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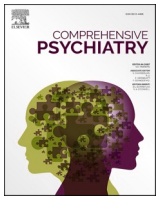

Dissociative experiences reduce online problem gambling treatment effectiveness

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ABSTRACT

Aims: To determine whether dissociative experiences moderate online problem gambling treatment effectiveness, and to characterize the temporal persistence of the relationship between dissociation and problem gambling.
Design: Repeatedly measured self-report data on a guided online cognitive behavioral therapy for problem gambling collected on four occasions: before treatment, after treatment, and at 6- and 12-month follow-ups.
Setting and participants: The data (N = 1243, 59.2% males) were collected in Finland between 2019 and 2021.
Measurements: The primary outcome variable was the self-reported level of problem gambling. The predictors were the treatment phase and dissociative experiences, their interaction, and the demographic covariates of age, education, income, and gender.
Findings: Problem gambling scores and dissociative experiences declined significantly following treatment and remained low through the follow-ups (retention rates: 52.6% [post-treatment], 26.3% [at the 6-month follow-up], and 16.1% [at the 12-month follow-up]). However, the treatment was significantly less effective in reducing problem gambling for individuals who kept experiencing dissociation after the treatment.
Conclusions: Dissociation is an integral sign of problem gambling severity and sustained dissociative experiences may significantly reduce the long-term effectiveness of online problem gambling treatments. Treatment efforts should be customized to account for individual differences in dissociative tendencies, and future research should broaden the study of dissociative experiences to other behavioral addictions.

1. Introduction

Gambling is a common leisure-time activity that may become problematic to varying degrees for some individuals, sometimes even leading to gambling disorder [1–3]. Excessive gambling can lead to various psychological, social, and economic repercussions [2,3] and is known to be highly comorbid with substance use disorders, psychological distress, neurocognitive problems, and past traumatic events [4]. Worldwide problem gambling prevalence rates range between 0.12% and 5.8% (being 3% in Finland [5,6]). A problem gambler can be seen as someone with a pattern of persistent excessive gambling, including impaired control with significant negative consequences. Problem gambling forms a continuum of severity, ranging from mild to moderate and onto severe[1] [2,3].

There are many psychosocial treatment options for problem gambling. The treatment modalities include self-directed interventions, face-to-face therapies, and online therapies, which are typically based on motivational interviewing and/or coupled with cognitive behavioral therapy (CBT) or its modifications. Pharmacological treatments are also available [7]. Although a third of problem gamblers recover spontaneously [8], interventions based on CBT are known to be effective [9,10]. CBTs typically focus on correcting dysfunctional cognitions about

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[1] In the current fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), *gambling disorder* (GD) is used to denote severe forms of problem gambling diagnosed by a physician [2] and the same term (*gambling disorder*) is also used in the revised version of the World Health Organization's *International Classification of Diseases* (11th revision; ICD-11; [3]). In this paper, the term *problem gambling* refers to self-assessment of the problem-gambling level based on a psychometric tool.

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gambling (such as beliefs about probability and the role of skill in the game) and on recognizing and managing environmental cues that trigger the gambling urge [11].

Most problem gamblers do not seek professional help due to stigma, feelings of shame, or wanting to handle problems alone [8,12,13]. The average drop-out rate from face-to-face psychological treatments for problem gambling was estimated to be 39.1% [14]. However, online interventions, most of which are CBT based, increase treatment adherence and can reach people who would not otherwise participate in an intervention [15–19]. Most online interventions are self-directed, but some include therapist guidance using messaging, chat, email [20,21], or phone and video calls [22,23].

Gambling can induce dissociative states of deep immersion that manifest as a sense of unreality, losing track of time, and a narrowing of attention [24–27]. Dissociative gambling is described as a trance-like state wherein money loses its sense of value and the person loses his or her ability to think critically [28]. On the other hand, gambling-related dissociation shares many features with the *flow* state [29]. For example, Murch et al. [30] argued that the gambling-induced immersive experience in a laboratory setting is better described as an active and deliberate "zoning in" instead of passive and detrimental "zoning out." It has also been suggested that dissociation forms a continuum from normative dissociation to pathological dissociation, the former referring to absorption in daily activities, fantasy, and dreaming [31,26].

Because of the lack of consensus on what *dissociation* is and the different dissociation measures used, prevalence estimates of gambling-related dissociative experiences remain suggestive. Wood et al. [32] found that roughly 40% of gamblers that they studied reported at least occasionally experiencing a trance-like state and feeling like a different person while gambling. About 20% of the gamblers reported experiencing blackouts and depersonalization, and up to 90% reported at least occasionally losing track of time while gambling.

According to Jacobs' general theory of addiction [33,34], dissociative experiences form the hard sign of addiction, and dissociation follows from a predisposition to escape from a painful reality in order to fulfil wishful fantasies of success and personal fame. In a similar vein, Dixon et al. [35] argued that a motivation to escape unpleasant emotions is a key feature in dissociative gambling. Dissociation experienced during a gambling session and a general proneness to dissociative experiences are associated with the severity of gambling problems [26]. Losing contact with reality and entering *the zone* can exacerbate relapse by extending the gambling episodes [28]. Problem gamblers report more symptoms of general dissociation compared with controls [36,37], and in-game dissociation and problem gambling severity are strongly correlated [38,39]. Dixon et al. [40] found that "dark flow"—a state of mental absorption leading to "dark" consequences, such as spending too much money—was positively associated with enjoyment during slot-machine gambling, problem gambling, and depression. Finally, a meta-analysis concluded that problem gambling severity was associated with dissociation regardless of the operationalization used [29].

Research also suggests that problem gamblers may respond differently to treatment depending on their dissociation tendencies [21,41]. Similarly, the pathways model [42] postulates an emotionally vulnerable subtype of problem gambler who typically exhibits gambling-related dissociation and may respond poorly to treatment. However, convincing evidence of the moderating effects of dissociation on treatment effectiveness is still lacking. Thus, our aims were the following:

1. To determine whether in-game dissociation measured during an online CBT-based problem-gambling intervention moderates treatment effectiveness using a large and recent dataset
2. To find out the temporal persistence and characteristics of the relationship between dissociation and problem gambling because such evidence is scarce and needed

We hypothesized that *higher levels of dissociation will negatively affect treatment success*.

2. Method

2.1. Design

We drew data from the Finnish Peli Poikki (PP) program, an eight-week CBT-based internet therapy program for problem gambling adapted from [43]. The program is free, anonymous, and offered for Finnish-speaking or Swedish-speaking individuals of 18 years of age and higher in Finland by the national helpline Peluuri. The program includes psycho-educative materials, independent exercises, weekly phone calls with a therapist, and an elective discussion forum. There are eight weekly sessions/modules, each followed by an hour-long phone call with a designated therapist. Participants with severe depression symptoms (>20 points on the Montgomery-Åsberg Depression Rating Scale [44]) are not excluded but encouraged to seek supplementary treatment. They are, however, discouraged from seeking simultaneous treatment for problem gambling. Due to therapist involvement and high demand, the program has a waiting list.

The treatment modules include exercises such as determining one's goals, making a contract for committing to those goals, scrutinizing one's motivations for gambling, and recognizing experienced ambivalence about changing one's behavior. The CBT-based techniques include modifying dysfunctional cognitions about gambling and its consequences, and recognizing and responding to the triggers of the gambling urge. A mindful and acceptance-based approach to one's feelings is encouraged. The intervention is future-oriented and focused on what could be gained by changing one's gambling behavior. Individuals are also offered relapse prevention and practical tips on how to take control of their financial situation.

Participants fill out questionnaires when entering the waiting list, just before the program (at baseline), post treatment, and at 6- and 12-month follow-up points. The questionnaires included themes such as *demographics, gambling habits, gambling onset, financial difficulties, well-being, depression symptoms, alcohol consumption,* and *relationships*. All the participants who completed the post-treatment questionnaire had verifiably completed all eight sessions/modules of the program. Only variables of interest to this study were included (for further analyses and details on the treatment contents and modules, see [23,45,46]). This study was approved by the Ethics Committee of the Finnish Institute for Health and Welfare. All the subjects gave their informed consent for their data to be analyzed. Prior to applying to the program, they were informed in writing of how their information will be used, their rights to see their data and have it removed, and that the information they provide may be used for scientific research.

2.2. Participants and therapists

The data were collected between 1.1.2019 and 31.12.2021, and involved a total of 1243 participants ($N = 1243$, $M_{age} = 34.01$, $SD_{age} = 9.25$, 59.7% males), and 23.25% reported having at least a bachelor's degree. The median self-reported income category was from €25,000 to €34,999. The weekly supportive phone calls were delivered by five trained therapists who were psychiatric nurses, psychotherapists, or other mental health professionals (individuals with an education in social services). The therapists had additional training in addiction treatment, especially in CBT and motivational interviewing techniques.

2.3. Measures

2.3.1. Dependent variable: NODS

The National Opinion Research Center DSM Screen for Gambling Problems (NODS) is a 17-item scale developed to reflect the DSM-IV criteria for gambling problems [47,48]. The participants answer dichotomous (*yes/no*) questions on whether they have engaged in

problem gambling behavior or experienced dysfunctional gambling-related thoughts during a certain period. NODS was administered to our participants using a two-month reporting window (at baseline and post treatment) and a six-month reporting window (with six-month and 12-month follow-ups). Overall, NODS scores range from 0 to 10. We analyzed NODS as a continuous variable but highlight the lower-end, mild gambling disorder cut-off point of 4 in the figs. [48]. Cronbach's alpha was calculated separately for each measurement point (alphas = 0.86, 0.85, 0.91, and 0.92, for baseline, post treatment, at the six-month follow-up, and at the 12-month follow-up, respectively).

2.3.2. Independent variable: JDEQ

Dissociation was measured with a modified four-item version of Jacobs' Dissociative Experience Questions (JDEQs, [34]): (1) "During the last two months, have you felt like you were in a trance while gambling?"; (2) "During the last two months, have you felt like a different person while gambling?"; (3) "During the last two months, have you lost track of time while gambling?"; and (4) "During the last two months, have you had difficulties remembering what happened during a gambling session – experienced a so-called memory blackout?" One question tapping depersonalization from the original JDEQs was replaced with the above question tapping tracking of time [70]. Responses were given on a five-point Likert scale ranging from 1 (*never*) to 5 (*always*). The Cronbach's alphas across the measurement points were 0.88, 0.92, 0.95, and 0.87, for baseline, post treatment, at the six-month follow-up, and at the 12-month follow-up, respectively).

2.3.3. Demographics

A host of different demographic variables were gathered, but only the following, most well-established variables known to be associated with problem gambling were controlled for: gender, income, education, and age. Previous studies on the PP program [23,45,46] have reported on further demographic- and gambling-related background variables. Gender was collected as a non-dichotomous variable (*male / female / other / I'd rather not say*), but categories besides *male* and *female* were excluded (n = 12). Income was collected as an ordinal variable with options ranging from Option 1 (*under 6500 euros/year*) to Option 8 (*50,000 euros/year or more*) but analyzed as a continuous variable. Education was also collected as an ordinal variable with options ranging from Option 1 (*primary education*) to Option 6 (*master's degree or higher*). Education and age (in years) were analyzed as continuous variables.

2.4. Statistical analyses

All analyses were conducted using the R platform for statistical computing (v. 4.2.1; [49]). We used linear mixed modelling (LMM) within the lme4 package [50]: The treatment phase and participant ID were Level 1 and Level 2 variables, respectively (repeated measurements within participants). Due to maximum likelihood estimation, LMM can deal with data attrition in the dependent variable. There were 184, 32, and 6 participants with missing values on age, education, and income, respectively, which were imputed using the variables' median values.

NODS was analyzed as a continuous dependent variable. The treatment phase (baseline, post treatment, and 6- and 12-month follow-up) was a categorical predictor. Due to a highly skewed distribution, JDEQ score was dichotomized (scores between 1 and 3 were coded as 0 [= "Dissociation is rare"], and scores between 3 and 5 were coded as 1 [= "Dissociation is frequent"]). The interaction between treatment and dichotomized JDEQ was modelled as per our hypothesis that participants with different levels of dissociation will respond differentially to treatment.

Two moderation models were calculated: one with JDEQ as a baseline-measured moderator (Model 1) and the other with JDEQ as a repeatedly measured moderator (Model 2). Model 1 reveals whether dissociation present at baseline affects treatment effectiveness. However, since dissociation and problem gambling are positively correlated (Pearson's rs = 0.56–0.70 across treatment phases), the treatment should also affect JDEQ scores. Model 2 allows for evaluating whether dissociation affects treatment effectiveness given that treatment also affects dissociation. JDEQ was further used as the (continuous) dependent variable in an LMM to see how treatment affects dissociation. JDEQ had a skewed distribution, so we also calculated the model using robust LMM [51].

We controlled for gender, income, education, and age. Participant ID was used as a random intercept effect, that is, variance was allowed in the intercepts between participants. The lmerTest package [52], which applies Satterthwaite's method, was used to estimate degrees of freedom and p values for LMM models. Marginal and conditional R^2 values were obtained as instructed by [53] using the performance package [54]. Marginal and conditional R^2 values estimate the variance explained by fixed factors and fixed *plus* random factors, respectively. All LMM models satisfied the assumptions of linearity. Q-Q plots indicated that the model residuals and random effects were normally distributed and homoscedastic.

We also calculated paired samples Cohen's d values (with Hedge's correction) for the treatment effect when comparing (i) baseline versus post treatment, (ii) baseline versus the six-month follow-up, and (iii) baseline versus the 12-month follow-up. Cohen's d values were only calculated for follow-up completers (Ns = 655, 327, and 200, for baseline versus post-treatment, baseline versus the six-month follow-up, and baseline versus the 12-month follow-up, respectively; see the supplementary materials for figures for the follow-up completers alone). Finally, we evaluated whether the results were robust against controlling for the COVID-19 pandemic period. We created a dichotomous COVID-variable indexing pre- and post-COVID periods (before and after 1 March 2020), based on the participants' registration date, and used it as a covariate.

3. Results

Of the participants, 40.9% reported losing track of time (M = 2.78, SD = 1.51), 33% reported experiencing a trance-like state (M = 2.51, SD = 1.42), 29.1% reported experiencing a change in identity (M = 2.33, SD = 1.46), and 10.83% reported having a memory blackout (= 1.74, SD = 1.14) during at least half of the gambling occasions (meaning they answered either 4 = *over half of the times* or 5 = *always*).

The retention rates were 52.7%, 26.3%, and 16.1% for post treatment, the six-month follow-up, and the 12-month follow-up, respectively (Table 1). Note, however, that there were several individuals who

Table 1
Number of participants, retention rates, NODS scores, JDEQ scores, mean age, and gender distribution by treatment phase.

	TREATMENT PHASE			
Variable	Baseline	Post treatment	6-month follow-up	12-month follow-up
Participants (retention %)	1243	655 (52.6)	327 (26.3)	200 (16.1)
NODS score (SD)	5.78 (2.57)	1.69 (2.05)	1.92 (2.05)	1.98 (2.85)
JDEQ score (SD)	2.54 (1.31)	1.33 (0.85)	1.39 (0.95)	1.32 (0.76)
Mean age (SD)	34.0 (9.25)	35.2 (9.98)	36.9 (10.5)	37.3 (10.8)
Males %	59.7	59.3	55.4	55.5

Note: The 8-week intervention took place between the baseline and the post-treatment measures. The retention rates (in brackets) are the percentages of participants who proceeded to the next treatment phase by filling out the questionnaire. Note that at post treatment this does *not* refer to the percentage of participants who completed the intervention (some completed all the treatment modules without filling out the post-treatment questionnaire; for more information on treatment discontinuation in this sample see [46]). NODS scores range from 0 to 10, and JDEQ scores range from 1 to 5.

completed all treatment modules but did not fill out the post-treatment questionnaire [46]. The treatment was effective, with average NODS scores (95% CI) dropping from 5.78 (5.62–5.94, baseline) to 1.69 (1.54–1.85, post-treatment), 1.92 (1.63–2.22, six-month follow-up), and 1.98 (1.59–2.38, 12-month follow-up) (see Table 1).

In Models 1 and 2, all predictors were statistically significant; see Table 2 for omnibus ANOVA analyses (see the supplementary document for detailed regression coefficient tables). Most importantly, there was a highly significant main effect of treatment (Model 1: $F(3, 1561) = 574.4$, $p < .0001$; Model 2: $F(3, 1601) = 119.1$, $p < .0001$), and the interaction between treatment and dissociation was also highly significant (Model 1: $F(3, 1566) = 23.2$, $p < .0001$; Model 2: $F(3, 1659) = 16.2$, $p < .0001$). The parameter estimates showed that higher NODS scores were associated with younger age (Model 1: B = −0.01, $t = -1.89$, $p = .059$; Model 2: B = −0.01, $t = -2.12$, $p = .03$), lower income (Model 1: B = −0.15, $t = -4.93$, $p < .0001$; Model 2: B = −0.16, $t = -4.89$, $p < .0001$), lower education (Model 1: −0.18, $t = -3.18$, $p = .001$; Model 2: B = −0.17, $t = -2.83$, $p = .004$), and male gender (Model 1: B = 0.4, $t = 3.29$, $p = .001$; Model 2: 0.46, $t = 3.61$, $p = .0003$).

The model pseudo R^2 values were 0.43 and 0.5 (marginal effects for Models 1 and 2, respectively) and 0.62 and 0.67 (conditional effects for Models 1 and 2, respectively), indicating strong effects (see Table 2). Cohen's *d* values for the paired samples comparisons were 1.21 (baseline vs. post treatment), 0.96 (baseline vs. the six-month follow-up), and 0.92 (baseline vs. the 12-month follow-up). These effect sizes are comparable to a meta-analysis average effect [19] at post treatment (Hedge's $g = 0.729$) and follow-up (Hedge's $g = 1.1$). Cohen's *d* values were only calculated for follow-up completers, making them robust against any attrition effects (see the supplementary materials for further figures).

Some individuals started the treatment but either never finished it or finished it but did not complete the post-treatment questionnaire ($N = 588$). We imputed their missing post-treatment NODS scores with their baseline NODS scores (post-treatment NODS score = baseline NODS score + X [random error with $X \sim N(0, 0.5)$]), which pessimistically assumes that none of these individuals would have benefited from the treatment. Even then Cohen's *d* indicated "moderate" effects (= 0.672) for the treatment.

The most notable drop in NODS scores occurred between baseline and post treatment and the changes diminished thereafter (Fig. 1). Both models (Model 1: baseline-measured JDEQ; Model 2: repeatedly measured JDEQ) showed a highly significant interaction, indicating that the treatment effect differed depending on the levels of dissociation. However, Fig. 1 shows that the effects of the two models need to be interpreted differently. Model 1 (baseline JDEQ) does *not* support our hypothesis: Regardless of the level of dissociation, there is a clear beneficial treatment effect. In fact, the treatment effect is significantly *stronger* for individuals who report frequent dissociation, likely because these individuals have higher average baseline NODS scores, and thus a higher potential for improvement. In Model 2 (repeatedly measured JDEQ), NODS scores declined uniformly after treatment, but the effect did not last as long for individuals with frequently reported dissociation. This supported our hypothesis and is in line with similar findings by [23] who used repeatedly measured depression symptoms as a treatment effect moderator. Model 2, unlike Model 1, controls for the fact that the treatment itself affects self-reported levels of dissociation. Thus, the treatment effect was not sustained for individuals who report frequent dissociation after treatment (Fig. 1). There was no change in the pattern of these results by including the dichotomous COVID variable as a covariate.

To determine that the moderating effect of dissociation on treatment is not a function of participant dropouts, which is crucial in order to show there is no bias in our analysis due to data attrition, we repeated our analysis with follow-up completers alone (i.e., only those completers who had gone through the whole program and follow-ups). This analysis is detailed in the supplementary document. Finally, we performed an additional analysis with a dichotomous "dropout" (1 = *dropped out*, 0 = *did not drop out between the baseline and 12-month follow-up measures*) variable as a control, but this had essentially no effect on the main pattern of the results. Together, these analyses show that the main results, including the interaction effects, are robust.

Finally, an LMM with JDEQ as the (continuous) dependent variable, and the demographic variables controlled for, revealed a significant main effect of the treatment phase on dissociation (Fig. 2; $F(3, 1396) = 239$, $p < .0001$; Robust LMM [51] baseline vs. post-treatment $B = -1.16$, $t = -22.3$). Thus, the intervention reduced dissociative experiences.

4. Discussion

We investigated whether gambling-related dissociative experiences hinder the effectiveness of a CBT-based online intervention for problem gambling. Dissociation was measured at four time points (at baseline, post-treatment, and at 6- and 12-month follow-ups), which allowed us to also examine its temporal persistence. Our results suggested that treatment effectiveness depended on self-reported levels of dissociation. The participants with high levels of dissociation at baseline seemed to benefit more from the intervention than those with lower levels of

Table 2
Omnibus (ANOVA) results for the LMM with NODS scores as a continuous DV.

	F value		Degrees of freedom		*P* value	
Predictor	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Treatment	574.46	119.13	3, 1561	3, 1601	<0.0001	<0.0001
JDEQ	38.57	323.34	1, 1573	1, 1948	<0.0001	<0.0001
Gender (B)	13.00	10.87	1, 1106	1, 1069	0.0003	0.001
Income (B)	23.98	24.38	1, 1150	1, 1112	<0.0001	<0.0001
Education (B)	8.05	10.14	1, 1094	1, 1041	0.004	0.001
Age (B)	4.52	3.57	1, 1005	1, 959	0.03	0.059
Treatment*JDEQ	23.26	16.20	3, 1566	3, 1659	<0.0001	<0.0001
Random effects						
Participant ID SD	1.43	1.34				
Residual SD	2.00	1.86				
Model fit						
Marginal R^2	0.43	0.50				
Conditional R^2	0.62	0.67				

Notes: B = the value used in the analysis was only measured at baseline (pre-treatment). Dissociation was collected in all phases of the study and analyzed as a dichotomous variable. Model 1 = baseline-measured dissociation as a moderator. Model 2 = repeatedly measured dissociation as a moderator. Type-3 ANOVA with Satterthwaite's method was used for approximating the degrees of freedom and calculating *p* values [53]. JDEQ = Jacobs' Dissociative Experience Questions scores. SD = Standard Deviation. See the supplementary document for detailed regression coefficient tables.

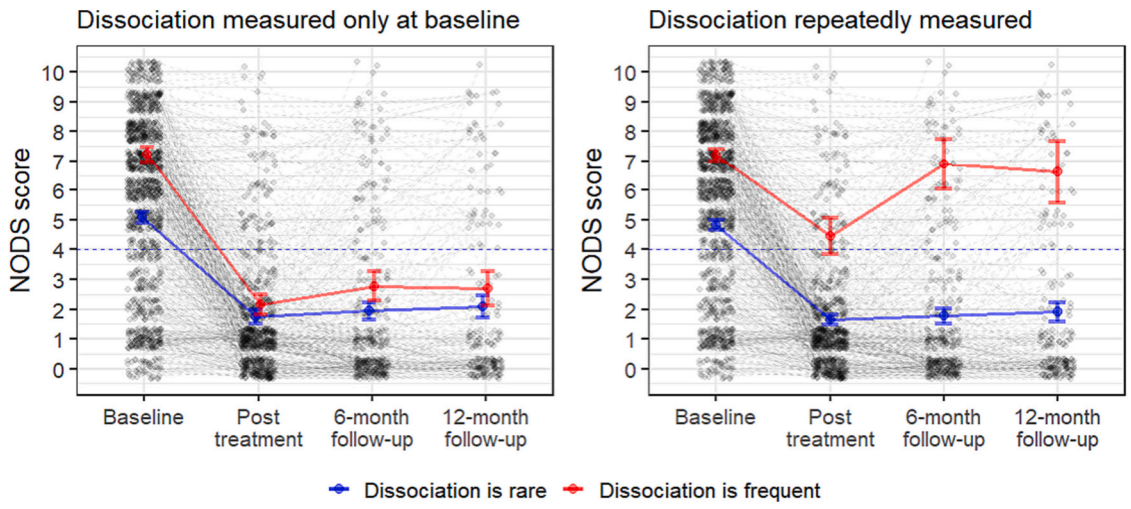

Fig. 1. Participant-wise NODS scores across the treatment phases and estimated marginal means for different levels of dissociation.
Note: NODS scores across treatment phases are presented separately for the dichotomized JDEQ variable (mean JDEQ values between 1 and 3 were coded as "0 = *Dissociation is rare*", and between 3 and 5 were coded as "1 = *Dissociation is frequent*"). *Left*: Baseline-measured JDEQ values. *Right*: Repeatedly measured JDEQ values. The blue and red lines are estimated marginal means controlling for age, gender, education, and income. Dashed grey lines are the individual-wise pathways of observations. Datapoints are jittered randomly to improve readability. The blue dashed line (at NODS score = 4) indicates the cut-off point for significant problem gambling. Error bars represent bootstrapped 95% confidence intervals.

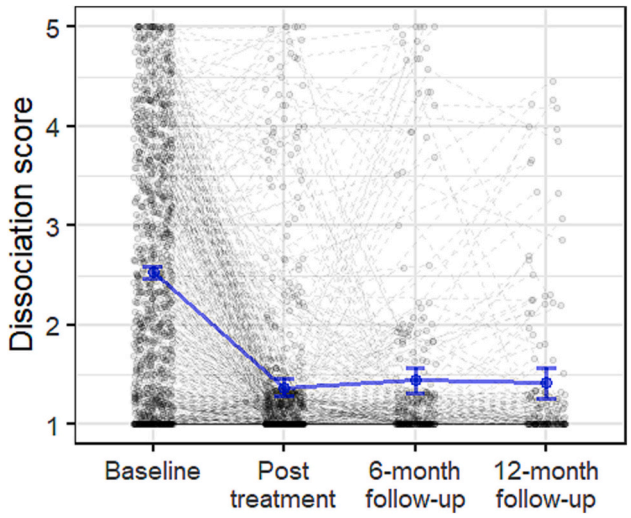

Fig. 2. Participant-wise dissociation (JDEQ) scores across treatment phases and estimated marginal means from a linear mixed model.
Note: The blue line represents estimated marginal means controlling for age, gender, education, and income. Dashed grey lines are the individual-wise pathways of observations. Datapoints are jittered randomly to improve readability. Error bars represent bootstrapped 95% confidence intervals.

dissociation. This did not support our hypothesis but aligns with addiction studies where individuals with more severe symptoms at baseline benefit more from interventions [55,56]. Participants with higher levels of baseline dissociation also had higher gambling severity and thus, ostensibly, a higher potential to improve. The treatment components are geared towards eliciting a motivation to change, addressing the negative consequences of gambling, and modifying gambling-related dysfunctional beliefs, which likely makes the treatment effective for individuals who tend to lose control of their gambling when in dissociative states.

When dissociation was repeatedly measured, thus controlling for the fact that the treatment affects dissociation alongside problem gambling, a different picture emerged: The participants with high levels of dissociation, although initially benefitting from the intervention, did not sustain the benefits *if* the dissociative symptoms were not simultaneously reduced. At the follow-ups, the beneficial treatment effect was reversed for those who also kept experiencing high levels of dissociation. These results are in line with an earlier report on the PP program [23] and support our initial hypothesis. Persisting dissociative features in gambling may reflect a motivation to escape unpleasant emotions and lead to losing control of both time and money spent gambling [35]. Recovering gamblers with a tendency to experience dissociation may thus benefit from bespoke booster sessions after the initial treatment, particularly because dissociation can increase the likelihood of relapse [57–59]. The problem-gambling population is heterogeneous in terms of motivations for gambling as well as in terms of problem-gambling symptoms, which should be taken into consideration when customizing treatment efforts.

4.1. *Limitations and future directions*

Our participants were treatment seekers, and the results may not generalize to people who are unwilling to seek help for their gambling problems. The lack of a control group also needs to be noted. Some participants had gambling severity scores of zero at baseline, which is partly explained by the waiting list period: Gambling severity was measured using a two-month reporting window at baseline, and thus, in some cases, the reporting window only (or mostly) covered the waiting list period. In the PP program, there is a minor (but notable) average decrease in gambling-severity scores during the waiting list period that has not yet been formally investigated.

In our study, problem-gambling severity and dissociation were highly correlated, and the treatment also reduced dissociation symptoms. This is in line with Jacobs' theory [34] as well as the Pathways model [41], both of which assert that dissociation is a sign of problem-gambling severity. However, dissociation is not included conceptually in NODS. One NODS item ("Have you ever gambled as a way to escape from personal problems?") measures escapist motivation for gambling, though not as comprehensively as scales designed to measure dissociation. Likewise, the DSM-5 and ICD-11 note that, while not diagnostically determinative, knowing when someone gambles to avoid negative affective states can inform treatment planning [2,3]. Murch et al. [30] have argued that being in *the zone* has more in common with active and deliberate flow states than pathological, escapism-related dissociation.

Currently, there is no consensus on how dissociation should be operationalized. JDEQ targets addiction-related dissociative experiences and differs from, for example, the Dissociative Experiences Scale (DES [25]). Future research would benefit from unifying measures assessing dissociation and should aim at deepening our understanding of different forms of gambling-related dissociative states. Future work should also measure gambling pathways [60] to determine whether dissociative gamblers fit one pathway (such as the pathway for emotionally vulnerable gamblers) better than another. Finally, future studies could extend work on dissociation to other forms of behavioral addictions. For example, the design techniques used by technology companies are very similar to the techniques used by the casino industry and many online gambling companies [61]. Social media and smartphones likely induce states of dissociation comparable to gambling [62]. Their use behaviorally resembles the diagnostic criteria of addictions [63–66] and is widely experienced as such [67–69].

4.2. Conclusion

The PP program is an effective online CBT-based treatment for problem gambling as well as for gambling-related dissociation. However, whether the beneficial reduction on problem gambling symptoms is sustained over time depends on the sustained level of dissociative symptoms. This study supports the notion of dissociation being a sign of problem-gambling severity and highlights the importance of customizing treatment efforts. Future studies should aim at clarifying the concept of dissociation, as well as broaden the study of dissociative experiences to concern other behavioral addictions.

Declaration of Competing Interest

Sari Castrén works at the Finnish Institute for Health and Welfare, and as a part-time private practitioner clinical psychologist at Addiktum Clinic Helsinki, Finland, treating mainly individuals with addiction problems, and at Mehiläinen Medical Center, Forum Helsinki, where she offers treatments for various psychological issues. She also trains professionals to treat gambling disorder (MI, CBT) as a part of her duty at the Finnish Institute for Health and Welfare and addictions in general privately. She has received fees from Helsinki University, Oulu University, Tampere City, Vocational School Stadi, and Mehiläinen for her lectures on behavioral addictions and for training professionals, and writer's fees from the Finnish Medical Society Duodecim, The Finnish Medical Association, the Finnish Association of Addiction Medicine, the Finnish Psychological Association, and Myllyhoitoyhdistys ry. She received fees from Svenska Spel (2021, 2022, 2023; Sweden) for evaluating grant proposals and received fees from Tampere University, Finland, for preliminary examination of PhD work, and received fees from Lund University, Sweden, for being the opponent for a PhD thesis. She declares no conflict of interest in relation to this manuscript. No other authors have any declarations of interest.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.comppsych.2023.152414.

References

[1] Shaffer HJ, Korn DA. Gambling and related mental disorders: a public health analysis. Annu Rev Public Health 2002;23:171–212.
[2] Association AP. Diagnostic and statistical manual of mental disorders (DSM-V). Arlington: American Psychiatric Association; 2013.
[3] World Health Organization. International classification of diseases (11th revision). Retrieved from, https://icd.who.int/; 2022.
[4] Abbott MW. The changing epidemiology of gambling disorder and gambling-related harm: public health implications. Public Health 2020;184:41–5.
[5] Calado F, Griffiths MD. Problem gambling worldwide: an update and systematic review of empirical research (2000–2015). J Behav Addict 2016;5(4):592–613.
[6] Salonen A, Hagfors H, Lind K, Kontto J. Gambling and Problem Gambling: Finnish Gambling 2019: Prevalence of At-risk Gambling has Decreased. 2020.
[7] Goslar M, Leibetseder M, Muench HM, Hofmann SG, Laireiter AR. Pharmacological treatments for disordered gambling: a meta-analysis. J Gambl Stud 2019;35(2):415–45.
[8] Hodgins DC, Stea JN, Grant JE. Gambling disorders. Lancet 2011;378(9806):1874–84.
[9] Cowlishaw S, Merkouris S, Dowling N, Anderson C, Jackson A, Thomas S. Psychological therapies for pathological and problem gambling. Cochrane Database Syst Rev 2012;11.
[10] Pfund RA, Peter SC, Whelan JP, Meyers AW, Ginley MK, Relyea G. Is more better? A meta-analysis of dose and efficacy in face-to-face psychological treatments for problem and disordered gambling. Psychol Addict Behav 2020;34(5):557.
[11] Rash CJ, Petry NM. Psychological treatments for gambling disorder. Psychol Res Behav Manag 2014;7:285.
[12] Hofmarcher T, Romild U, Spångberg J, Persson U, Håkansson A. The societal costs of problem gambling in Sweden. BMC Public Health 2020;20(1):1–14.
[13] Suurvali H, Cordingley J, Hodgins DC, Cunningham J. Barriers to seeking help for gambling problems: a review of the empirical literature. J Gambl Stud 2009;25(3):407–24.
[14] Pfund RA, Peter SC, McAfee NW, Ginley MK, Whelan JP, Meyers AW. Dropout from face-to-face, multi-session psychological treatments for problem and disordered gambling: a systematic review and meta-analysis. Psychol Addict Behav 2021;35(8):901–13.
[15] Giroux I, Goulet A, Mercier J, Jacques C, Bouchard S. Online and mobile interventions for problem gambling, alcohol, and drugs: a systematic review. Front Psychol 2017;8:954.
[16] McDonald A, Eccles JA, Fallahkhair S, Critchley HD. Online psychotherapy: trailblazing digital healthcare. BJPsych bulletin 2020;44(2):60–6.
[17] Van Der Maas M, Shi J, Elton-Marshall T, Hodgins DC, Sanchez S, Lobo DS, et al. Internet-based interventions for problem gambling: scoping review. JMIR Mental Health 2019;6(1):e9419.
[18] Augner C, Vlasak T, Aichhorn W, Barth A. Psychological online interventions for problem gambling and gambling disorder–a meta-analytic approach. J Psychiatr Res 2022;151:86–94.
[19] Sagoe D, Griffiths MD, Erevik EK, Høyland T, Leino T, Lande IA, et al. Internet-based treatment of gambling problems: a systematic review and meta-analysis of randomized controlled trials. J Behav Addict 2021;10(3):546–65.
[20] Dowling NA, Rodda SN, Lubman DI, Jackson AC. The impacts of problem gambling on concerned significant others accessing web-based counselling. Addict Behav 2014;39(8):1253–7.
[21] Carlbring P, Degerman N, Jonsson J, Andersson G. Internet-based treatment of pathological gambling with a three-year follow-up. Cogn Behav Ther 2012;41(4):321–34.
[22] Boughton RR, Jindani F, Turner NE. Group treatment for women gamblers using web, teleconference and workbook: effectiveness pilot. Int J Ment Heal Addict 2016;14(6):1074–95.
[23] Palomäki J, Heiskanen M, Castrén S. Online 8-week cognitive therapy for problem gamblers: the moderating effects of depression symptoms and perceived financial control. J Behav Addict 2022;11(1):75–87.
[24] Dixon MJ, Graydon C, Harrigan KA, Wojtowicz L, Siu V, Fugelsang JA. The allure of multi-line games in modern slot machines. Addiction. 2014;109(11):1920–8.
[25] Rogier G, Beomonte Zobel S, Marini A, Camponeschi J, Velotti P. Gambling disorder and dissociative features: a systematic review and meta-analysis. Psychol Addict Behav 2021;35(3):247.
[26] Schluter MG, Hodgins DC. Dissociative experiences in gambling disorder. Curr Addict Rep 2019;6(1):34–40.
[27] Schüll ND. Addiction by design. In: Addiction by design. Princeton University Press; 2012.
[28] Oakes J, Pols R, Battersby M, Lawn S, Pulvirenti M, Smith D. A focus group study of predictors of relapse in electronic gaming machine problem gambling, part 1: factors that 'push'towards relapse. J Gambl Stud 2012;28(3):451–64.
[29] Csikszentmihalyi M. Flow: The psychology of optimal experiencevol. 1990. New York: Harper & Row; 1990.
[30] Murch WS, Limbrick-Oldfield EH, Ferrari MA, MacDonald KI, Fooken J, Cherkasova MV, et al. Zoned in or zoned out? Investigating immersion in slot machine gambling using mobile eye-tracking. Addiction. 2020;115(6):1127–38.
[31] Butler LD. Normative dissociation. Psychiatr Clin 2006;29(1):45–62.
[32] Wood RT, Gupta R, Derevensky JL, Griffiths M. Video game playing and gambling in adolescents: common risk factors. J Child Adolesc Subst Abuse 2004;14(1):77–100.
[33] Jacobs DF. A general theory of addictions: a new theoretical model. J Gambl Behav 1986;2(1):15–31.

[34] Jacobs DF. Evidence for a common dissociative-like reaction among addicts. J Gambl Behav 1988;4(1):27–37.
[35] Dixon MJ, Gutierrez J, Larche CJ, Stange M, Graydon C, Kruger TB, et al. Reward reactivity and dark flow in slot-machine gambling:"light" and "dark" routes to enjoyment. J Behav Addict 2019;8(3):489–98.
[36] Diskin KM, Hodgins DC. Narrowing of attention and dissociation in pathological video lottery gamblers. J Gambl Stud 1999;15(1):17–28.
[37] Imperatori C, Innamorati M, Bersani FS, Imbimbo F, Pompili M, Contardi A, et al. The association among childhood trauma, pathological dissociation and gambling severity in casino gamblers. Clin Psychol Psychother 2017;24(1):203–11.
[38] McCormick J, Delfabbro P, Denson LA. Psychological vulnerability and problem gambling: an application of Durand Jacobs' general theory of addictions to electronic gaming machine playing in Australia. J Gambl Stud 2012;28(4):665–90.
[39] Murch WS, Chu SW, Clark L. Measuring the slot machine zone with attentional dual tasks and respiratory sinus arrhythmia. Psychol Addict Behav 2017;31(3):375.
[40] Dixon MJ, Gutierrez J, Stange M, Larche CJ, Graydon C, Vintan S, et al. Mindfulness problems and depression symptoms in everyday life predict dark flow during slots play: implications for gambling as a form of escape. Psychol Addict Behav 2019;33(1):81.
[41] Milosevic A, Ledgerwood DM. The subtyping of pathological gambling: a comprehensive review. Clin Psychol Rev 2010;30(8):988–98.
[42] Blaszczynski A, Nower L. A pathways model of problem and pathological gambling. Addiction. 2002;97(5):487–99.
[43] Carlbring P, Smit F. Randomized trial of internet-delivered self-help with telephone support for pathological gamblers. J Consult Clin Psychol 2008;76(6):1090.
[44] Montgomery SA, Åsberg M. A new depression scale designed to be sensitive to change. Br J Psychiatry 1979;134(4):382–9.
[45] Castrén S, Pankakoski M, Tamminen M, Lipsanen J, Ladouceur R, Lahti T. Internet-based CBT intervention for gamblers in Finland: experiences from the field. Scand J Psychol 2013;54(3):230–5.
[46] Palomäki J, Lind K, Heiskanen M, Castrén S. Predicting online problem gambling treatment discontinuation: new evidence from cross-validated models. Psychol Addict Behav 2022;37(3):519–32.
[47] Gerstein D, Volberg RA, Toce MT, Harwood H, Johnson RA, Buie T, et al. Gambling impact and behavior study: Report to the national gambling impact study commission. Chicago: National Opinion Research Center; 1999.
[48] Brazeau BW, Hodgins DC. Psychometric evaluation of the NORC diagnostic screen for gambling problems (NODS) for the assessment of DSM-5 gambling disorder. Addict Behav 2022;130:107310.
[49] Team RC. R: A language and environment for statistical computing. 2013.
[50] Bates D, Mächler M, Bolker B, Walker S. Fitting linear mixed-effects models using lme4. arXiv preprint arXiv 2014:14065823.
[51] Koller M. Robustlmm: an R package for robust estimation of linear mixed-effects models. J Stat Softw 2016;75:1–24.
[52] Kuznetsova A, Brockhoff PB, Christensen RH. lmerTest package: tests in linear mixed effects models. J Stat Softw 2017;82:1–26.
[53] Nakagawa S, Schielzeth H. A general and simple method for obtaining R2 from generalized linear mixed-effects models. Methods Ecol Evol 2013;4(2):133–42.
[54] Lüdecke D, Ben-Shachar MS, Patil I, Waggoner P, Makowski D. Performance: an R package for assessment, comparison and testing of statistical models. J Open Source Software 2021;6(60).
[55] Tiet QQ, Ilgen MA, Byrnes HF, Harris AH, Finney JW. Treatment setting and baseline substance use severity interact to predict patients' outcomes. Addiction. 2007;102(3):432–40.
[56] Crits-Christoph P, Markell HM, Gallop R, Gibbons MBC, McClure B, Rotrosen J. Predicting outcome of substance abuse treatment in a feedback study: can recovery curves be improved upon? Psychother Res 2015;25(6):694–704.
[57] Oakes J, Pols R, Lawn S. The 'merry-go-round'of habitual relapse: a qualitative study of relapse in electronic gaming machine problem gambling. Int J Environ Res Public Health 2019;16(16):2858.
[58] Raylu N, Oei TP. A cognitive behavioural therapy programme for problem gambling: Therapist manual. Routledge; 2010.
[59] Rizeanu S. The efficacy of cognitive-behavioral intervention in pathological gambling treatment. Procedia Soc Behav Sci 2014;127:626–30.
[60] Nower L, Blaszczynski A. Development and validation of the gambling pathways questionnaire (GPQ). Psychol Addict Behav 2017;31(1):95.
[61] What Happened in Vegas — with Natasha Dow Schüll | Your Undivided Attention. Available from: https://your-undivided-attention.simplecast.com/episodes/what-happened-in-vegas-kHYm_esr; 2022.
[62] Baughan A, Zhang MR, Rao R, Lukoff K, Schaadhardt A, Butler LD, et al. "I Don't Even Remember What I Read": How Design Influences Dissociation on Social Media. In: CHI Conference on Human Factors in Computing Systems; 2022. p. 1–13.
[63] Andreassen CS. Online social network site addiction: a comprehensive review. Curr Addict Rep 2015;2(2):175–84.
[64] Billieux J, Philippot P, Schmid C, Maurage P, De Mol J, Van der Linden M. Is dysfunctional use of the mobile phone a behavioural addiction? Confronting symptom-based versus process-based approaches. Clin Psychol Psychother 2015;22(5):460–8.
[65] Błachnio A, Przepiorka A, Pantic I. Association between Facebook addiction, self-esteem and life satisfaction: a cross-sectional study. Comput Hum Behav 2016;55:701–5.
[66] Busch PA, McCarthy S. Antecedents and consequences of problematic smartphone use: a systematic literature review of an emerging research area. Comput Hum Behav 2021;114:106414.
[67] Adorjan M, Ricciardelli R. Smartphone and social media addiction: exploring the perceptions and experiences of Canadian teenagers. Can Rev Sociol 2021;58(1):45–64.
[68] Conroy D, Chadwick D, Fullwood C, Lloyd J. "You have to know how to live with it without getting to the addiction part": British young adult experiences of smartphone overreliance and disconnectivity. Psychology of Popular Media; 2022.
[69] Li L, Lin TT. Over-connected? A qualitative exploration of smartphone addiction among working adults in China. BMC Psychiatry 2019;19(1):1–10.
[70] Diskin KM, Hodgins DC. Narrowed focus and dissociative experiences in a community sample of experienced video lottery gamblers. Can J Behav Sci 2001;33(1):58–64.