

Data Curation: A Ekenna

Writing — Original Draft: A Ekenna and D Dekel

Writing — Review & Editing: A Ekenna, D Dekel, S Dymond, C Kay, H Engward, L Godier-MacBard, T Kersey, and M Fossey

Funding acquisition: S Dymond and M Fossey

ETHICS APPROVAL

This study was approved by the Research Ethics Committee, School of Psychology, Swansea University, Swansea, Wales, United Kingdom, on Mar. 22, 2024 (approval no. 1 2024 8399 8380).

INFORMED CONSENT

N/A

REGISTRY AND REGISTRATION NO. OF THE STUDY/TRIAL

N/A

ANIMAL STUDIES

N/A

FUNDING

This work was funded by an award from the Gambling Commission's Social Responsibility Fund (Regulatory Settlements). The funders had no role in design and conduct of the study, collection, management, analysis, and interpretation of the data, preparation, review, or approval of the manuscript, and decision to submit the manuscript for publication.

PEER REVIEW

This manuscript has been peer reviewed.

REFERENCES

1. Yau YH, Potenza MN. Gambling disorder and other behavioral addictions: recognition and treatment. Harv Rev Psychiatry. 2015 Mar-Apr;23(2);134-46. https://doi.org/10.1097/hrp.0000000000000051
2. American Psychiatric Association. Diagnostic and statistical manual of mental disorders:DSM-5. 5th ed. Washington (DC): American Psychiatric Publishing; 2013.
3. Derevensky JL. Behavioral addictions: some developmental considerations. Curr Addict Rep. 2019 May 20;6:313-22. https://doi.org/10.1007/s40429-019-00257-z
4. Derevensky JL, Hayman V, Lynette G. Behavioral addictions: excessive gambling, gaming, internet, and smartphone use among children and adolescents. Pediatr Clin North Am. 2019 Dec;66(6):1163-82. https://doi.org/10.1016/j.pcl.2019.08.008
5. Grant JE, Potenza MN, Aviv W, et al. Introduction to behavioral addictions. Am J Drug Alcohol Abuse. 2010 Jun 21;36(5):233-41. https://doi.org/10.3109/00952990.2010.491884
6. Wardle H, Degenhardt L, Marionneau V, et al. The Lancet Public Health Commission on gambling. Lancet Public Health. 2024 Nov;9(11):E950-94. https://doi.org/10.1016/S2468-2667(24)00167-1
7. Ferris JA, Wynne HJ. The Canadian Problem Gambling Index. Ottawa (ON): Canadian Centre on Substance Abuse; 2001.
8. Metcalf O, Lawrence-Wood E, Baur J, et al. Prevalence of gambling problems, help-seeking, and relationships with trauma in Veterans. PLoS One. 2022 May 25;17(5):e0268346. https://doi.org/10.1371/journal.pone.0268346
9. Whiting SW, Potenza MN, Park CL, et al. Investigating Veterans' pre-, peri-, and post-deployment experiences as potential risk factors for problem gambling. J Behav Addict. 2016 May 9;5(2):213-20. https://doi.org/10.1556/2006.5.2016.027
10. Stefanovics EA, Potenza MN, Pietrzak RH. Gambling in a national U.S. Veteran population: prevalence, socio-demographics, and psychiatric comorbidities. J Gambl Stud. 2017 Mar 14;33(4):1099-120. https://doi.org/10.1007/s10899-017-9678-2
11. Dighton G, Wood K, Armour C, et al. Gambling problems among United Kingdom armed forces Veterans: associations with gambling motivation and post-traumatic stress disorder. Int Gambl Stud. 2022 May 10;23(1):35-56. https://doi.org/10.1080/14459795.2022.2063923
12. Vana N, Kraus SW, Way BM, et al. Barriers to gambling treatment among American military personnel: a qualitative study. J Gambl Stud. 2025 Apr 24;41(3):959-76. https://doi.org/10.1007/s10899-025-10385-z
13. Etuk R, Shirk SD, Grubbs J, et al. Gambling problems in US military Veterans. Curr Addict Rep. 2020 Jun 1;7:210-28. https://doi.org/10.1007/s40429-020-00310-2
14. Metcalf O, Roebuck G, Lawrence-Wood E, et al. Gambling problems predict suicidality in recently

transitioned military Veterans. Aust N Z J Public Health. 2023 Jun;47(3):100038. https://doi.org/10.1016/j.anzjph.2023.100038

15. Buen A, Flack M. Predicting problem gambling severity: interplay between emotion dysregulation and gambling-related cognitions. J Gambl Stud. 2021 May 31;38(2):483-98. https://doi.org/10.1007/s10899-021-10039-w
16. Grubbs JB, Chapman H. Predicting gambling situations: the roles of impulsivity, substance use, and post-traumatic stress. Subst Abuse Res Treat. 2019 Jun 24;13:1178221819852641. https://doi.org/10.1177/1178221819852641
17. Stefanovics EA, Potenza MN, Tsai J, et al. Gambling and substance use disorders in U.S. military Veterans: prevalence, clinical characteristics, and suicide risk. J Gambl Stud. 2024 Sep 29;40(4):2119-39. https://doi.org/10.1007/s10899-024-10359-7
18. Radell ML, Myers CE, Beck KD, et al. The personality trait of intolerance to uncertainty affects behavior in a novel computer-based conditioned place preference task. Front Psychol. 2016 Aug 8;7:1175. https://doi.org/10.3389/fpsyg.2016.01175
19. Zhou H, Hung EP, Xie L, et al. The application of the intolerance of uncertainty model to gambling urge and involvement. Int J Environ Res Public Health. 2022 Nov 9;19(22):14738. https://doi.org/10.3390/ijerph192214738
20. Nower L, Blaszczynski A, Anthony WL. Clarifying gambling subtypes: the revised pathways model of problem gambling. Addiction. 2022 Jul;117(7):2000-8. https://doi.org/10.1111/add.15745
21. Stefanovics EA, Potenza MN, Tsai J, et al. Prevalence and clinical characteristics of recreational and at-risk/problematic gambling in a national sample of U.S. military Veterans. J Gambl Stud. 2023 Sep;39(3):1077-97. https://doi.org/10.1007/s10899-022-10165-z
22. Grubbs JB, Chapman H, Shepherd KA. Post-traumatic stress and gambling-related cognitions: analyses in inpatient and online samples. Addict Behav. 2019 Feb;89:128-35. https://doi.org/10.1016/j.addbeh.2018.09.035
23. Najavits LM. Treatment utilization of pathological gamblers with and without PTSD. J Gambl Stud. 2010 Feb 17;26(4):583-92. https://doi.org/10.1007/s10899-010-9179-z
24. Dowling NA, Cowlishaw S, Jackson AC, et al. Prevalence of psychiatric comorbidity in treatment-seeking problem gamblers: a systematic review and meta-analysis. Aust N Z J Psychiatry. 2015 Mar 3;49(6):519-39. https://doi.org/10.1177/0004867415575774
25. Ledgerwood DM, Milosevic A. Clinical and personality characteristics associated with post-traumatic stress disorder in problem and pathological gamblers recruited from the community. J Gambl Stud. 2015 Sep;31(2):501-12. https://doi.org/10.1007/s10899-013-9426-1
26. Najavits LM, Meyer T, Johnson KM, et al. Pathological gambling and posttraumatic stress disorder: a study of the co-morbidity versus each alone. J Gambl Stud. 2011 Dec;27(4):663-83. https://doi.org/10.1007/s10899-010-9230-0
27. Scherrer J, Xian H, Kapp J, et al. Association between exposure to childhood and lifetime traumatic events and lifetime pathological gambling in a twin cohort. J Nerv Ment Dis. 2007 Jan;195(1):72-8. https://doi.org/10.1097/01.nmd.0000252384.20382.e9
28. Horak NS, Eagle G, Stein DJ, et al. Gambling disorder and childhood trauma: a complex association. J Gambl Stud. 2021 Jun;37(2):515-28. https://doi.org/10.1007/s10899-020-09983-w
29. Ross J, Armour C, Murphy D. Childhood adversities in UK treatment-seeking military Veterans. BMJ Mil Health. 2022 Apr 20;168(1):43-8. https://doi.org/10.1136/jramc-2019-001297
30. Montgomery AE, Cutuli JJ, Evans-Chase M, et al. Relationship among adverse childhood experiences, history of active military service, and adult outcomes: homelessness, mental health, and physical health. Am J Public Health. 2013 Nov 20;103(Suppl 2):S262-8. https://doi.org/10.2105/AJPH.2013.301474
31. Moeller FG, Barratt ES, Dougherty DM, et al. Psychiatric aspects of impulsivity. Am J Psychiatry. 2001 Nov 1;158(11):1783-93. https://doi.org/10.1176/appi.ajp.158.11.1783
32. Hodgins DC, Holub A. Components of impulsivity in gambling disorder. Int J Ment Health Addict. 2015 Jul 24;13(6):699-711. https://doi.org/10.1007/s11469-015-9572-z
33. Ioannidis K, Hook R, Wickham K, et al. Impulsivity in gambling disorder and problem gambling: a meta-analysis. Neuropsychopharmacology. 2019 Apr 16;44:1354-61. https://doi.org/10.1038/s41386-019-0393-9
34. Morris VL, Huffman LG, Naish KR, et al. Impulsivity as a mediating factor in the association between post-traumatic stress disorder symptoms and substance use. Psychol Trauma. 2020 Sep;12(6):659-68. https://doi.org/10.1037/tra0000588
35. Shakeel MK, Hodgins DC, Goghari VM. A comparison of self-reported impulsivity in gambling disorder and bipolar disorder. J Gambl Stud. 2019

Mar;35(1):339-50. https://doi.org/10.1007/s10899-018-9808-5

36. Carleton RN, Norton MA, Asmundson GJ. Fearing the unknown: a short version of the Intolerance of Uncertainty Scale. J Anxiety Disord. 2007;21(1):105-17. https://doi.org/10.1016/j.janxdis.2006.03.014
37. Nelson BD, Kessel EM, Jackson F, et al. The impact of an unpredictable context and intolerance of uncertainty on the electrocortical response to monetary gains and losses. Cogn Affect Behav Neurosci. 2016 Feb;16(1):153-63. https://doi.org/10.3758/s13415-015-0382-3
38. Raines AM, Oglesby ME, Walton JL, et al. Intolerance of uncertainty and *DSM-5* PTSD symptoms: associations among a treatment-seeking Veteran sample. J Anxiety Disord. 2019 Mar;62:61-7. https://doi.org/10.1016/j.janxdis.2018.12.002
39. Hromova HM. Interrelation between intolerance of uncertainty and the time perspective profile in the military. Curr Issues Pers Psychol. 2022 Mar 6;10(4):321-32. https://doi.org/10.5114/cipp.2021.111984
40. Hollingsworth DW, Gauthier JM, McGuire AP, et al. Intolerance of uncertainty mediates symptoms of PTSD and depression in African American Veterans with comorbid PTSD and substance use disorders. J Black Psychol. 2018 Nov 15;44(7):667-88. https://doi.org/10.1177/0095798418809201
41. Hunt C, Exline JJ, Fletcher TL, et al. Intolerance of uncertainty prospectively predicts the transdiagnostic severity of emotional psychopathology: evidence from a Veteran sample. J Anxiety Disord. 2022 Mar;86:102530. https://doi.org/10.1016/j.janxdis.2022.102530
42. Gloster AT, Klotsche J, Chaker S, et al. Assessing psychological flexibility: what does it add above and beyond existing constructs? Psychol Assess. 2011 Dec;23(4):970-82. https://doi.org/10.1037/a0024135
43. Dutra SJ, Sadeh N. Psychological flexibility mitigates effects of PTSD symptoms and negative urgency on aggressive behavior in trauma-exposed Veterans. Personal Disord. 2018;9:315-23. https://doi.org/10.1037/per0000251
44. Avery T, Blasey C, Rosen C, et al. Psychological flexibility and set-shifting among Veterans participating in a yoga program: a pilot study. Mil Med. 2018 Mar 26;183(11-12):e359-63. https://doi.org/10.1093/milmed/usy045
45. Meyer EC, Kotte A, Kimbrel NA, et al. Predictors of lower-than-expected posttraumatic symptom severity in war Veterans: the influence of personality, self-reported trait resilience, and psychological flexibility. Behav Res Ther. 2019 Feb;113:1-8. https://doi.org/10.1016/j.brat.2018.12.005
46. Twohig MP, Crosby JM. Acceptance and commitment therapy as a treatment for problematic internet pornography viewing. Behav Ther. 2010 Sep;41(3):285-92. https://doi.org/10.1016/j.beth.2009.06.002
47. Williams JM, Heath C, Leightley D, et al. Smartphone app-delivered Acceptance and Commitment Therapy (ACT) for post-traumatic stress disorder and gambling harm in Veterans: a pilot feasibility study. J Contextual Behav Sci. 2025 Oct;38:100956. https://doi.org/10.1016/j.jcbs.2025.100956
48. Hitch C, Leightley D, Murphy D, et al. Acceptance and commitment therapy for co-occurring gambling disorder and posttraumatic stress disorder in Veterans: a narrative review. Eur J Psychotraumatol. 2023 Feb 24;14(1):2178203. https://doi.org/10.1080/20008066.2023.2178203
49. Odlaug BL, Marsh PJ, Kim SW, et al. Strategic vs nonstrategic gambling: characteristics of pathological gamblers based on gambling preference. Ann Clin Psychiatry. 2011 May 1;23(2):105-12. https://doi.org/10.1177/104012371102300204
50. Ledgerwood DM, Petry NM. Posttraumatic stress disorder symptoms in treatment-seeking pathological gamblers. J Trauma Stress. 2006 Jun 20;19(3):411-6. https://doi.org/10.1002/jts.20123
51. Cocco N, Sharpe L, Blaszczynski AP. Differences in preferred level of arousal in two sub-groups of problem gamblers: a preliminary report. J Gambl Stud. 1995 Jun;11(2):221-9. https://doi.org/10.1007/bf02107116
52. Binde P, Romild U. Risk of problem gambling among occupational groups: a population and registry study. Nord Stud Alcohol Drugs. 2020 Mar 13;37(3):262-78. https://doi.org/10.1177/1455072519899779
53. Kryszajtys DT, Hahmann TE, Schuler A, et al. Problem gambling and delinquent behaviours among adolescents: a scoping review. J Gambl Stud. 2018 Feb 22;34(3):893-914. https://doi.org/10.1007/s10899-018-9754-2
54. Harris S, Pockett RD, Dighton G, et al. Social and economic costs of gambling problems and related harm among UK military Veterans. BMJ Mil Health. 2023 Sep 22;169(5):413-8. https://doi.org/10.1136/bmjmilitary-2021-001892
55. Ekenna A, Dekel D, Engward H, et al. Coping, civilian transition, and gambling harm severity in UK Armed Forces Veterans. J Gambl Stud. 2025 Nov 4;42(1):199-218. https://doi.org/10.1007/s10899-025-10451-6
56. Faul F, Erdfelder E, Lang A-G, et al. G*Power 3: a flexible statistical power analysis program for the social,

behavioral, and biomedical sciences. Behav Res Methods. 2007 May;39:175-91. https://doi.org/10.3758/bf03193146

57. Blevins CA, Weathers FW, Davis MT, et al. The Posttraumatic Stress Disorder Checklist for *DSM-5* (PCL-5): development and initial psychometric evaluation. J Trauma Stress. 2015 Nov 25;28(6):489-98. https://doi.org/10.1002/jts.22059
58. Bovin MJ, Marx BP, Weathers FW, et al. Psychometric properties of the PTSD Checklist for Diagnostic and Statistical Manual of Mental Disorders-Fifth Edition (PCL-5) in Veterans. Psychol Assess. 2016 Nov;28(11):1379-91. https://doi.org/10.1037/pas0000254
59. Krüger-Gottschalk A, Knaevelsrud C, Rau H, et al. The German version of the Posttraumatic Stress Disorder Checklist for DSM-5 (PCL-5): psychometric properties and diagnostic utility. BMC Psychiatry. 2017 Nov 28;17(1):379. https://doi.org/10.1186/s12888-017-1541-6
60. Rosendahl J, Kisyova H, Gawlytta R, et al. Comparative validation of three screening instruments for posttraumatic stress disorder after intensive care. J Crit Care. 2019 Oct;53:149-54. https://doi.org/10.1016/j.jcrc.2019.06.016
61. Felitti VJ, Anda RF, Nordenberg D, et al. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: the Adverse Childhood Experiences (ACE) Study. Am J Prev Med. 1998 May;14(4):245-58. https://doi.org/10.1016/S0749-3797(98)00017-8
62. Cyders MA, Littlefield AK, Coffey S, et al. Examination of a short English version of the UPPS-P Impulsive Behavior Scale. Addict Behav. 2014 Sep;39(9):1372-6. https://doi.org/10.1016/j.addbeh.2014.02.013
63. Grubbs JB, Chapman H. Predicting gambling situations: the roles of impulsivity, substance use, and post-traumatic stress. Subst Abuse. 2019 Jun 24;13:1-8. https://doi.org/10.1177/1178221819852641
64. Banducci AN, Bujarski SJ, Bonn-Miller MO, et al. The impact of intolerance of emotional distress and uncertainty on Veterans with co-occurring PTSD and substance use disorders. J Anxiety Disord. 2016 Jun;41:73-81. https://doi.org/10.1016/j.janxdis.2016.03.003
65. Torres M. A systematic literature review on the impact of sensation seeking on risk, impulsivity, and PTSD. [Chandler (AZ)]: California Southern University; 2023.
66. Bristow LA, Afifi TO, Salmon S, et al. Risky gambling behaviors: associations with mental health and a history of adverse childhood experiences (ACEs). J Gambl Stud. 2022 Sep;38(3):699-716. https://doi.org/10.1007/s10899-021-10040-3
67. Stefanovics EA, Potenza MN, Tsai J. Prevalence and clinical characteristics of recreational and at-risk/problematic gambling among low-income U.S. Veterans: results from the National Veteran Homeless and Other Poverty Experiences (NV-HOPE) study. J Gambl Stud. 2024 Jun;40(2):915-35. https://doi.org/10.1007/s10899-023-10257-4
68. Blain B, Gill PR, Teese R. Predicting problem gambling in Australian adults using a multifaceted model of impulsivity. Int Gambl Stud. 2015 Apr 29;15(2):239-55. https://doi.org/10.1080/14459795.2015.1029960
69. Navas JF, Contreras-Rodríguez O, Verdejo-Román J, et al. Trait and neurobiological underpinnings of negative emotion regulation in gambling disorder. Addiction. 2017 Jan 6;112(6):1086-94. https://doi.org/10.1111/add.13751
70. Atkinson J, Sharp C, Schmitz J, et al. Behavioral activation and inhibition, negative affect, and gambling severity in a sample of young adult college students. J Gambl Stud. 2012 Sep;28(3):437-49. https://doi.org/10.1007/s10899-011-9273-x
71. Daughters SB, Lejuez CW, Strong DR, et al. The relationship among negative affect, distress tolerance, and length of gambling abstinence attempt. J Gambl Stud. 2005 Dec;21(4):363-78. https://doi.org/10.1007/s10899-005-5554-6
72. Rogier G, Colombi F, Velotti P. A brief report on dysregulation of positive emotions and impulsivity: their roles in gambling disorder. Curr Psychol. 2022 Apr;41(4):1835-41. https://doi.org/10.1007/s12144-020-00638-y
73. Luhmann C, Ishida K, Hajcak G. Intolerance of uncertainty and decisions about delayed, probabilistic rewards. Behav Ther. 2011 Sep;42(3):378-86. https://doi.org/10.1016/j.beth.2010.09.002
74. Odlaug BL, Chamberlain SR, Kim SW, et al. A neurocognitive comparison of cognitive flexibility and response inhibition in gamblers with varying degrees of clinical severity. Psychol Med. 2011 Oct;41(10):2111-9. https://doi.org/10.1017/S0033291711000316
75. Grant JE, Odlaug BL, Chamberlain SR, et al. Neurocognitive dysfunction in strategic and non-strategic gamblers. Prog Neuropsychopharmacol Biol Psychiatry. 2012 Aug 7;38(2):336-40. https://doi.org/10.1016/j.pnpbp.2012.05.006
76. Heath C, Williams JM, Leightley D, et al. Leveraging social media and crowdsourcing to recruit and retain military Veterans with posttraumatic stress disorder or experience of harmful gambling for mHealth

interventions: descriptive study. JMIR Mhealth Uhealth. 2025 Nov 11;13:e73706. https://doi.org/10.2196/73706

77. Office for National Statistics. Health and well-being of UK armed forces Veterans: Veterans' Survey 2022, UK [Internet]. Newport (UK): Office for National Statistics; 2024 Dec 4 [cited 2025 Apr 12]. Available from: https://www.ons.gov.uk/releases/healthandwellbeingofukarmedforcesveteransveteranssurvey2022uk
78. National Health Service (NHS). Mental health support for Veterans, service leavers and reservists [Internet]. Leeds (UK): NHS; 2024 Jul 18 [cited 2025 Apr 5]. Available from: https://www.nhs.uk/nhs-services/armed-forces-community/mental-health/veterans-reservists/
79. Department for Culture, Media and Sport. High stakes: gambling reform for the digital age [Internet]. London (UK): GOV.UK; 2023 Apr 27 [cited 2025 May 19]. Available from: https://www.gov.uk/government/publications/high-stakes-gambling-reform-for-the-digital-age
80. National Institute for Health and Care Excellence (NICE). Gambling-related harms: identification, assessment and management [Internet]. Manchester (UK): NICE; 2025 Jan 28 [cited 2025 Apr 9]. Available from: https://www.nice.org.uk/guidance/ng248/resources/gamblingrelated-harms-identification-assessment-and-management-pdf-66143963317957