



Exploring gambling craving through the elaborated intrusion theory of desire: a mixed methods approach

Aurélien Cornil, Olatz Lopez-Fernandez, Gaëtan Devos, Philippe de Timary, Anna E. Goudriaan & Joël Billieux

To cite this article: Aurélien Cornil, Olatz Lopez-Fernandez, Gaëtan Devos, Philippe de Timary, Anna E. Goudriaan & Joël Billieux (2018) Exploring gambling craving through the elaborated intrusion theory of desire: a mixed methods approach, *International Gambling Studies*, 18:1, 1-21, DOI: [10.1080/14459795.2017.1368686](https://doi.org/10.1080/14459795.2017.1368686)

To link to this article: <https://doi.org/10.1080/14459795.2017.1368686>



Published online: 13 Sep 2017.



Submit your article to this journal [↗](#)



Article views: 43



View related articles [↗](#)



View Crossmark data [↗](#)



Exploring gambling craving through the elaborated intrusion theory of desire: a mixed methods approach

Aurélien Cornil^{a,b}, Olatz Lopez-Fernandez^{a,d}, Gaëtan Devos^a, Philippe de Timary^{a,b,c}, Anna E. Goudriaan^{e,f} and Joël Billieux^{a,b,g}

^aLaboratory for Experimental Psychopathology (LEP), Psychological Science Research Institute, Université catholique de Louvain, Louvain-la-Neuve, Belgium; ^bInternet and Gambling Disorders Clinic, Department of Adult Psychiatry, Saint-Luc University Hospital, Brussels, Belgium; ^cInstitute of Neuroscience, Université catholique de Louvain, Brussels, Belgium; ^dInternational Gaming Research Unit (IGRU), Department of Psychology, Nottingham Trent University, Nottingham, UK; ^eDepartment of Research, Arkin Mental Health Care, Amsterdam, The Netherlands; ^fAcademic Medical Center, Department of Psychiatry, Amsterdam Institute for Addiction Research, University of Amsterdam, Amsterdam, The Netherlands; ^gAddictive and Compulsive Behaviour Lab (ACB-Lab), Institute for Health and Behaviour. Integrative Research Unit on Social and Individual Development (INSIDE), University of Luxembourg, Esch-sur-Alzette, Luxembourg

ABSTRACT

Gambling disorder is a well-established behavioural addiction, which was classified with substance-related disorders in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders*. Although craving was introduced as a new diagnostic criterion for substance-related disorders, it was not included for gambling disorder. This study aimed to explore the experience of gambling craving and to evaluate whether the elaborated intrusion theory of desire (EIT), a cognitive model of craving, fits gambling craving. A mixed methods study was conducted among 31 non-clinical gamblers. The qualitative part consisted of open-ended questions targeting the components of the EIT. The quantitative part consisted of a questionnaire designed to assess triggers and descriptions of gambling craving. Qualitative analysis revealed six distinct conceptual categories related to gambling craving: positive and negative affect, external cues, mental imageries, thoughts and physiological sensations. The quantitative analysis highlighted the most relevant triggers (e.g. spontaneous thoughts) and experiential characteristics (e.g. visual imagery) of gambling craving. The present study allowed the authors to support the relevance of the EIT as it applies to gambling craving by disentangling its core features. Findings from this study suggest that the use of interventions derived from the EIT may be relevant for problem gambling treatment.

ARTICLE HISTORY

Received 18 March 2017
Accepted 13 August 2017

KEYWORDS

Craving; urge; gambling; problem gambling; elaborated intrusion theory of desire; mixed methods research

Introduction

Gambling disorder is a well-established behavioural addiction and nowadays constitutes a recognized public health issue. Gambling disorder has an estimated prevalence around 1.5% in the adult population (Gowing et al., 2015; Williams, Volberg, & Stevens, 2012),

yet important national differences exist (Hodgins & Petry, 2016). Originally, pathological gambling was included as an impulse control disorder in previous editions of the *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed., *DSM-III*; 4th ed., text rev., *DSM-IV-TR*; American Psychiatric Association, 1985, 2000). It was renamed as gambling disorder in the fifth edition of the manual (*DSM-5*; American Psychiatric Association, 2013) and aligned with the substance-related and addictive disorder category. This amendment was due to the accumulation of evidence emphasizing similarities with substance use disorders, such as similar neurobiological and cognitive impairments and shared psychosocial risk factors (e.g. Clark, 2010; Goudriaan, Oosterlaan, De Beurs, & Van Den Brink, 2006; Potenza, 2006). Craving as a diagnostic criterion was for the first time included in the *DSM-5* to define substance-related disorders (Romanczuk-Seiferth, van den Brink, & Goudriaan, 2014) on the basis of behavioural, imaging, pharmacological and genetic evidence (Hasin et al., 2013). Craving was not included as a criterion of gambling disorder, which constitutes a striking difference from substance-related disorders, because the question of whether craving is central to the diagnosis of gambling disorder remains to date unanswered (Rash, Weinstock, & Van Patten, 2016).

Gambling craving

In past years, the study of gambling craving has received a growing interest. Initial evidence was gathered by adapting questionnaires developed to assess alcohol craving for gambling craving (de Castro, Fong, Rosenthal, & Tavares, 2007; Tavares, Zilberman, Hodgins, & el-Guebaly, 2005). Using this approach, these studies demonstrated that both alcohol and gambling craving correlate with negative affect, whereas only gambling craving was found to be associated with positive affect. The relation between negative affect and gambling craving is in accordance with the cognitive behavioural model of gambling disorder formulated by Sharpe (2002), which posits that gamblers characterized by maladaptive coping strategies are more prone to experience adverse emotional states promoting craving episodes. It has also been suggested by Ladouceur, Sylvain, and Gosselin (2007) that gambling craving persists over time and has a long-term impact, based on data highlighting that the majority of a sample of self-excluded casino gamblers still felt cravings six months after being excluded from gambling. Another study by de Castro and colleagues (2007) found that the self-reported subjective intensity of craving was equivalent, and in certain cases even more pronounced, in pathological gamblers versus patients with an alcohol use disorder. Along the same lines, recent studies have demonstrated that the cerebral activity observed during substance and gambling craving episodes (provoked via cue exposure) presented striking similarities (van Holst, van den Brink, Veltman, & Goudriaan, 2010).

Several instruments have been developed in recent years to assess gambling craving, most of them being inspired or adapted from questionnaires measuring craving for psychoactive substances. Among existing measures, some are unidimensional (e.g. Gambling Urge Questionnaire; Elman, Tschibelu, & Borsook, 2010; Gambling Urge Scale; Raylu & Oei, 2004; Penn Gambling Craving Scale; Tavares et al., 2005), whereas others comprise different subscales and distinguish between various dimensions of craving. For example, the Gambling Craving Scale (Young & Wohl, 2009) separately assesses desire (urgent desire), anticipation (of positive affect) and relief (from negative affect). Considering gambling disorder as a condition within the spectrum of obsessive and compulsive disorders, Pallanti,

DeCaria, Grant, Urpe, and Hollander (2005) adapted the Yale-Brown Obsessive-Compulsive Scale to measure, on the one hand, gambling-related thoughts and cravings and, on the other hand, gambling-related behaviours.

According to Grant, Potenza, Weinstein, and Gorelick (2010), a core characteristic of behavioural addictions consists in the inability to inhibit harmful behaviours (such as gambling) that are triggered by craving episodes. This assumption is in line with theoretical (Blaszczynski & Nower, 2002; Sharpe, 2002) and empirical (e.g. Ashrafioun, Kostek, & Ziegelmeyer, 2013; Raylu & Oei, 2004; Young & Wohl, 2009) evidence that craving is a key factor involved in the development, maintenance and relapse of gambling disorder, similar to what was demonstrated in relation to substance use disorders. Furthermore, Hormes (2017) recently advocated for retaining craving as a diagnostic criterion in behavioural addictions, on the basis of a corpus of data emphasizing that craving is a reliable index to differentiate between normal and pathological appetitive behaviours and that intensity of craving correlates with functional impairment in the context of gambling disorder. Nonetheless, most existing gambling craving research is anchored within the biomedical approach of addiction and thus focuses on the physiological and cerebral similarities between gambling and substance-related disorders, rather than on the potential unique features of gambling craving (e.g. van Holst et al., 2010). Thus, studies offering an in-depth exploration of the psychological processes (e.g. cognitive, affective or motivational) involved in the onset and continuation of gambling craving are lacking. Actually, it appears that most research conducted in the field a priori transposes what is known about substance craving and applies this to gambling craving, from scale development to hypothesis testing (for a critical discussion, see Billieux, Schimmenti, Khazaal, Maurage, & Heeren, 2015; Kardefelt-Winther et al., 2017). A consequence of this ‘confirmatory bias’ is that qualitative studies aiming at exploring the core features of gambling craving and related subjective experiences are lacking. This is unfortunate, as such studies could inform the field on potential unique aspects of gambling craving and thus participate in the refinement of gambling craving assessment and treatment.

The elaborated intrusion theory of desire

Traditional models of craving define it as a motivational state characterized by an intense ‘urge to consume’ a psychoactive substance (e.g. Baker, Morse, & Sherman, 1987; Marlatt, 1985). Cognitive models of craving challenged these theories. Among them, the elaborated intrusion theory of desire (EIT; Figure 1; Kavanagh, Andrade, & May, 2005) conceptualizes episodes of craving as high-level cognitive processes – or elaborations – recruiting mental imagery and executive (controlled) mechanisms. According to the EIT, cravings and desires are not qualitatively distinct phenomena; rather, they constitute subjective psychological experiences of various intensity aligned on the same continuum, which can be linked to any potential hedonic or reinforcing activity or behaviour. Within the EIT, desire – or craving – is the result of an emotion-laden cognitive elaboration where a specific behaviour (e.g. eating, consuming a psychoactive substance), together with its anticipated consequences (e.g. pleasure, relief), overwhelm one’s attentional focus (Kavanagh et al., 2005, 2013).

The EIT identifies five types of triggers that are susceptible to promote a subjective state of craving. *External cues* (1) are elements from the environment that have been associated (conditioned) with an implicated behaviour. *Anticipatory responses* (2) are physiological

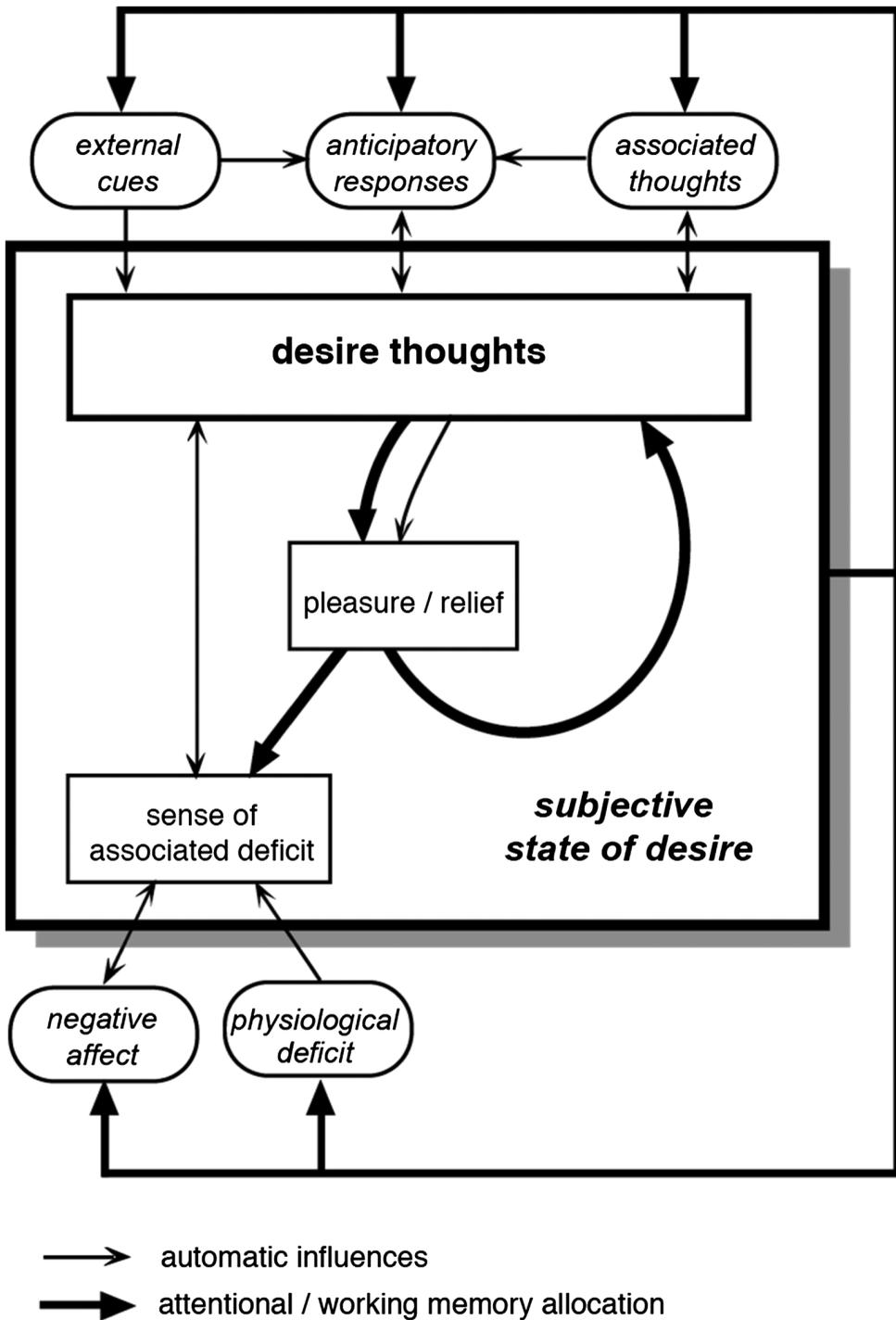


Figure 1. The elaborated intrusion theory of desire. Adapted from 'Imaginary Relish and Exquisite Torture: The Elaborated Intrusion Theory of Desire' (Kavanagh, Andrade, & May, 2005, p. 448). Copyright 2005 by the American Psychological Association. Adapted with permission.

sensations (e.g. saliva, rumbling of stomach) that are not necessarily related to the incriminated behaviour, but that are interpreted in this way. *Associated thoughts* (3) are thoughts unrelated to the incriminated behaviour (e.g. task-unrelated intrusive thoughts, mind wandering or episodic memory retrieval) that are prone to attract the attention on the incriminated behaviour through associative processes. According to the EIT, these three types of triggers promote *desire thoughts*, which consist in multi-sensorial cognitive elaborations about the desired object composed of mental imageries (e.g. mentally picturing a casino), thoughts (e.g. thinking how good it would be to gamble right now), and plans related to the satisfaction of the desire (e.g. planning to get money out of the cash point to gamble). The last two types of triggers, namely *physiological deficits* (4) and *negative affect* (5), are postulated to cause desire/craving through the mediation of a *sense of associated deficit*; that is, the awareness of discomfort or a withdrawal state. Based on the EIT, *desire thoughts* allow one to voluntarily and mentally feel the desired object, and thus have the function to either generate pleasure or relieve the discomfort caused by the *sense of associated deficit*. This, however, comes at a cost, as the cognitive elaborations sustaining *desire thoughts* are demanding in terms of cognitive resources (attentional processes and working memory).

Importantly, the EIT posits that a double retroactive loop (or vicious circle) is responsible for the acute subjective experience of desire – or craving – which ultimately promotes the compulsive/impulsive satisfaction of the desired object. The first vicious circle is explained by the positive and negative reinforcement value of the *desire thoughts*, whereas the second vicious circle is sustained by the fact that the object of desire is only fulfilled to a lesser extent (i.e. through mental imagery), which, through a counterfactual process (i.e. a comparison between the desired versus actual state), strengthens the *sense of associated deficit* and perpetuates *desire thoughts*, as previously described. The EIT is now a well-established theory in the field of substance use disorders (Caselli & Spada, 2015; May, Kavanagh, & Andrade, 2015; Tiggemann & Kemps, 2005), which allows to disentangle the various psychological processes involved in craving episodes.

Current study

Despite growing evidence suggesting that gambling and substance craving show similarities in underlying physiological and neurological factors (de Castro et al., 2007; Romanczuk-Seiferth et al., 2014; Tavares et al., 2005), craving was not retained in the *DSM-5* to define gambling disorder. Research on the psychological aspects of gambling craving is thus warranted. Importantly, this research must be explorative in nature, because most previous studies adopted a confirmatory approach, following what is known about substance craving. To the best of our knowledge, no qualitative study has been conducted previously to explore the experience of gambling craving and consider it in the light of existing theoretical models of craving.

The first objective of the current study, therefore, was to provide a content analysis of the core features and characteristics of gambling craving, based on the framework of the EIT, which constitutes a sound theoretical rationale to account for the complexity and multi-determined nature of the psychological processes implicated. The second aim of this research was to further investigate the relevance of the EIT by assessing the weight of its components regarding gambling craving.

To reach these objectives, we recruited a sample of non-clinical gamblers from the community and conducted a mixed methods study with complementary purposes (Greene, Caracelli, & Graham, 1989). This study had a sequential triangulation design (Creswell & Plano Clark, 2011; Morse, 1991) composed of two stand-alone data sets, one qualitative and one quantitative, that are analysed separately. In this approach, the results are combined for discussion in order to address one specific research topic. We adopted this research design because it allowed us to investigate gambling craving via two different and independent approaches, thus combining their strengths. In the present study, the qualitative part was conducted first and comprised open-ended questions covering the various components of the EIT in order to meet the first goal of this research and to examine gamblers' subjective representation of their craving experiences. Second, we collected the quantitative questions using a questionnaire developed by May, Andrade, Panabokke, and Kavanagh (2004) in order to assess triggers and components of gambling craving. This step consisted of the adaptation of a questionnaire that was created to measure the components of substance craving within the rationale provided by the EIT (May et al., 2004). Third, we cross-checked the qualitative results with the quantitative ones. In the final step, qualitative and quantitative data were conjointly considered to explore and describe the phenomenon of gambling craving.

Methods

Participants and procedure

The study consisted of an online self-reported survey (hosted by Qualtrics) and was composed of three distinct sections: (1) the assessment of demographic and gambling-related variables (type and frequency of gambling, symptoms of disordered gambling); (2) a set of qualitative questions developed to investigate the relevance of the EIT applied to gambling craving; and (3) a set of items (quantitative questions) targeting gambling craving. The sections were administered separately, in the mentioned order, and were parts of a broader longitudinal study. Other data not related to the current project will be presented elsewhere.

Participants were regular gamblers from the community who volunteered to participate. Inclusion criteria were being aged 18 years and older, being fluent in French and being involved in some form of gambling (at least twice a week at the moment of the study). Participants were recruited through advertisements (gambling houses in Brussels, news shops and other public places at the Université catholique de Louvain), snowballing techniques, and distribution in social networks (e.g. research-related groups on Facebook).

Confidentiality of the participants was guaranteed and no personal data was collected. Participants were identified by a personalized code of 2 letters and 4 numbers, signed an informed consent and were paid 20€ for their participation. The study protocol was approved by the ethical committee of the Psychological Sciences Research Institute of the Université catholique de Louvain. This study is part of a larger longitudinal research project on gambling, and other data not related to the current project are presented elsewhere.

A total of 31 regular gamblers (21 males), aged from 19 to 37 years ($M = 22.65$, $SD = 3.31$), took part in the study. Most of the participants were students at the time of the experiment ($n = 28$). All but one participant indicated being involved in more than one gambling activity. The gambling activities reported were the following: scratch cards ($n = 28$), lotteries ($n = 25$),

poker ($n = 17$), bets ($n = 14$), online poker ($n = 8$), slot machines ($n = 5$) and others (roulette, casino, electronic gambling machines; $n = 5$). Symptoms of disordered gambling were assessed via the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001), which is a widely used screening test composed of 9 continuous items based on experiences of the past 12 months. This questionnaire allows classification of gamblers into categories related to the severity of their symptoms, according to defined cut-offs. Twenty-one (68% of the sample) had a score equal to or higher than 3 on the PGSI, indicating probable at-risk gambling associated with negative consequences to some extent. Among them, 11 participants (35% of the sample) had a score equal to or higher than 8, indicating probable gambling disorder. It is worth noting that the elevated proportion of at-risk gamblers identified in the study sample is not surprising given that all recruited participants were highly involved gamblers.

Qualitative section

Nine questions were generated to explore the core features and characteristics of gambling craving (see Table 1) on the basis of the EIT. Themes covered by the questions mainly focused on craving triggers (e.g. external cues, physical sensations, emotional states) and related cognitive elaborations (e.g. mental imageries). Temporality was also considered, as some questions referred to emotional states and physical sensations that generally precede gambling (i.e. during the craving episode), whereas others referred to emotional states and physical sensations taking place while gambling or after having gambled. This approach was used to distinguish between craving versus gambling-related emotional states and physical sensations. In order to cover aspects that previous questions might have neglected, we added an additional non-mandatory question for participants who wanted to add or specify some elements or details regarding their gambling cravings.

Quantitative section

The quantitative section consisted of the adaptation of a questionnaire developed to assess the component of the EIT related to substance craving (May et al., 2004)¹. The questionnaire

Table 1. Qualitative part of the study.

Internal and external triggers

1. What are the thoughts and/or mental imageries that come to your mind and promote your desire to gamble? How do they appear?
2. When the desire to gamble occurs (before gambling), what emotions do you experience?
3. When the desire to gamble occurs (before gambling), what are the related body sensations or physical reactions?
4. Do environmental elements promote your desire to gamble or generate gambling-related thoughts? For example, an advertisement, a smell, the sound of coins ...

Temporal aspects

5. What emotions do you experience while involved in gambling?
6. What types of body sensations or physical reactions do you experience while gambling?
7. What emotions do you experience after having been involved in gambling?
8. What types of body sensations or physical reactions do you experience after having been involved in gambling?

Additional question

9. What further information would you like to give us about your gambling cravings? It might be a deepening of a question that has been asked or an element on which no question was raised but that you find interesting to mention.
-

Note: The open-ended questions were presented in the following order: 1, 2, 5, 6, 3, 7, 8, 4, 9.

was adjusted to gambling and measured triggers (12 items) and characteristics (10 items) of gambling-related craving (see Table 2 for the specific items). In the current study, this questionnaire was used to determine whether the descriptors of gambling craving refute or support the EIT.

The scale was translated to French as follows: (1) two authors of this manuscript (AC and JB) translated the 22 items into French; (2) an English-French bilingual person translated the French version back into English; and (3) all discrepancies identified between the original English scale and the back translation were discussed until a satisfactory solution was found. Several items were adapted to target gambling rather than substance craving. First, three items that relate to smell and taste, relevant in the context of substance use but probably not in the context of gambling, were replaced by items related to the sense of touch, which we hypothesized is more relevant in the context of gambling (e.g. manipulating cards, dice, slot machines). Second, one item which originally addressed the availability of the substance was adapted to refer to the availability of gambling (see Table 2). All items were scored on a 5-point Likert scale ranging from 1 ('not at all') to 5 ('absolutely'). Due to technical failure, two participants did not complete the quantitative section of the study.

Table 2. Participant's answers on the quantitative questions, based on an adaptation of the questionnaire developed by May et al. (2004).

	Mean rating	Agreement percentage				
		1	2	3	4	5
<i>What in general triggers your gambling craving?</i>						
I suddenly think about it – spontaneous thoughts	3.3	3	14	41	28	14
I have nothing else to do / I am bored – boredom	3.1	17	3	38	38	3
I picture myself gambling – visual imagery	2.7	24	21	21	34	0
I feel happy – positive affect	2.5	24	28	21	28	0
Other things I am thinking about remind me of it – associated thoughts	2.4	24	31	24	21	0
I see the game / touch the game / hear sounds related to the game – external cues	2.1	38	28	21	10	3
I imagine the sensation of touching objects related to gambling – tactile imagery	1.9	62	3	21	10	3
I imagine the sounds related to the game – auditory imagery	1.7	66	14	10	7	3
I always gamble at a certain time / place – habit	1.7	59	21	17	3	0
I feel stressed / anxious / sad – negative affect	1.6	66	14	14	7	0
I am really busy – being busy	1.5	66	21	10	3	0
I feel hungry / thirsty / tired / physical discomfort – physiological deficit	1.3	79	14	3	3	0
<i>Please describe your gambling craving when it occurs</i>						
If I don't think about gambling, my craving will go away – distraction	2.7	31	10	21	31	7
I am visualising it – visual imagery	2.4	34	17	21	24	3
I am in a place where it is possible to gamble – context	2.4	31	21	24	21	3
Gambling would feel very comforting at that time – comfort expectation	2.2	38	24	24	10	3
I am imagining the touch sensations related to gambling – tactile imagery	2.1	48	10	21	21	0
I am thinking of how much better I will feel after I have gambled – thoughts about mood improvement	2.0	45	24	17	14	0
I am trying to resist gambling – self-control	2.0	45	24	21	10	0
I would feel more relaxed if I gambled – expectation of relaxation	1.9	52	17	17	14	0
I can hear myself gambling – auditory imagery	1.7	55	24	14	7	0
I want to gamble because I am hungry / thirsty or I feel tiredness / a physical discomfort – physiological deficit	1.2	79	17	3	0	0

Note: The items highlighted in grey do not fit with the Elaborated Intrusion Theory, according to the initial conceptualization by May et al. (2004). The Likert scale used for all items ranged from 1 ('not at all') to 5 ('absolutely'). The bold dashed lines represent the cut-off to consider an item as relevant.

Data analytic strategy

Qualitative data analysis

Thematic analysis was used to create categories of answers by identifying ‘themes which capture the most important patterns of meaning contained within the data’ (Willig, 2013, p. 57). Qualitative transcripts were indexed via NVivo 10 (NVivo qualitative data analysis software, 2012) computer software and initial thematic analysis was conducted by the principal investigator (AC). Another author (OLF) verified and validated the findings and a third author (JB) supervised the whole process and added a layer of consensus. Regular discussions between AC and OLF resulted in the identification of themes based on data obtained with the open-ended questions (see Table 1). We relied on an in-depth analysis conducted by two distinct authors to reduce potential bias and overstatements. All qualitative data were classified into 44 themes (see Table 3: e.g. excitement, stress, advertisement, wealth/win, tension, activities), and a conceptual network was created based on the occurrence (i.e. presence of a specific theme in the answers of a participant) of each identified theme (Hsieh & Shannon, 2005). In our qualitative analysis, we decided to focus on the occurrence rather than on the frequency (i.e. the number of times a specific theme is mentioned by a participant) of the themes. The rationale for this choice is that in qualitative research, frequency is generally considered a potentially biased variable, especially influenced by the participant’s pre-existing knowledge about the phenomenon under investigation, and not necessarily representative of its importance for the participant (Willig, 2013). To support our qualitative data analysis, we systematically illustrated each identified theme with participant’s quotes (see Table 3).

Quantitative data analysis

The analysis of the answers obtained via the quantitative items was performed in accordance with the descriptive data analytic strategy proposed by May et al. (2004) to examine the relevance of various craving descriptors according to the EIT. Using the same analysis as May et al. (2004) is also necessary for comparison purposes. To this end, a cut-off was used to define relevant versus non-relevant descriptors, based on the 5-point Likert scale. More precisely, an item was considered non-relevant if (1) the lowest point of the Likert scale (answer = ‘not at all’) was selected by at least 50% of the participants, and (2) the mean response score for that item was lower than 2. All items that passed this threshold were considered relevant.

Results

Qualitative results

Core features and characteristics of gambling craving

The qualitative data analytic process conducted highlighted the existence of five main themes that emerged from the analysis of the four questions addressing gambling craving triggers (questions 1 to 4) and the additional non-mandatory supplementary question (question 9). These themes were the following: (1) affect; (2) external cues; (3) mental imageries; (4) thoughts; and (5) physiological sensations. It is worth noting that all answers were taken into account in the qualitative analysis process, even when a reply to one question (e.g. a participant reported ‘boredom’ in the space dedicated to the answer to question 4 about

Table 3. Qualitative thematic analysis of gambling craving triggers.

Themes	Quotes	Percentage (n = 31)
Affect		97%
<i>Positive</i>		81%
Excitement	'I feel excitement' (06 M 20)	61%
Joy	'I feel euphoria and joy because I'm gonna win' (05 F 26)	39%
Confidence	'confidence' (01 M 22); 'safety' (25 F 21)	6%
<i>Negative</i>		48%
Stress	'stress that I cannot get over till I've lost [...] money' (02 M 23)	32%
Others ^a	'doubt' (26 M 22); 'feeling of smallness' (15 M 23)	13%
Boredom	'boredom plays also a part in it' (28 M 21)	6%
Irritation	'I feel irritated towards the equipment [i.e., the computer]' (19 F 21)	6%
External Cues		94%
Advertisement	'the advertisement for sports betting sites' (01 M 22)	55%
Cues related to gambling / sport	'casino token' (15 M 23); 'a football match' (11 M 23)	42%
Cues related to wealth	'the sight of the price of some things' (17 M 21)	26%
Sounds	'the sound of coins' (05 F 26); 'casino sounds' (03 F 26)	19%
Hearing gambling-related words	'words specific to poker [...] (raise, shove, fold, creep...)' (28 M 21)	19%
Gambling locations	'the places leading to gambling' (31 M 19)	16%
Others ^b	'the hour that the online poker tournament begin' (19 F 21)	16%
Specific events	'Friday 13th' (06 M 20); 'big sport events' (12 M 21)	13%
TV shows	'poker television programs' (21 M 22)	6%
Images		74%
Wealth / Win	'I imagine the amount of money I could have' (08 M 24)	35%
Dream, realization, projection	'image of what I could do, live' (14 F 24)	26%
Gambling stuff	'the images are: cards, dices [...] colors' (30 F 25)	23%
Others ^c	'about images, I'd say [...] a glass of alcohol, men' (23 F 21)	13%
Gambling locations	'the image of a casino' (31 M 19)	10%
Thoughts		65%
Wealth / Win	'to be rich' (25 F 21); 'thoughts of money' (18 M 20)	39%
Dream, realization, projection	'dreams coming true through money' (06 M 20)	23%
People	'the thought of this person' (02 M 23)	10%
Others ^d	'thoughts of victory, surpassing oneself' (04 M 37)	10%
Justification	'better spend money on it than on cigarettes' (07 M 21)	6%
Physiological Sensations		48%
<i>No physiological sensation</i>	'I don't remember any specific body sensation' (15 M 23)	39%
Tension	'clenched fist' (10 M 19)	19%
Twitch	'finger tapping on the table' (04 M 37)	16%
Body temperature change	'I feel like warmth' (05 F 26)	13%
Sweat	'sweat, hands a bit wet' (30 F 25)	10%
Heart rate acceleration	'palpitation' (23 F 21)	6%

Note: For each quote, the following information is reported in brackets: (1) identification number of the participant; (2) gender; and (3) age. Percentages reported concerned the entire sample.

^aSmallness, Fear, Doubt;

^bBeing with Friends, a Computer Screen, a Smell, the Hour;

^cFlash, Images of Joy, Colors, a Glass of Alcohol, a Specific Atmosphere;

^dImprecise Thoughts, Victory.

external cues) better fitted another question ('boredom' was a better answer to question 2 about emotions). Figure 2 illustrates the proportion of participants who reported each main theme and Table 3 provides a comprehensive and exhaustive description of the themes and sub-themes identified, alongside with supportive quotes extracted from the participants' responses. We created categories named 'other' to group unique answers that cannot be linked to the identified sub-themes in order to ensure that the analysis was exhaustive.

As reported in Table 3, the qualitative data analysis revealed that *affect* is the most prevalent theme identified by the participants (97%), with positive affect being more frequently identified (81%) than negative affect (48%). Positive affect was generally related to constructs such as arousal, joy or confidence, whereas negative affect was related to constructs

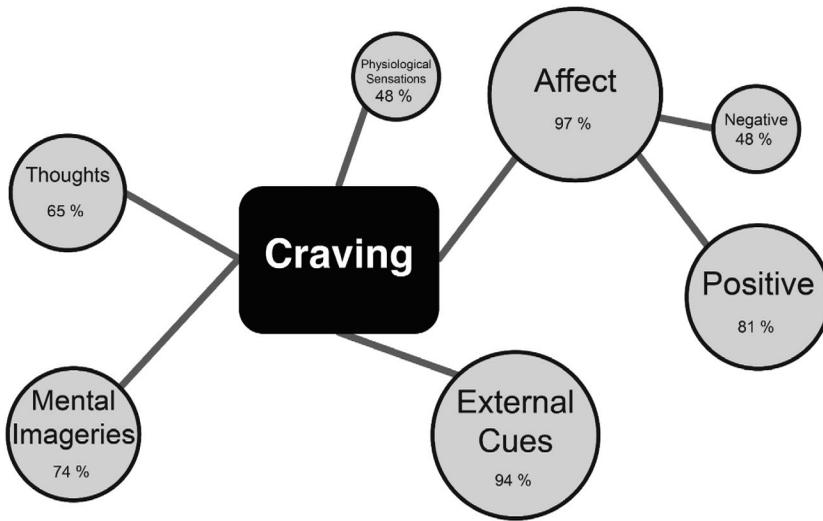


Figure 2. The core features of gambling craving. The macro-themes generated from participants' answers to open-ended questions are reported in the circles. The size of the circles is proportional to the percentage of participants who mentioned each theme.

such as stress, boredom or irritation. Another major theme identified pertains to *external cues* (94%), such as advertisement or gambling-related cues or words, wealth-related cues, gambling locations, or special events and TV shows. The majority of the participants also described that their gambling cravings were associated with *mental imageries* (74%) or *thoughts* (65%) that largely concerned the same types of contents, such as wealth or wins, dream or realization, or gambling locations. Finally, physiological sensations were reported by almost half of the participants (48%), and included physical tension, twitch, body temperature fluctuation, sweat or heart rate acceleration. It is worth noting that a considerable part of the sample (39%) indicated that physiological sensations were not present in gambling craving experiences.

Temporality of emotional states and physiological sensations

The qualitative analysis revealed differential emotional states and physiological sensations before gambling (i.e. while experiencing craving), during gambling and post-gambling (questions 2, 3 and 5 to 8; see Table 4).

Regarding emotional states, it appears first that positive affect is reported by the great majority of the participants before gambling (81%) and post-gambling (84%), but is slightly less prevalent during gambling (61%). Interestingly, an in-depth consideration of the type of affect reported revealed the special status of 'excitement', which is generally reported before gambling (61%), diminished during gambling (26%) and quasi-absent post-gambling (6%). In contrast, joy seems more frequent post-gambling (65%) than before gambling (39%) or when actually gambling (26%). When it comes to negative affect, it appeared that approximately half of the participants (48%) reported negative affect before gambling, while this proportion increases during gambling (65%) and culminates post-gambling (84%). When looking at the type of negative affect reported, it appears that stress is frequently reported

Table 4. Temporality of emotional states and physical sensations.

	Percentage (n = 31)		
	Before	During	After
Affect	97%	90%	97%
<i>Positive</i>	<i>81%</i>	<i>61%</i>	<i>84%</i>
Excitement	61%	26%	6%
Joy	39%	26%	65%
Confidence	6%	0%	0%
Pleasure	0%	13%	0%
Others	0%	6% ^a	6% ^b
Satisfaction	0%	0%	16%
Relief	0%	0%	10%
Relaxation	0%	0%	6%
<i>Negative</i>	<i>48%</i>	<i>65%</i>	<i>84%</i>
Stress	32%	52%	6%
Others	6% ^c	0%	13% ^d
Boredom	6%	3%	0%
Irritation	6%	23%	35%
Doubt	3%	6%	0%
Disappointment	0%	10%	39%
Despair - Sadness	0%	3%	13%
Guilt - Remorse	0%	0%	6%
<i>Neutral</i>	<i>0%</i>	<i>16%</i>	<i>0%</i>
Physiological Sensations	48%	77%	65%
<i>No physiological sensation</i>	<i>39%</i>	<i>16%</i>	<i>19%</i>
Tension	19%	32%	16%
Twitch	16%	29%	0%
Body temperature change	13%	6%	10%
Sweat	10%	6%	3%
Heart rate acceleration	6%	19%	3%
Others	0%	10% ^e	6% ^f
Headache	0%	6%	0%
Relaxation	0%	0%	26%
Tiredness	0%	0%	19%

Note: The themes in bold constitutes the main categories; those in italic, intermediate or alternate categories; and, in regular form, the detailed categories. Percentages reported concerned the entire sample. The sub-themes highlighted in grey show noticeable report variations (at least 13%) of sub-themes mentioned by at least 25% of the sample either before, during or after gambling.

^aFeeling Well, Hope;

^bFeeling Well, Optimistic;

^cSmallness, Fear;

^dDisgust, Lost, Failure, Void Feelings;

^eBlurred Vision, Hunger, Bristly Hairs;

^fShiver, Dynamic or Slow Activity.

during gambling (52%), whereas irritation (35%) and disappointment (39%) are the most frequently reported negative affect characterizing post-gambling.

As described earlier, physiological sensations were not reported as frequently as other themes (e.g. affect, cues) by the participants. Nonetheless, an analysis of their temporality showed that physical sensations are less often reported by the participants pre-gambling (i.e. when the craving occurs; 48%) than when being involved in gambling (77%) or post-gambling (65%). An in-depth analysis of sub-themes highlighted more specific variations. Both tension and twitch are reported before gambling (respectively 19% and 16%) and increase in similar proportion during gambling (respectively 32% and 29%). In contrast, twitch totally disappears after gambling, whereas tension remains mentioned by a subpart of the participants (16%). Relaxation does not appear before or during gambling but only afterwards, and is frequently related to wins ('Wellbeing and relaxation if win').

Quantitative results

According to the statistical approach applied by May et al. (2004), and as described earlier, an item was considered non-relevant if the lowest point of the Likert scale was selected by at least half of the sample and if the mean response score for that item was lower than 2 on the 5-point Likert scale. Each item that did not match these two conditions was considered relevant. Six triggers for craving were classified as relevant (external cues, associated thoughts, positive affect, visual imagery, boredom and spontaneous thoughts) and six triggers were classified as non-relevant (physiological deficit, being busy, negative affect, habit, auditory imagery and tactile imagery); see Table 2. Regarding craving characteristics, seven descriptors were classified as relevant (self-control, thoughts about mood improvement, tactile imagery, comfort expectation, context, visual imagery and distraction) and three descriptors were classified as non-relevant (physiological deficit, auditory imagery and expectation of relaxation). The results of the quantitative analysis are summarized in Table 2.

Discussion

Although gambling disorder has been aligned with substance-related and addictive disorders in the *DSM-5* (American Psychiatric Association, 2013), a craving criterion was not included to define the condition. Research is thus warranted in order to test the relevance of established craving models in relation to gambling craving. The current study consists of a first qualitative and quantitative endeavour to explore the core features of gambling craving and to determine whether it can be conceptualized within the framework of the EIT, an empirically supported cognitive model of craving. On the whole, although the EIT was initially conceptualized to account for desire and craving related to psychoactive substances and food, the current study supports its relevance within the context of gambling as well. In addition, in consistency with previous findings by May and colleagues (2004), the EIT appears to be a valid cognitive model to account for craving episodes. In the next sections, we discuss the key themes identified (see Figure 2) based on the EIT (see Figure 1), and point out the arguments pro and con the suitability of the EIT to account for the subjective experience of gambling craving. The discussion conducted will also be fuelled by the cross-checking of the qualitative and quantitative results. We also discuss how our findings open up promising avenues in terms of process-based psychological treatment.

Affect

In accordance with the EIT theory, which posits the central role of affective states in triggering and perpetuating craving episodes (Kavanagh et al., 2005), our study identifies affect-related contents as being the most frequently reported theme. Similar to what is described in previous studies (e.g. de Castro et al., 2007; Schlauch, Gwynn-Shapiro, Stasiewicz, Molnar, & Lang, 2013), *positive affect* seems an inherent feature of gambling craving. Indeed, the majority of the participants described that feelings of joy and excitement act as triggers with regard to their subjective experiences of gambling craving. This phenomenon is compatible with the EIT, which stipulates that pleasure and relief participate in reinforcing the cognitive elaborations underlying craving episodes (Kavanagh et al., 2005). Importantly, our analysis supports the view that positive affect *per se* can trigger gambling craving, which

is not mentioned as such in the initial formulation of the EIT (see Figure 1). Indeed, the participants reported, both in the qualitative and quantitative questions, that positive affect (e.g. excitement, joy, feeling happy) is important in triggering their gambling craving.

In contrast, *negative affect* is described by less than half of the participants in the qualitative questions; in addition, from the quantitative analysis conducted, negative affect cannot be considered an important trigger of gambling craving in the current sample of gamblers. Given the massive evidence supporting the role of negative affect in triggering gambling behaviours (Raylu & Oei, 2004), this finding might seem counter-intuitive and could be attributed – at least in part – to the non-clinical nature of the study sample. Indeed, the participants in our study included recreational or at-risk gamblers, who probably did not fulfil many of the criteria for disordered gambling or display clinically relevant symptoms. Notably, however, when reconsidering the responses provided to the qualitative questions, recreational and at-risk gamblers both appear to have reported negative affect as a potential trigger of craving, confirming the continuum between desire and craving postulated by the EIT. Nonetheless, and very interestingly, it appears that ‘boredom’, which can be considered a non-clinical index of negative affect, is the second most pervasive trigger reported in the quantitative questions (see Table 2). Accordingly, our findings are not necessarily in contradiction with the cumulating body of research emphasizing the role of negative affect in triggering craving states. Moreover, boredom might be regarded as a state in which cognitive resources could be available for the elaboration of desire thoughts, which is compatible with the EIT even if this particular factor is not directly addressed in this very theory (May et al., 2004).

External cues

The importance of conditioned external (i.e. environmental) cues in triggering gambling craving (Potenza et al., 2003; Sharpe, 2002; Smith, Pols, Battersby, & Harvey, 2013) is confirmed in our sample of gamblers from the community, as *external cues* was the second most prominent theme identified by the participants (see Figure 2 and Table 3). The importance of external cues in promoting gambling craving is also supported by the quantitative items analysis (see Table 2). An in-depth content analysis reveals that the types of external cues reported by the participants included gambling-related advertisements and areas in which gambling opportunities were available. These findings are in line with recent studies emphasizing that young problem gamblers are more sensitive to gambling advertising (Hanss, Mentzoni, Griffiths, & Pallesen, 2015) and that the availability of gambling (context) has to be considered a risk factor for disordered gambling (Jacques, Ladouceur, & Ferland, 2000; Phillips, Ogeil, Chow, & Blaszczynski, 2013). Interestingly, the qualitative data analysis conducted also reveals that external cues can be related to differential sensory modalities (i.e. seeing, hearing and touching; see Table 3 for concrete examples). Regarding the findings that are in line with our theoretical rationale, it appears that the importance of external cues in triggering gambling craving (second most frequent theme reported) supports the relevance of the EIT, as the availability of the desired product, through confrontation with salient external cues, is susceptible to promoting the occurrence of desire thoughts and thus craving.

Mental imageries and thoughts

Mental imagery plays a core role in perpetuating desire thoughts and craving according to the EIT (Kavanagh et al., 2005), whether the craving is induced in a laboratory (Tiffany & Drobos, 1990) or occurs naturally (May et al., 2004). Moreover, it is shown that the vividness of mental imageries is related to the intensity and overwhelming nature of the craving (Harvey, Kemps, & Tiggemann, 2005). In our sample, both the quantitative and the qualitative analyses highlight that mental imagery is a core aspect of the gambling craving experience (see Table 3), whereas the quantitative analysis emphasizes it can also constitute a trigger for gambling craving (see Table 2). On the whole, the various analyses conducted emphasize that visual imagery can act as a trigger for gambling craving, whereas the subjective experience of craving itself is associated with both visual imagery (e.g. visualizing a gambling session) and tactile imagery (e.g. imaging the sensation of manipulating tokens). It is worth mentioning that albeit gambling-related sounds (e.g. the sound of the coins dropping when a slots player cashes out) are known to play a key role in the initiation and perpetuation of gambling behaviours (Brevers & Noël, 2013), auditory imagery *per se* was not described by the participants as an important aspect of the features of gambling craving.

According to the EIT, the *thoughts* related to the desired product constitute a fundamental feature of the subjective experience of craving (Kavanagh et al., 2005). Our sample confirms the importance of thoughts, although less prominently than mental imageries. Although the qualitative analysis conducted does not allow us to distinguish between thoughts triggering craving through classical conditioning from thoughts related to (spontaneous) recollection of gambling-related memories (Kavanagh et al., 2005), the quantitative analysis points out that spontaneous or associated thoughts are prone to trigger gambling craving. Importantly, the comprehensive analysis conducted shows that it is actually complicated to differentiate between mental imageries and thoughts, as they are often related to similar sub-themes (e.g. wealth, win, dream, realization, future mental projection). However, this superposition actually makes sense because both mental imageries and thoughts related to the desired product are postulated to interact in promoting the craving experience in the EIT (Kavanagh et al., 2005; Salkovskis & Reynolds, 1994).

Physiological sensations

Within the EIT, *physiological sensations* are referred to as anticipatory responses on the one hand, which can trigger desire thoughts, and as physiological deficits on the other hand, promoting craving through the focus on the subjective state of deprivation – as, for example, in the case of a withdrawal syndrome (see Figure 2). In the present study, ‘physiological sensations’ is a less prominent theme and related descriptions are limited to anticipatory physiological responses. This is not surprising as gambling behaviours are not associated with the ingestion of a substance (e.g. a drug or an aliment) influencing physiological homeostasis. Yet the qualitative analyses conducted reveals that physiological sensations (e.g. muscular tension, twitch, heart rate acceleration) are part of the gambling craving experience for a subpart of the participants (see Table 3). Interestingly, in the qualitative part, both recreational and at-risk gamblers reported physiological sensations or the absence of such sensations, confirming, as for negative affect, the continuum hypothesis of the EIT. The temporal analysis conducted further illustrates that reported physiological sensations

increase during the game, and decrease afterwards. Coming back to the EIT, this observation tentatively supports the view that the cognitive elaborations underlying desire thoughts already provide satisfaction and/or relief, but to a lesser extent than the actual involvement in the object of desire or craving (Kavanagh et al., 2005).

Clinical implications, limitations and perspectives

The present study confirms the relevance of the EIT to account for the gambling craving experience, which opens up avenues for clinical management of gambling craving. Yet some limitations of the study have to be acknowledged. First, the current study consists of an online study using open-ended questions, which on the one hand limits the influence of social desirability bias, but on the other hand might result in less rich or sophisticated qualitative material than what would be obtained using in-depth interviews or focus groups. Second, our study was conducted in a small sample of non-clinical gamblers with heterogeneous gambling habits and preferred game types (the most frequent gambling activities reported were scratch cards and lotteries). Accordingly, although the tenets of the EIT conceptualized healthy desire and obsessive craving as two extremes of the same continuum (Kavanagh et al., 2005), further research on clinical gamblers and/or research that takes into account gambling preferences is warranted to confirm and extend the findings of the present study. Inclusion of clinical gamblers is also necessary to disentangle which types of triggers are more frequently related to dysfunctional gambling habits. Another important limitation is the self-reported and retrospective nature of our measures, which might result in partly distorted or stereotypical rather than accurate or spontaneous answers. Nonetheless, the study design was adapted to reach the objectives formulated; that is, to measure the subjective experience of gambling craving and analyse it in relation to a specific theoretical framework. Future studies should, however, be conducted with experimental designs or real-world settings (e.g. laboratory-induced craving, craving monitoring via mobile apps).

Despite its limitations, the current study supports the use of interventions derived from the EIT to target craving in gambling disorder. In particular, a promising psychological intervention directly resulting from the EIT consists in recruiting the cognitive resources necessary for the elaboration of mental imageries and thoughts sustaining craving through a competing task, which diminishes their vividness and overwhelming nature. Interference-based psychological interventions thus aim to block or reduce craving by switching the cognitive resources (e.g. attentional processes, visuospatial sketchpad of the working memory) allocated to the elaboration of *desire thoughts* to another competing task that recruits the same type of resources (May, Andrade, Kavanagh, & Penfound, 2008; May, Andrade, Panabokke, & Kavanagh, 2010; Steel, Kemps, & Tiggemann, 2006). Growing evidence supports the usefulness of interference-based interventions (e.g. as diverse as clay modelling, playing the video game Tetris, guided imagery) to interfere with psychoactive substance-related craving (May et al., 2010; Skorka-Brown, Andrade, & May, 2014; Skorka-Brown, Andrade, Whalley, & May, 2015) or food-related craving (Andrade, Pears, May, & Kavanagh, 2012; Hamilton, Fawson, May, Andrade, & Kavanagh, 2013). However, to date, interference-based techniques have not been tested in relation to gambling craving, implying that further research on this very topic is warranted. According to May et al. (2015), other psychological interventions targeting central aspects involved in experiencing craving are worth considering to reduce the frequency and/or vividness of craving. This could include

techniques designed to reduce the influence of external or environmental cues (cognitive bias modification) or interventions which are related to improving emotion regulation skills (e.g. mindfulness-based interventions).

Note

1. The study by May et al. (2004) was conducted to compare the EIT to another theory explaining substance craving, the Cognitive Processing Model (CPM; Tiffany, 1990). The comparison of these theories was not relevant to our objectives in the present study. However, all items of the initial questionnaire were adapted in order to assess the components related to the EIT, as well as to challenge this model on aspects that it does not cover.

Acknowledgements

We thank Prof. Jan De Mol for his help regarding the qualitative data analysis process and the members of the LEP, Université catholique de Louvain, for their useful feedback on earlier drafts of the manuscript.

Conflicts of interest

Funding sources

The study was supported by an independent research grant from the Belgium National Lottery obtained by Joël Billieux. This funding agency did not influence the design of the study, the analyses of results, or content of this article.

Competing interests

The authors declare no competing interests. Joël Billieux is a regional assistant editor for *International Gambling Studies*. He was blinded from the review process and had no access to reviewers' details.

Constraints on publishing

There were no constraints on publishing.

Notes on contributors

Aurélien Cornil is a PhD Student at the Faculty of Psychology of the Université catholique de Louvain and is member of the Addictive Behaviour Unit of Academic Hospital Saint-Luc. His PhD thesis aims to better understand, assess, and treat gambling craving.

Olatz Lopez-Fernandez is currently senior lecturer in the Psychology Department at Nottingham Trent University (UK) and associate member of the Laboratory for Experimental Psychopathology at the Université catholique de Louvain (Belgium). Her main area of research regards the psychological factors involved in addictive behaviours, with a particular focus on technological influence.

Gaëtan Devos is a PhD Student at the Faculty of Psychology of the Université catholique de Louvain. His PhD thesis focuses on the conjoint role of impulsivity and cognitive distortions in gambling and disordered gambling.

Philippe de Timary is full clinical professor of psychiatry at the Université catholique de Louvain, co-head of the alcohol-dependence unit (Unité Intégrée d'Hépatologie) and of the Addictive Behaviour

Unit of Academic Hospital Saint-Luc. His main areas of research are in the biological and psychological processes involved in the development of addictions, with a specific interest in emotion and self-regulation and in the role of personality factors.

Anna E. Goudriaan is professor of working mechanisms and treatment in addiction at the University of Amsterdam, Academic Medical Center (Amsterdam Institute for Addiction Research) and head of the Addiction Research Program of Arkin Mental Health, including Jellinek Addiction Care Amsterdam, The Netherlands. She works as a clinical mental health psychologist in the field of addiction. Her research focuses on understanding mechanisms in behavioural addictions like gambling and substance use disorders, using neuroimaging and neurocognitive methods, in order to develop personalized interventions, and the study of efficacy of neuromodulation in addiction. A more recent focus is on the development of interventions for dually diagnosed patients.

Joël Billieux is currently associate professor of clinical psychology at the university of Luxembourg and visiting professor at the Université catholique de Louvain (Louvain-La-Neuve, Belgium). He is head of the Addictive and Compulsive Behaviours Lab (ACB-Lab) and member of the Integrative Research Unit on Social and Individual Development (INSIDE, University of Luxembourg). His main area of research regards the psychological factors (cognitive, affective, motivational, interpersonal) involved in the etiology of addictive and compulsive behaviours, with a particular focus on self-regulation-related processes.

References

- American Psychiatric Association. (1985). *DSM-III: Diagnostic and statistical manual of mental disorders, 3rd Edition* (3rd ed.). Washington, D.C.: The American Psychiatric Association.
- American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders, 4th edition, text revision* (4th ed.). Washington, DC: American Psychiatric Association.
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. Washington, D.C.: American Psychiatric Association.
- Andrade, J., Pears, S., May, J., & Kavanagh, D. J. (2012). Use of a clay modeling task to reduce chocolate craving. *Appetite*, 58, 955–963. doi:10.1016/j.appet.2012.02.044
- Ashrafioun, L., Kostek, J., & Ziegelmeier, E. (2013). Assessing post-cue exposure craving and its association with amount wagered in an optional betting task. *Journal of Behavioral Addictions*, 2, 133–137. doi:10.1556/JBA.2.2013.011
- Baker, T. B., Morse, E., & Sherman, J. E. (1987). The motivation to use drugs: A psychological analysis of urges. In C. Rivers (Ed.), *The Nebraska symposium on motivation: Alcohol use and abuse* (Vol. 34, pp. 257–323). Lincoln: University of Nebraska Press.
- Billieux, J., Schimmenti, A., Khazaal, Y., Maurage, P., & Heeren, A. (2015). Are we overpathologizing everyday life? A tenable blueprint for behavioral addiction research. *Journal of Behavioral Addictions*, 4, 119–123. doi:10.1556/2006.4.2015.009
- Blaszczynski, A., & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction*, 97, 487–499.
- Brevers, D., & Noël, X. (2013). Pathological gambling and the loss of willpower: A neurocognitive perspective. *Socioaffective Neuroscience & Psychology*, 3, 21592. doi:10.3402/snp.v3i0.21592
- Caselli, G., & Spada, M. M. (2015). Desire thinking: What is it and what drives it? *Addictive Behaviors*, 44, 71–79. doi:10.1016/j.addbeh.2014.07.021
- de Castro, V., Fong, T., Rosenthal, R. J., & Tavares, H. (2007). A comparison of craving and emotional states between pathological gamblers and alcoholics. *Addictive Behaviors*, 32, 1555–1564. doi:10.1016/j.addbeh.2006.11.014
- Clark, L. (2010). Decision-making during gambling: An integration of cognitive and psychobiological approaches. *Philosophical Transactions of the Royal Society B: Biological Sciences*, 365, 319–330. doi:10.1098/rstb.2009.0147
- Creswell, J. W., & Plano Clark, V. L. (2011). *Designing and conducting mixed methods research* (2nd (revised ed.)). Los Angeles, LA: SAGE Publications.

- Elman, I., Tschibelu, E., & Borsook, D. (2010). Psychosocial stress and its relationship to gambling urges in individuals with pathological gambling. *American Journal on Addictions, 19*, 332–339. doi:10.1111/j.1521-0391.2010.00055.x
- Ferris, J., & Wynne, H. (2001). *The Canadian problem gambling index*. Ottawa, ON: Canadian Centre on Substance Abuse.
- Goudriaan, A. E., Oosterlaan, J., De Beurs, E., & Van Den Brink, W. (2006). Neurocognitive functions in pathological gambling: A comparison with alcohol dependence. *Tourette syndrome and normal controls. Addiction, 101*, 534–547. doi:10.1111/j.1360-0443.2006.01380.x
- Gowing, L. R., Ali, R. L., Allsop, S., Marsden, J., Turf, E. E., West, R., & Witton, J. (2015). Global statistics on addictive behaviours: 2014 status report: Addiction global statistics. *Addiction, 110*, 904–919. doi:10.1111/add.12899
- Grant, J. E., Potenza, M. N., Weinstein, A., & Gorelick, D. A. (2010). Introduction to behavioral addictions. *The American Journal of Drug and Alcohol Abuse, 36*, 233–241. doi:10.3109/00952990.2010.491884
- Greene, J. C., Caracelli, V. J., & Graham, W. F. (1989). Toward a conceptual framework for mixed-method evaluation designs. *Educational Evaluation and Policy Analysis, 11*, 255–274. doi:10.3102/01623737011003255
- Hamilton, J., Fawson, S., May, J., Andrade, J., & Kavanagh, D. J. (2013). Brief guided imagery and body scanning interventions reduce food cravings. *Appetite, 71*, 158–162. doi:10.1016/j.appet.2013.08.005
- Hanss, D., Mentzoni, R. A., Griffiths, M. D., & Pallesen, S. (2015). The impact of gambling advertising: Problem gamblers report stronger impacts on involvement, knowledge, and awareness than recreational gamblers. *Psychology of Addictive Behaviors, 29*, 483–491. doi:10.1037/adb0000062
- Harvey, K., Kemps, E., & Tiggemann, M. (2005). The nature of imagery processes underlying food cravings. *British Journal of Health Psychology, 10*, 49–56. doi:10.1348/135910704X14249
- Hasin, D. S., O'Brien, C. P., Auriacombe, M., Borges, G., Bucholz, K., Budney, A., ... Grant, B. F. (2013). DSM-5 criteria for substance use disorders: Recommendations and rationale. *American Journal of Psychiatry, 170*, 834–851. doi:10.1176/appi.ajp.2013.12060782
- Hodgins, D. C., & Petry, N. M. (2016). The world of gambling: The national gambling experiences series: Editorial. *Addiction, 111*, 1516–1518. doi:10.1111/add.13445
- van Holst, R. J., van den Brink, W., Veltman, D. J., & Goudriaan, A. E. (2010). Why gamblers fail to win: A review of cognitive and neuroimaging findings in pathological gambling. *Neuroscience and Biobehavioral Reviews, 34*, 87–107. doi:10.1016/j.neubiorev.2009.07.007
- Hormes, J. M. (2017). The clinical significance of craving across the addictive behaviors: A review. *Current Addiction Reports, 4*, 132–141. doi:10.1007/s40429-017-0138-y
- Hsieh, H.-F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research, 15*, 1277–1288. doi:10.1177/1049732305276687
- Jacques, C., Ladouceur, R., & Ferland, F. (2000). Impact of availability on gambling: A longitudinal study. *The Canadian Journal of Psychiatry, 45*, 810–815.
- Kardfelt-Winther, D., Heeren, A., Schimmenti, A., van Rooij, A., Maurage, P., Carras, M., ... Billieux, J. (2017). How can we conceptualize behavioural addiction without pathologizing common behaviours? *Addiction* [Epub ahead of print]. doi:10.1111/add.13763
- Kavanagh, D. J., Andrade, J., & May, J. (2005). Imaginary relish and exquisite torture: The elaborated intrusion theory of desire. *Psychological Review, 112*, 446–467. doi:10.1037/0033-295X.112.2.446
- Kavanagh, D. J., Statham, D. J., Feeney, G. F. X., Young, R. M., May, J., Andrade, J., & Connor, J. P. (2013). Measurement of alcohol craving. *Addictive Behaviors, 38*, 1572–1584. doi:10.1016/j.addbeh.2012.08.004
- Ladouceur, R., Sylvain, C., & Gosselin, P. (2007). Self-exclusion program: A longitudinal evaluation study. *Journal of Gambling Studies, 23*, 85–94. doi:10.1007/s10899-006-9032-6
- Marlatt, G. A. (1985). Relapse prevention: Theoretical rationale and overview of the model. In G. A. Marlatt & J. R. Gordon (Eds.), *Relapse prevention* (pp. 3–70). New York, NY: Guilford Press.
- May, J., Andrade, J., Panabokke, N., & Kavanagh, D. (2004). Images of desire: Cognitive models of craving. *Memory, 12*, 447–461. doi:10.1080/09658210444000061
- May, J., Andrade, J., Kavanagh, D., & Penfound, L. (2008). Imagery and strength of craving for eating, drinking, and playing sport. *Cognition & Emotion, 22*, 633–650. doi:10.1080/02699930701446296

- May, J., Andrade, J., Panabokke, N., & Kavanagh, D. (2010). Visuospatial tasks suppress craving for cigarettes. *Behaviour Research and Therapy*, 48, 476–485. doi:10.1016/j.brat.2010.02.001
- May, J., Kavanagh, D. J., & Andrade, J. (2015). The Elaborated Intrusion Theory of desire: A 10-year retrospective and implications for addiction treatments. *Addictive Behaviors*, 44, 29–34. doi:10.1016/j.addbeh.2014.09.016
- Morse, J. M. (1991). Approaches to qualitative-quantitative methodological triangulation. *Nursing Research*, 40, 120–123.
- NVivo qualitative data analysis software. (2012). (Version 10). QSR International PtyLtd.
- Pallanti, S., DeCaria, C. M., Grant, J. E., Urpe, M., & Hollander, E. (2005). Reliability and validity of the pathological gambling adaptation of the yale-brown obsessive-compulsive scale (PG-YBOCS). *Journal of Gambling Studies*, 21, 431–443. doi:10.1007/s10899-005-5557-3
- Phillips, J. G., Ogeil, R., Chow, Y.-W., & Blaszczynski, A. (2013). Gambling involvement and increased risk of gambling problems. *Journal of Gambling Studies*, 29, 601–611. doi:10.1007/s10899-012-9325-x
- Potenza, M. N. (2006). Should addictive disorders include non-substance-related conditions? *Addiction*, 101, 142–151. doi:10.1111/j.1360-0443.2006.01591.x
- Potenza, M. N., Steinberg, M. A., Skudlarski, P., Fulbright, R. K., Lacadie, C. M., Wilber, M. K., ... Rounsaville, B. E. (2003). Gambling urges in pathological gambling: A functional magnetic resonance imaging study. *Archives of General Psychiatry*, 60, 828–836. doi:10.1001/archpsyc.60.8.828
- Rash, C., Weinstock, J., & Van Patten, R. (2016). A review of gambling disorder and substance use disorders. *Substance Abuse and Rehabilitation*, 7, 3–13. doi:10.2147/SAR.S83460
- Raylu, N., & Oei, T. P. S. (2004). The gambling urge scale: Development, confirmatory factor validation, and psychometric properties. *Psychology of Addictive Behaviors*, 18, 100–105. doi:10.1037/0893-164X.18.2.100
- Romanczuk-Seiferth, N., van den Brink, W., & Goudriaan, A. E. (2014). From symptoms to neurobiology: pathological gambling in the light of the new classification in DSM-5. *Neuropsychobiology*, 70, 95–102. doi:10.1159/000362839
- Salkovskis, P. M., & Reynolds, M. (1994). Thought suppression and smoking cessation. *Behaviour Research and Therapy*, 32, 193–201. doi:10.1016/0005-7967(94)90112-0
- Schlauch, R. C., Gwynn-Shapiro, D., Stasiewicz, P. R., Molnar, D. S., & Lang, A. R. (2013). Affect and craving: Positive and negative affect are differentially associated with approach and avoidance inclinations. *Addictive Behaviors*, 38, 1970–1979. doi:10.1016/j.addbeh.2012.12.003
- Sharpe, L. (2002). A reformulated cognitive-behavioral model of problem gambling: A biopsychosocial perspective. *Clinical Psychology Review*, 22(1), 1–25.
- Skorka-Brown, J., Andrade, J., & May, J. (2014). Playing “Tetris” reduces the strength, frequency and vividness of naturally occurring cravings. *Appetite*, 76, 161–165. doi:10.1016/j.appet.2014.01.073
- Skorka-Brown, J., Andrade, J., Whalley, B., & May, J. (2015). Playing Tetris decreases drug and other cravings in real world settings. *Addictive Behaviors*, 51, 165–170. doi:10.1016/j.addbeh.2015.07.020
- Smith, D. P., Pols, R. G., Battersby, M. W., & Harvey, P. W. (2013). The gambling urge scale: Reliability and validity in a clinical population. *Addiction Research & Theory*, 21, 113–122. doi:10.3109/16066359.2012.696293
- Steel, D., Kemps, E., & Tiggemann, M. (2006). Effects of hunger and visuo-spatial interference on imagery-induced food cravings. *Appetite*, 46, 36–40. doi:10.1016/j.appet.2005.11.001
- Tavares H., Zilberman M. L., Hodgins D. C., & el-Guebaly N. (2005). Comparison of craving between pathological gamblers and alcoholics. *Alcoholism: Clinical and Experimental Research*, 29, 1427–1431. doi:10.1097/01.alc.0000175071.22872.98
- Tiffany, S. T. (1990). A cognitive model of drug urges and drug-use behavior: Role of automatic and nonautomatic processes. *Psychological Review*, 97, 147–168.
- Tiffany, S. T., & Drobes, D. J. (1990). Imagery and smoking urges: The manipulation of affective content. *Addictive Behaviors*, 15, 531–539. doi:10.1016/0306-4603(90)90053-Z
- Tiggemann, M., & Kemps, E. (2005). The phenomenology of food cravings: The role of mental imagery. *Appetite*, 45, 305–313. doi:10.1016/j.appet.2005.06.004
- Williams, R. J., Volberg, R. A., & Stevens, R. M. (2012). *The population prevalence of problem gambling: Methodological influences, standardized rates, jurisdictional differences, and worldwide*

trends. Ontario Problem Gambling Research Centre. Retrieved from <https://www.uleth.ca/dspace/handle/10133/3068>

Willig, C. (2013). *Introducing qualitative research in psychology* (3rd ed.). Maidenhead: Open Univ. Press.

Young, M. M., & Wohl, M. J. A. (2009). The gambling craving scale: Psychometric validation and behavioral outcomes. *Psychology of Addictive Behaviors*, 23, 512–522. doi:10.1037/a0015043