Behavioural expressions of loss-chasing in gambling: A systematic scoping review

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Abstract

Loss-chasing, the tendency to continue and/or intensify gambling following losses, is a key clinical symptom in gambling disorder and a central feature in problem gambling, endorsed by at-risk problem gamblers. Despite its centrality, the extant literature has often operationalised loss-chasing across distinct behavioural expressions. The current systematic scoping review aimed to map the heterogeneous operationalisations of loss-chasing in the literature. The reviewed studies defined loss-chasing either *between-sessions (n=39)* or *within-sessions (n=38),* as a long-recognised distinction. For both categories, further behavioural expressions could be distinguished. Between-session loss-chasing was captured by endorsing an item 'returning another day/time to recoup losses', or behaviourally as the interval between successive sessions, or as increasing stakes on the next visit. Within-session loss-chasing was defined as continuing to gamble, and/or intensifying betting either by increased risk-taking, stake size, or speed of play. Additionally, much heterogeneity was observed in gambling contexts examined, the exact definition of loss, and the potential delineation of win-chasing. Open questions and future directions are discussed. Overall, this paper severs as a first step towards more conceptual clarity of loss-chasing.

Keywords: Loss-chasing, Chasing, Between-session, Within-session, Gambling, Problem gambling

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Gambling, a popular recreational activity worldwide, has existed in some human societies since pre-historic times (Binde, 2005). When people gamble, they wager something valuable (e.g., money) on a random event, with the goal of maximizing their initial wager. Modern commercial gambling activities often have negative expected values, such that most gamblers lose money in the long run. Yet, many people gamble, and a subset of gamblers persist in gambling despite mounting and debilitating financial losses (Calado & Griffiths, 2016), resulting in negative consequences for both themselves and those around them (American Psychiatric Association [APA], 2013). Their behaviour may seem paradoxical in the context of traditional psychological theories of learning, which argue that behaviours that result in aversive outcomes (such as losing money) should become attenuated and eventually extinguish (e.g., the law of effect, Thorndike, 1927; and reinforcement learning, Sutton & Barto, 2018). Understanding how gamblers react to losses will therefore help us better understand how gambling-related harms arise in some individuals and shed light on the broader question of how individuals learn (or fail) to regulate sequential choices when pursuing reward.

The seemingly paradoxical act of continuing or even intensifying betting in the face of losses is termed *loss-chasing* (Lesieur, 1977; Zhang & Clark, 2020). Loss-chasing has been considered a key clinical symptom of gambling disorder (GD), a behavioural addiction characterised by functional impairments, coupled with recurrent maladaptive patterns of gambling engagement (Grant et al., 2012). Unlike other diagnostic criteria for GD (e.g., preoccupation, escalation etc.) that were largely derived from substance use disorders, loss-chasing is the only criterion for GD in the Diagnostic and Statistical Manual of Mental Disorders-5 (DSM-5; APA, 2013) that is specific to gambling. Thus, it may offer unique insights into GD as a behavioural addiction. Furthermore, it plays a prominent role in theoretical models of GD. For instance, the influential Pathways Model classifies gamblers based on the distinct pathways from initial gambling involvement to the development of GD. Chasing is a key transition in the

final common pathway (i.e., Pathway 1), and is shared across individuals with the emotional- and impulsivity-related vulnerability factors (i.e., Pathways 2 and 3; Blaszczynski & Nower, 2002; Nower et al., 2022). Loss-chasing is not only endorsed by the small (~0.4 – 1.6%; Grant et al., 2012) proportion of people diagnosed with GD but it is a defining feature among problem gamblers (a larger spectrum of people who are at-risk of developing GD but do not meet the diagnostic threshold for a GD diagnosis), as well (Zhang & Clark, 2020). Loss-chasing is considered to facilitate the transition from recreational to problem gambling (PG) and remains central to the initiation and maintenance of PG (Sharpe, 2002; Zhang & Clark, 2020).

Two broad types of loss-chasing have been proposed. The clinical diagnosis of GD defines loss-chasing as returning another day/time to recoup prior losses. This is commonly referred to as *between-session loss-chasing* (Lesieur, 1979;1977). In interviews with gamblers, Browne (1989) and later Dickerson et al. (1991), also reported the loss of control within a gambling episode, which cannot be captured by between-session loss-chasing (O'Connor & Dickerson, 2003). Breen & Zuckerman (1999) formalised such a loss of control as *within-session loss-chasing,* defined as the continuation and/or intensification of gambling to recoup losses within a session.

Since the two broad types of loss-chasing were proposed, there has been a rise in research on loss-chasing, using both laboratory studies and behavioural tracking data collected in the field, e.g. from an online gambling platform (Ciccarelli et al., 2019a; Zhang & Clark, 2020). Some of the more recent studies have also gone beyond the initial definitions and tried to capture loss-chasing in a diverse set of behavioural expressions. This article aims to systematically characterise the different behavioural expressions of loss-chasing, which we view as important for several reasons. First, psychological constructs are the basic building blocks of theoretical models. The lack of conceptual clarity for fundamental constructs may seep through all aspect of research and impede the development of integrated theories (Eronen & Bringmann, 2021; Bringmann et al., 2022). For instance, recent conceptual analyses of several key psychological

constructs (e.g., impulsivity, Strickland & Johnson, 2021; self-esteem, Lawson & Robins, 2021; self-identity, Snippe et al., 2021; subjective well-being, Busseri & Sadava, 2011, etc.) have revealed much heterogeneity in how researchers conceptualise and operationalise these constructs. Such conceptual unclarity may lead to inconsistent empirical observations (e.g., when researchers use the same term for different phenomena) and impede cumulative theoretical progress. In the case of loss-chasing, a systematic investigation of its current operationalisation will be a crucial first step towards more conceptual clarity on this key construct. Second, a systematic review of the loss-chasing operationalisations may reveal potential gaps in the literature and guide further research. A better understanding of loss-chasing at the behavioural level can also inform further research into its neural underpinnings (for a recent call on the importance of behaviour in neuroscience research, see Niv, 2021) , and clinical implications for severe and/or treatment-seeking cases with GD. Lastly, an overview of the operationalisations of loss-chasing is valuable from an applied perspective. With the increasing availability of online gambling, gambling operators are tracking and recording ever more data on people's gambling behaviour (Deng et al., 2019; Ghaharian et al., 2022). A comprehensive list of potential behavioural markers of loss-chasing may allow gambling operators and regulators to incorporate these markers into risk detection systems (Catania & Griffiths, 2021), to detect vulnerable gamblers and intervene at an early stage.

To the best of our knowledge, no comprehensive review of loss-chasing in gambling has been conducted so far. To fill this gap in the literature, we therefore conducted a scoping review, to map the existing evidence on loss-chasing and determine the scope of the extant loss-chasing literature. Undertaking a scoping review was especially suitable for this purpose, as we aimed to examine the types of research conducted thus far, clarify the different ways in which 'loss-chasing' has been operationalized, and identify knowledge gaps and novel questions, which are all main purposes of conducting scoping reviews (see Munn et al., 2018).

Methods

We followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist of reporting guidelines for systematic reviews (Page et al., 2021). Since this paper was a literature review, ethical approval was not required.

Article Databases Search Strategy

Relevant articles were searched across four databases, PubMed and PsycINFO (which gave access to published research), Gambling Research Exchange Ontario (GREO; which gave access to grey literature) and ProQuest (which gave access to dissertation and thesis). Papers from 1980 to September 2022 were searched on 24th September 2022. The following search strings were used to search the databases – (gambling OR gamb* OR bet OR betting OR bettor) AND (chasing OR chase OR chaser), however specific search strings differed across databases (for exact search strings see Supplementary Materials). These search strings restricted the search to gambling research on loss-chasing. Search results were first exported to Zotero to remove duplicates, and then exported to Rayyan.ai (Ouzzani et al., 2016) for screening. Database search was supplemented by searching the references of eligible articles.

Screening protocol and selection process

All authors enlisted and refined the search strings for each database. NB conducted the initial search, removed duplicates, and exported the list to Rayyan.ai for screening. Screening was conducted in two stages: 1.) screening titles and abstracts and 2.) full-text screening. Both stages were conducted by NB and ZC independently blind from each other's decisions. Any conflicts in screening decisions were resolved by discussions between NB and ZC. NB further screened the reference lists of included articles for eligible articles (see Fig. 1 for the PRISMA flow-chart).

Eligibility criteria

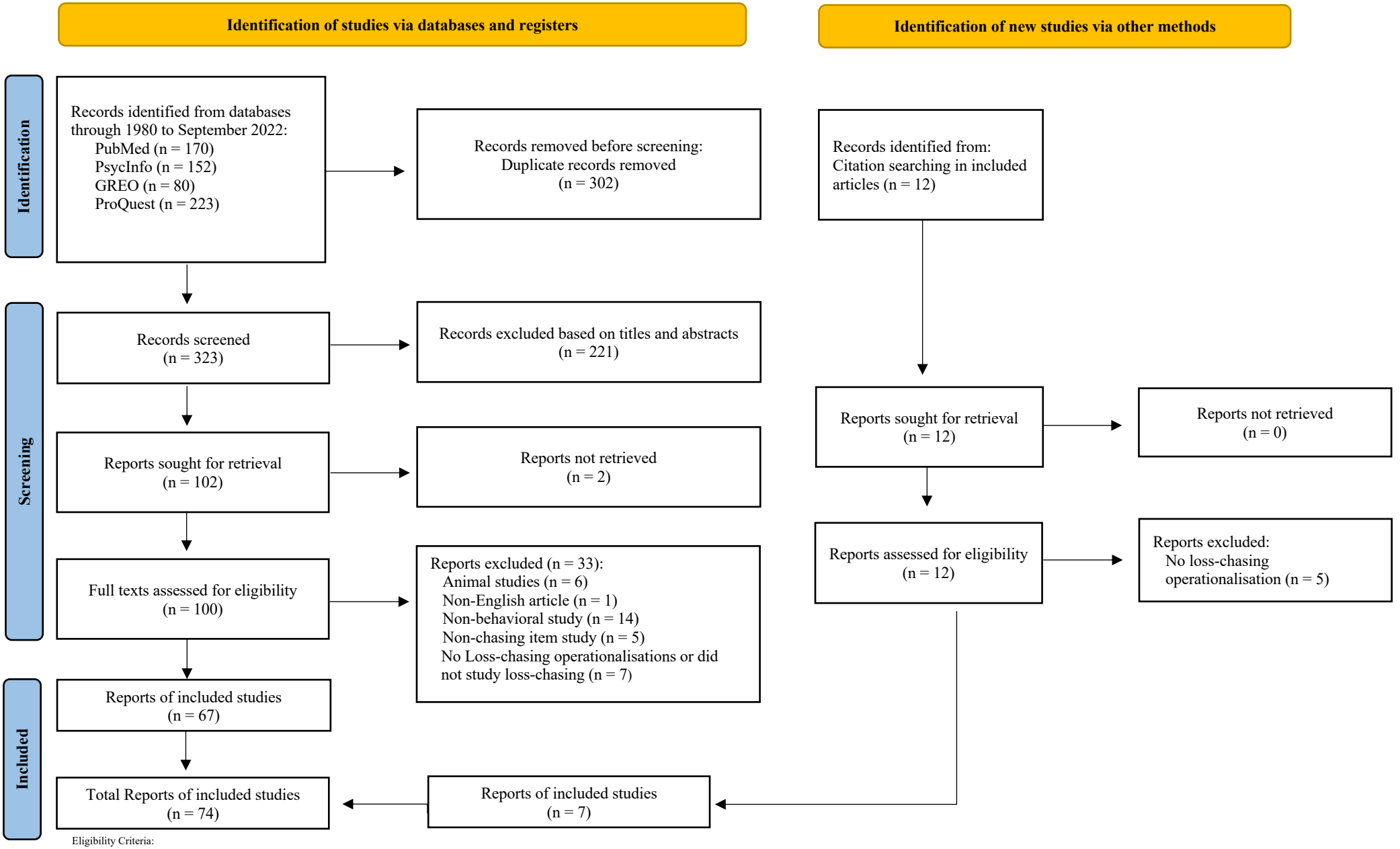
The following eligibility criteria were defined prior to database search and article screening: 1.) A study must use either simulated or gambling-like tasks that involve real

monetary outcomes 2.) The study must recruit real gamblers. Note that studies recruiting non-gamblers (e.g., student samples) were included if criteria 1 was fulfilled, such that criteria 1 and 2 represented and/or, see also Ladouceur et al. (2017). 3.) A study must assess a certain aspect of gambling behaviour as loss-chasing either via clinical screening tools (e.g., SOGS; Lesieur & Blume, 1987), gambling-like tasks or behavioural tracking data. Studies considering only physiological or neural responses were excluded. 4.) Since many studies use clinical screening tools that typically include a loss-chasing item, such studies were only included if they reported item-wise results that included the loss-chasing item. 5.) Studies with non-human animals were excluded. 6.) Only articles from 1980 till 2022 (24th September) were included. 7.) Only English articles were included.

Data extraction and synthesis for results

A data extraction form was constructed by NB (see osf.io). Evidence from included studies were synthesized and grouped based on the type of operationalisation adopted. The synthesized evidence is presented in both a narrative and tables (Table 2 and 3).

Fig. 1 PRISMA Flow-chart



Eligibility Criteria:

1.) A study must use either simulated or gambling-like tasks that involve real monetary outcomes.
2.) The study must recruit real gamblers. Studies recruiting non-gamblers (e.g., student population) will be included if criteria 1 is fulfilled.
3.) A study must examine a certain aspect of gambling behaviour, either via self-reports on gambling behaviour, responses in simulated gambling or gambling-like tasks, or behavioural tracking data from real gambling. Studies that only consider physiological or neural responses will be excluded.
4.) Since many studies use clinical screening tools that typically include a loss-chasing item, such studies were only included if they reported item-wise results that included the loss-chasing item.
5.) Studies that use non-human animals will be excluded.
6.) Only articles from 1980 till 2022 (24th September) were included.
7.) Only English articles were included.

Results

The systematic search identified 74 eligible articles (Fig. 1). The reviewed studies were evenly distributed across loss-chasing between-session (*n=36*) and within-session (*n=35*), and only a small number of studies investigated both types of loss-chasing (*n=3*). Below we present the key findings of the included articles, for between-session and within-session loss-chasing separately.

Table 1. Between- and Within-session loss-chasing behavioural expressions

Operationalisation	Description
Between-session loss-chasing	Returning another day or another time to recoup previous losses (in self-report items), the time interval between-sessions following a losing session in *in-vivo* online and land-based gambling and increasing wagers in the next session following a losing session in *in-vivo* online gambling.
Within-session loss-chasing	**Continuation or Persistence:** Continuing to gamble persistently in a session in the face of losses. Persistence may be captured in gamble-specific behaviours (e.g., continuing to listen to a horse-race in horse-race betting, or staying in betting venues after one has lost a gamble), or in gamblers' account history (e.g., the frequency of gambling account depletion and in-session monetary deposits). **Intensification:** Intensifying an aspect of gambling behaviour, such as increased risk-taking (e.g., choosing high risk gambles, undertaking reckless betting, increasing stake sizes etc.), or increased speed of play following losses within a session.

Between-session loss-chasing

Overall, most of the reviewed studies (*n=36*) on between-session loss-chasing used survey or interview (including epidemiological and prevalence surveys) designs, assessing loss-chasing with a self-reported item. A small number of studies (*n=3*) used field study design and assessed loss-chasing between-sessions using behavioural tracking data. In terms of sample characteristics, the self-report studies mainly assessed the samples from nationally representative population *(n=19)* followed by active gamblers *(n=8)*, treatment-seeking gamblers *(n=3)*, student samples *(n=3),* and other distinctive populations (e.g., prison population, or people with schizophrenia) *(n=3)*. The behavioural tracking studies mainly assessed active gamblers *(n=3)*.

Notably, no laboratory studies were identified investigating between-session loss-chasing. Below we present a narrative of the key findings from the included studies (for an overview of all studies, see Table 2).

The studies using self-report loss-chasing item asked respondents if they have gone back another day/time to try to win back past losses (answered with yes/no e.g., Sleczka et al., 2015), or how often this has occurred in a certain period (answered with a frequency scale, e.g., O'Connor & Dickerson, 2003). This description is also used to inform the chasing criterion for GD in DSM-IV/V for diagnostic purposes (APA, 1994; 2013). Since such screening or diagnostic tools for GD are widely used in studies on gambling behaviours, this operationalisation of loss-chasing is arguably also the most widely used one. However, as specified in the eligibility criteria (see methods section), we focused only on studies that have reported results on the loss-chasing item specifically (and not the sum score of all items).

Collectively, the self-report studies indicated that loss-chasing between-sessions was highly prevalent. It was highly endorsed by both adult (James et al., 2016; McBride et al., 2010; Sacco et al., 2011; Toce-Gerstein et al., 2003) and adolescent gamblers (Faregh & Derevensky, 2011; Goldstein et al., 2013; Kong et al., 2014) and frequently reported across the entire continuum of problem gambling severity (Toce-Gerstein et al., 2003). Between-session loss-chasing was highly endorsed as gambling involvement increased (Carragher & McWilliams, 2011). It was also a stable symptom of GD (Sleczka & Romild, 2021; although Nelson et al., 2009, did not find this) and its endorsement tripled the risk of developing more severe gambling problems after one year (Sleczka & Romild, 2021). However, the high overall prevalence and sensitivity of between-session loss-chasing items may also be a weakness, in that the item may lack discriminatory power to distinguish gamblers with and without GD (Sleczka et al., 2015). Among female respondents, Temcheff et al. (2016) reported that the between-session loss-chasing item on the DSM best discriminated social from problem gamblers, but this was not observed among male participants.

A small number of studies *(n=3)* assessed between-session loss-chasing in field data by assessing the time-span of re-engagement between the last losing session and the next session. A study with regular land-based casino players found that while majority of the players stayed away following a last losing session, a small proportion of the players (2%) returned much sooner than usual following a session ending in atypical losses, which was interpreted as between-session loss-chasing (Forrest & McHale, 2016). Similarly, active horse-race bettors on average refrained from wagering 27% longer following a last losing session, as compared to a last winning or break-even session (Kainulainen, 2021). However, bettors with high past frequency of gambling returned sooner compared to bettors with low past frequency of gambling (Kainulainen, 2021). Furthermore, a recent study investigated between-session loss-chasing by assessing changes in wagers placed in the next session following a last losing session (Auer & Griffiths, 2022). This study showed that changes in wagers were only observed if the losses incurred in the previous session were small and if the next session occurred across days and not within 24 hours (Auer & Griffiths, 2022).

Table 2. Summary of between-session loss-chasing studies

Authors	Participants	Methods: Task/Instrument description	Type of Study	Operationalisation of Loss-chasing	Results
Beaudoin and Cox (1999)	Treatment seeking adult gamblers (n = 57) from Addiction foundation of Manitoba.	The loss-chasing item from $SOGS_{3b}$ and $DSM\text{-}IV_{3c}$ criteria.	Survey	Returning another day to gamble.	Loss-chasing (along with lying to family and friends) was most frequently reported.
Toce-Gerstein et al. (2003)	Respondents (n = 399) who reported at least one NODS criterion in the US Gambling Impact and Behavior Study (1998–99).	The loss-chasing item from $NODS_{3d}$.	Telephone and in-person survey	Returning another day to gamble.	Loss-chasing was the most frequently endorsed criteria (59.6% of all respondents) and thus a low-threshold symptom. Endorsement of loss-chasing increased as problem gambling severity increased.
O'Connor and Dickerson (2003)	Convenience sample of Australian Electronic Gaming Machine (EGM) players (n = 137) and off-course bettors (n = 84).	A self-report loss-chasing item worded similarly as $DSM\text{-}IV_{3c}$ loss-chasing item, answered with a five-point frequency scale (0-4).	In-person interview	Returning another day/time to gamble.	Frequent loss-chasing was correlated with higher impaired control scores and more monetary expenditure on gambling as a proportion of one's income. Frequent loss-chasing was associated with more monetary expenditure per week in EGM players, and more time spent gambling per week in off-course bettors.
Felsher et al. (2004)	A youth sample of n = 1072 (10 to 18 years) from grades 6 to 12 in Ontario, Canada. Gambling severity was assessed using DSM-IV-MR-J.	Loss-chasing was assessed by the self-report of the number of lotto tickets purchased by the respondents.	Questionnaire study	Returning to the store and purchasing more lotto tickets.	Youths with gambling problems reported re-purchasing lotto tickets following both losses and wins. The probable pathological gamblers reported high frequency in the return to the store to purchase more tickets to recoup losses.
Stinchfield et al. (2005)	A sample of 259 gamblers (121 from a gambling treatment facility & 138 who gambled in last 12 months, from Windsor, Ontario community).	The structured Gambling Behaviour Interview (GBI) which uses $SOGS_{3b}$ and $DSM\text{-}IV_{3c}$ loss-chasing items.	Telephone and Clinical interview	Returning another day to gamble.	Loss-chasing (along with pre-occupation, loss of control and gambling escape) was a powerful predictor discriminating between disordered and non-disordered groups.
Strong and Kahler (2007)	Respondents (n = 11,153) form the National Epidemiologic Survey on Alcohol & related conditions.	The loss-chasing item from $DSM\text{-}IV_{3c}$.	Interview	Returning another day to gamble.	Loss-chasing was most frequently endorsed by younger respondents in the lower levels of gambling severity.
Ellenbogen et al. (2007)	5313 respondents from 5 self-report studies.	The loss-chasing item from $DSM\text{-}IV\text{-}MR\text{-}J_{3c}$.	Survey	Returning another day to gamble.	At-risk players overall and males as compared to females were more likely to endorse loss-chasing.
Xian et al. (2008)	Twin-pairs of middle-aged men who served in the Vietnam military (n = 8138).	The loss-chasing item from $DSM\text{-}III\text{-}R_{3c}$.	Survey	Returning another day to gamble.	Loss-chasing was the most endorsed item (along with attempts to reduce gambling) for respondents in the low-risk group (88.7% of the total respondents).
Nelson et al. (2009)	Respondents (n = 11,153) from the NESARC dataset.	The loss-chasing item from $DSM\text{-}IV_{3c}$.	Survey	Returning another day to gamble.	Although loss-chasing was a highly prevalent symptom (along with pre-occupation) it was not a stable symptom over the time span of 1 year or >12 months period.

Holtgraves (2009)	Respondents (n = 21,375) of multiple surveys conducted between 2001 – 2005 in Ontario.	The loss-chasing item from $PGSI_{3a}$ and $SOGS_{3b}$.	Survey and Telephone interviews	Returning another day to gamble.	Loss-chasing was the most commonly endorsed item across problem gambling severity.
Hong et al. (2009)	Old adult gamblers (n = 489) from the Gambling Impact and Behaviour study.	The loss-chasing item from DSM-IV_{3c}.	Survey	Returning another day to gamble.	Loss-chasing (along with withdrawal and loss of control) was the most commonly endorsed item for respondents in the non-problematic class (88.9% of the total respondents).
McBride et al. (2010)	Respondents (n = 5644) in the 2007 British Gambling Prevalence Survey who provided information on the DSM-IV criteria.	A self-report loss-chasing item worded similarly as DSM-IV_{3c} loss-chasing item.	Survey	Returning another day to gamble.	Loss-chasing was the most frequently endorsed criteria (13.0% of all respondents). About 9.7% of respondents were classed as preoccupied chasers, as they endorsed loss-chasing more than other DSM symptoms.
Molde et al. (2010)	A national representative sample of n = 5235 respondents from a Gambling survey in Norway.	The loss-chasing item from $NODS_{3d}$.	Survey	Returning another day to gamble.	Loss-chasing was most frequently endorsed by younger respondents and was a useful discriminator to identify problematic gambling engagement. It was also a low-threshold symptom.
Sacco et al. (2011)	Respondents (n = 11,153) from a nationally representative sample of non-institutionalised adults (18 or above) in the US endorsing gambling 5 times in any 1 year of their lives.	The loss-chasing item in DSM-IV_{3c}.	Survey	Returning another day to gamble.	Younger adults (18-24) were more likely to endorse loss-chasing, while older adults (60+) were less likely to chase losses, compared to the reference age group (25-59).
Carragher and McWilliams (2011)	Respondents (n = 11,108) from the National Epidemiologic Survey on Alcohol and Related Conditions (2001-2002).	Loss-chasing item in DSM-IV_{3c}.	Survey	Returning another day to gamble.	Loss-chasing was endorsed by 6.1% of the population (along with preoccupation and tolerance) and this group was termed as the moderate gambling problem class in the Latent Class Analysis.
Faregh and Derevensky (2011)	Treatment sample of adolescents (n = 723) from inpatient treatment facilities in Montreal (age: 13 – 18 years) and a community sample (n = 5313) from Ontario and Quebec high school (age: 12 – 18 years).	Loss-chasing item in DSM-IV-MR-J and DSM-IV-J_{3c}.	Survey	Returning another day to gamble.	Loss-chasing was the most endorsed item (along with stealing, tolerance, and escape) for respondents in the social and at-risk class, but only for males in the treatment sample.
Goldstein et al. (2013)	Adolescents (n = 249, 14-18 years) from inner-city emergency department who reported having gambled once in the last year.	Loss-chasing item in SOGS-RA_{3b}.	Survey	Returning another day to gamble.	Loss-chasing was endorsed (along with gambled more than planned and felt bad for gambling), by respondents classed as Low consequence gamblers.
Miller et al. (2013)	A dataset (n = 33301) of multiple survey conducted in Canada was analysed.	Loss-chasing item from $PGSI_{3a}$.	Survey	Returning another day to gamble.	Low problem gambling severity respondents endorsed loss-chasing.

Kong et al. (2014)	Adolescents who reported gambling in the previous year (n = 3901) in 10 high schools in Connecticut, USA.	A loss-chasing item from the Massachusetts Gambling Screening tool (MGSI) worded as the loss-chasing item from DSM-IV_{3c} was used.	Survey	Returning another day to gamble.	Latent class analysis identified four groups of which 86.4% were classed as low-risk and 7.6% of at-risk loss-chasing. The low-risk group frequently endorsed loss-chasing (and pre-occupation) in the absence of other symptoms.
Carneiro et al. (2014)	Respondents (n = 3007) from a national household survey in Brazil.	The loss-chasing item from DSM-IV-J_{3c} criteria and $NODS_{3d}$.	Survey	Returning another day to gamble.	Respondents reporting early onset of gambling (prior 20 years of age), classed as at-risk of developing gambling disorder reported loss-chasing frequently.
Raisamo et al. (2015)	Respondents (n = 4484; 15 – 74 years) in a nationwide survey in Finland.	The loss-chasing item from $PGSI_{3a}$.	Telephone survey	Returning another day to gamble.	Loss-chasing was one of the most common problem gambling behaviour reported by 8.6% of the respondents (along with betting more than one can afford, feeling guilty and escalation of gambling).
Sleczka et al. (2015)	Respondents (n = 107) in the 2009 German Epidemiological Survey of Substance Abuse and a sample of frequent slot machine gamblers (n = 376) in Germany.	Two yes/no items: 1.) worded as DSM-IV, and 2.)"*When you had a large gambling debt, did you gamble more often in the hopes of winning back your money?*". Loss-chasing was considered present when either item is endorsed.	Survey	Returning another day to gamble, and increased frequency of gambling after losing.	Loss-chasing was endorsed by 55.1% of the respondents. Loss-chasing was associated with a lower level of severity of gambling disorder and had low discriminatory power.
Christensen et al. (2015)	Treatment seeking gamblers (n = 4349) from Australia.	The loss-chasing item from DSM-IV_{3c} .	Survey	Returning another day to gamble.	Endorsement of loss-chasing intensified with increasing problem gambling severity scores on DSM-IV and it was the second most endorsed symptom (after Escape).
Medeiros et al. (2015)	Treatment seeking gamblers (n = 733) in outpatient clinics in Brazil and America.	The loss-chasing item from DSM-IV_{3c}.	Semi-structured interview	Returning another day to gamble.	Inter-cultural differences were observed in the endorsement of loss-chasing. Brazilian respondents (males and females) highly endorsed loss-chasing than American respondents.
James et al. (2016)	Nationally representative population from British surveys (n = 50,000) collected between 1999 – 2012	The loss-chasing item from – 1.) $PGSI_{3a}$, 2.) $SOGS_{3b}$ 3.) DSM-IV_{3c}.	Survey	Returning another day to gamble.	Loss-chasing (along with pre-occupation) was the most commonly endorsed item across all the screening tools among respondents classed with moderate problem gambling severity.
Canale et al. (2016)	Respondents (n = 7756) in the British Gambling prevalence survey (2010).	The loss-chasing item from DSM-IV_{3c} criteria.	Survey	Returning another day to gamble.	Loss-chasing losses was frequently endorsed in the past-year prevalence rates of gambling harm, across gambling severity levels assessed by PGSI.
Temcheff et al. (2016)	College athletes (n = 8674) across USA.	The loss-chasing item from DSM-V_{3c}.	Survey	Returning another day to gamble.	Loss-chasing was the DSM item that best discriminated between social and problem gamblers, specifically among female respondents.

Medeiros et al. (2016)	Female gamblers with gambling disorder across Brazil (n = 406) and America (n = 275).	The loss-chasing item from DSM-IV$_{3c}$.	Structured interview	Returning another day to gamble.	Brazilian respondents more highly endorsed loss-chasing than American respondents.
Forrest and McHale (2016)	Loyalty card players (n = 855,608) at Rank Group casinos, who visited the casino at least 50 times in a year.	How quickly players returned to the casino after previous wins and losses.	Behavioural tracking study	Returning another day to gamble.	Losing in the last visit predicted a longer time before the next visit for majority of the players, but for 2% of the players incurring an atypically large loss resulted in returning to play sooner than usual.
Yakovenko (2017)	A sample of 111 participants (based on PGSI responses – n = 51 social gamblers & n = 60 disordered gamblers) were recruited.	The loss-chasing item from uses DSM-V$_{3c}$ and a question worded as: *"How interested are you in returning at another time to have a chance to play the machine again and possibly increase your final winnings?"* was used following a slot-machine task in a lab-setting.	Survey in Lab-setting	Returning another day to gamble and wanting to return to possibly increase the wins.	Both social and disordered problem gamblers reported loss-chasing across both questions, with the disorder group reporting more frequent loss-chasing and being more interested in returning.
Chamberlain et al. (2017)	Sample of n = 582 non-treatment seeking young adults from USA.	Loss-chasing was assessed in a Structured Clinical Interview for Gambling Disorder (SCI-DG) which uses DSM-V$_{3c}$ loss-chasing item.	Clinical Interview	Returning another day to gamble.	Loss-chasing was strongly endorsed by problem gamblers and was a significant marker discriminating recreational from problematic gambling engagement.
May-Chahal et al. (2017)	A sample of n = 1057 male & female prisoners from England & Scotland were recruited.	The loss-chasing item from PGSI$_{3a}$ was administered.	Survey	Returning another day to gamble.	The latent-class analysis highlighted that endorsement of loss-chasing intensified with increasing problem gambling severity.
Castrén et al. (2018)	A random sample of n = 2921 respondents (15 – 74 years) from the cross-sectional Finish Gambling survey (2015) were interviewed.	Loss-chasing items from SOGS$_{3b}$ and PGSI$_{3a}$.	Telephone survey	Returning to gamble another day.	Loss-chasing was most typically reported by respondents playing gambles like poker and fast-paced daily lottery.
Yakovenko et al. (2018)	Outpatients (n = 336) meeting DSM-IV criteria for schizophrenia or schizoaffective disorder in Connecticut, USA.	A self-report question worded as the DSM-IV$_{3c}$ loss-chasing item was used to assess chasing.	Survey	Returning another day to gamble.	Individuals spending more days gambling in the past year, and those who began gambling at an early age, were more likely to endorse frequent loss-chasing behaviour.
Nong et al. (2020)	Data of n = 855 respondents from a telephone survey conducted in Macau in 2016.	Loss-chasing item from DSM-V$_{3a}$.	Telephone interview	Returning another day to gamble.	Overall loss-chasing was highly reported by respondents. Compared to lottery gamblers, sociable gamblers were more likely to undertake loss-chasing.

Sleczka and Romild (2021)	Respondents (n = 8165) in the Swedish Longitudinal Gambling Study between 2008 and 2014.	The loss-chasing item in the $PGSI_{3a}$ for the past 12 months was administered.	Survey	Returning another day to gamble.	Loss-chasing was the most stable symptom, with the stability rates being 42% after one year and 17% after 5 years. Presence of loss-chasing tripled the risk of developing more severe gambling problems after one year.
Delfabbro and King (2021)	A sample of n = 187,000 from 17 prevalence surveys conducted between 2005 – 2020 in Australia.	Loss-chasing item from the DSM-V_{3c} and $PGSI_{3a}$.	Survey	Returning another day to gamble.	As compared to moderate, low-risk and non-gamblers, problem gamblers endorsed disproportionately high levels of loss-chasing.
Kainulainen (2021)	Bettors in online horse races (n = 9151) in Finland between 1 August and 30 August 2012.	This study examined the effect of wins and losses in a previous betting day on the time to next participation in betting.	Behavioural tracking	How quickly bettors re-engaged in betting after losing in a prior betting day.	After a losing betting day, a bettor on average refrained from wagering for 27% longer time compared to after winning or breaking even. Unusually large win or loss amounts did not predict the time to re-engagement.
Auer and Griffiths (2022)	Active players (n = 16, 771) from a European online casino during December 2021 were assessed.	Behavioural tracking data was used to examine multiple operationalisations of loss-chasing.	Behavioural tracking	Increasing stakes in the next session (following a losing session) played either within 24 hours (called across-session chasing) or played over 24 hours (called across-days chasing).	Loss-chasing across-sessions was not captured, however players chased across days, but only when the losses incurred in previous gambling day was low in magnitude.

*Note: **[1]** All studies are arranged year-wise. **[2]** Screening tools/Questionnaires used: a. **PGSI:** Problem Gambling Severity Index; b. **SOGS:** South Oaks Gambling Index; c. **DSM-III/IV/V:** Diagnostic Statistical Manual of Mental Health Disorder and **DSM-IV-MR-J**: DSM screening for adolescents; d. **NODS**: National Opinion Research Centre Diagnostic Screen for Gambling.
[3] The wording of the Between-session loss-chasing item was slightly different across the screening tools. Below is the exact wording for each tool:
a. PGSI: *"When you gambled, did you go back another day to try to win back the money you lost?"* (Never, seldom, often, almost always)
b. SOGS: *"Have you gone back another day to try and win back money you lost while gambling?"*
c. DSM-III/IV/V (and DSM-IV-MR-J/III-R): *"After losing money gambling, often returns another day to get even?"*
d. NODS: *"Has there ever been a period when if you lost money gambling one day, you would return another day to get even?"*
e. Massachusetts Gambling Screening tool: *"During the past 12 months, after losing money gambling, have you returned to gambling on another day to win back your lost money?"*.

Table 3. Summary of within-session loss-chasing studies

Authors	Participants	Methods: Task/Instrument description	Type of Study	Operationalisation of Loss-chasing	Results
Dickerson et al. (1987)	General public who had just placed a bet in an off-course agency (n = 83, 6 females) in Australia.	A self-report item: *"When you are behind or losing, how often do you attempt to chase your losses? In other words, how often do you start placing more bets or larger bets once you've had a few losers?"* (Never, occasionally, usually, nearly always).	Interview and survey	Changes in stake sizes following losses/wins.	55.7% of the respondents never chased, 30.4% occasionally chased, 12.7% usually chased and 1.3% always chased. Higher level of involvement (i.e., higher estimated monetary expenditure per week) was associated with more loss-chasing.

Coventry and Brown (1993)	A sample of n = 76 off-course bettors and n = 96 members of the general public in Glasgow were recruited.	The same self-report question as Dickerson et al. (1987) was used.	Survey	Changes in stake sizes following losses/wins.	34% of the off-course bettors reported, never loss-chasing, 26% occasionally chased, 17% usually chased and 23% nearly always chased. Loss-chasing was correlated with other aspects of loss of control like spending more and gambling longer than planned, making attempts to stop, and admitting that the engagement is problematic.
Coventry and Norman (1997)	A sample of n = 32 off-course horse-race bettors.	A self-report item: *"If you are losing do you increase your bet sizes to win back your losses?".*	Survey	Increasing bet sizes following losses.	A small proportion of players (n = 9) reported loss-chasing.
Breen and Zuckerman (1999)	A sample of n = 248 undergraduate male students (49% gambled at least once & 51% gambled less than once per month).	Participants played a gambling like task in which one bets on the card to be drawn from a deck of randomly generated cards. The rate of bets won was set at 70% for the first 10 trials and was pre-determined to reduce at a rate of 10% every 10 trial blocks. After 70 trials the task continued at 0% reward rate.	Lab study	Continuing gambling after losses. Increase in stake sizes following losses.	The study made a distinction between – 1.) *Non-players:* participants who declined the offer to gamble, 2.) *Non-chasers:* chose to gamble but stopped while they still had money left in their account & 3.) *Chasers:* chose to gamble until all their money was exhausted. No significant difference in the mean bet sizes placed by chasers (M = $2.35) and non-chasers (M = $2.15) were observed. However, chasers played significantly greater number of trials than non-chasers.
O'Connor and Dickerson (2003)	Convenience sample EGM players (n = 137) and Off-course bettors (TAB players; n = 84).	A self-report question: *"Have you tried to get back your losses before the end of a session of play/betting?".*	Survey	Self-reported increase in stake sizes following losses/wins.	After winning heavily, 27.3% of EGM and 47.1% of TAB players reported to increase their bet sizes. However, after losing heavily 14.7% of EGM and 20.9% of TAB players reported increasing bet sizes.
Linnet et al. (2006)	A sample of n = 61 problem gamblers (PG's) and n = 39 non-problem gamblers (NPG's).	Loss-chasing was assessed with the proportions of risky decisions made in the Iowa Gambling task.	Lab study	Defined it as the continuation (or persistence) of a disadvantageous choice sequence i.e., choosing 5 bad cards in a row.	Problem gamblers (PG's) chased significantly more than non-PG's, specifically male PG's.
Campbell-Meiklejohn et al. (2008)	Healthy volunteers (n = 23) were recruited from the Oxford University.	An incentivised gambling analogue task that required players to make a series of decisions of continuing in the face of losses to recover the losses (at the risk of doubling the losses) or quit (and sustain losses) was administered.	Lab study	Defined as the proportion of decisions to chase (out of all decisions) and the mean deliberation time of the decision to chase.	Participants chased on about 2% of the trials and chased a +/- 2.07 trials. The total scores on a psychometric assessment from O'Connor & Dickerson (2003) that assessed propensity to chase had a strong association with the decisions to chase. The deliberation times for the decisions to chase were also lower than decisions to quit.
Xuan and Shaffer (2009)	A sample of n = 47,603 players from an internet-based sports-betting service.	A dataset of live action sports bettors was analysed to assess loss-chasing.	Behavioural tracking study	Increasing stakes and/or betting.	Players, both general and those who self-identified as having gambling problems did not chase their losses and made conservative bets in the face of losses to prevent further losses.
Rogers et al. (2011)	A sample of n = 22 patients with advanced idiopathic	Same task as Campbell-Meiklejohn et al. (2008) was administered.	Lab study	Same operationalisation as Campbell-Meiklejohn et al. (2008)	Loss-chasing was observed among patients being administered deep-brain stimulation.

	Parkinson's and chronically implanted deep brain stimulation electrode were recruited.				
Gainsbury et al. (2014)	Online sample of 10,838 participants (n = 7342 internet casino players, n = 5461 poker players & n = 2723 played both) from 96 countries.	A self-report question: *"If you lose when gambling online are you more likely or less likely to keep playing to try and win some money back?".*	Survey	Continuing gambling after losses.	37.8 % reported unaffected by losses, 28.5% reported being more likely to bet following losses, and 32.4% reported being less likely to bet following losses.
Bauchner (2014)	A sample of n = 36 participants (n = 20 non-gamblers and n = 16 gamblers).	The risk-taking propensity in the Balloon Analogue risk task (BART) was used to assess loss-chasing.	Lab study	Continuing gambling after losses within a session and was called perseverative loss-chasing.	Gamblers showed higher levels of preservative loss-chasing by overcompensating the number of balloon pumps made in the next trial after a loss incurred in the previous trial.
Studer et al. (2015) Experiment 3	A sample of n = 40 healthy university students.	An incentivised computerized roulette task (modified from Ayton & Fischer, 2004) was used.	Lab study	Increasing bet sizes.	There were significant changes in the size of bets placed after a losing streak as opposed to winning streaks.
Bibby (2016)	A sample of n = 60 (experiment 1) and n = 49 undergraduate students (experiment 2).	An incentivised version of the Cambridge Gambling task was used.	Lab study	Increasing bet sizes from the available stakes.	Loss-chasing was observed in the participants however the extant of the endorsement varied as a function of the levels of alexithymia reported by the participants.
Lister et al. (2016)	University participants (n = 121) who reported lifetime gambling.	Participants played a slot machine in an immersive virtual casino. The first 30 spins were programmed to disseminate a mix of low magnitude wins and losses. After 30 trials participants were asked if they wanted to continue gambling. Participants who continued received up to 30 losing spins.	Lab study	Decisions to continue after cumulative losses/wins.	Gambling outcomes did not significantly impact chasing persistence and decision to chase.
Romo et al. (2016)	A sample of n = 628 respondents (169 problem gamblers without treatment, 203 problem gamblers seeking treatment & 256 non-problem gamblers or problem gamblers sought treatment).	Loss-chasing was assessed with the questions from the loss-chasing dimension from the Gambling Attitudes and Beliefs Survey (GABS-23).	Survey	Continuing gambling after losses.	Loss-chasing (and emotion) item from GABS-23 delineated between problem gamblers seeking treatment and those not seeking treatment and was significantly correlated with gambling-related cognitive distortions.
Wu et al. (2016)	A sample of n = 26 healthy university female students.	A computerized and incentivised gambling task that presented two gambles – a less risky and a high risky gamble, was used to assess loss-chasing behaviour.	Lab study	The proportion of risky gambles selected following a loss v/s a win.	Loss-chasing was observed however, its endorsement was contingent on if the participant was in the testosterone or placebo group.

Whiting et al. (2016)	A sample of lotto players (n = 1081) from convenience lottery ticket store.	Assessed the lotto ticket purchasing behaviour.	Behavioural tracking study	Repurchasing of lotto tickets by allocating more funds to purchase additional instant lotto tickets in separate transactions before leaving the store premises was defined as episodic loss-chasing.	Episodic loss-chasing was only observed for the low-price instant lotto tickets.
Bibby and Ross (2017)	An opportunity sample of n = 58 gamblers across 6 betting shops in London.	A non-incentivised version of the Cambridge Gambling task was administered.	Lab study	Increasing bet sizes from the available stakes.	Loss-chasing was observed, and its endorsement varied as a function of alexithymia severity but did not differ based on problem gambling severity.
Brevers et al. (2017)	A sample of n = 15 regular poker players and n = 14 healthy controls.	A modified version of the Cups task was used to assess gambling behaviour.	Lab study	Increased risk taking in the face of losses.	Loss-chasing was captured however, no significant differences were found in the indices of loss-chasing (i.e., in the proportion of increased risk taking after losses) between the poker players and controls.
Worhunsky et al. (2017)	A sample of n = 70 participants (25 gamblers, 18 cocaine users and 27 healthy controls).	The loss-chasing task from Campbell-Meiklejohn et al. (2008) was administered.	Lab study	Same operationalisation as Campbell-Meiklejohn et al. (2008).	Loss-chasing was observed on 66.9% of all losses. Both, the decisions to chase and quit were made at an average depth of 1.8 decisions and there were no differences in the time of the decisions to chase and quit across the 3 participant groups.
Yakovenko (2017)	A sample of n = 111 participants (based on PGSI responses – n = 51 social gamblers & n = 60 disordered gamblers).	Within-session chasing was assessed with – 1.) a self-report question used by O'Connor & Dickerson (2003) & 2.) chasing persistence in a slot machine task in a lab-setting.	Lab study	Continuing gambling after losses.	Loss-chasing was observed across both measures among both social and disordered gamblers. Disordered gamblers had higher levels of persistence (persisting up to 15 losses) than social gamblers (persisting up to 4 losses).
Bonini et al. (2018)	A sample of n = 120 participants (40 pathological & 40 problem gambler, 40 healthy controls).	Risk-taking propensity in the Balloon Analogue risk task (BART) and the Unlucky BART (U-BART) in which risk taking was measured after prior losses was administered.	Lab study	Increased risk taking in the face of losses.	While loss-chasing was not captured according to the operationalisation used in the study in the BART, it was observed among problem gamblers only in the U-BART.
Trivedi and Teichert, (2018)	Responses of n = 500 online gamblers who gambled heavily in the last 4 weeks prior to the survey was collected from Germany.	Loss-chasing was assessed with the questions from the loss-chasing dimension from the Gambling Attitudes and Beliefs Survey (GABS-23).	Survey	Continuing gambling after losses.	Higher endorsement of loss-chasing on the GABS-23 predicted the severity of online gambling addiction which was independent of the reported impulsivity levels.

Nigro et al. (2018a)	A sample of n = 104 participants (76.9% males), between ages 18 – 70 years from across 7 gambling venues was recruited.	In *ChasIT,* participants drew one of the presented cards. If the selected card was greater than the house, participants win 1 Euro and vice-e-versa. Phase 1 contained 30 trials, and participants were assigned into the loss (21 losses) and the control (15 losses) condition. At the end of phase-1, participants are presented with cumulative outcome, and asked if they wanted to continue in phase 2. Participants who continued were classified as chasers and those who did not as non-chasers.	Lab study	Decisions to continue after cumulative losses/wins following 30 trials.	Decision to continue after phase 1 and number of trials played in phase 2 did not vary as a function of previous outcomes. Those who endorsed between-session loss-chasing measured using SOGS, played more trials in phase 2.
Nigro et al. (2018b)	A convenience sample of Italian adults (n = 126) from four Video lottery terminal venues. Additionally, n = 132 habitual players were recruited.	*ChasIT* task from (Nigro et al., 2018a) was administered.	Lab study	Same operationalisation as Nigro et al., 2018a.	Participants played for more number of trials in the loss condition than the control condition. Those who endorsed between-session loss-chasing measured using SOGS, were more likely to continue and played for more trials in phase 2.
Perrot et al. (2018)	A sample of n = 10,000 active player account data from a French online operator.	The study analysed a large behavioural tracking data of active lottery and scratch card gamble players.	Behavioural tracking study	Loss-chasing episode was defined as the number of times that the money was deposited into the gambling account – such as 3 or more deposits made within 12-hour period and deposits made less than 1 hour after a bet is placed.	The study found 7 clusters of gamblers – 1-3 clusters were characterised by very low levels of problematic gambling engagement and 4 – 7 with high problem gambling behaviour. The propensity to chase based on deposit frequency, increased as a function of the cluster the player was assigned. Highest propensity to chase was observed among cluster 7 gamblers.
Nigro et al. (2019)	A convenience sample of Italian adults (n = 132, 82.6% males) from across 5 video lottery terminal gambling venues. A sample of n = 133 habitual players were also recruited.	*ChasIT* task from (Nigro et al., 2018a) was used with an added win condition (9 losses in the initial 30 trials).	Lab study	Same operationalisation as Nigro et al., 2018a.	Participants played for more number of trials in phase 2 in the win condition than the loss and control conditions. The latter two groups did not significantly differ.
Ciccarelli et al. (2019a)	Adult gamblers (n = 58 non-problem gamblers, n = 18 problem gamblers, n = 52 pathological gamblers based on SOGS scores) from Video lottery terminals.	*ChasIT* task from (Nigro et al., 2018a) was admistered.	Lab study	Same operationalisation as Nigro et al., 2018a.	Previous outcomes did not affect the decision to continue, nor the number of trials played.
Ciccarelli et al. (2019b)	A sample of n = 26 non-problem gamblers and n = 66 problem gamblers were recruited.	*ChasIT* task from (Nigro et al., 2018a) was admistered.	Lab study	Same operationalisation as Nigro et al., 2018a.	Previous outcomes did not impact decisions to continue at the end of phase 1. Overall problem gamblers played significantly more trials than non-problem gamblers. Participants with high problem gambling scores on SOGS played more trials in loss condition than those in control condition, while previous outcomes did not influence the number of trials played for non-problem gamblers.

Cosenza et al. (2020)	Adolescent gamblers (n = 364 , 46% males).	*ChasIT* task from (Nigro et al., 2018a) was admistered.	Lab study	Same operationalisation as Nigro et al., 2018a.	Previous outcome did not influence the decision to continue to phase 2, nor the number of extra trials played.
Tobias-Webb et al. (2020)	A sample of n = 46 male university students (half of the sample received alcohol vs placebo, as a part of the study manipulation).	An incentivised computerized roulette task (modified from Ayton & Fischer, 2004) was used to assess gambling behaviour.	Lab study	Increasing bet sizes.	There were significant changes in the size of bets placed after a losing streak as opposed to winning streaks.
Challet-Bouju et al. (2020)	A sample of n = 1152 online lotto players from French national lottery was assessed.	The gambling behaviour of French online lotto players was assessed to account for a specific loss-chasing operationalisation.	Behavioural tracking study	Same operationalisation as Perrot et al. (2018).	The study found 5 classes of gamblers – 1-3 classes characterised by very low levels of problematic gambling engagement and 4 – 5 with high problem gambling behaviour. The propensity to chase based on deposit frequency, increased as a function of the class the player was assigned.
Abe et al. (2021)	Active Baccarat players (n = 3986) were analysed.	This study analysed data of 7,935,566 games of active Baccarat players from land-based casino.	Behavioural tracking study	Increases in stake sizes.	Winning streaks resulted in an increase in the stake sizes significantly as compared to losing streaks. Losing streaks (but not winning streaks) overall reduced risky betting.
Nigro et al. (2021)	Adult habitual gamblers (n = 255, 70% males) from several Video lottery terminal venues in Italy.	*ChasIT* task from (Nigro et al., 2018a) was used, with an added win condition (9 losses in the initial 30 trials).	Lab study	Decisions to continue after cumulative losses/wins following 30 trials.	Previous outcomes did not increase the decision to continue. Participants in loss condition played more extra trials than the control group, but no difference between the loss and win condition was observed.
Balem et al. (2022)	A sample of n = 14,988 poker players and horse-race or sports bettors (n = 9306) and lottery players (n = 5682).	Assessed the impact of wagering inducements on the behavioural tracking data of active online poker and horse-race or sports bettors for a specific loss-chasing operationalisation and administered PGSI & players were asked about their types and distribution of both on- & offline gambling activities.	Behavioural tracking and online-survey study	Same operationalisation as Perrot et al. (2018).	Players with PGSI scores >= 5 had the largest impact on the loss-chasing operationalisations assessed. Loss-chasing was captured among both non-at-risk & at-risk poker players, sports- & horse-race bettors, however, was more pronounced for the at-risk players. Loss-chasing episode was less likely to occur among lottery players and there was no difference observed across non-at-risk & at-risk players.
Chen et al. (2022)	Players (n = 2713) in an online gambling product Mystery Arena in Belgium.	This study analysed all three facets of within-session chasing in an online dice gamble called Mystery Arena, namely (1) the decision to end a session, (2) the change in stake sizes, and (3) the speed of play after wins and losses.	Behavioural tracking study	Decisions of when to stop, increase in stake sizes and post-loss speeding	The study divided the sample into high and low involvement levels based on involvement scores provided by the operator. Both groups were more likely to end a session after losing, and increased the stake sizes more after winning, thus showing no loss-chasing in the first two facets. However, both groups played more quickly after a loss than after a win.

Taoka and Kusumi (2022)	A sample of n = 63 Japanese university students.	An incentivised Acey-Deucey task was used to assess reckless betting behaviour in the face of losses and wins.	Lab study	Reckless betting in the face of losses	In the time series analysis, the study found an increase in the reckless betting following losses by the end of the task.
Auer and Griffiths (2022)	Active players (n = 16, 771) from a European online casino during December 2021 were assessed.	Behavioural tracking data was used to examine multiple operationalisations of loss-chasing.	Behavioural tracking study	1.) Changes in stake sizes within-sessions (i.e., each wager placed) 2.) Frequency of session deposits defined as percentage of sessions with more than one monetary deposit. 3.) Regular gambling account depletion computed as the amount of money in the gambling account after the last game of a session.	Loss-chasing across all the operationalisations varied as a function of problem gambling severity (high, moderate, low). Loss-chasing was not captured in the regular gambling account depletion operationalisation. But it was captured in the within-session chasing operationalisation (but there were no actual numerical differences in stake sizes after incurring losses across the groups) and frequency of session depositing (which acted as a good proxy of increased gambling engagement).

Within-session loss-chasing

Overall, and in contrast to the between-session studies, most of the reviewed studies (*n=23*) on within-session loss-chasing used gambling-like tasks and/or risk-taking tasks in laboratory settings. Some studies also used a survey/interview design to assess within-session loss-chasing with self-report questions (*n=7*) while others assessed loss-chasing within-sessions using behavioural tracking field data (*n=8*). In terms of the sample studied, both the laboratory and the survey/interview studies assessed active gamblers *(n=13)*. However, some laboratory studies used a between-group comparison design recruiting non-gamblers to compare with active gamblers *(n=7).* Some laboratory studies assessed only student samples *(n=7)* and a few recruited participants best categorised as other (e.g., patients with Parkinson's Disease) *(n=3)*. All behavioural tracking studies assessed active gamblers (*n=8*).

In line with the definition by Breen & Zuckerman (1999), some reviewed studies captured within-session loss-chasing either via persistence / continuation, or intensification of gambling behaviour via increasing stake sizes. In addition to increasing stake sizes, the reviewed studies also presented other distinct ways of intensifying gambling behaviour within-sessions to chase losses, specifically via increased risk-taking and increasing speed of play following losses. Below we present a narrative of the key findings on within-session loss-chasing (for an overview of all studies, see Table 3).

Continuation (Persistence)

Gamblers may chase losses by continuing playing in a session (i.e., persistence). In laboratory studies, one of the more widely used experimental task to assess persistence is the ChasIT. In this task, a player wins if they have the card with the highest value and lose if the house has the card with the highest value. Following 30 trials (Phase 1), the net win or loss compared to the initial budget was revealed. Participants had to decide if they wanted to continue playing (for up to another 30 trials; Phase 2) or quit (Nigro et al., 2018a). Persistence was measured as (1) the decision to continue gambling or not following phase 1, and (2), the

number of extra trials played in phase 2, among participants who continue. Across several studies, decision to continue were not consistently influenced by the overall wins and losses in phase 1 (Ciccarelli, et al., 2019a; Ciccarelli, et al., 2019b; Cosenza et al., 2020; Nigro et al., 2018a, 2021; for a similar finding in simulated slot machine gambling, see Lister et al., 2016) . Overall individuals with GD played more trials in ChasIT than non-problem gamblers or non-gamblers in phase 2 (Ciccarelli, et al., 2019a). However, findings on persistence in phase 2 (i.e., the number of extra trials played) were equivocal. Although some studies found that following a net loss, participants on average played more extra trials than after breaking even (Nigro et al., 2018b, 2021), other studies failed to support this effect (Ciccarelli, et al., 2019b; Cosenza et al., 2020; Nigro et al., 2019).

Persistence has also been assessed in real gambling behaviour, either by assessing self-reported tendencies of persisting following losses or by assessing behavioural tracking data. For instance, to assess within-session loss-chasing, an online survey of internet gamblers asked respondents "if you lose when gambling online are you more likely or less likely to keep playing to try and win some money back?" (Gainsbury et al., 2014). Slightly more respondents (32.4%) reported being less likely to bet after losses than those reporting being more likely to bet after losses (28.5%). This finding is broadly in line with some results from behavioural tracking data analyses assessing in-vivo gambling behaviour. For instance, in an online casino game based upon a dice format ('Mystery Arena'), both high- and low-involvement gamblers were more likely to end a session after a loss than after a win (Chen et al., 2022). However, opposite findings have also been observed. For example, horse-race bettors have been reported to prolong their stay in betting premises and listen to races following losing bets (Dickerson et al., 1987). Furthermore, the effects of wins and losses on persistence may depend on their magnitudes. Whiting et al. (2016) found that instant lotto ticket gamblers purchased additional tickets before leaving the store premises, especially for low-price tickets (which may indicate chasing small losses, although the previous outcome was not recorded in this study).

Persistence may be captured indirectly in gamblers' account history, such as the frequency of depleting gambling account (Auer & Griffiths, 2022) or the frequency of monetary deposits (Perrot et al., 2018; Challet-Bouju et al., 2020; Balem et al., 2022; Auer & Griffiths, 2022). Gambler who persisted would presumably deplete their accounts more frequently and would have to make more deposits if they wanted to prolong gambling sessions. Three studies used the frequency of monetary deposits to define a loss-chasing episode as 3 or more deposits made within a 12-hour period and any deposit made less than 1 hour after placing a bet (Perrot et al., 2018; Challet-Bouju et al., 2020; Balem et al., 2022). Perrot et al. (2018) and Challet-Bouju et al. (2020) found that French online lottery gamblers chased losses by increasing the frequency of monetary deposits. Balem et al. (2022) found similar results among online sports/horse-race bettors and online-poker gamblers, but not among internet lottery gamblers. Gamblers with high GD severity were more likely to increase the frequency of deposits following losses across all three studies. Auer & Griffiths (2022) used two metrics to define within-session loss-chasing (persistence), namely the percentage of sessions with >1 monetary deposit, and the percentage of sessions with little money left in the gambling account (< 5 euro) after the last gamble session (i.e., regular account depletion). In line with previous studies, loss-chasing was reliably captured via frequency of deposits. However, contrary to the authors' prediction, the high-risk players had lower regular account depletion as compared to low-risk players (Auer & Griffiths, 2022).

Intensification

Apart from persistence, gamblers may also chase losses within a session by 'intensifying' certain aspects of their gambling behaviour. One way to 'intensify' betting is to take on more risk. The reviewed studies have assessed risk-taking in idiosyncratic manners using various paradigms, such as the Iowa Gambling task (Linnet et al., 2006), a double-or-quits task that was specifically designed to elicit and quantify loss-chasing tendencies (Campbell-Meiklejohn et al., 2008; Rogers et al., 2011; Worhunsky et al., 2017), the Cups task

(Brevers et al., 2017), the Balloon Analogue Risk-Taking task (Bauchner, 2014; Bonini et al., 2018) and the Acey-Deucy task (Taoka & Kusumi, 2022). Another common way to take more risks in gambling is to increase the stake size, which increases the variance in the potential outcomes (i.e., one definition of 'risk'). Using gambling-like tasks, 4 laboratory studies found increases in stake sizes following losses (Bibby, 2016; Bibby & Ross, 2017) and losing streaks (Studer et al., 2015; Tobias-Webb et al., 2020), as an expression of within-session loss-chasing.

Field studies have also assessed loss-chasing via increases in stake size. In a series of survey studies, off-course bettors self-reported loss-chasing by either changing (Coventry & Brown, 1993; Dickerson et al., 1987) or increasing stake sizes (Coventry & Norman, 1997). Similarly, online casino players increased stake sizes within a session following losses, however, no difference were observed across high- or low-risk gamblers (Auer & Griffiths, 2022). Some findings in the opposite direction have also been observed. Xuan & Shaffer (2009) found that online sports bettors (self-identified to have problematic gambling engagement) placed safer, more conservative bets following losses. Furthermore, a survey conducted among electronic gambling machine (EGM) gamblers and off-course bettors found that, in general, more gamblers increased stakes after winning heavily than after losing heavily (O'Connor & Dickerson, 2003). Similarly, active Baccarat players displayed a systematic decrease in risky betting trends following a losing streak but increased it following a winning streak (Abe et al., 2021). Lastly, in an online dice game, players changed stake sizes very infrequently, but on average increased their stake sizes following wins, but not after losses (Chen et al., 2022). These field studies on risk-taking via increasing stake sizes, after winning and losing thus presented equivocal findings.

A small number of studies have also considered how gamblers may 'intensify' betting by playing more quickly. Using gambling-like tasks, some studies have shown that the decision to chase was made more quickly than the decision to not chase (Campbell-Meiklejohn et al., 2008; Rogers et al., 2011. Note that Worhunsky et al., 2017 did not replicate this effect, albeit

in a long neuroimaging study where fatigue or trial repetition may have attenuated the effect). Additionally, in an online dice gamble, both high- and low-involvement players played more quickly after losing than winning (Chen et al., 2022). This speeding up after losing than winning has also been observed in laboratory tasks and simulated gambling (e.g., Verbruggen et al., 2017; Eben et al., 2020; Ferrari et al., 2022), although it was not explicitly labelled as loss-chasing in these previous studies.

Discussion

Our systematic scoping review on loss-chasing in gambling revealed that the existing loss-chasing research operationalises loss-chasing across multiple distinct behavioural expressions. Overall, the operationalisations adopted have been broadly couched under the widely used categories of between-session *(n=39)* and within-session loss-chasing *(n=38)*. Between-session loss-chasing was commonly defined as returning another day/time to recoup losses, specifically in survey/interview studies. Additionally, the time interval between sessions, and increasing wagers in the next session following a losing visit were used as behavioural expressions of between-session loss-chasing when assessing behavioural tracking data in field studies. Within-session loss-chasing was most commonly operationalised as continuing and/or intensifying gambling behaviour after losing (e.g., by increasing stake sizes, risk-taking and speed of play following losses) across laboratory, survey/interview, and behavioural tracking studies. In addition to the observed heterogeneity among the behavioural expressions of loss-chasing, the review also revealed discrepancies in the gambling contexts examined, ambiguities in the definition of losses and use of the terms chasing, loss- and win-chasing, which we discuss below.

Discrepancies in the methodologies used

Across the reviewed studies, we observed a large discrepancy in the gambling contexts examined. The studies on between-session loss-chasing either asked respondents to self-report their own loss-chasing behaviour (*n=36*) or examined real gambling behaviour by

analysing behavioural tracking data (*n=3*). There is a salient lack of experimental research on between-session loss-chasing, presumably because of a logistical requirement for examining loss-chasing across multiple sessions (Breen & Zuckerman, 1999). In contrast, within-session loss-chasing lends itself well to experimental examination. Most of the studies on within-session loss-chasing have examined loss-chasing in laboratory experimental tasks (*n=23*; and *n=7* survey/interviews studies), with the remaining studies analysing behavioural tracking data from real gambling (*n=8*).

Examining loss-chasing in real versus simulated gambling contexts using different methodologies offers different strengths and weaknesses. Asking people to report their own loss-chasing behaviours (using self-report items) may provide an overview of their past gambling behaviours, but the responses may be distorted by social desirability or memory biases (Braverman et al., 2014). Examining loss-chasing in real gambling using behavioural tracking data inherently provides high ecological validity and derives objective measures. However, this approach tends to be restricted to a single gambling platform. Many online gamblers hold accounts with multiple gambling operators, and may even use multiple platforms simultaneously, and this engagement is not registered in the data (Parke & Parke, 2019). Another methodological drawback in behavioural tracking data is that there is typically no neutral outcome (i.e., a zero-point outcome) to compare behaviours after wins and losses, which is problematic given that gamblers may chase both losses but also wins. Non-linear effects may also be observed as a function of the magnitude of the loss (or gain). Lastly, examining loss-chasing in simulated gambling contexts (e.g., in a laboratory) provides more experimental control and can allow us to model such neutral outcomes (e.g., Verbruggen et al., 2017; Eben et al., 2020). However, laboratory studies often lack ecological validity. For instance, laboratory studies often provide gambling funds or tokens to participants, which may be different from gambling with one's own money. Moreover, in some reviewed studies the tasks included unrealistic conditions, such as allowing players to continue despite the

exhaustion of all play money (e.g., Ciccarelli et al., 2019b), which is not possible in real gambling. Whether gamblers can initiate a new session or increase stakes within a session are necessarily limited by the amount of gambling funds available (Sharpe et al., 2005; Bibby & Ross, 2017). Such resource limitations have not yet been modelled in laboratory settings. This difference may explain some of the observed inconsistencies (e.g., on stake sizes after wins and losses). Furthermore, it highlights the importance of considering loss and win amounts in real gambling (e.g., Whiting et al., 2016; Forrest & McHale, 2016; Auer & Griffiths, 2022), as they may limit the extent to which gamblers can chase their losses.

Ambiguities in what constitutes a "loss"

Much ambiguity exists in defining what constitutes a "loss". For instance, it is unclear if the between-session loss-chasing item taps on returning to recoup losses from the previous session (Forrest & McHale, 2016; Kainulainen, 2021), cumulative losses over a week/month (Ma et al., 2014), or indeed the overall loss incurred in one's gambling career to date (Lesieur, 1979; 1977). This ambiguity can lead to different interpretations, or even misinterpretations of the between-session loss-chasing item (Samuelsson et al., 2019). Studies on within-session loss-chasing have defined 'losses' more objectively. However, inconsistencies in the definition of losses also exist. For instance, within a session, a loss has been defined as either the cumulative loss in a certain number of trials (e.g., after 30 trials; Lister et al., 2016; Nigro et al., 2021), the immediate loss in the previous gamble (Chen et al., 2022), having less money than one's initial budget (Breen & Zuckerman, 1999), or depleting one's account below a certain threshold (e.g., Auer & Griffiths, 2022). Similar ambiguities also exist for defining 'break-even', where gamblers recover their previous 'losses'. These inconsistencies can introduce heterogeneity and confusion across studies. Additionally, it is possible that the same outcome may be seen as a loss or not, depending on the definition adopted. For example, a study assessing online gambling behaviour found that increases in both net cumulative losses and wins increased wagering in subsequent online gambling. However, higher immediate

losses decreased wagering compared to higher immediate wins (Ma et al., 2014). Whether we observe loss-chasing or not will thus depend on how we define a 'loss'.

Furthermore, different types and patterns of losses may have distinct influences on loss-chasing behaviour. For instance, near-misses (i.e., losses that are close to wins) and losses disguised as wins (LDW's; gamblers 'win' back part of their wager, thus effectively lose money), two common types of losses in real gambling, have been shown to increase persistence (see Barton et al., 2017, for a review). Moreover, outcome streaks (i.e. a consecutive sequence of the same outcome, such a losing streak) can impact loss-chasing, as two lab-studies on within-session loss-chasing found increases in bet sizes as a function of losing streaks (Studer et al., 2015; Tobias-Webb et al., 2020; although Abe et al. (2021) failed to observe these effects in a field setting, studying baccarat players). Near-misses, LDW's and outcome streaks are important structural features that may inflate the perceptions of winning and create illusions of control (Ayton & Fischer, 2004; Burns & Corpus, 2004; Croson & Sundali, 2005). Further examining their influences on loss-chasing is thus warranted in future research.

Loss-chasing, win-chasing or just chasing?

Some of the reviewed studies also observe 'win-chasing' (e.g., O'Connor & Dickerson; 2003; Xuan & Shaffer, 2009; Nigro et al., 2019; Nigro et al., 2021; Kainukainen, 2021; Chen et al., 2022), that is, continuation and/or intensification of gambling after winning (compared to losing). Win-chasing has received much less attention than loss-chasing (Auer & Griffiths, 2023). Thus, it remains unclear whether and how the two constructs are cognitively related to one another.

One explanation for 'win-chasing' is that winning simply provides gamblers with more funds to bet with (Auer & Griffiths, 2023) a phenomenon referred to as a 'wealth effect' (e.g., Salaghe et al., 2020). When studies observe greater chasing of wins relative to losses, the attenuated loss-chasing could be explained merely by insufficient funds. However,

O'Connor & Dickerson (2003) found that a small proportion of gamblers reported to continue following wins but not following losses. Win-chasing may therefore be a valid construct that warrants further examination. In the Pathways Model of GD, chasing encompasses chasing both wins and losses (Blaszczynski & Nower, 2002). However, note that 'chasing' was not clearly defined in this influential model, again highlighting the necessity of systematically examining how 'chasing' has been operationalised.

Chasing both wins and losses may be called just 'chasing', that is, continuing and/or intensifying gambling as a function of previous outcomes. However, this raises the question of to what extent is chasing distinct from general gambling involvement, or disinhibition more generally (see Zhang & Clark, 2020). The close relation between 'chasing' and gambling involvement can be seen in the large body of studies that have used the self-report loss-chasing items. These items often ask respondents *how often* they return to recoup their losses (Lesieur, 1979). Since most gambles have negative expected values, most sessions are likely to end with losses. Thus, when gamblers return, it is most likely that they are returning after previous losses. The higher the involvement in gambling, the more frequent such 'returning after losing' will occur. Going beyond such 'frequency-based' measures will therefore be helpful in capturing 'chasing' behaviour that cannot simply be equated with general gambling involvement. For instance, Forrest & McHale, (2016) found that while most slot machine gamblers stayed away from the casino for a longer duration after a losing session, a small percentage (2%) returned sooner than usual after an atypically large loss. This loss-chasing behaviour would not be captured by a frequency-based measure (e.g., Ma et al., 2014; Kainulainen, 2021), such as how often they returned. More broadly, this finding shows the value of considering different outcomes (i.e., wins and losses, and the magnitudes) in explaining 'chasing' behaviour. This indicates that instead of frequency-based measures, intensification-based measures may better distinguish gamblers' chasing behaviour. Since

"just chasing" may be strongly linked to general gambling involvement, we think it is informative to consider loss-chasing and win-chasing as two distinct constructs.

Open questions and directions for future research

Relationships between between-session and within-session loss-chasing

While most studies reviewed considered either between-session or within-session loss-chasing separately, a small number of studies *(n=3)* studied both forms of loss-chasing. Some researchers have proposed that within-session loss-chasing is a building block of between-session loss-chasing (Breen & Zuckerman, 1999; Cronce & Corbin, 2010). However, the relationship between within-session and between-session loss-chasing has remained unclear. Some studies found that participants who self-reported more frequent between-session loss-chasing played more extra trials in simulated gambling or a gambling-like task (persistence within a session; Yakovenko, 2017; Nigro et al., 2018a; 2018b; Ciccarelli et al., 2019a), suggesting a correlation between the two types of loss-chasing, others have failed to find this effect (Cosenza et al., 2020, Yakovenko, 2017). Since the self-report loss-chasing items may capture gambling involvement, this correlation may reflect an individual's overall involvement in gambling, rather than a genuine correlation between the two types of loss-chasing.

The reviewed studies on between-session and within-session loss-chasing largely used different methodologies. The differences in methods make it challenging to examine the relations between loss-chasing within a session and across sessions. One promising approach may be to use behavioural tracking data from real gambling. Gambling operators nowadays track gambling behaviour at high resolution (e.g., at both round and session level), making it possible to examine how different facets of gambling behaviours may change both within- and between-session. Although this approach has high ecological validity, its ability to offer insights into the underlying cognitive mechanisms may be limited. Furthermore, commercial gambling products often include rather idiosyncratic features that may influence the

expressions of loss-chasing (see the next section). Research on simulated gambling in controlled yet still realistic settings is therefore needed. Although examining gambling behaviours across multiple sessions in a laboratory setting is challenging, some recent work has succeeded in doing this (e.g., Ferrari et al., 2022). In addition, it will be fruitful to explore novel paradigms that can capture key cognitive processes that may be involved in between-session and within-session loss-chasing. For instance, recent work developed a new behavioural task that allowed rats to initiate gambling (which might be related to between-session loss-chasing) or continue gambling after starting (which might be related to within-session loss-chasing), and showed that these two decisions have dissociable neurochemical underpinnings (Humby et al., 2020). An interesting avenue for future research can be to examine whether the decisions to initiate or continue gambling in such tasks can be related to loss-chasing between- and within-session among gamblers.

One challenge that may arise, especially when assessing loss-chasing from behavioural tracking data, is how a session should be defined. There is variation in how a 'session' is defined in the literature. For instance, a session has been defined as a span of 24 hours or across consecutive days (Auer & Griffiths, 2022), 1 hour after placing a bet (Balem, et al., 2022; Challet-Bouju et al., 2020; Perrot et al., 2018) or more recently as a gap of fifteen minutes between two wagers (Auer & Griffiths, 2023). Furthermore, gambling modality can impact how we define a session. In offline gambling, a gambling session may be relatively straightforward to define (e.g., Lesieur, 1979; Dickerson et al., 1987). However, when gambling online, gamblers can gamble around the clock, making the boundary between separate sessions blurred. This may be one reason why among various risk factors, online gambling is most strongly associated with problem gambling (Allami et al., 2021). It is possible that while the between- versus within-session distinction was useful in accounting for loss-chasing in offline gambling, it may be less adequate for online gambling. Examining loss-chasing in online gambling will help address this issue.

Loss-chasing in different types of gambling products

One important source of variation that has not been adequately considered is gambling type. Gambling products can be broadly divided into two types, namely games of chance/non-strategic gambles (i.e., games involving little deliberation/strategy and skill, e.g., slots; 32 reviewed studies were on games of chance) and games of skill/strategic-gambles (i.e., games involving some level of deliberation/strategy and skill, e.g., poker, blackjack; Jiménez-Murcia et al., 2020; 9 reviewed studies were on games of skill; the rest did not specify gambling type). Different gambling types differ in their structural characteristics, which may influence how gamblers chase losses. For instance, in fast-paced (mostly) chance-based games like a slot machine, gamblers rarely change their stakes, and predominantly chase losses by playing more quickly after losing (Chen et al., 2022; Ferrari et al., 2022). In contrast, adjusting stakes might be more frequently observed in skill-based games, based on the structural features of the game, or the gambler's strategy. For example, O'Connor & Dickerson (2003) reported that off-course bettors were more susceptible to increase bet sizes as compared to EGM gamblers. Furthermore, strategic- and non-strategic gamblers respond differently to different types of losses. For instance, off-course bettors increased bet sizes following near-misses while EGM gamblers reacted to heavy losses by persisting (O'Connor & Dickerson, 2003). Additionally, subjective perceptions of losses and wins predicted between-session loss-chasing among non-strategic but not strategic-gamblers (O'Connor & Dickerson, 2003). Taken together, these findings highlight a potential impact of gamble types on the expression of loss-chasing, an aspect which should be systematically investigated in future studies.

Individual differences among gamblers

Gamblers are a heterogenous group, and the individual differences they display can impact the expression of loss-chasing. For example, Coventry & Brown (1993) reported that increases in bet sizes among off-course bettors was significantly predicted by the Thrill-

Adventure-Seeking sub-scale of the Sensation Seeking (however this finding was not replicated by Coventry & Norman (1997)). O'Connor & Dickerson (2003) found that gamblers with increased impaired control reported an increased urge to continue gambling once they started a session or returned back later. Similar results were reported by Nigro et al. (2018b) in a lab-study. They found a significant positive correlation between measures of disinhibition and persistence. A few studies examined the impact of alexithymia, a personality trait characterised with marked difficulties in processing emotional information, on loss-chasing within sessions. Across two lab-studies, Bibby (2016) and Bibby & Ross (2017) found that increasing stake sizes following losses was more pronounced in participants with high alexithymia (Bibby, 2016; Bibby & Ross, 2017). Collectively, the evidence indicates that individual differences can impact loss-chasing in specific ways. Understanding the role of individual differences in loss-chasing can aid our understanding of how specific gamblers might chase losses. This can further allow us to tailor the diagnosis and treatment protocol for different sub-groups of gamblers.

Limitations

There are a few limitations of the current review. Firstly, the protocol of the current review was not pre-registered. Secondly, only two unpublished theses were identified in our gray literature search of the GREO database. Although other databases for accessing gray literature exists, the field lacks best practices for searching the gambling-related gray literature (Palmer et al., 2022). Thirdly, our search terms included studies that explicitly used the term "chasing" (or variants thereof), which in turn restricted our search results to bonafide gambling research, by filtering out studies from other disciplines studying phenomenologically-similar constructs like sunk costs (Friedman et al., 2007), escalation of commitment (McCarthy et al., 1993), or entrapment (Ariyabuddhiphongs & Phengphol, 2008). Furthermore, even within the gambling research screened with these search terms we acknowledge that our criteria excluded some studies examining gambling persistence (e.g.,

Witts & Lyons, 2013; Devos et al., 2015, 2018) or speed of play (e.g., Verbruggen et al., 2017; Eben et al., 2020; Ferrari et al., 2022), but without placing their observations in the context of loss-chasing behaviour. This further raises the question, under what conditions researchers consider conceptually similar gambling behaviours as reflecting (or not reflecting) loss-chasing which in turn impacts the terminology and operational definitions adopted in the studies. Finally, we did not quantitatively synthesize the results of the identified studies (i.e., meta-analysis), as the substantial heterogeneity in the study designs and dependent variables precludes such an approach. Future work selecting subsets of the research that we characterize (e.g., the studies using the ChasIT task) could consider meta-analysis, but this is outside the scope of the present article. Rather, our scoping review aims to map the extant literature on loss-chasing and raise researchers' awareness of this heterogeneity. The lack of conceptual clarity should be addressed before any quantitative synthesis of evidence can be undertaken.

Conclusion

Loss-chasing is a key clinical symptom in gambling disorder (GD) and a central feature in problem gambling (PG). Our systematic scoping review revealed much heterogeneity in the loss-chasing operationalisations currently adopted, gambling contexts examined, the exact definitions of a 'loss', and whether loss-chasing should be distinguished from 'win-chasing'. Furthermore, there is paucity of research examining the relationships between within-session and between-session loss-chasing, loss-chasing in different gambling types, and the potential role of individual differences. By highlighting these inconsistencies and gaps in the literature, this paper serves as a first step towards more conceptual clarity of loss-chasing as a key construct in theoretical models of GD. The reviewed studies also provide a comprehensive description of behavioural markers that have been considered as 'loss-chasing' by gambling researchers, which will be useful to practitioners who may use these markers to improve the detection, prevention, diagnosis, and treatment of gambling disorder.

Supplementary Material

Search Strings, filters and database search results:

PubMed search string

Filter: a.) Year: 1980-2022
Search strings: (gambling [Mesh] OR gambl* OR bet OR betting OR bettor OR “electronic gaming machine” OR “slot machine” OR EGM OR "video lottery terminal" OR "video gaming terminal" OR casino OR bingo OR lottery OR lotto OR poker OR blackjack OR “scratch card*” OR roulette) AND (chasing OR chase OR chaser)
Results: 170 results, accessed on 24 September 2022.

PsycINFO:

Filter: a.) Year: 1980-2022, b.) Source: scholarly journal articles, Book resources, Dissertation and Theses resources
Search strings: (gambling [Mesh] OR gambl* OR bet OR betting OR bettor OR “electronic gaming machine” OR “slot machine” OR EGM OR "video lottery terminal" OR "video gaming terminal" OR casino OR bingo OR lottery OR lotto OR poker OR blackjack OR “scratch card*” OR roulette) AND (chasing OR chase OR chaser)
Results: 152 results, accessed on 24 September 2022.

ProQuest search string

Filter: a.) Year - published since 1 January, 1980, b.) Language - English and c.) Source: Scholarly Journals, Dissertations & Theses, Reports, d.) Databases included: Acta Sanctorum, APA PsycArticles®, Avery Index to Architectural Periodicals, Coronavirus Research Database, Early Modern Books, Ebook Central, Gerritsen Women's History Collection of Aletta H. Jacobs, International Bibliography of Art (IBA), MEDLINE®, Patrologia Latina, Performing Arts, Periodicals Database, Periodicals Archive Online, ProQuest Central, ProQuest One Literature, PTSDpubs, Social Science Premium Collection, Trench Journals and Unit Magazines of the First World War.
Search strings: TI((gambl* OR bet OR betting OR bettor OR "electronic gaming machine" OR "slot machine" OR EGM OR "video lottery terminal" OR "video gaming terminal" OR casino OR bingo OR lottery OR lotto OR poker OR blackjack OR "scratch card*" OR roulette) AND (chasing OR chase OR chaser)) OR AB((gambl* OR bet OR betting OR bettor OR "electronic gaming machine" OR "slot machine" OR EGM OR "video lottery terminal" OR "video gaming terminal" OR casino OR bingo OR lottery OR lotto OR poker OR blackjack OR "scratch card*" OR roulette) AND (chasing OR chase OR chaser))
Results: 223 results, accessed on 24 September, 2022.

GREO Evidence centre search string

Filter: a.) Year - 1980-2022 and b.) Datasets and multimedia excluded
Search strings: (gambl* OR bet OR betting OR bettor OR “electronic gaming machine” OR “slot machine” OR EGM OR "video lottery terminal" OR "video gaming terminal" OR casino OR bingo OR lottery OR lotto OR poker OR blackjack OR “scratch card*” OR roulette) AND (chasing OR chase OR chaser)

Results: 80 results, accessed on 24 September 2022.

Data Access: List of included articles can be downloaded from this ofs.io link.

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