Gender by Preferred Gambling Activity in Treatment Seeking Problem Gamblers: A Comparison of Subgroup Characteristics and Treatment Outcomes.

Background: Problem gambling is a growing public health concern and treatment incompletion levels remain high. The study aims to support and extend previous studies in relation to the heterogeneity of the gambling population based on gender and gambling type, and the implications of subgroup differences on treatment outcomes. Additionally, the concept of drop-out is addressed in terms of categorical treatment measures. The empirical findings are examined in the context of the theoretical framework of the pathways model.

Methods: Participants were recruited from the Statewide Gambling Therapy Service and stratified into subgroups based on gender and gambling mode preference (Electronic Gambling Machines [EGM] or track race betters). Baseline predictors collected and analysed using multinomial logistical regression included demographic information as well as gambling variables, while treatment outcomes consisted of three therapist rated measures.

Results: Significant differences between the subgroups were found for age, marital and employment status, gambling duration, alcohol use and the Kessler 10 measure of psychological distress. Specifically, male track race gamblers were younger, married, employed, had a longer duration of gambling, higher alcohol use and lower psychological distress relative to EGM users. No difference was found in any of the treatment outcomes, however, consistent with previous studies, all subgroups had high treatment incompletion levels.

Conclusion: The findings demonstrate the importance of screening, assessing and treating problem gamblers as a heterogeneous group with different underlying demographics and psychopathologies. It is also hoped future studies will continue to address treatment incompletion with a re-conceptualisation of the term drop-out.

Keywords: Gambling addiction, Pathways model, Subpopulations, Predictors, Treatment success, Therapy drop-out

Word count: 5000

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Comparison of Subgroup Characteristics and Treatment Outcomes.

Introduction

Problem gambling represents a serious, and growing, public health concern. The rise in accessibility and legalisation of gambling has heralded a rise in the prevalence of disordered gambling behaviour; an estimated 2% of Australians meet the criteria for problem gambling - a figure paralleled in Canada and the USA (Rodda, Lubman & Latage, 2012, Smith, Harvey, Battersby, Pols, Oakes, & Baigent, 2010). Defined as "persistent and recurrent problematic gambling behaviour leading to clinically significant impairment or distress", disordered gambling is now classified as an addiction in the DSM-5 (American Psychiatric Association, 2013). With a predicted overall cost to Australia of between $4.7 and $8.4 billion annually, problem gambling is not only a public health threat, but also encompasses widespread social and economic repercussions. (Productivity Commission, 2010, Rodda et al., 2012, Social Research Centre, 2013).

Understanding the pathogenesis of gambling is pivotal to the development and application of treatment approaches. Theoretical models attempting to explain the gambling development include social learning, behavioural conditioning and cognitive theory paradigms (Battersby, Oakes, Tolchard, Forbes & Pols, 2008). While these models likely interact with each other, emphasising different principles of mechanism for the same complex biopsychosocial aetiology, the short-comings of the individual frameworks become apparent when considering the empirical findings of problem gambling research. The models fail to account for the heterogeneity within the gambling population, as well as why only a small subset of gamblers develop a gambling addiction (Blaszczynski & Nower, 2002). Current treatment methods are based on potentially flawed theoretical assumptions, whereby problem gamblers are regarded as belonging to a homogenous population, irrespective of their gambling form, demographics, co-morbidities or neurobiological differences.

Recognising gamblers form a heterogeneous population is a relatively recent development in gambling literature. Furthermore, there remains a paucity of studies examining the implications of these subgroups on treatment methods and outcomes (Smith, Harvey, Humeniuk, Battersby, & Pols,

2014). In 2002, Blaszczynski and Nower drew on traditional theoretical models as applied to gambling and proposed a more integrated aetiological framework; the pathways model. Introducing an explanatory model for different subsets of gamblers, the pathways model has served as the primary framework in which problem gambling has been conceptualised within previous literature (Balodis, Thomas, & Moore, 2014, Blaszczynski & Nower, 2002, Rodda et al., 2012, Smith et al., 2010, Smith et al. 2014).

The model proposes three subpopulations of problem gamblers; the behaviourally conditioned, the emotionally vulnerable with premorbid mood disorders, and the biologically vulnerable with antisocial and impulsive traits. The three subgroups share an underlying common pathway to gambling consisting of ecological accessibility, classical and operant behavioural conditioning, cognitive biases and chasing losses. However, the emotionally vulnerable gambler characteristically also suffers from premorbid anxiety or depression and uses gambling as an escapist activity to alleviate aversive affective states. Conversely, the biologically vulnerable gambler typically has underlying antisocial personality traits and gambles to stimulate excitement and heighten arousal (Blaszczynski, Steel & McConaghy, 1997).

Extrapolating from the pathways model is the implication that gambling mode plays a key role in understanding gambling aetiology. Previous research exploring gambler profiling and correlates to factors such as severity, drop-out, and treatment effects, have been riddled with inconsistent findings and conflicting results (Bonnaire, Bungener & Varescon, 2009, Melville, Casey, & Kavanagh, 2007, Oakes, Pols, Battersby, Lawn, Pulvirenti & Smith, 2012a, 2012b). By taking into account gambling preference however, distinct patterns of gambler profiles have begun to emerge in empirical studies (Balodis et al., 2014, Bonnaire et al., 2009, Petry, 2003). Corresponding to Blaszczynski and Nower's (2002) emotionally vulnerable subgroup, gamblers that predominately use Electronic Gaming Machines (EGMs) tend to be older, married females with pre-existing mood disorders and a late gambling onset (Crisp et al., 2004, Tang, Wu & Tang, 2007, South Australian [SA] Centre for Economic Studies with the Department of Psychology, University of Adelaide, 2005). In contrast, antisocial impulsive gamblers are more likely to prefer horse/dog track race gambling; a non-continuous form of gambling with perceived high skill in a socially stimulating environment.

This subgroup consists almost exclusively of single, young males, who score highly on sensation seeking and impulsivity scores, have an earlier onset of gambling, and often have comorbid substance misuse and legal transgressions (Crisp et al., 2004, Tang et al., 2007, Petry, 2001).

Blaszczynski and Nower's (2002) model also correlates to the broader neuropsychological reinforcement sensitivity theory, which describes neurological models of reward and avoidance. Applied to gamblers, it has been found that emotionally vulnerable EGM users correspond to having a high behavioural inhibition system and escapist motivation. Contrastingly, antisocial impulsive track betters have high behavioural approach systems and greater propensity to seek positive reinforcement (Balodis et al., 2014). Neurobiological studies have further evidenced that gamblers who correspond to the antisocial/track race subgroup have deficits in dopaminergic reward pathways (possessing the D2A1 allele resulting in reduced D2 receptors), and lower baseline levels of beta endorphins (Blaszczynski & Nower, 2002, Petry, 2003). These biological correlates predispose to (comorbid) addictions and are associated with impulse control disorders with higher sensitivity to reward and lower sensitivity to punishment (Balodis et al., 2014, Blaszczynski & Nower, 2002, Verdejo-Garcia, Lawrence & Clark, 2008).

Currently, treatment of problem gamblers primarily consists of Exposure Therapy (ET) based Cognitive Behavioural Therapy (CBT), in concurrence with its known effectiveness in treating other addictions and psychopathologies (Battersby, Smith, Harvey & Pols, 2013, Problem Gambling Research and Treatment Centre, 2011). However, little research has been done on the efficacy of this mode of treatment on (subgroups of) problem gamblers, or comparing CBT and ET with other treatment protocols in this population (Battersby et al., 2013, Westphal, Jackson, Thomas & Blaszczynski, 2008). Evaluating treatment types becomes particularly important when considering that gambling treatment has notoriously high drop-out rates – as much as 50% (Melville et al., 2007, Smith et al., 2010). A systemic review of studies addressing this issue revealed a poor understanding of the variables contributing to drop-out, though impulsivity and sensation seeking traits have been found to be significant predictors of it (Melville et al., 2007, Smith et al., 2010, Verdejo-Garcia et al., 2008). Research is further complicated by ambiguity of what constitutes a drop-out and though it has traditionally been viewed as a dichotomous variable, this is arguably an oversimplification of the

concept (Melville et al., 2007, Smith et al., 2010).

The current study aims to support and extend previous studies by examining a range of demographic characteristics, gambling variables and treatment outcomes in subpopulations of problem gamblers. Specifically, the focus of this study is to compare the data between subgroups of problem gamblers based on gender and gambling preference type; EGM and horse/dog track gamblers. Baseline demographics were expected to replicate previous studies with differences being found between subgroups, while no difference was expected in gambling specific variables due to the commonality of behavioural and cognitive processes in the pathways model of problem gambling (Blaszczynski & Nower, 2002). Concurrent alcohol use and mood dysfunction measures were included with the prediction that male track race betters likely correspond to the antisocial impulsive gambler with comorbid substance use, while EGM users will be more likely to suffer from mood disorders in accordance with the emotionally vulnerable gambler subgroup. As no such studies exist examining these variables between male and female EGM users, it will be of interest to see how and if gender effects a difference.

Drop-out is explored in terms of treatment incompletion using an approach of three therapist rated categorical treatment outcome measures. Differences are predicted based on the theoretical assumption that antisocial impulsive/track race betters will be more treatment resistant to current CBT treatment methods due to their biological psychopathologies (Blaszczynski & Nower, 2002). By acknowledging underlying emotional and biological pre-morbidities and their contributions to the motivations and preferences of problem gamblers, we may be better placed to tailor treatment programs and improve treatment attrition and outcomes.

Methods

Service and participants

Participants consisted of treatment seeking adults (N=410) who presented to the Statewide Gambling Therapy Service (SGTS) for problem gambling. All participants were first time presenters. The outpatient SGTS offers one-on-one CBT for problem gamblers in key metropolitan and rural

regions across South Australia. The service is staffed by a psychiatrist and multidisciplinary therapists with post graduate qualifications in CBT (Battersby et al. 2008).

Assessment and treatment

Clients undergo a screening interview on first presentation to SGTS to assess suitability for admission into the treatment program. The interview consists of a gambling focused cognitive behavioural assessment including DSM-5 criteria for identifying problem gambling. Treatment used at the service is behavioural (ET) focused CBT. ET is grounded in a classical conditioning paradigm and uses graded cue exposure with extinction processes. The initial procedure comprises a therapist guiding the client through imagined gambling scenarios with the client rating his/her urge to gamble at regular intervals while verbalising the scenes. The client is asked to stay with the urge until habituation occurs. Once habituation is achieved through imagined exposure, the client progresses onto a hierarchy of various in-vivo exposures to challenge the triggers of their urges while preventing a response. The cognitive aspect targets erroneous gambling beliefs and perceptions, while the behavioural component specifically focuses on the urge to gamble. On average, clients are seen on a weekly basis for approximately 5-12 weeks (Battersby et al., 2008).

Design and Procedure

Participants were recruited from consecutive referrals to SGTS in the time period January 2012 to December 2014. To be eligible, clients had to have been assessed as treatment seeking problem gamblers at the screening interview and suitable for admission into the treatment program. Baseline measures were collected prior to the screening interview and consent. The study was approved by the Southern Adelaide Clinical Human Research Ethics Committee.

Baseline Variables

Socio-demographics

Baseline demographic variables were gender (dichotomous), age (continuous), marital status (stratified into never married, married/defacto, separated, other), employment status (employed,

unemployed, disability, other), self-reported gambling duration (<2, 2-5, >5 years) and gambling type (EGM or track race users).

Problem Gambling Severity Index (PGSI)

A self-report questionnaire that was developed to reflect severity of problem gambling behaviour from a social context. Each of the nine items are rated on a Likert (0-3) scale. A total score is indicative of either non-problem gambling (score of 0), low level of problems (1-2), moderate level of problems (3-7), or problem gambling (8 +). The classification of problem gambling is considered to be equivalent to DSM-IV pathological gambling (Ferris & Wynne, 2001). Whilst PGSI was originally developed for use in prevalence surveys involving general populations, it has shown sound psychometric properties in clinical settings (Young & Wohl, 2011).

Victorian Gambling Severity (VGS)

The VGS is a self-report questionnaire measuring the extent to which gambling has impaired an individual's life. It comprises three subscales; enjoyment of gambling, harm to partner, and harm to self, with a total of 21 items. For the purposes of this study only the principle subscale, harm to self, was utilised, in accordance with previous studies conducted in Australia (Hounslow, Smith, Battersby & Morefield, 2011, Smith et al., 2010, Smith et al., 2014). It consists of 15 items scored on four point scales (range 0-60), and relates to experiences in the previous four weeks. Higher scores indicate greater impairment, with a cut off of 21 + indicative of the person being a problem gambler (SA Centre for Economic Studies with the Department of Psychology, University of Adelaide, 2005). Developed in Australia, the VGS has high concurrent validity with the South Oaks Gambling Screen but has an extended score range that enables greater sensitivity to variation in gambling symptom severity (SA Centre for Economic Studies, with the Department of Psychology, University of Adelaide, 2005). Research into the VGS has yielded robust internal validity and good reliability (Smith et al., 2010, SA Centre for Economic Studies with the Department of Psychology, University of Adelaide, 2005).

Work and Social Adjustment Scale (WSAS)

The WSAS is a five item scale used to measure an individual's perspective of their functional

ability/impairment. It enquires about the degree to which gambling affects functioning in the areas of work, home, social leisure, private leisure, family and relationships. Higher scores indicate greater impairment with a score range of 0-40. Scores below 10 represent subclinical populations; 10-20 indicate significant impairment but less severe symptomatology; and scores >20 imply moderate to severe symptomatic impairment. Research into the validity of the scale suggests the WSAS correlates closely to depression severity (Smith et al., 2010).

Kessler 10 scale (K10)

The K10 is a self-report questionnaire designed to produce a global measure of psychological distress. Questions relate to the level of anxiety and depression symptoms experienced in the past four weeks. Higher scores indicate greater distress. No significant distress corresponds to a score of 10-19; mild distress consistent with a diagnosis of mild depression and/or anxiety, 20-29; and severe distress consistent with a diagnosis of severe depression and/or anxiety, 30-50.

Alcohol Use Disorders Identification Test (AUDIT)

The AUDIT is a non-diagnostic 10 item questionnaire used to measure hazardous alcohol use. It enquires about the quantity and frequency of alcohol use, possible dependence on alcohol and alcohol related problems. A score of 0 indicates an abstainer; <8, low risk alcohol use; 8-13, risky or harmful alcohol use; and a score of >13 suggests alcohol dependence is likely. The AUDIT has proved to have higher specificity and sensitivity to diagnostic criteria than other self-report measures of alcohol use and good test-retest reliability and internal consistency (Reinert & Allen, 2002).

Gambling Urge Scale (GUS)

The GUS measures gambling urge as self-reported by clients. The scale consists of six items with statements such as "I crave a gamble right now". Scores range from 0-42 with higher scores indicating greater urges to gamble. Research into concurrent, predictive and criterion-related validity suggest the GUS is a valid and reliable instrument for assessing gambling urges (Raylu & Oei, 2004b).

Gambling Related Cognitions Scale (GRCS)

The GRCS is a 23 item self-report questionnaire of common thoughts related to gambling. It includes

statements such as "losses when gambling are bound to be followed by a series of wins". Scores range from 0-161 with higher sores indicating greater cognitive distortion. A comparison with the SOGS indicate the scale has good psycho-metric properties in measuring gambling cognitions (Raylu & Oei, 2004a).

Outcome Measures

The three outcome measures used were based on clinician entered data regarding client treatment at the end of the study period. Clinicians filled out questionnaires for each client to three outcome questions which consisted of stratified categorical answers. The first was the reason for the client's case closure; did the client complete treatment, withdraw from treatment with notification, cease treatment without notice, move from the area or was the client referred elsewhere? The second question pertained to what progress the client made through treatment; was treatment completed, not completed but with agreement that goals had been reached, not completed without agreement, or was only screening attended? Finally, what was the outcome of the case; did the client fully, substantially or partially reach their goals, not reach any goals, or were there no goals set? The availability of treatment outcome data was, at least partly, influenced by the proximity of participant recruitment date relative to study commencement and completion dates.

Statistical methods

Participants (N=410) were grouped by cross-classification on variables gender and gambling type to form three subgroups: female EGM users (*n*=169), male EGM users (*n*=166), and male track race gamblers (*n*=75). Baseline demographic and clinical characteristics were compared between subgroups using Pearson Chi-square tests for categorical variables and oneway ANOVA for continuous variables, as a univariate analysis. A Pearson's correlation coefficient was also calculated to examine the relationship between the VGS and PGSI. For statistical modelling of predictors of subgroup (gender by gambling type), multinomial logistic regression was used for the unordered or nominal response categories (Long & Freese, 2006). Variable selection for regression models was based on the aforementioned univariate analysis and were included in the multivariate model if

p<0.25 (Homer & Lemeshow, 2000). To interpret effect sizes, relative risk ratios (RRR) were calculated to represent the probability of being in one subgroup of problem gamblers (male EGM and male track race users) over the probability of being in the reference category of female EGM users. Effect estimates were also calculated for the comparison of male EGM users versus male track race users. Outcome measures were analysed using Pearson Chi-square tests for contingency tables. All statistical analyses were conducted using Stata 13 (Statacorp, 2013). A Type 1 error rate of a=0.05 was used to determine statistical significance.

Results

Baseline descriptors

Baseline characteristics of the study participants are presented in Table 1. As predicted, there was no significant difference between subgroups in the two severity measures, the PGSI or VGS, but results indicate all three subgroups are moderate-to-severe gamblers. The scores are consistent with meeting the DSM-5 criteria for having a gambling disorder. The correlation between the VGS and the PGSI, which was examined to investigate whether the two scales were consistent in their measurement of severity, had a correlation coefficient of 0.77, indicating a strong correlation and adding to the concurrent validity of the VGS.

Statistically significant differences were found between the subgroups of problem gamblers in relation to age, marital status, employment status and AUDIT scores. Female EGM users were, on average, approximately 10 years older than male EGM and track users, while track users were more likely to be married and employed based on univariate analysis. Males had significantly higher AUDIT scores with both male groups scoring in the risky or harmful alcohol use range, compared to females who were low risk. As expected, the WSAS, GUS and GRCS were not found to be significantly different between subgroups, though all subgroups ranked within the moderate functional impairment range on the WSAS scale.

Multivariate model

In the multivariate regression model presented in Table 2, additional significant differences were found in gambling duration and the K10 measure. Unlike the univariate results, marital status and employment were not statistically different between the subgroups (though the p-value in the category 'other' for employment was 0.028, this was deemed to be a product of small cell sizes and thus not clinically relevant). Both groups of males were more likely to be gambling for over five years compared to female EGM users, with track users having a relative risk ratio of 6.2 (95% CI: 2.5-17.3), given the covariates in the model are held constant. Both male groups also scored statistically significantly less in K10 than the female EGM users, indicating they suffer less psychological distress. Concordant with the univariate analysis, age and AUDIT scores were found to significantly differ between each male group relative to the female EGM users. If a participants age as to increase by one year, the relative risk for being male and having a preferred gambling activity of track race betting relative to being a female EGM user would be expected to decrease by a factor of 0.93 (95% CI: 0.90-0.96).

When examining differences between the two male groups using multinomial regression and male EGM users as a referent, a significant difference was found in gambling duration of >5 years and having a married marital status. The risk of being a male track race gambler relative to male EGM user was 3.11 for those who have gambled >5 years relative to those who have gambled <2 years (referent). Likewise, the relative risk ratio for being a married track race gambler was 2.54 relative to male EGM user and to those who never married. No significant difference was found in all other examined measures.

Treatment outcomes

Although the total sample size was N=410, outcome measure data was n=363, due to 47 'open episodes' whereby the client was still having ongoing treatment at the time of data collection. There were no significant differences between the subgroups across any of the three outcome measures, as shown in Table 3. The best possible outcomes were completed service plan (reason for

case closure), therapy completed (progress through treatment) and goals fully reached (outcome of case). These categories were low across all three subgroups (under 50% in all measures), though within each group each of these categories had the highest proportion of participants relative to other categories. All groups had similarly high rates of inadequate treatment outcomes; ceasing or withdrawing before completion, attended screening only and no goals set or reached.

Discussion

Results largely supported previous studies providing evidence that problem gamblers form a heterogeneous population where gambling preference type is an important indicator of differing underlying characteristics. Salient findings included a difference between subgroups in the domains of age, employment, marital status, gambling duration, alcohol use and psychological distress. No difference was found however, between subgroups on any of the three outcome measures (reason for case closure, progress and outcome of case). Concordant with other studies, track users in this dataset were exclusively men, while women were EGM users (Bonnaire et al., 2009, Petry, 2003). Females were older, had lower AUDIT scores indicating lower alcohol misuse than their male counterparts, and had higher K10 scores, implying greater psychological distress. A greater proportion of males in the study were employed compared to females, but in contrast with previous studies whereby males tended to be single, it was found that comparatively more males were married (Blaszczynski et al., 1997, Blaszczynski & Nower, 2002, Bonnaire et al., 2009, Crisp et al., 2004).

Consistent with expectations based on the pathways model, there was no significant difference between subgroups in gambling urges and cognitions; behavioural conditioning and cognitive biases are common to all problem gamblers regardless of gambling mode (Blaszczynski & Nower, 2002). Gambling severity and functional impairment were similarly uniform and on the higher end of the scales across subgroups, which may be reflective of the sample itself; the participants were all treatment seekers. Gamblers presenting for treatment likely represent a distinct portion of the gambling population at large, being in the moderate-severe range where motivation to seek help is highest. It is noteworthy that only an estimated 10% of problem gamblers actually present for

treatment, emphasising the importance of research into non-treatment seeking gamblers – an area that is currently lacking in the literature (Hounslow et al., 2011, Petry, 2003, Social Research Centre, 2013). It also portrays that the generalisation of these results is limited to treatment seeking individuals only; it is likely that non-treatment seeking gamblers differ markedly from those that do, and further investigation is warranted to characterise this group (Bonnaire et al., 2009, Petry, 2003).

That there were no significant differences between subgroups in the treatment outcome measures is somewhat surprising. However, considering there was also no difference in baseline gambling parameters (urge, cognitions, severity or impairment), these results are actually consistent with Oakes et al. (2012a), in which a number of baseline variables were qualitatively, predictors of outcome. It is also in line with Melville et al.'s (2007) review of drop-out, which suggested that gambling type had no effect on incompletion. Nonetheless, the present findings are contrary to what was theoretically expected; that male track race gamblers would have less favourable outcomes on the basis of their presumed impulsivity and the potentially inappropriate treatment method (Blaszczynski et al., 1997, Melville et al., 2007, Smith et al., 2010). It is also at odds with findings that chronic gamblers were more likely to drop-out of treatment (Milton, Crino, Hunt & Prosser, 2002). Given track users were significantly more likely to be gambling >5 years relative to the other two subgroups, it is unexpected that this subgroup did not differ in treatment completion measures. The pathways model postulates behaviourally conditioned gamblers would derive the greatest benefit from CBT, while emotionally vulnerable gamblers additionally need treatment for underlying mood disorders. More intensive treatment may be needed for biologically vulnerable gamblers, with the possible addition of pharmacological management to correct for neurochemical abnormalities (Blaszczynski & Nower, 2002, Petry, 2003, Westphal et al., 2008). It appears that at least preliminarily, empirical data contradict these theoretical postulations.

Despite applying one homogeneous treatment to what we now acknowledge as a heterogeneous group, previous studies have demonstrated that CBT can be efficacious for clinically diverse populations (Battersby et al., 2013, Hides, Samet & Lubman, 2010, Smith et al., 2014). Far from gambling targeted CBT being less effective for those with underlying mood disorders, Smith et al. (2014) report significantly greater improvements in subgroups with high K10 scores, compared

with low. It is possible that the SGTS CBT treatment program, coupled with a therapeutic relationship - itself shown to be beneficial for psychological distress – aids in addressing underlying comorbidities as well as gambling addiction. It's also possible that CBT is not as homogeneous as implied, and may differ depending on the therapist and the therapist-patient rapport. There may therefore be nonspecific therapy effects of the treatment being delivered which are unaccounted for in empirical studies. Therapist fidelity is also something to consider and was not included in this study (Melville et al., 2007). Considering the lack of empirical comparison of different treatment methods for problem gamblers, this is an area that warrants further exploration (Battersby et al., 2013, Westphal et al., 2008).

The present findings demonstrate what is considered reasonably high success rates for first time presenters – approaching 50% across measures of the best possible outcome; treatment completion and goals fully reached (Melville et al., 2007). However, this figure also highlights the well documented fact that problem gamblers have unanimously high treatment incompletion levels. The current study has deliberately avoided categorising participants as drop-outs; the use of the term in gambling literature is used inconsistently, with no evidence based consensus on what constitutes it (Melville et al., 2007). Generally there are two approaches; when attendance falls below a specific session number, or when a therapist deems treatment has prematurely stopped (Melville et al., 2007). Both these classifications are dichotomous and disregards the point at which the client leaves treatment, but there is good evidence that even attending one CBT session can achieve therapeutic effect (Smith et al., 2010, Tolchard, Thomas, Battersby, 2006). Those who withdraw from treatment therefore, may actually be successfully treated but erroneously classed at drop-outs. It is proposed that drop-out be reconceptualised in order to be better understood and to develop more applicable solutions to the problem. The current study thus used categorical therapist responses across three measures to give a more holistic account of what aspects of treatment were uncompleted, and why.

While it is widely acknowledged that gender has an effect on gambling behaviour, a thorough exploration of the variable has been hampered by small numbers of females in sample sizes (Crisp et al., 2004). Traditionally seen as a predominately male problem, gambling studies have either exclusively focused on men, or controlled for gender as a confounder, rather than a variable of interest

(Crisp et al., 2004, Petry, 2003, Tang et al., 2007). Though males still outnumber females in treatment seeking populations, the gender ratio in the general population is likely evenly matched (Crisp et al. 2004). That females are less likely to seek treatment emphasises the importance for healthcare professionals to screen and assess for gambling problems without gender bias (Crisp et al., 2004, Thomas, 2014). The current study not only confirms that gender differences are prevalent and easily identifiable, but also extends existing studies by examining them in the context of gambling preference, in line with the pathways theoretical framework.

Discrepancies in the demographic profiles of subgroups between studies may point towards the oversimplification of subgroup categories. Based on the data obtained, only EGM and track users had a large enough sample size to analyse in this study. However, multiple other forms of gambling exist, all with different social contexts, environmental cues and varying levels of risk/reward. It seems likely there are multiple subgroups with distinct but sometimes overlapping characteristics. Petry (2003) describes five profiles of gamblers according to the most common forms of gambling, suggesting there may be more than the three clusters proposed by Blaszczynski and Nower (2002). Furthermore, although most gamblers have a primary gambling activity, there is considerable overlap with gamblers participating in multiple forms (Petry, 2003). Theoretical models explaining variables in gambling subpopulations may thus need further revision and refinement to account for the complexity empirical data is producing.

While previous studies confirm EGM and track race gamblers correlate to Blaszczynski and Nower's (2002) emotionally and biologically vulnerable subgroups respectively, definitively categorizing participants beyond gambling preference was outside the scope of this study (Balodis et al., 2014). Collecting measures of sensation seeking, impulsivity and behavioural inhibition/approach systems would have strengthened the study in this regard and added weight to this well founded yet tentative assumption. Likewise, despite the recognised validity and reliability of the measures used, the study was limited by the use of subjective self-report scales. While chosen for the applicability and ease of administration in a clinical setting, it is acknowledged that more robust data would have been obtained by using objective measures such as diagnostic rather than screening measures. The AUDIT and K10 further have the ambiguity of whether alcohol/mood issues pre-dated the gambling

problem, or were rather a consequence of gambling activity, not a trivial distinction when applied to the theoretical framework.

Conclusions

Gambling research is becoming an increasingly important field due to the growing health, economic and social burden of problem gamblers. Understanding gambling aetiology in terms of a theoretical framework has proven difficult however, and empirical data has often yielded conflicting results. The current study adds to the body of existing research on gambling subgroups by extending previous studies, exploring baseline characteristics and treatment outcomes between gender and gambling preference, within the pathways model of problem gambling. Additionally, the study readdressed the issue of drop-out classification, using a therapist rated categorical approach as opposed to previously used binary systems. Results confirm the heterogeneity of problem gamblers, though the implications subgroup differences have on treatment outcomes remains to be fully elucidated. Future research is needed to expound the problem of treatment incompletion, build upon the theoretical basis of empirical data, and characterise the majority of problem gamblers who do not seek treatment.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article

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Table 1 Univariate analysis of baseline variables by gambling subgroup[a].

Variable	Female EGM (n=169)	Male EGM (n=166)	Male Track (n=75)	p-value[b]
Age	48.80 (12.65)	37.75 (11.58)	38.22 (12.38)	0.000
Marital status				0.004
Never married	42 (25.15)	65 (39.88)	20 (27.03)	
Married	59 (35.33)	59 (36.20)	37 (50.00)	
Separated	52 (31.14)	36 (22.09)	16 (21.62)	
Other	14 (8.38)	3 (1.84)	1 (1.35)	
Unknown	2 (1.18)	3 (1.81)	1 (1.33)	
Employment status				0.000
Employed	80 (48.19)	103 (62.42)	52 (71.23)	
Unemployed	21 (12.65)	30 (18.18)	14 (19.18)	
Disability	30 (18.07)	22 (13.33)	3 (4.11)	
Other	35 (21.08)	10 (6.06)	4 (5.48)	
Unknown	3 (1.78)	1 (0.6)	2 (2.67)	
Gambling duration				0.123
<2 years	41 (25.31)	38 (24.36)	8 (11.27)	
2-5 years	37 (22.84)	34 (21.79)	12 (16.90)	
>5 years	84 (51.85)	84 (53.85)	51 (71.83)	
Unknown	7 (4.14)	10 (6.02)	4 (5.33)	
PGSI	16.76 (5.11)	16.22 (6.09)	17.41 (5.77)	0.304
VGS	40.59 (11.32)	39.02 (12.91)	40.6 (12.82)	0.447
WSAS	14.86 (10.83)	14.96 (10.10)	17.19 (9.46)	0.224
K10	20.22 (9.78)	18.66 (9.86)	18.28 (9.35)	0.222
AUDIT	4.34 (5.98)	8.34 (7.45)	9.65 (7.57)	0.000
GUS	11.60 (12.18)	11.86 (12.18)	11.71 (11.41)	0.981
GRCS	49.12 (24.03)	51.66 (26.62)	48 (21.02)	0.483

Abbreviations: *AUDIT,* Alcohol Use Disorders Identification Test; *EGM,* Electronic Gaming Machines; *K10,* Kessler 10 Scale; *GRCS,* Gambling Related Cognition Scale; *GUS,* Gambling Urge Scale; *PGSI,* Problem Gambling Severity Index; *VGS,* Victorian Gambling Screen harm to self subscale; *WSAS,* Work and Social Adjustment Scale

[a] Presented as means (standard deviation) or frequency (%)

[b] Based on Pearson Chi-square test for categorical variables, and oneway ANOVA for continuous variables

Table 2 Multivariate model of predictors of problem gambling subgroup[a]

Variable	Male EGM (n=166)		Male Track (n=75)	
	RRR (95% CI)	*p*-value	RRR (95% CI)	*p*-value
Age	0.94 (0.91-0.96)	0.000	0.93 (0.90-0.96)	0.000
Marital status				
Never married (referent)	1		1	
Married	1.16 (0.58-2.30)	0.678	2.94 (1.20-7.20)	0.018
Separated	0.88 (0.43-1.90)	0.733	1.36 (0.51-3.67)	0.541
Other	0.36 (0.08-1.59)	0.177	0.47 (0.05-4.86)	0.528
Employment status				
Employed (referent)	1		1	
Unemployed	1.39 (0.63-3.04)	0.415	2.07 (0.77-5.59)	0.147
Disability	0.87 (0.40-1.86)	0.711	0.29 (0.07-1.13)	0.074
Other	0.36 (0.17-0.90)	0.028	0.32 (0.10-1.08)	0.066
Gambling Duration				
<2 years (referent)	1		1	
2-5 years	1.33 (0.62-2.98)	0.466	2.73 (0.90-8.28)	0.077
>5 years	2.12 (1.10-4.05)	0.024	6.59 (2.50-17.34)	0.000
WSAS	0.99 (0.96-1.02)	0.674	1.02 (0.98-1.06)	0.349
K10	0.97 (0.94-1.00)	0.048	0.95 (0.91-0.99)	0.025
AUDIT	1.07 (1.02-1.11)	0.002	1.09 (1.04-1.15)	0.000

Abbreviations: *AUDIT,* Alcohol Use Disorders Identification Test; *CI,* Confidence Interval; *EGM,* Electronic Gaming Machines; *K10,* Kessler 10 Scale; *RRR* Relative Risk Ratio*; WSAS,* Work and Social Adjustment Scale

[a] Female EGM users (*n*=169) as referent using multinomial logistic regression model

Table 3 Frequency (%) of treatment outcome categories by gambling subgroup

Treatment measure	Female EGM (*n*=169)	Male EGM (*n*=166)	Male Track (*n*=75)	*p*-value[a]
Reason for case closure				0.500
Referred to another agency	5 (3.23)	5 (3.47)	0 (0.00)	
Completed service plan	67 (43.23)	71 (49.31)	29 (45.31)	
Moved from area	1 (0.65)	2 (1.39)	1 (1.56)	
Ceased contact	50 (32.26)	46 (31.94)	25 (39.06)	
Withdrew	32 (20.65)	20 (13.89)	9 (14.06)	
Unknown	14 (8.28)	22 (13.25)	11 (14.67)	
Progress through therapy				0.349
Attended screening only	23 (14.84)	30 (20.83)	13 (20.31)	
Ceased before treatment completion	59 (38.06)	46 (31.94)	21 (32.81)	
Agreement that goals met	8 (5.16)	6 (4.17)	0 (0.00)	
Therapy completed	65 (41.94)	62 (43.06)	30 (46.88)	
Unknown	14 (8.28)	22 (13.25)	11 (14.67)	
Outcome of case				0.535
Goals fully reached	52 (33.55)	50 (34.72)	22 (34.38)	
Goals substantially reached	28 (18.06)	34 (23.61)	10 (15.63)	
Goals partially reached	25 (16.13)	13 (9.03)	9 (14.06)	
No goals reached	20 (12.90)	15 (10.42)	7 (10.94)	
N/A no goals set	30 (19.35)	32 (22.22)	16 (25.00)	
Unknown	14 (8.28)	22 (13.25)	11 (14.67)	

[a] Based on Pearson Chi-square test