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**Internet-based delivery of Cognitive Behaviour Therapy compared to Monitoring,  
Feedback and Support for Problem Gambling: A Randomised Controlled Trial**

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**Abstract**

**Objective:** The aim of this study was to investigate the efficacy of an Internet-based cognitive behavioural therapy program (I-CBT) for the treatment of problem gambling, when compared to a waitlist control and an active comparison condition consisting of monitoring, feedback, and support (I-MFS). **Methods:** Participants ( $N = 174$ ) were randomly allocated to the three conditions. Variables of interest were gambling outcome and related mental health measures. Participants in the active conditions (I-CBT and I-MFS) completed six online modules.

**Results:** Both I-CBT and I-MFS conditions resulted in significant treatment gains on gambling severity. However, I-CBT was also associated with reductions in a range of other gambling-related and mental health outcomes. Compared with I-MFS, I-CBT produced greater effects across seven outcomes measures, relating to gambling urges, cognitions, stress, and life satisfaction. I-CBT participants also rated the program as significantly more satisfactory. Treatment gains observed for both active conditions were found to be stable through to 12 month follow up. **Conclusions:** It was indicated that the benefits of I-CBT were more than simply the non-specific effects of engaging in online treatment or receiving motivation, feedback, and support. Online treatments for gambling may be a valuable tool in increasing help-seeking and treatment engagement in this population, and be integrated as part of stepped care approaches to treatment.

**Keywords:** pathological gambling, problem gambling, e-therapy, e-mental health, gambling disorder

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At any given point in time, 10-30% of people meeting criteria for problem gambling are in treatment, with consistently low rates of help-seeking observed across countries (Evans & Delfabbro, 2005; Suurvali, Hodgins, & Cunningham, 2010). As shame and secrecy regarding gambling strongly predict delay in seeking treatment (Tavares, Martins, Zilberman, & el-Guebaly, 2002), Internet-based treatment may overcome barriers that prevent individuals from seeking face-to-face help (Casey, Wright, & Clough, 2014). Internet based approaches have been shown to reduce gambling (e.g., Carlbring & Smit, 2008; Castren et al., 2013; Myrseth, Brunborg, Eidem, & Pallesen, 2013). However, the evidence base supporting these interventions is still in its infancy, with a greater emphasis on independent replication and comparisons of treatment efficacy required.

Two studies have reported on the efficacy of an Internet-based intervention for problem gambling, which was tested by means of a Randomised Controlled Trial (RCT) (Carlbring & Smit, 2008), with 36-month follow-up effects also examined (Carlbring, Degerman, Jonsson, & Andersson, 2012). Myrseth and colleagues (2013) have also reported on a single sample pilot investigation of an online treatment program for problem gambling. These studies support the claim that Internet-based interventions can be effective for the treatment of problem gambling. However, therapists in these studies maintained weekly telephone contact with participants. The first trial (Carlbring & Smit, 2008) utilised a waitlist control design, which is appropriate for estimating treatment effects relative to no-treatment. The current study follows the same approach since it trials a novel intervention with no active therapist support. Waitlist design comparisons are appropriate for interventions that do not have proven efficacy against inactive control conditions (Comer & Kendall, 2013). However, waitlist control designs do not control for the potentially confounding effects of treatment

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participation. As such, there is a need for treatments to not only be compared against the effects of passive control conditions, but also against other active therapeutic conditions.

To date, no research has compared Internet based treatment for problem gambling to either active online or face-to-face (F2F) treatment for the disorder. Both of these strategies will contribute to our understanding of the efficacy of online approaches to problem gambling treatment. However, direct comparisons of online treatment to F2F treatment (whilst utilising random allocation) can be problematic, as inclusion criteria specifies that all participants need to be willing and able to attend F2F treatment should they be allocated to that condition. This may limit the available sample and reach of an intervention, and also exclude participants who experience barriers to accessing F2F treatment (e.g. shame or embarrassment), but who may be explicitly targeted by an online intervention to address the critically low help-seeking within this population. An alternative method of examining these differences is to compare the effect sizes associated with Internet-based treatment of problem gambling to those previously observed in a face-to-face version of the same program. Such analyses of effect sizes have been established as a valuable method of comparison across studies (Deville & McFarlane, 2009), and was utilised as the strategy of comparison in the current study.

### **The Current Study**

The overall aim was to test the effect of Internet-based cognitive behavioural therapy (I-CBT) relative to a waitlist control condition and to also compare the effectiveness of I-CBT against an Internet-based motivation, feedback, and support (I-MFS) program for problem gambling. It was hypothesised that participants completing the active conditions would demonstrate significantly greater reductions in gambling behaviours than participants in a waitlist condition at post-treatment and that these treatment gains would be maintained over follow-up periods. An additional research question focused on investigating differences in post-treatment outcomes for participants completing I-CBT and participants completing I-

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MFS. Pre-treatment variables and their relationship to gambling outcomes were also of interest and included: depression, alcohol use, gambling severity, number of sessions completed and age. This goal was exploratory in nature, and aimed to determine whether the pre-treatment variables were predictive of treatment outcomes in the two treatment conditions. Finally, we were also interested in comparing treatment effects sizes between I-CBT and the face-to-face version, which had been previously developed and investigated by the same research team (Oei, Raylu, & Casey, 2010).

### **Method**

#### **Participants**

Participants were recruited via Internet, newspaper, and radio advertisements about the program, which was described as a free online program developed for people with gambling problems that would involve completing six weekly sessions online. They were required to be over 18 years of age, reside in Australia, and meet Diagnostic and Statistical Manual for Mental Disorders Fourth Editions (DSM-IV; American Psychiatric Association, 2000) criteria for pathological gambling as initially assessed using an online checklist. Due to lowering in the clinical threshold in the shift from DSM-IV-TR to DSM5 (Reilly & Smith, 2013), all participants in the current study would have met criteria for Gambling Disorder by DSM5 criteria.

Participants were excluded if they were receiving additional assistance for their gambling problem; were involved in legal proceedings related to their gambling behaviour; were not proficient with English; at a high risk of suicide; were acutely psychotic; or if their gambling behaviour only occurred in the context of a Manic Episode. All individuals who fulfilled the initial inclusion criteria and completed the pre-treatment questionnaire package were randomly allocated to a therapist to complete a telephone clinical interview during which the presence/ absence of suicidal symptoms or mania were assessed and the diagnosis

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of pathological gambling was confirmed using the Diagnostic Interview for Gambling Severity (Winters, Specker, & Stinchfield, 2002).

Minimum sample size was determined by an a priori power analysis using GPower (Faul & Erdfelder, 1992). We found only one previous trial (Carlbring & Smit, 2008) on which to base our power calculations, and while they found a large effect ( $d = .83$ ), we considered it more appropriate to be conservative and expect a medium effect. Using an estimated medium effect size of  $f = .25$ ,  $\alpha = .05$ ,  $\text{power} = .8$ , estimated correlation among repeated measures =  $.5$ , minimum sample size was calculated to be 102 participants for the mixed design. An allowance of 20% for participant attrition was made, giving a final minimum sample size of 123 participants. Of the 462 participants who registered for the study, 174 (45.31% of 384 found eligible) met inclusion criteria and completed the pre-intervention measures prior to randomisation procedures. Participant flow and reasons for exclusion and dropout are displayed in Figure 1. Demographic data on the 174 participants included in the study is provided in Table 1.

*[Approximate location of Table 1 and Figure 1]*

Participants reported engaging in a diverse range of gambling behaviours. Approximately 85% ( $n = 51$ ), 74.58% ( $n = 44$ ), and 78.19% ( $n = 43$ ) of the I-CBT, I-MFS, and waitlist samples (respectively) reported twice monthly or greater use of gaming machines. Tables games was the least frequently reported gambling behaviour, with 1.67% ( $n = 1$ ), 6.78% ( $n = 4$ ), and 7.27% ( $n = 4$ ) of I-CBT, I-MFS, and waitlist participants reporting than twice monthly or greater use. Gambling on events involving animals was endorsed by 21.67% ( $n = 13$ ), 25.42% ( $n = 15$ ), and 23.64% ( $n = 13$ ) of I-CBT, I-MFS, and waitlist samples as twice monthly or greater. Other forms of gambling (including online gambling) were reported by 36.67% ( $n = 22$ ), 37.29% ( $n = 22$ ), 29.09% ( $n = 16$ ) of I-CBT, I-MFS, and waitlist samples reporting twice monthly or greater use. The majority of participants (63.22%,  $n = 110$ )

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reported engaging in two or more forms of gambling on a twice monthly or greater basis (I-CBT = 73.33% ( $n = 44$ ), I-MFS = 54.24% ( $n = 32$ ), waitlist = 61.82% ( $n = 34$ )).

### Measures

**Primary Outcome.** The primary outcome measure was the Gambling Symptom Assessment Scale (GSAS; Kim, Grant, Adson, & Shin, 2001). The GSAS is a 12 item self-report scale measuring gambling urges, cognitions, behaviours and interpersonal function. Items are rated on scales ranging from 0-4, summing to give total scale scores ranging from 0-48. The GSAS has demonstrated strong convergent validity with other gambling measures, moderate one week test-retest reliability ( $r = .56$ ), and strong internal consistency ( $\alpha = .87$ ; Kim, Grant, Potenza, Blanco, & Hollander, 2009).

**Gambling Measures.** A number of well researched and psychometrically sound additional measures were also used to assess gambling behaviour, namely the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987), Gambling Urge Scale (GUS; Raylu & Oei, 2004c), Gambling Refusal Self-Efficacy Questionnaire (GRSEQ; Casey, Oei, Melville, Bourke, & Newcombe, 2008), and the Gambling Related Cognitions Scale (GRCS; Raylu & Oei, 2004a). The SOGS was also used to determine the amount of money (in Australian dollars) spent gambling over the two week period prior to assessment.

**Additional Measures.** Depression, anxiety and stress was measured using the 21 item version of the Depression Anxiety and Stress Scales (DASS-21; Lovibond & Lovibond, 1995). Alcohol use was measured using the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993), and coping style using the Brief COPE (Carver, 1997). Quality of life was measured by the Quality of Life Inventory (QOLI; Frisch, 1994) and satisfaction with life measured by the Satisfaction with Life Questionnaire (SWLQ; Diener, Emmons, Larsen, & Griffin, 1985).

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Information was also gathered relating to age, gender, income, education, relationship status, employment, religion, ethnic background, previous professional help-seeking, frequency of computer and Internet use, gambling frequency amount (\$) spent per day on gambling and treatment satisfaction. Participants were also asked to indicate their satisfaction with treatment using a 5-point scale (1 = not at all satisfied, 2 = somewhat satisfied, 3 = moderately satisfied, 4 = very much satisfied, 5 = extremely satisfied).

### **Procedure and Design**

This study was an open-label parallel-group trial with participants randomly assigned to either an active treatment (I-CBT or I-MFS) or waitlist control condition.

Ethical approval for this study was granted by the University Human Research Ethics Committee, and informed consent procedures were completed prior to collection of data. The trial was registered retrospectively with the Australian New Zealand Clinical Trials Registry (ANZCTR; ACTRN12615000228583, data collected 2007 - 2010). The 174 participants who completed pre-treatment procedures were randomly allocated to an active treatment condition (I-CBT ( $n = 60$ ) or I-MFS ( $n = 59$ )) or the six-week waitlist group ( $n = 55$ ), according to a computer generated sequence using simple randomisation. Participants and project staff were not blind to allocation. Those assigned to a treatment condition were sent an email with a user name and password to access the treatment areas of the Internet site. Those assigned to the wait-list condition were required to complete a subset of the questionnaires three weeks later (mid-wait) and six weeks later (end of wait period). At the end of the six-week waiting period, waitlist participants were offered participation in one of the active treatment arms.

Participants in the active treatment conditions were required to complete a subset of the questionnaires throughout treatment (i.e., either before or after completing sessions), at post-treatment, and at three-, six- and twelve-month follow-ups. Table 2 displays a schedule of administration and mode of administration of questionnaires. No changes to methods or trial



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outcome measures were made after trial commencement. The trial ended upon reaching the pre-determined sample size.

*[Approximate location of Table 2]*

### **Treatment**

The *Improving the Odds* program was developed to assist gamblers to either control or abstain from gambling. Participants completed sessions online, once a week for six weeks and received access to a session one week after completing the previous session. The only treatment related telephone contact was the telephone-based clinical interview to assess suitability for program, which was conducted by four therapists, all of whom were completing advanced training in Clinical Psychology. Therapists were provided with weekly supervision by the first author.

**I-CBT.** Development of I-CBT treatment condition was based on CBT principles as used in the face-to-face treatment program reported in Oei, Raylu & Casey (2011). In order to duplicate the interactive style of face to face treatment as much as possible, participants were provided with a series of interactive exercises throughout each session (six in total) and graphical feedback on their progress at the beginning of each session. Session one aimed to increase awareness of factors that may be playing a role in gambling behaviour and also to provide strategies to stabilise gambling. Sessions two and three aimed to identify gambling and general thinking errors, challenge these thinking errors and replace them with more helpful thoughts and help individuals to get out of debt. Session four focused on imaginal exposure and also aimed to help individuals learn how to apply relaxation strategies. Session five focused on problem solving, setting goals, and learning how to deal with negative emotions. Finally, session six maintenance of treatment gains and relapse prevention.

**I-MFS.** Participants in the I-MFS treatment condition were given access to selected portions (or “pages”) of the weekly session content provided to participants in the I-CBT

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condition, over the six week treatment period. These pages dealt only with assisting them to monitor gambling behaviours, providing feedback on their progress, and giving supportive messages. Participants in I-MFS did not have access to any additional CBT tasks or strategies during their Internet treatment period. Whereas completion of I-CBT requires approximately one hour per session, participants in the I-MFS condition were required to spend only 5 to 10 minutes completing each session.

### **Analyses**

Multilevel statistical modelling was used to analyse the data. The multilevel models were fitted with the MIXED procedure in SPSS. Alpha criterion was set at .05. Data from all 174 randomised participants were used in analyses. To evaluate treatment outcome, a continuous *time* variable was created with integer values ranging between 0 and 6, and where each integer represented a respective stage of data collection (i.e. pre-treatment = 0, mid-wait or Session 3 = 3, and end-wait or post-treatment = 6). Two dummy *condition* variables representing I-MFS and I-CBT were created, with WL as the reference condition for each. To explore differences between conditions in change over time, *time* by *condition* interactions were estimated through the multilevel models. For gambling refusal self-efficacy (GRSEQ), quality of life (QOL) and satisfaction with life (SWLQ), a positive estimate represents improvement and a negative estimate represents a “worsening of symptoms”. For all other outcome variables, a negative estimate represents improvement and a positive effect size represented a “worsening of symptoms”.

Maintenance of treatment gains were examined for the two treatment conditions by examining the significance of the linear slopes of change between post-treatment and 12-month follow-up.

To examine the relationship between several pre-treatment variables and change in gambling outcome variables, the multilevel models were extended to include the three-way

interactions between specific predictor variables, the treatment dummy variables, and the time variable. Results of these moderator analyses are described separately for each treatment condition.

### Results

#### Preliminary Analyses

Comparisons of completers vs non completers on all baseline variables indicated that participants who discontinued the treatment program used the computer ( $F(1, 156) = 4.21, p < .05$ ) and Internet ( $F(1, 155) = 5.05, p < .05$ ) less often at baseline than those who completed treatment.

*[Approximate location of Table 3]*

#### Evaluation of Treatment Outcome

Table 4 reports the outcomes related to the interaction terms for each outcome variable.

*[Approximate location of Table 4]*

**I-CBT versus WL.** Compared to participants completing the waitlist control condition, participants completing I-CBT noted significantly greater reductions in gambling amount, gambling frequency, gambling severity (GSAS and SOGS), gambling urge (GUS), gambling related cognitions (GRCS), depression, anxiety and stress (DASS). They were also more likely to report increases in gambling refusal self-efficacy (GRSEQ), quality of life (QOLI), satisfaction with life (SWLQ) and use of emotion-focused coping strategies (Brief COPE). No significant differences between participants completing the waitlist control condition and participants completing the I-CBT condition were found with regards to changes in alcohol use (AUDIT), cognitive coping, avoidance coping or active coping (Brief COPE).

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**I-MFS versus WL.** Compared to participants completing the waitlist control condition, participants completing I-MFS noted significantly greater reductions in gambling severity (GSAS) and showed a non-significant trend ( $p = .08$ ) for increased quality of life (QOLI). No significant differences between participants completing the waitlist control condition and participants completing the I-MFS were found on any other outcome.

**I-CBT versus I-MFS.** Differences in treatment outcomes between participants in the I-CBT condition compared to the I-MFS condition are shown by the I-CBTvsI-MFS\*TIME interaction (Table 4). Compared to participants completing the I-MFS condition, participants completing I-CBT noted significantly greater reductions in gambling urges (GUS), gambling related cognitions (GRCS) and stress. No significant differences between participants completing the I-MFS condition and participants completing the I-CBT condition were found on any other outcome.

Participants in the I-CBT condition were significantly more satisfied with the program than those in the I-MFS condition ( $F(1, 45) = 15.05, p < .01$ ). Treatment satisfaction in the I-CBT had a mean score of 4.00 (SD = 0.89) indicating that participants were on average very much satisfied with the treatment program. In I-MFS, the mean score treatment satisfaction was 2.73 (SD = 1.31) indicating that participants were on average moderately satisfied with the treatment program.

**Maintenance of Treatment Gains.** Pre to post treatment changes associated with I-CBT and I-MFS were maintained across 3-, 6- and 12-month follow-up assessments, with no significant changes observed ( $p$ 's  $> .05$ ).

### **Predictors of Treatment Outcome**

**Predictors of Treatment Outcome within I-CBT.** No significant associations were found between pre-treatment depression and change in gambling amount, gambling

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frequency, SOGS gambling severity, gambling related cognitions, gambling refusal self-efficacy, GUS or GSAS gambling symptom severity ( $p$ 's  $\geq .21$ ).

No significant associations were found between pre-treatment alcohol use and change in gambling amount, gambling frequency, SOGS gambling severity, gambling related cognitions, gambling refusal self-efficacy, gambling urge or GSAS gambling symptom severity ( $p$ 's  $\geq .11$ ).

Higher pre-treatment gambling severity (pre-treatment SOGS) was significantly associated with less change in gambling urge ( $p < .01$ ). No significant associations were found between pre-treatment gambling severity and change in gambling amount, gambling frequency, SOGS gambling severity, gambling related cognitions, gambling refusal self-efficacy and GSAS gambling symptom severity ( $p$ 's  $\geq .10$ ).

Older age was significantly associated with less change in GRSEQ ( $p < .05$ ). No significant associations were found between age and change in gambling amount, gambling frequency, SOGS gambling severity, gambling related cognitions, gambling urge and GSAS gambling symptom severity ( $p$ 's  $\geq .20$ ).

An increased number of sessions completed was significantly associated with increased change in gambling related cognitions ( $p < .05$ ). No significant associations were found between number of sessions completed and change in gambling amount, gambling frequency, SOGS gambling severity, gambling refusal self-efficacy, gambling urge and GSAS gambling symptom severity ( $p$ 's  $\geq .31$ ). There were also no significant differences between the I-CBT ( $M = 3.57$ ,  $SD = 2.27$ ) and I-MFS ( $M = 3.84$ ,  $SD = 2.12$ ) conditions on mean sessions completed ( $t(116) = -0.687$ ,  $p = .493$ ,  $d = .12$ ).

**Predictors of Treatment Outcome within I-MFS.** No significant associations were found between pre-treatment depression and change in gambling amount, gambling

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frequency, SOGS gambling severity, gambling related cognitions, gambling refusal self-efficacy, gambling urge or GSAS gambling symptom severity ( $p$ 's  $\geq .54$ ).

No significant associations were found between pre-treatment alcohol use and change in gambling amount, gambling frequency, SOGS gambling severity, gambling related cognitions, gambling refusal self-efficacy, gambling urge or GSAS gambling symptom severity ( $p$ 's  $\geq .25$ ).

Higher pre-treatment gambling severity (pre-treatment SOGS) was significantly associated with less change in gambling severity (SOGS) across treatment ( $p < .05$ ). No significant associations were found between pre-treatment gambling severity and change in gambling amount, gambling frequency, gambling related cognitions, gambling refusal self-efficacy, gambling urge and gambling symptom severity ( $p$ 's  $\geq .12$ ).

Older age was significantly associated with less change in gambling refusal self-efficacy ( $p < .05$ ). No significant associations were found between age and change in gambling amount, gambling frequency, gambling severity (SOGS & GSAS), gambling related cognitions and gambling urge ( $p$ 's  $\geq .15$ ).

Higher number of sessions completed was significantly associated with higher change in gambling related cognitions ( $p < .05$ ). No significant associations were found between number of sessions completed and change in gambling amount, gambling frequency, SOGS gambling severity, gambling refusal self-efficacy, gambling urge and GSAS gambling symptom severity ( $p$ 's  $\geq .46$ ).

**Comparison of Internet-based and Face-to-Face Interventions.** The effect size for change from pre- to post in gambling amount, gambling frequency, gambling urge, gambling-related cognitions and gambling refusal self-efficacy were contrasted between the Internet-based CBT program and a previous analysis of the face-to-face CBT program (Oei et al., 2010) using Cohen's *d*. Participants involved in the previous trial of the face-to-face CBT

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program were recruited from the same population and by the same recruitment methods as for the current study. The I-CBT program was modelled on the previous face-to-face version of the program in terms of content, with each being of six module/ session duration. As shown in Table 5 the Internet-based CBT program and the face-to-face CBT program were equally effective in producing improvements in gambling amount, gambling frequency, gambling urge and gambling refusal self-efficacy across treatment. However, the face-to-face CBT program (95% CI -2.40 to -1.19) was more effective in producing improvement in gambling related cognitions than the Internet-based CBT program (95% CI -1.84 to -1.03). A substantially lower dropout rate was also observed for the face-to-face version of the program (18.63%) than the Internet version of the program (47.70%, from pre to post treatment), indicating that online programs may be associated with own unique barriers to treatment, such as familiarity and access to equipment and the Internet.

*[Approximate location of Table 5]*

### **Discussion**

The primary purpose of this project was to evaluate the specific effects of Internet-based CBT for gambling. Across 12 of the 17 outcome variables, I-CBT produced significant improvements when compared to the waitlist control group. For the primary outcome of gambling severity, both active interventions produced significant improvement relative to the waitlist. In addition to producing change across a greater number of variables when compared to the waitlist control (including gambling related cognitions, depression, anxiety, and life satisfaction), the I-CBT condition was found to produce significantly greater change than the I-MFS condition in direction comparisons for seven of the outcome variables, relating to gambling behaviours, urges, cognitions, mood, and life satisfaction. Furthermore, participants in the I-CBT condition were significantly more satisfied with the program than those in the I-MFS condition. These results suggest, particularly for gambling urges, gambling cognitions,

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and mood, the effects of I-CBT extend beyond the effects of monitoring, feedback and support. This results are not unexpected given the CBT intervention specifically targeted cognitions and urges. Further, comparison of effect sizes obtained in I-CBT and face-to-face CBT provides preliminary evidence that the efficacy of I-CBT may be sufficiently similar to face-to-face treatment, and be offered as a way of enabling gamblers to overcome many of the barriers that prevent them from accessing traditional forms of treatment. The treatment gains observed for both active conditions were found to be stable over time, through to the 12-month follow-up.

The overall rate of dropout in this study was higher than predicted in the initial power analysis, but comparable to that reported previously regarding dropout from problem gambling treatment programs (Melville, Casey, & Kavanagh, 2007) and dropout from Internet-based treatment programs for psychological disorders (Melville, Casey, & Kavanagh, 2010). It should be noted that these reviews of dropout among problem gambling and Internet based programs were conducted subsequent to the initial power analysis for this study. As such a greater allowance for dropout should be made in future studies of this population and these types of interventions. Regardless, the significant effects observed in the current study indicates that sufficient power was obtained to detect a medium effect with statistical significance. One variable was found to reliably discriminate between dropouts and completers. Participants who dropped out from treatment sessions used the computer or Internet less often than completers. This suggests a possible boundary condition on the applicability for Internet-delivered interventions for those with low baseline computer or Internet use. Furthermore, a higher number of sessions completed was significantly associated with increased change in gambling related cognitions.

For I-CBT participants, there was no association between pre-treatment severity and change in gambling severity across treatment. However, for I-MFS participants, higher pre-



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treatment gambling severity was associated with less change in gambling severity across treatment. These findings suggest that severe gambling may be resistant to motivation, feedback, and support-type interventions and that this type of support may be more useful for less severe gambling problems or provide a useful adjunct in relapse prevention.

The relationship between pre-treatment variables and outcome in Internet-based treatment for gambling was examined. Significant relationships were found between less positive change in gambling refusal self-efficacy and older age in I-CBT and I-MFS. In principle, problem gamblers of an older age may have had a longer duration of gambling behaviour, may have more entrenched difficulties and may have had previous unsuccessful treatment experiences. They may therefore, require more time and effort in treatment to produce change and may be more likely to report less positive change in gambling refusal self-efficacy than younger participants.

There was no association between treatment outcome and pre-treatment depression or alcohol use. Although there is some evidence that comorbid psychological conditions may influence treatment outcome amongst problem gamblers (Gainsbury & Blaszczynski, 2011; Hodgins, Peden, & Cassidy, 2005) other researchers have also reported no association between comorbid psychological conditions and gambling treatment outcome (Stinchfield, Kushner, & Winters, 2005; Toneatto, Skinner, & Dragonetti, 2002).

A number of limitations in the present study must be noted. Firstly, participants were required to have access to the Internet in order to complete the program and this may have resulted in a less representative sample. Secondly, as participants on the waitlist, for ethical reasons, received treatment before follow-up data was collected, there were no comparisons between the waitlist control group and the active treatment conditions at follow-up.

In summary, the current results suggest that online CBT and motivation, support and feedback treatments were effective at reducing gambling severity, the primary outcome

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measure of the current study. However, CBT also demonstrated a range of other beneficial gambling-related and mental health outcomes for participants, and also generated greater satisfaction. Treatment gains for both active conditions were found to be stable over time. Furthermore, comparisons of effect sizes provide preliminary evidence that I-CBT may be similar in its effects to face-to-face therapy. In light of the attrition issues observed in the current study, as well as those reported in other studies in the field, research is required to examine methods for increasing participant engagement and reducing dropout in online interventions. The results of the current study suggest that I-CBT for problem gambling will likely provide a useful addition to increase treatment options and facilitate stepped care approaches to treatment. In light of high satisfaction ratings observed for I-CBT, the current results are particularly encouraging given the low help-seeking and engagement with face-to-face treatments that is observed within this population. Future research should examine additional ways that I-CBT could be used to increase current treatment options available to individuals with gambling problems.

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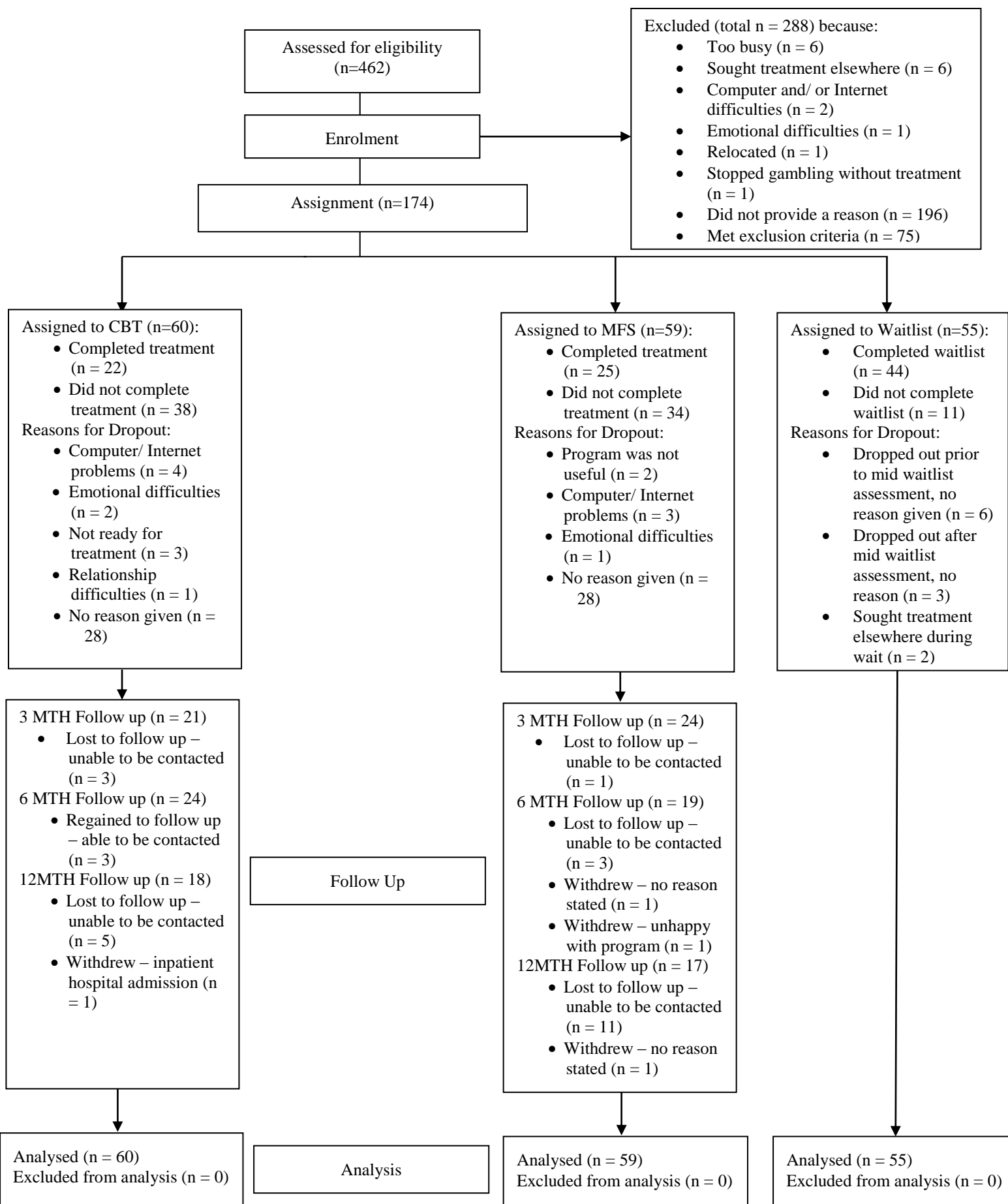


Figure 1. Participant flow (CONSORT diagram) and study design.

# INTERNET DELIVERED CBT AND MFS FOR GAMBLING

Table 1

## *Demographic Characteristics of Participants*

| Variable                           | I-CBT<br>%   | I-MFS<br>%    | Waitlist<br>% |
|------------------------------------|--------------|---------------|---------------|
| Age                                |              |               |               |
| Mean (SD)                          | 44.82 (9.02) | 44.08 (10.48) | 44.18 (9.51)  |
| Gender                             |              |               |               |
| Male                               | 42           | 39            | 42            |
| Female                             | 58           | 61            | 58            |
| Relationship Status                |              |               |               |
| Single                             | 42           | 32            | 29            |
| In a relationship                  | 58           | 68            | 71            |
| Annual Income                      |              |               |               |
| <\$10000AU                         | 7            | 2             | 2             |
| \$10000-29000                      | 20           | 23            | 19            |
| \$30000-49000                      | 35           | 32            | 22            |
| >\$50000                           | 38           | 43            | 57            |
| Education (highest level)          |              |               |               |
| Primary                            | 0            | 3             | 0             |
| Junior secondary                   | 15           | 9             | 7             |
| Senior Secondary                   | 34           | 25            | 33            |
| Certificate /Diploma               | 34           | 41            | 33            |
| Bachelor /Higher Degree            | 17           | 22            | 27            |
| Employment                         |              |               |               |
| Full time                          | 53           | 68            | 73            |
| Part time                          | 20           | 22            | 20            |
| Full time students                 | 2            | 2             | 2             |
| Other                              | 25           | 8             | 5             |
| Race/Ethnicity                     |              |               |               |
| Caucasian                          | 81           | 76            | 82            |
| Asian                              | 2            | 6             | 2             |
| Other                              | 17           | 18            | 16            |
| Religion                           |              |               |               |
| Catholic                           | 20           | 42            | 42            |
| No religion                        | 49           | 26            | 38            |
| Protestant                         | 14           | 10            | 6             |
| Other                              | 17           | 22            | 14            |
| Previous professional help seeking |              |               |               |
| Yes                                | 53           | 54            | 55            |
| No                                 | 47           | 46            | 45            |
| Frequency of computer use          |              |               |               |
| Daily                              | 86           | 95            | 87            |
| Weekly                             | 12           | 5             | 7             |
| Less than once per month           | 2            | 0             | 6             |
| Frequency of Internet use          |              |               |               |
| Daily                              | 84           | 79            | 78            |
| Weekly                             | 14           | 19            | 13            |
| Less than once per month           | 2            | 2             | 9             |



## INTERNET DELIVERED CBT AND MFS FOR GAMBLING

Table 2

*Schedule of administration of questionnaires*

|                       | GSAS | SOGS | Gambling Amount<br>and Frequency | GUS | GRSEQ | GRCS | DASS | AUDIT | COPE | QOLI | SWLQ |
|-----------------------|------|------|----------------------------------|-----|-------|------|------|-------|------|------|------|
| Pre-treatment         | X    | X    | X                                | X   | X     | X    | X    | X     | X    | X    | X    |
| Mid-wait              | X    |      |                                  |     | X     | X    |      |       |      |      |      |
| End of wait<br>period | X    | X    | X                                | X   | X     | X    | X    | X     | X    | X    | X    |
| Session 1             | X    |      |                                  |     |       |      |      |       |      |      |      |
| Session 2             | X    |      |                                  |     |       |      |      |       |      |      |      |
| Session 3             | X    |      | X                                | X   | X     | X    |      |       |      |      |      |
| Session 4             | X    |      |                                  |     |       |      |      |       |      |      |      |
| Session 5             | X    |      |                                  |     |       |      |      |       |      |      |      |
| Session 6             | X    | X    |                                  | X   | X     | X    |      |       |      |      |      |
| Post-treatment        |      |      | X                                |     |       |      | X    | X     | X    | X    | X    |
| 3-month<br>Follow-up  |      | X    | X                                | X   | X     | X    | X    | X     | X    | X    | X    |
| 6-month<br>Follow-up  |      | X    | X                                | X   | X     | X    | X    | X     | X    | X    | X    |
| 12-month<br>Follow-up |      | X    | X                                | X   | X     | X    | X    | X     | X    | X    | X    |

*Note:* X = questionnaire completed. GSAS = Gambling Symptom Assessment Scale; SOGS = South Oaks Gambling Screen; GUS = Gambling Urge Scale; GRSEQ = Gambling Refusal Self Efficacy Questionnaire; GRCS = Gambling Related Cognitions Scale; DASS = Depression, Anxiety and Stress Scale; AUDIT = Alcohol Use Disorders Identification Test; QOLI = Quality of Life Inventory; SWLQ = Satisfaction with Life Questionnaire.

## INTERNET DELIVERED CBT AND MFS FOR GAMBLING

Table 3

*Means and standard deviations of study variables at pre- and post-intervention for I-CBT, I-MFS and Waitlist Groups*

| Variable               | I-CBT ( <i>n</i> = 60) |                | I-MFS ( <i>n</i> = 59) |                 | Waitlist ( <i>n</i> = 55) |               |
|------------------------|------------------------|----------------|------------------------|-----------------|---------------------------|---------------|
|                        | Pre                    | Post           | Pre                    | Post            | Pre                       | Post          |
|                        | M (SD)                 | M (SD)         | M (SD)                 | M (SD)          | M (SD)                    | M (SD)        |
| GSAS                   | 31.46 (7.36)           | 14.00 (11.05)  | 32.94 (7.15)           | 16.15 (10.06)   | 31.76 (6.29)              | 27.16 (10.27) |
| SOGS                   | 9.97 (3.27)            | 3.00 (3.61)    | 10.27 (2.81)           | 5.43 (3.81)     | 8.14 (4.19)               | 7.53 (4.31)   |
| Gambling Amount        | 565.88 (1372.55)       | 96.33 (189.10) | 603.94 (1318.46)       | 146.50 (363.06) | 268.91 (453.73)           | 251 (454.44)  |
| Gambling Frequency     | 4.82 (2.10)            | 1.58 (1.38)    | 4.68 (1.88)            | 1.76 (1.69)     | 3.15 (2.09)               | 2.91 (2.12)   |
| GUS                    | 22.18 (11.19)          | 9.56 (6.52)    | 19.84 (11.34)          | 13.03 (8.32)    | 18.53 (10.59)             | 18.41 (9.81)  |
| GRCS                   | 86.13 (27.27)          | 36.74 (16.50)  | 81.11 (24.67)          | 58.39 (24.66)   | 75.90 (19.57)             | 60.41 (20.51) |
| GRSEQ                  | 37.23 (18.60)          | 72.65 (20.65)  | 38.75 (16.13)          | 57.21 (23.50)   | 39.08 (18.34)             | 46.63 (21.75) |
| DASS                   |                        |                |                        |                 |                           |               |
| Depression             | 23.07 (10.30)          | 8.25 (10.78)   | 19.93 (11.84)          | 12.61 (9.71)    | 17.35 (12.55)             | 8.58 (6.41)   |
| Anxiety                | 13.07 (8.79)           | 4.67 (6.48)    | 11.76 (10.42)          | 8.00 (9.22)     | 9.09 (8.49)               | 8.86 (8.43)   |
| Stress                 | 22.03 (9.75)           | 10.92 (8.87)   | 20.54 (10.89)          | 15.83 (9.72)    | 18.51 (11.28)             | 18.55 (12.06) |
| AUDIT                  | 6.98 (6.28)            | 4.17 (3.87)    | 7.05 (7.70)            | 5.17 (6.81)     | 6.76 (5.06)               | 6.66 (5.22)   |
| Brief COPE             |                        |                |                        |                 |                           |               |
| Active Coping          | 4.22 (1.77)            | 5.00 (1.22)    | 4.17 (1.71)            | 4.91 (1.34)     | 4.33 (1.64)               | 4.32 (1.94)   |
| Cognitive Coping       | 4.68 (1.92)            | 5.38 (1.28)    | 4.64 (1.79)            | 5.18 (1.40)     | 5.07 (1.53)               | 4.89 (1.83)   |
| Emotion-focused Coping | 3.45 (1.97)            | 4.42 (1.41)    | 3.43 (1.85)            | 4.36 (1.53)     | 3.69 (1.85)               | 3.57 (1.90)   |
| Avoidance Coping       | 3.90 (2.17)            | 3.00 (2.09)    | 3.46 (2.05)            | 3.18 (1.97)     | 3.64 (2.06)               | 3.50 (1.98)   |
| QOLI                   | -12.88 (25.07)         | 12.28 (26.33)  | -0.29 (31.01)          | 15.56 (30.25)   | 1.78 (30.56)              | 7.92 (33.87)  |
| SWLQ                   | 12.75 (4.86)           | 19.21 (7.36)   | 15.87 (6.95)           | 18.50 (7.39)    | 16.67 (6.97)              | 18.30 (7.87)  |

*Note:* Means and standard deviations based on available data for each variable at each time point. Available data at *pre* ranged between *n* = 50 – 60 for I-CBT, *n* = 45 – 59 for I-MFS, and *n* = 49 – 55 for Waitlist. Available data at *post* ranged between *n* = 18 – 27 for I-CBT, *n* = 18 – 30 for I-MFS, and *n* = 38 – 44 for Waitlist.

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Table 4

*Parameter estimates of group x time interactions from mixed effects models showing change from pre- to post-intervention.*

| Outcome Variable                    | Parameter         | Estimate      | SE    | p      | 95% Confidence Interval |             |
|-------------------------------------|-------------------|---------------|-------|--------|-------------------------|-------------|
|                                     |                   |               |       |        | Lower Bound             | Upper Bound |
| GSAS                                | I-MFSvsWL*TIME    | <b>-1.50</b>  | 0.42  | < .001 | -2.33                   | -0.67       |
|                                     | I-CBTvsWL*TIME    | <b>-2.13</b>  | 0.42  | < .001 | -2.96                   | -1.29       |
|                                     | I-CBTvsI-MFS*TIME | -0.63         | 0.43  | .146   | -1.47                   | 0.22        |
| SOGS                                | I-MFSvsWL*TIME    | <b>-0.70</b>  | 0.12  | < .001 | -0.93                   | -0.46       |
|                                     | I-CBTvsWL*TIME    | <b>-1.10</b>  | 0.13  | < .001 | -1.35                   | -0.85       |
|                                     | I-CBTvsI-MFS*TIME | <b>-0.40</b>  | 0.13  | .003   | -0.67                   | -0.14       |
| Gambling Amount                     | I-MFSvsWL*TIME    | <b>-81.09</b> | 38.05 | .034   | -156.14                 | -6.04       |
|                                     | I-CBTvsWL*TIME    | <b>-84.05</b> | 38.05 | .028   | -159.09                 | -9.01       |
|                                     | I-CBTvsI-MFS*TIME | -2.96         | 38.17 | .938   | -78.23                  | 72.31       |
| Gambling Frequency                  | I-MFSvsWL*TIME    | <b>-0.46</b>  | 0.06  | < .001 | -0.59                   | -0.34       |
|                                     | I-CBTvsWL*TIME    | <b>-0.51</b>  | 0.07  | < .001 | -0.64                   | -0.38       |
|                                     | I-CBTvsI-MFS*TIME | -0.05         | 0.07  | .490   | -0.19                   | 0.09        |
| GUS                                 | I-MFSvsWL*TIME    | <b>-0.97</b>  | 0.39  | .012   | -1.73                   | -0.21       |
|                                     | I-CBTvsWL*TIME    | <b>-2.37</b>  | 0.39  | < .001 | -3.14                   | -1.61       |
|                                     | I-CBTvsI-MFS*TIME | <b>-1.40</b>  | 0.41  | < .001 | -2.21                   | -0.59       |
| GRCS                                | I-MFSvsWL*TIME    | -1.62         | 0.90  | .073   | -3.39                   | 0.15        |
|                                     | I-CBTvsWL*TIME    | <b>-5.99</b>  | 0.91  | < .001 | -7.79                   | -4.20       |
|                                     | I-CBTvsI-MFS*TIME | <b>-4.37</b>  | 0.95  | < .001 | -6.25                   | -2.50       |
| GRSEQ                               | I-MFSvsWL*TIME    | <b>2.12</b>   | 0.83  | .011   | 0.48                    | 3.76        |
|                                     | I-CBTvsWL*TIME    | <b>4.20</b>   | 0.84  | < .001 | 2.55                    | 5.85        |
|                                     | I-CBTvsI-MFS*TIME | <b>2.08</b>   | 0.90  | .023   | 0.30                    | 3.86        |
| DASS – Depression                   | I-MFSvsWL*TIME    | 0.40          | 0.41  | .333   | -0.41                   | 1.20        |
|                                     | I-CBTvsWL*TIME    | <b>-0.94</b>  | 0.40  | .022   | -1.74                   | -0.14       |
|                                     | I-CBTvsI-MFS*TIME | <b>-1.33</b>  | 0.44  | .003   | -2.20                   | -0.46       |
| DASS – Anxiety                      | I-MFSvsWL*TIME    | -0.55         | 0.31  | .084   | -1.17                   | 0.07        |
|                                     | I-CBTvsWL*TIME    | <b>-1.18</b>  | 0.30  | < .001 | -1.79                   | -0.58       |
|                                     | I-CBTvsI-MFS*TIME | -0.64         | 0.35  | .069   | -1.33                   | 0.05        |
| DASS-Stress                         | I-MFSvsWL*TIME    | <b>-0.64</b>  | 0.32  | .047   | -1.27                   | -0.01       |
|                                     | I-CBTvsWL*TIME    | <b>-1.88</b>  | 0.31  | < .001 | -2.51                   | -1.26       |
|                                     | I-CBTvsI-MFS*TIME | <b>-1.24</b>  | 0.36  | < .001 | -1.95                   | -0.53       |
| AUDIT                               | I-MFSvsWL*TIME    | <b>-0.19</b>  | 0.07  | .008   | -0.33                   | -0.05       |
|                                     | I-CBTvsWL*TIME    | <b>-0.33</b>  | 0.07  | < .001 | -0.47                   | -0.19       |
|                                     | I-CBTvsI-MFS*TIME | -0.14         | 0.08  | .066   | -0.29                   | 0.01        |
| Brief COPE – Active Coping          | I-MFSvsWL*TIME    | 0.12          | 0.07  | .096   | -0.02                   | 0.27        |
|                                     | I-CBTvsWL*TIME    | 0.14          | 0.07  | .061   | -0.01                   | 0.28        |
|                                     | I-CBTvsI-MFS*TIME | 0.01          | 0.08  | .878   | -0.15                   | 0.17        |
| Brief COPE – Cognitive Coping       | I-MFSvsWL*TIME    | 0.11          | 0.08  | .156   | -0.04                   | 0.27        |
|                                     | I-CBTvsWL*TIME    | 0.15          | 0.08  | .059   | -0.01                   | 0.30        |
|                                     | I-CBTvsI-MFS*TIME | 0.03          | 0.08  | .688   | -0.15                   | 0.17        |
| Brief COPE – Emotion-Focused Coping | I-MFSvsWL*TIME    | <b>0.16</b>   | 0.07  | .035   | 0.01                    | 0.31        |
|                                     | I-CBTvsWL*TIME    | <b>0.19</b>   | 0.07  | .011   | 0.05                    | 0.33        |
|                                     | I-CBTvsI-MFS*TIME | 0.03          | 0.08  | .715   | -0.13                   | 0.19        |
| Brief COPE – Avoidance Coping       |                   |               |       |        |                         |             |

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|      |                   |             |      |      |       |      |
|------|-------------------|-------------|------|------|-------|------|
|      | I-MFSvsWL*TIME    | -0.02       | 0.09 | .859 | -0.20 | 0.17 |
|      | I-CBTvsWL*TIME    | -0.12       | 0.09 | .200 | -0.30 | 0.06 |
|      | I-CBTvsI-MFS*TIME | -0.10       | 0.10 | .327 | -0.30 | 0.10 |
| QOLI |                   |             |      |      |       |      |
|      | I-MFSvsWL*TIME    | 1.31        | 1.16 | .265 | -1.02 | 3.64 |
|      | I-CBTvsWL*TIME    | 2.27        | 1.15 | .052 | -0.02 | 4.57 |
|      | I-CBTvsI-MFS*TIME | 0.97        | 1.35 | .475 | -1.72 | 3.66 |
| SWLQ |                   |             |      |      |       |      |
|      | I-MFSvsWL*TIME    | 0.07        | 0.24 | .784 | -0.41 | 0.55 |
|      | I-CBTvsWL*TIME    | <b>0.66</b> | 0.23 | .005 | 0.20  | 1.12 |
|      | I-CBTvsI-MFS*TIME | <b>0.59</b> | 0.27 | .031 | 0.05  | 1.13 |

*Note.*  $N = 174$ ,  $n$  I-CBT = 60,  $n$  I-MFS = 59,  $n$  Waitlist = 55. For gambling amount, gambling frequency, gambling urge and gambling-related cognitions, a positive estimate represented improvement and a negative estimate represented a “worsening of symptoms”. With regards to gambling refusal self-efficacy, a negative estimate represented improvement and a positive estimate represented a “worsening of symptoms”.

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Table 5

*Change in outcome measures from pre- to post-treatment in Internet-based CBT program and the face-to-face CBT*

| Variable           | Internet-based CBT for pathological gambling |             |              | Face-to-face CBT for pathological gambling |             |               |
|--------------------|--|-------------|--------------|--|-------------|---------------|
|                    | Mean change                                  | Effect size | 95% CI       | Mean change                                | Effect size | 95% CI        |
| Gambling Amount    | 469.55                                       | 1.02        | [0.71, 1.33] | 71.00                                      | 0.31        | [-0.06, 0.68] |
| Gambling Frequency | 3.24   | 2.19        | [1.72, 2.66] | 3.06                                       | 1.47        | [1.04, 1.87]  |
| GUS                | 12.62  | 0.99        | [0.67, 1.30] | 8.90                                       | 0.94        | [0.54, 1.32]  |
| GRCS               | 49.39  | 1.92        | [1.47, 2.36] | 38.40                                      | 2.26        | [1.77, 2.71]  |
| GRSEQ              | 35.42  | 1.27        | [0.90, 1.64] | 919.00                                     | 1.63        | [1.19, 2.40]  |

CI = Confidence Interval, GUS = Gambling Urge Scale, GRCS = Gambling Related Cognitions Scale, GRSEQ = Gambling Refusal Self Efficacy Questionnaire. *N* for I-CBT = 60, *N* for CBT = 64