Measuring treatment outcomes in gambling disorders: a systematic review

Dylan Pickering, Brittany Keen, Gavin Entwistle & Alex Blaszczynski
School of Psychology, University of Sydney, Sydney, Australia

ABSTRACT

Background and Aims  Considerable variation of outcome variables used to measure recovery in the gambling treatment literature has precluded effective cross-study evaluations and hindered the development of best-practice treatment methodologies. The aim of this systematic review was to describe current diffuse concepts of recovery in the gambling field by mapping the range of outcomes and measurement strategies used to evaluate treatments, and to identify more commonly accepted indices of recovery.

Methods  A systematic search of six academic databases for studies evaluating treatments (psychological and pharmacological) for gambling disorders with a minimum 6-month follow-up. Data from eligible studies were tabulated and analysis conducted using a narrative approach. Guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) were adhered to.

Results  Thirty-four studies were reviewed systematically (RCTs = 17, comparative designs = 17). Sixty-three different outcome measures were identified: 25 (39.7%) assessed gambling-specific constructs, 36 (57.1%) assessed non-gambling specific constructs, and two instruments were used across both categories (3.2%). Self-report instruments ranged from psychometrically validated to ad-hoc author-designed questionnaires. Units of measurement were inconsistent, particularly in the assessment of gambling behaviour. All studies assessed indices of gambling behaviour and/or symptoms of gambling disorder. Almost all studies (n = 30; 88.2%) included secondary measures relating to psychiatric comorbidities, psychological processes linked to treatment approach, or global functioning and wellbeing.

Conclusions  In research on gambling disorders, the incorporation of broader outcome domains that extend beyond disorder-specific symptoms and behaviours suggests a multi-dimensional conceptualization of recovery. Development of a single comprehensive scale to measure all aspects of gambling recovery could help to facilitate uniform reporting practices across the field.

Keywords  Gambling disorder, intervention, outcome measures, problem gambling, recovery, systematic review, treatment outcome.

INTRODUCTION

Treatment outcomes for gambling disorders are defined poorly and measured inconsistently across studies [1,2]. In particular, the concept of recovery itself is rarely operationalized, with outcomes referring variably to abstinence, controlled gambling or broader psychosocial or other impacts [3]. Lack of conceptual clarity and consensus on operational criteria in defining and measuring recovery compromises the capacity to determine which treatment interventions achieve optimal outcomes [4]. Establishing uniform operational criteria would facilitate meaningful cross-study evaluations that enable researchers to determine the relative efficacy of treatments. The development of meta-analytical techniques has provided a powerful statistical tool to combine data between studies and calculate overall effect sizes. Although moderate heterogeneity among studies is to be expected in meta-analysis, high degrees of inconsistency can seriously limit its application and validity [5–7].

Analogous to gambling disorders, the substance use disorders (SUDs) field also demonstrates inconsistency in the outcomes and metrics utilized to quantify treatment success [8]. There is no consensus regarding best-practice outcomes for SUD clinical trials, and the field is yet to adopt a core set of ‘ancillary’ domains or optimal methods of...
assessment [9]. The relative importance of specific outcomes is fuelled by differences in intervention type (behavioural, pharmacological), therapeutic targets (abstinence, controlled use) and expectations of stakeholders (clinician, researcher, client or policymaker) [10].

Despite this, the SUD field accepts that recovery is the fundamental goal of treatment programmes, and hence the benchmark for evaluating treatment efficacy [11–16]. Recovery, in a contemporary sense, refers broadly to improvements extending beyond target problem symptoms to pertinent functional areas and quality of life domains [16]. A scoping review conducted by Laudet [17] identified psychometrically validated measures of recovery across several addiction fields. She found that, in contrast to the mental health field, no dedicated measure of recovery existed for addictions, despite the evident need. In response, Neale et al. [18] developed and validated the first instrument designed specifically to assess recovery in SUD populations ( Substance Use Recovery Evaluator; SURE). Reflecting the more ‘inclusive’ approach to recovery, the scale comprises five factors, one specific to substance use and the remaining four assessing a range of life areas (material resources, outlook on life, self-care and relationships) [18–20].

Similarly, the gambling field has moved to establish a core set of reporting standards for treatment studies. A frequently cited paper by Walker et al. [21] describes a reporting framework constructed by an expert panel (the ‘Banff Consensus’), including three relevant outcome domains. The first includes measures of gambling frequency and expenditure, although such outcomes are known to be inherently difficult to measure. The alcohol field has established a standardized unit of consumption that is related directly to personal risk of alcohol-related harm [22]. In contrast, a standardized unit of gambling is not possible, as the negative consequences associated with gambling expenditure are contingent upon the gambler’s unique financial resources. Additionally, there are no biological markers of gambling behaviour as there are with substance use (e.g. blood alcohol). Consequently, measuring levels of involvement relies entirely upon self-report methods, which have been shown to be unreliable [23–27]. Although Walker et al.’s [21] paper aims to facilitate cross-comparability of outcomes, it does not endorse specific instruments designed to assess each domain. Consequently, researchers are afforded significant flexibility relating to their selection of appropriate instruments, which may contribute to the variability of reported outcomes in treatment studies.

Other than investigations of ‘natural recovery’ [28,29], there is a distinct lack of literature addressing how recovery as an outcome should be operationalized and measured in gambling disorders. Nower & Blaszczynski [4] proposed a spectrum of recovery that includes improvements across several areas. At the fundamental level, recovery is described as decreased time and money spent gambling not leading to added consequences. The highest level represents an absence of negative consequences and sustained improvements in quality of life over time. There appears to be more acceptance of controlled use in alcohol and gambling disorders compared to illicit drug use. This may be because of their relative legality and, hence, social acceptability; or because lower levels of consumption are perceived to be comparatively safe [30,31]. Furthermore, there is a growing body of literature demonstrating the viability of moderation-based treatment goals and their link to positive treatment outcomes [32–35].

The degree to which gambling treatment studies have adhered to reporting standards advanced by the Banff Consensus [21] is unclear. Additionally, there is no indication of the impact of early conceptualizations of recovery [4] on determining relevant metrics of treatment success. The purpose of this paper was to detail how recovery is portrayed currently in the gambling field by extracting and mapping the range of outcome variables used to evaluate treatment efficacy. Identifying outcome variables that are commonly utilized provides one indication of their relative importance to recovery, as perceived by researchers. The derived information will help the field move closer towards a unified operationalization of recovery and attendant measurement criteria, thus maximizing the potential for advancements in therapy. Although studies have commented previously on the inconsistent reporting standards in the gambling treatment literature [2,4,21,36], this systematic review is the first to document rigorously the degree of variability and present clinically relevant domains of recovery based on empirical data.

**METHODS**

A systematic literature review was undertaken in accordance with guidelines outlined by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [37]. The protocol details of this systematic review were registered with the International Prospective Register of Systematic Reviews (PROSPERO) under the registration code: CRD42016039905.

**Search strategy**

The following databases were searched for peer-reviewed journal papers published between 2005 and 2016: (1) PsycINFO, (2) Scopus, (3) PubMed, (4) Medline, (5) Web of Science and (6) Google Scholar. The search strategy included the following terms: gambli* AND (problem* OR patholog* OR disorder*) AND (treatment OR therap* OR intervention) AND (outcome OR variable OR metric OR measure OR criter*) AND (recover* OR...
success* OR respon* OR effective* OR efficacy). Additional hand-searches were conducted on the bibliography and ‘cited by others’ section of key papers, and recent literature reviews of gambling disorder treatments [38–44].

Screen for eligibility

Titles and abstracts of the initial search results were screened. Articles deemed relevant were downloaded into Zotero—a reference collection and organization tool. Two reviewers screened the full texts independently to determine eligibility. The eligibility criteria consisted of: (1) an adult treatment-seeking sample of \( n > 10 \) with a primary gambling disorder diagnosis (based on validated metrics: \( > 3 \) DSM-IV-TR, \( > 4 \) SOGS, \( > 5 \) PGSI; see [45–47]); (2) treatment interventions for gambling disorders excluding harm-minimization strategies (i.e. pre-commitment, self-exclusion, personalized feedback, warning messages); (3) fully or quasi-randomized controlled trials, prospective cohort and descriptive/case–series designs; and (4) quantitative outcomes reported over at least 6 months of follow-up post-baseline assessment.

Quality assessment

Design quality and risk of bias was assessed independently by two reviewers using the Meta-Analysis of Statistics Assessment and Review Instrument (MAStARI) [48]. The MAStARI was applied because it provides separate criteria relevant to specific study designs, including randomized controlled trials (RCTs), cohort/case–controlled studies and observational/descriptive studies. Inter-rater reliability was calculated (criteria agreed upon/total number of criteria) and any discrepancies that could not be resolved between the two reviewers were mediated by a third reviewer. Studies were classified as ‘high’ (> 75% criteria met), ‘moderate’ (50–75% criteria met) and ‘low’ (< 50%). Papers that met fewer than 25% of criteria were deemed unacceptable for review and were removed from remaining analyses.

Data extraction and summary

Data from the selected studies were tabulated in the following format: author and publication year, country, sample characteristics, intervention type, study design and ranking, follow-up duration, gambling and non-gambling specific outcome measure, and whether treatment success or recovery were defined. Study designs were ranked according to the National Health and Medical Research Council’s (NHMRC) [49] levels of evidence and grading system. The extracted data were summarized using a narrative approach with a focus on treatment outcome type. Meta-analytical techniques were not utilized, as the aims of the review were not to evaluate relative treatment effectiveness.

RESULTS

Study selection

The initial search yielded more than 1400 citations (see Fig. 1). Given the vast number of results returned by Google Scholar (29 000 results), screening in Google Scholar ceased 10 pages (10 results per page) after the last eligible reference was returned. One hundred and seventy papers were screened and retained initially. The hand-search method identified a further 27 relevant papers. After applying the eligibility criteria to 197 papers, a total of 34 papers were retained in the final review (Fig. 1).

Inter-rater reliability between the two reviewers was good, with initial agreement on 87.82% of papers, \( \kappa = 0.673 \), 95% confidence interval (CI) = 0.55, 0.79. The most common reasons for exclusion fell under design issues (see Fig. 1). One paper was excluded because it did not meet minimum quality assessment standards (< 25% MAStARI rating; described in Methods).

Quality assessment

Seventeen RCT studies and 17 comparative designs: two cohort/case–control studies and 15 observational/descriptive studies were assessed using the corresponding MAStARI criteria. Overall inter-rater reliability for quality assessment between the two reviewers was 73.5%. A third reviewer was enlisted to resolve three items of discrepancy. Studies were on average classified as of ‘moderate’ quality [mean = 68.61%; standard deviation (SD) = 13.72]. Quality assessment for each of the three research designs can be seen in their respective tables (Tables 1, 2 and 3).

Characteristics of included studies

Data extracted from the 34 studies are summarized in Table 4. Sample sizes varied considerably and ranged from \( n = 19 \) to \( n = 566 \) (mean = 144); a greater percentage of participants were male (mean = 71.2%) and the mean age of participants was 41.6 years (SD = 5.95; range = 30.7–55.5). Nationalities were diverse, with several studies originating from Spain, Australia, the United States and Canada. More than half the reviewed studies (\( n = 18 \); 52.9%) were designed as RCTs, three of which employed pseudo-randomization (i.e. non-random allocation to intervention), and met levels II and III-1 of the National Health and Medical Research Council (NHMRC) study design hierarchy, respectively. The remainder of the studies reported data from comparative studies (levels III-2/3), involving pre–post intervention scores.
Most studies \((n = 23; 67.6\%)\) used psychological interventions [e.g. cognitive–behavioural therapy (CBT)], five of the studies evaluated pharmacological interventions, while other interventions included self-help material, group programmes and miscellaneous psychological techniques (e.g. self-hypnosis, imaginal desensitization). Large portions of pharmacological and brief intervention studies were excluded because they did not meet the minimum follow-up period criteria. The median follow-up duration was 6 months (range = 3–36). Some post-treatment follow-up periods could not be determined because the length of treatment was not described, or because treatment was ongoing at the time of follow-up.

Outcome measures

Among the studies reviewed, 25 (39.7%) primarily gambling-specific outcome measures (e.g. gambling pathology, severity etc.; see Fig. 2), 36 (57.1%) primarily non-gambling outcome measures (e.g. depression, anxiety, wellbeing, etc.; see Fig. 3) and two (3.2%) outcome measures utilized for both categories (time-line follow-back/
diary method and visual analogue scale), were used to assess and evaluate treatment success, response or recovery from gambling problems. Gambling outcome measures were under-represented in RCTs compared to pre–post–designed studies (16 : 19), whereas a larger proportion of non-gambling measures were used in RCTs compared to pre–post–designed studies (26 : 17). Taking into account the number of times each measure was used, non-gambling measures overall were used more than gambling outcome measures (65 : 59).

**Gambling symptoms and severity**

Signs and symptoms of gambling disorders were included as outcome variables in 82.4% (n = 28) of the reviewed studies. Validated self-report psychometric instruments designed to screen for problem or pathological gambling were most popular. The South Oaks Gambling Screen (SOGS) [50], based on the DSM-III [51] criteria for Pathological Gambling, was the most frequently employed gambling screen (n = 8; 23.5%) (see Fig. 2). In terms of the reporting metrics used, nine studies analysed significant improvement or reduction of total scores, one study calculated decreases in the percentage of participants fulfilling threshold criteria and four studies reported both. DSM criteria were administered directly to participants in six studies (20.6%); one analysed the number of symptoms endorsed, two reported on changes in gambling disorder prevalence and three studies reported both.

Criteria: (1) Assignment to treatment group truly random. (2) Participants blinded to treatment allocation. (3) Allocation to treatment groups concealed from allocator. (4) Outcomes of people who withdrew described and included in analysis. (5) Researchers assessing outcomes blind to treatment allocation. (6) Control and treatment group comparable at entry. (7) Groups treated identically other than for named interventions. (8) Outcomes measured in a reliable way. (9) Appropriate statistical analysis used. + = yes; − = no; ? = not enough information. NA = not applicable.

**Table 1 Results of quality assessment for randomized controlled trial (RCT) studies [based on Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI MAStARI) checklist criteria].**

| Study                        | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|------------------------------|---|---|---|---|---|---|---|---|---|-------|
| Carlbring et al. (2010) [90] | + | NA | + | + | ? | ? | − | + | − | + | 55.6% |
| Carlbring & Smith (2008) [91]| + | NA | + | + | + | + | − | + | + | + | 88.9% |
| Dowling et al. (2006) [53]  | ? | NA | ? | − | ? | + | + | + | + | + | 55.6% |
| Grant et al. (2011) [78]    | + | NA | ? | − | + | − | + | + | + | + | 66.7% |
| Grant et al. (2014) [92]    | ? | + | ? | ? | + | + | + | + | + | + | 60.0% |
| Hodgins et al. (2007) [82]  | ? | + | ? | + | + | + | + | ? | + | + | 70.0% |
| Korman et al. (2008) [93]   | ? | NA | ? | + | − | + | − | + | + | + | 56.5% |
| Lloret et al. (2014) [75]   | − | NA | ? | + | ? | + | − | + | + | + | 56.5% |
| Marceaux & Melville (2011) [94]| ? | NA | ? | + | ? | + | + | + | + | + | 66.7% |
| McIntosh et al. (2016) [66] | ? | NA | ? | + | ? | − | + | + | + | + | 56.5% |
| Myrseth et al. (2011) [76]  | + | − | − | + | − | + | − | + | + | + | 70.0% |
| Petry et al. (2006) [72]    | + | NA | ? | + | ? | + | + | + | + | + | 77.8% |
| Rosenberg et al. (2013) [68]| ? | ? | ? | ? | + | + | + | + | ? | + | 40.0% |
| Rossini-Dib et al. (2015) [73]| − | NA | ? | + | ? | NA | + | + | + | + | 62.5% |
| Saiz-Ruiz et al. (2005) [81]| ? | + | ? | + | + | + | + | + | + | + | 80.0% |
| Smith, Battersby, et al. (2015) [95]| + | + | + | + | + | + | + | + | + | + | 100.0% |
| Toneyitto et al. (2009) [96]| ? | + | + | + | + | + | + | + | + | + | 90.0% |

Criteria: (1) Sample is representative of patients in population as a whole. (2) Patients are at a similar point in the course of their condition/illness. (3) Bias minimized in relation to selection of cases and controls. (4) Confounding factors identified and strategies to deal with them stated. (5) Outcomes assessed using objective criteria. (6) Follow-up carried out of a sufficient time-period. (7) Outcomes of people who withdrew described and included in analysis. (8) Outcomes measured in a reliable way. (9) Appropriate statistical analysis used. + = yes; − = no; ? = not enough information. NA = not applicable.

**Table 2 Results of quality assessment for comparable cohort/case–control studies [based on Joanna Briggs Institute Meta Analysis of Statistics Assessment and Review Instrument (JBI MAStARI) checklist criteria].**

| Study                        | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | Total |
|------------------------------|---|---|---|---|---|---|---|---|---|-------|
| Odlaug et al. (2013) [71]    | + | + | + | + | + | − | + | + | + | 88.9% |
| Ramos-Grille et al. (2015) [97]| + | + | + | − | + | + | − | + | + | 66.7% |

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Several studies also employed self-report measures that evaluated the severity of symptoms during shorter periods (between 1 and 4 weeks); the most frequent was the Gambling Symptom Assessment Scale (G-SAS) \[52\] \((n = 3)\). Most of the studies assessing gambling severity reported changes in overall scores \((n = 4)\), three used validated cut-offs to indicate shifts to minimal or mild symptom severity and one study defined a specific percentage of symptom reduction \((35\%)\). One study had participants define their own problem in a short statement and indicate improvement with an eight-point Visual Analogue Scale (VAS).

A number of studies also analysed specific psychological indicators: these were typically the processes targeted by the intervention, and were linked theoretically to changes in other outcome variables, including gambling behaviour. Gambling urges and cravings, for example, were assessed by five measures throughout seven separate studies \((20.6\%)\), and erroneous cognitions about gambling were included as outcomes in five studies \((8.8\%)\).

### Gambling behaviour

#### Time and money

Twenty-four of the included studies \((70.6\%)\) measured some aspect of gambling behaviour as an outcome of treatment. The time indices of gambling behaviour were measured in terms of frequency \((n = 14; 41.2\%)\) and/or less commonly, duration \((n = 6; 17.6\%)\). Studies often used more than one metric to measure frequency and included varied assessments of days gambled over different time-frames, gambling episodes, days since last gambled, days binge gambling and ranges from ‘never (0)’ to ‘very often (100)’. Similarly, a variety of assessment metrics were used to measure duration, including hours/minutes spent gambling over the past week, month or gambling day/session.

The other major behavioural aspect of gambling involvement reported was monetary expenditure \((n = 13; 38.2\%)\). Gambling expenditure was again assessed during different time-periods via changes in money wagered, total expenditure, net losses, amount gambled on primary form, money inserted and a scale from ‘nothing (0)’ to ‘very much (100)’. One study included money planned to wager.

The most common measure of gambling activity was the time-line follow-back (TLFB) method \((n = 6)\). Two studies included collateral validations (corroborating data from significant others) and structured retrospective questions \((n = 4)\).

#### Abstinence and relapse

The rates of abstinence and/or relapse were reported in slightly more than half the studies \((n = 19; 55.9\%)\). The majority of these studies did not define abstinence explicitly; however, it can be implied by its definition as absolutely no gambling on any form. One study \[53\] specified abstinence from gaming machines.
Table 4: Study characteristics and treatment outcomes.

| Study                  | Country    | Sample (n, % female, age) | Type of intervention | Design                  | Follow-up (post-treatment, months) | Gambling-specific outcome(s)                        | Non-gambling outcomes(s) | Recovery defined? |
|------------------------|------------|---------------------------|----------------------|--------------------------|------------------------------------|-----------------------------------------------------|--------------------------|------------------|
| Aragay et al. (2015)   | Spain      | 566, 8%, 43.5             | CBT                  | Pre-post level III-3      | 6                                  | Lapse, relapse                                     | Dropout                 | No               |
| Carlbring & Smit (2008) | Sweden     | 66, 6%, 31.9              | Internet CBT self-help w/ telephone support | RCT – level II           | 6, 18, 36                          | NODS                                                | HADS-A; HADS-D; QOLI   | No               |
| Carlbring et al. (2010) | Sweden     | 127, 16.5%, 40.5          | MI and CBGT          | RCT – level II           | 6, 12                              | NODS; TLFB (gambl. days/ time/$ wagered-won-lost)    | BDI-II; BAI            | No               |
| Carlbring et al. (2012) | Sweden     | 284, 9%, 32.2             | Internet CBT w/ minimal therapist support | Pre-post level III-3      | 6, 18, 36                          | NODS                                                | HADS-A; HADS-D; QOLI   | No               |
| Dowling et al. (2006)  | Australia  | 19, 100%, 44.8            | CBT                  | RCT – level II           | 6                                  | Diary: weekly (freq./time/$ spent); abstinence/ control; DSM-IV-TR; GAS | BDI-II; STAI; CSEI     | No               |
| Grant et al. (2011)    | United States | 68, 38%, 49.0          | IDMI, GA             | RCT – level II           | 6                                  | PG-YBOCS; G-SAS; PG-CGI                           | SDS; HAM-A; HAM-D; QOLI | Yes              |
| Grant et al. (2014)    | United States | 28, 18%, 47.6          | IDMI + N-acetylcystine, IDMI + placebo | RCT – level II           | 3                                  | PG-YBOCS                                           | FTND; HAM-A; HAM-D    | No               |
| Guo et al. (2014)      | Singapore  | 80, 7.5%, 36.7            | CBT                  | Pre-post level III-3      | 3, 6, 12 (baseline)                | Abstinence; freq. (monthly); G-SAS                   | PWI                     | No               |
| Hodgins et al. (2007)  | Canada     | 169, 42%, 32              | Relapse prevention booklet | RCT – level II           | 6 weeks, 6, 12 (baseline)          | TLFB w/ collaterals (gambl. days $ per sess.); GASS; SOGS; NODS; goal achievement | CES-D                  | No               |
| Jackson et al. (2013)  | Australia  | 30, 70%, 51–60           | (Re)Making meaning program | Pre-post level III-3      | 3                                  | GAMI: fortnight (freq./time/$ spent); TGQ           | K6; WSAS; RSE; DGLS; Social capital       | No               |
| Jimenez-Murcia et al. (2015) | Spain   | 440, 5.5%, 41.2        | CBGT                 | Pre-post level III-3      | 1, 3                               | SOGS; relapse                                      | SCL-90-R; Dropout      | Yes              |
| Jimenez-Murcia et al. (2007) | Spain   | 290, 2%, 39.9           | Group CBT            | Pre-post level III-3      | 1, 3, 6                            | SOGS; relapse                                      | SCL-90-R; Dropout      | No               |
| Komar et al. (2008)    | Canada     | 42, 14%, 47.6            | Anger and Addiction Therapy TAU (CBT) | RCT – level II           | 3                                  | CPGI                                                | DHQ; STAXI              | No               |
| Ladouceur et al. (2009) | Canada    | 89, 52%, 52              | CBT                  | Pre-post level III-3      | 6, 12                              | DSM-IV: freq./time/$ spent (past week); control self-efficacy; SLUGS; severity/ consequences; erroneous beliefs | QOLI; BDI-II; BAI     | No               |
| Lloret et al. (2014)   | Spain      | 49, 14.3%, 37.8          | CBT, CBT + self-hypnosis | Level III-1              | 6                                  | Abstinence                                          | Dropout                 | Yes              |
| Marceaux & Melville (2011) | United States | 49, 65.3%, 46.57 | Wait list, 12-step group therapy, CBGT | RCT – level II           | 6                                  | DSM-IV; control; TLFB (freq/$ spent)               | BDI-II; BAI            | No               |

(Continues)
| Study             | Country     | Sample (n, % female, age) | Type of intervention | Design            | Follow-up (post-treatment, months) | Gambling-specific outcome(s) | Non-gambling outcomes(s) | Recovery defined? |
|-------------------|-------------|---------------------------|----------------------|-------------------|-----------------------------------|-----------------------------|-------------------------|-------------------|
| McIntosh et al.   | Australia   | 77, 28.6%, 38.48          | CBT, Mindfulness, TAU (CBT) | RCT – level II    | 3, 6                              | SOGS; DSM-5; urges (freq./intensity), days abstinent, freq./$ spent | DASS-21; FFMQ-SF; WBSI; RRQ; SF-12 | Yes               |
| Morefield et al.  | Australia   | 53, 42%, 43.5             | CBT w/ exposure emphasis | Pre-post level III-3 | 1, 3, 6, 12                       | VGS                          | K10; GSSI; WSAS        | No                |
| Muller et al.     | Germany     | 76, 5%, 40.3              | CBT + added holistic approaches | Pre-post level III-3 | 12                                | L/BQ; SOGS                    |                        |                   |
| Myns et al.       | Norway      | 35, 13%, 32.8             | CBT + escitalopram, escitalopram, CBT | RCT – level II    | 3, 6                              | G-SAS; PGVAC; PGBS; past week ($ spent/ freq./total time) |                        | Yes               |
| Myns et al.       | Norway      | 112, 15%, 35.7            | Internet & telephone CBT | Pre-post level III-3 | 3                                 | SOGS; GQ                      |                        | No                |
| Odlaug et al.     | United States| 385, 54%, 43.7           | Individual/group therapy in-/out-patient centre (mode unspecified) | Pre-post level III-3 | 6                                 | ASI-PG; TLFB; past month (gamb. days), GAMTOMS; SOGS |                        | No                |
| Petry et al.      | United States| 231, 45%, 44.9           | GA, GA + CBT workbook, GA + CBT | RCT – level II    | 6, 12                             | ASI-PG; SOGS; TLFB past month w/ collaterals (gamb. days/$ spent) | BSI                   | Yes               |
| Ramos-Grille et al. | Spain        | 132, 9%, 39.8            | CBT                    | Pseudo RCT – level III-1 | 6                                | Relapse                       |                        | No                |
| Rosenberg et al.  | Israel      | 78, 0%, 30.7              | Naltrexone, bupropion, escitalopram, topiramate | RCT – level II    | 1, 6, 24, 48 (baseline) | Abstinence                    | HAM-D; HAM-A; GAF; VAS (well-being); dropout |                      |
| Rossini-Dib et al.| Brazil      | 72, 44%, 48.6             | Psycho-ed., psycho-ed. + group CBT | Pseudo RCT – level III-1 | 6 (baseline) | GFS; DSM-5; GBQ                  |                        | Yes               |
| Saiz-Ruiz et al.  | Spain       | 60, 10%, 38.9             | Sertraline, placebo    | RCT – level II    | 6 (baseline) | CCPQ; PG-CG; VAS (freq./severity/$ spent/improvement); SOGS |                        |                   |
| Sanders & Peters  | Germany     | 281, 12%, 38.2            | In-patient CBT        | Pre-post level III-3 | 12                               | Abstinence (12 months); Abstaining (3 months); relapse | SOGS |                   |
| Smith et al.      | Australia   | 127, 46%, 43.1            | ET                    | Pre-post level III-3 | 1, 3, 6, 12 (baseline) | VGS 'harm to self’ subscale; GRCs; GUS | DASS-21; WSAS        | No                |
| Smith, Battersby et al. | Australia  | 87, 50%, 46.5          | CT, ET                | RCT – level II    | 1, 3, 6                           | VGS; freq./ time/$ spent (past month); GRCs; GUS | K10; WSAS | No                |
| Smith, Harvey et al. | Australia  | 380, 45%, 44.0          | CBT + ET              | Pre-post level III-3 | 1, 3, 6, 12                      | VGS 'harm to self’ subscale | WSAS               | No                |

(Continues)
| Study                  | Country | Sample (n, % female, age) | Type of intervention | Design | Follow-up (post-treatment, months) | Gambling-specific outcome(s) | Non-gambling outcome(s) | Recovery defined? |
|-----------------------|---------|---------------------------|----------------------|--------|------------------------------------|-----------------------------|------------------------|-------------------|
| Tolchard & Battersby  | Australia | 205, 58%, 36-45          | CBT                  | Pre-post level III-3  | 1, 3, 6, 12 | VAS (statement of main problem)    | BDI; BAI; WSAS          | Yes               |
| Toneatto et al. (2009)| Canada  | 52, 7%, 40.0              | Naltrexone + CBT, placebo + CBT | RCT – Level II | 3, 6, 12 | Abstinence; TLFB (freq. Past month $ spent per day) | TLFB: alcohol (freq. past month quantity per day) | No                |
| Toneatto & Wang (2009)| Canada  | 60, 27%, 45.4             | CBT                  | Pre-post level III-3 | 6       | Abstinence; CPGI ($ spent); DSM-IV; severity (11-Likert); IGS | BSI-18                 | No                |

ASI-PG = Addiction Severity Index-Problem Gambling; BAI = Beck Anxiety Inventory; BDI = Beck Depression Inventory; BDI-II = Beck Depression Inventory-2; BIS-11 = Barratt Impulsivity Scale; BSI = Brief Symptom Inventory; BSI-18 = Brief Symptom Inventory Fourth Edition; CIS-D = Centre of Epidemiologic Studies-Depressed Mood Scale; CPTGQ = Control of Pathological Gambling Questionnaire; CSEI = Coopersmith Self-Esteem Inventory; CSQ-8 = Client Satisfaction Questionnaire-8; DASS-21 = Psychological Distress; DGLS = Dejong Giervald Loneliness Scale; DHQ = Drug History Questionnaire; DSM-5 = Diagnostic and Statistical Manual of Mental Disorders Fifth Edition; DSM-IV = Diagnostic and Statistical Manual of Mental Disorders Fourth Edition; EIQ = Eysenck Impulsiveness Questionnaire; FFMQ-SF = Five Factor Mindfulness Questionnaire-Short Form; FTND = Fagerstrom Test for Nicotine Dependence; G-SAS = Gambling Symptom Assessment Scale; GAF = Global Assessment of Functioning; GAMAT = Gambling Activity Measurement Tool; GAMTOMS = Gambling Treatment Outcome Monitoring System; GAS = Goal achievement Scale; GBI = Gambling Abstinence Self-efficacy Scale; GBIQ = Gambling Beliefs Questionnaire; GFS = Gambling Followup Scale; GSI = The Goldney Scale of Suicidal Ideation; GRCS = Gambling Related Cognitions Scale; GSR = Global Severity Index; GST = Go-Stop Test; GUS = Gambling Urges Scale; HADS = Hospital Anxiety & Depression Scale; HAM-A = Hamilton Anxiety Rating Scale; HAM-D = Hamilton Depression Rating Scale; IGS = Inventory of Gambling Situations; ICT = Iowa Gambling Task; L/BQ = Lie/Bet Questionnaire; IGT = Iowa Gambling Test; K6 = Kessler 6-item; K10 = Kessler 10-item; NODS = NORC DSM-IV Screen for gambling problems; PGS = Pathological Gambling Behavioral Scale; PGSI = Problem Gambling Severity Index; PG-YBOCS = Yale–Brown Obsessive Compulsive Scale; PG-CGQ = Clinical Global Impression Scales for Pathological Gambling; PGVAC = Pathological Gambling Visual Analogue Craving Scale; PWI = Personal Well-being Index; QOLI = Quality of Life Inventory; ROCF = Rey–Osterrieth Complex Figure Test; RRQ = Rumination Reflection Questionnaire; RSE = Rosenberg Self-Esteem Scale; RPWB = Ryff’s Scales of Psychological Well-Being; SAS = Social Adaptation Scale; SCL-90-R = Symptom Checklist-90; SCL-90 = Symptom Checklist-Revised; SF-12 = Short Form Health Survey; SOGS = South Oaks Gambling Screen; SSI = Semi-structured Interview; STAI = State–Trait Anxiety Inventory; STAXI = State–Trait Anger Expression Inventory; SLUGS = Sydney-Laval Gambling Scale; TPQ = Temptations for Gambling Questionnaire; TLFB = Timeline follow-back; TPQ = Treatment Perceptions Questionnaire; VAS = Visual Analogue Scale; VGS = Victorian Gambling Scale; WBSI = White bear Suppression Index; WCST = Wisconsin Card Sorting Test; WSAS = Work and Social Adjustment Scale; CBGT = cognitive behaviour group therapy; CBT = cognitive behaviour therapy; ET = exposure therapy; GA = Gamblers Anonymous; IDPML = Imaginal desensitization plus motivational interviewing; MI = motivational interviewing; TAU = treatment as usual.
only (i.e. main problem form), another study defined abstinence as fulfilling none of the DSM-IV-TR [54] criteria for pathological gambling [55] and the term ‘abstainer’ was proposed in reference to participants who were abstinent for at least 3 months post-relapse [56]. The definition of relapse was also mainly implied as any episodes of gambling during the assessment period where abstinence was the treatment goal [56]. Aragay et al. ([57], p. 59) differentiated ‘lapse’—an ‘isolated gambling episode with only mild consequence’—from ‘relapse’—‘two or more consecutive episodes or one episode with loss of control’ (expenditure higher than the week prior to treatment.

Lastly, concepts of controlled gambling were evaluated in two studies (5.9%). This was defined as reduced time and money spent gambling that did not cause adverse consequences [34], and continued gambling in the absence of any DSM-5 criteria [58].

**Psychological functioning**

Outcomes not specific to gambling were included as secondary outcomes in all but four studies (88.2%). The most prevalent were self-report measures of affective disorders. Depression was evaluated in 12 different studies (35.3%), while anxiety was incorporated into 11 (32.4%). The two most popular measures were the Beck Depression Inventory (BDI) [59,60] (n = 6) and the Beck Anxiety Inventory (BAI) [61] (n = 5), respectively.

Several studies (n = 10; 29.4%) included global and multi-dimensional measures of psychopathology. Six such measures were used a total of 11 times throughout the
10 studies. The most comprehensive of these was the Symptom Checklist-90-Revised (SCL-90-R) \( [62] \) \((n = 3)\), which comprises nine independent mental health symptom dimensions. Other briefer measures that provided psychopathological dimensions and an overall distress composite included the Brief Symptom Inventory (BSI) \([63] \) \((n = 2)\) and the Depression, Anxiety and Stress Scale (DASS-21) \([64] \) \((n = 2)\).

Treatment outcomes relating to substance use were also included in five studies (14.7%). Inclusion of such outcomes was consistent with the treatment modality and presence of concurrent disorders in the study populations.

![Figure 3](image-url)  
**Figure 3** Frequency of non-gambling measures as a percentage of all studies reviewed and separated into outcome domains.
Additionally, two studies administered the comprehensive Addiction Severity Index (ASI) [65] modified for gambling disorders that provides not only data on patterns of gambling behaviour and substance use, but also the various psychosocial domains which may be affected by addictive disorders.

In several instances, main outcomes were selected based on their appropriateness to the individual research aims or to the intent of treatment within the sample population. For example, McIntosh et al. [66] employed a mindfulness-based treatment approach to problem gambling, and subsequently evaluated treatment success via outcome variables related to mindfulness practice (cognitive flexibility, thought suppression, etc.).

Global functioning and wellbeing

Global functioning across multiple domains was evaluated as a secondary outcome measure in eight (23.5%) of the studies. Most commonly, the Work and Social Adjustment Scale (WSAS) [67] was employed in six different studies to measure the experiential impact of a gambling disorder on participants’ day-to-day functioning. Eight studies (23.5%) included a quality of life outcome measure, with only one of these studies also measuring global functioning [68]. The self-report instrument with the highest frequency of use was the Quality of Life Inventory (QOLI) [69] (n = 4). Two other constructs relevant to this category include social capital (i.e. the subjective value of social networks and bonds) [70] and financial consequences [71], which were measured in both studies with author-designed questions.

Operationalization of recovery

Approximately one-third of the reviewed studies (n = 11; 32.4%) provided an operational definition of recovery, or treatment response or success. Four studies defined being recovered as no longer meeting DSM criteria for a gambling disorder, one of which also required a > 50% reduction in gambling frequency and expenditure [66], another > 80% decreased gambling expenditure [72] and one set an additional cut-off score > 33 on the gambling follow-up scale [73]. Two studies specified that recovery required the maintenance of abstinence during the assessment period [74,75]. Recovered or successful participants were also defined as those scoring between 0–7 on the G-SAS [76], a > 35% decrease in symptoms based on the (PG-YBOCS) [77] maintained for at least 1 month at final assessment [78], a SOGS score between 0–2 reflecting no problem [79], a > 50% reduction of a self-defined ‘main problem’ statement [80], and those responding ‘yes’ to the second (ability to control/resist impulses to gamble) and fourth (substantial decrease in gambling problem) questions of the Control of Pathological Gambling Questionnaire (CCPGQ) [81].

In the studies that did not state explicitly the criteria for treatment success (n = 25; 73.5%), success was implied as the maintenance of abstinence and/or clinically significant improvements in main outcome variables during the treatment and follow-up periods. Only two studies assessed client treatment goals (i.e. control versus abstinence) and evaluated these at follow-ups as outcome measures for treatment [34,82].

DISCUSSION

Thirty-four treatment studies for gambling disorders, including psychological and pharmacological interventions, met the eligibility criteria for this systematic review. Results revealed a selection of outcome domains that were frequently assessed. Primary domains included gambling symptoms and behaviour. Secondary domains consisted of psychiatric comorbidities, psychological processes relevant to treatment approaches and global functioning and wellbeing. Evolved from early gambling treatment studies that adopt the traditional medical model of pathological gambling (with a singular goal of abstinence [83]), this selection of studies incorporated a broad array of outcome domains that represent a multi-dimensional conceptualization of recovery. This is consistent with the contemporary ‘recovery-orientated’ model that characterizes the modern framework of addiction treatment services and policy [15,16,84–86].

Operational criteria for measuring recovery in treatment, however, were rarely specified. In the few studies that defined this construct operationally, specific criteria differed significantly, although almost always related to abstaining or the absence of diagnostic criteria for a gambling disorder. Failure to incorporate broader psychosocial outcomes into definitions indicates that researchers, while recognizing their value as supplementary measures, do not perceive such indices as integral to recovery. The finding contrasts with Nower & Blaszczynski’s [4] recommendation that treatment studies provide clear conceptualizations of recovery. They argue that in addition to basic reductions of gambling behaviour and symptomatology, definitions should include a combination of indices specifying improvements in gambling urges, psychosocial consequences and quality of life. Furthermore, when operationalized, criteria for recovery were almost always pre-defined by the investigators and imposed upon participants, despite potential conflicting client goals. For example, participants may want to reduce their gambling, or their problem form of gambling. In this case, there is conflict between the individual and researcher/clinician regarding what is considered recovery. Only two studies assessed client treatment goals as outcome measures [34,82].

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Although the selected studies demonstrated multidimensional treatment measures, there was large variability in the range of outcomes used and inconsistency in specific measurement methods. This issue has been reported previously in the SUD literature [8,10], as well as intervention trials for gambling disorders [1,2], and supports the need to introduce a clear and uniform definition of recovery across fields. Sixty-three different instruments were documented, almost twice the number of reviewed studies. Instruments varied from validated psychometric measures and selective subdomains of measures to ad-hoc author-designed items. Units of measurement and time-frames were also highly inconsistent in assessing gambling frequency and expenditure. Although some studies followed guidelines outlined by Walker et al. [21] (e.g. reporting net loss, frequency in days/month and utilizing diary/time-line follow-back methods), most did not. This suggests that many researchers fail to consider expert guidelines when nominating primary outcomes. The median post-treatment follow-up period was 6 months, which falls far below recommendations by López Viets & Miller [87] for a minimum 1-year follow-up post-treatment. Monitoring longer-term outcomes is a core aspect of the recovery framework [12]; it allows researchers to determine whether or not the benefits of treatment are sustained over time, particularly with high rates of relapse in gambling disorders [88].

Much of the measurement criteria for recovery in treatment has been adapted and developed from the substance use field. It may be for this reason that only two of the reviewed studies included outcomes relating to financial status and gambling debt [34,71]. A critical feature differentiating recovery in gambling disorder from all other forms of addiction is financial recovery. Financial instability and debt serves as a chronic and severe harm from gambling problems, and is not alleviated upon abstinence or cessation. Future models of recovery must consider the unique impairment financial consequences present in gambling disorders, its distinct risk for relapse (chasing) and the extended length of time it takes to recover from.

This review followed a strict systematic search protocol; however, it is not without limitations. Strict eligibility criteria were applied in selecting relevant treatment studies and therefore represent only a sample of published gambling treatment studies. Consequently, the studies reviewed may not encompass the full array of measurement instruments and treatment success outcomes. A large proportion of screened pharmacological and brief intervention studies were excluded from the final review due to the brevity in follow-up. The identified recovery domains were derived from the perspective of the researcher. Consequently, other stakeholder views were not accounted for, particularly those of problem gamblers. In-depth qualitative interviews with treatment-seeking gamblers may help to shed more light on the different components of recovery.

**CONCLUSIONS AND RECOMMENDATIONS**

This systematic review provides a rigorous investigation of the methods and practices used to assess treatment outcomes in gambling disorders. The use of outcomes extended beyond gambling symptoms and behaviour to include measures of positive health as manifested by physical, mental and social wellbeing. This suggests a multidimensional conceptualization of recovery that is consistent with the contemporary ‘recovery-orientated’ health model. The findings, however, revealed substantial diversity of measurement approaches, rendering it difficult to conduct cross-study comparisons and impeding the refinement of effective treatments for gambling disorders. Researchers of future treatment studies must consider carefully the selection of appropriate outcome variables and measurement strategies in the early developmental stages of their research design. Walker et al.’s [21] paper serves as a useful resource providing minimum reporting standards for treatment efficacy.

Recovery is a complex phenomenon, and defining it in the context of gambling disorders requires further investigation on a conceptual level with input from similar fields, including substance use disorders. The literature would benefit immensely from the development of a single comprehensive multi-dimensional scale to measure recovery. The availability of such a scale would enable clinicians and researchers to triangulate improvements in various domains of functioning when reporting outcomes for the successful treatment of gambling disorders.

**Declaration of interests**

None.

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