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A systematic review of Internet-based therapy for the treatment of addictions

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ABSTRACT

Traditional therapies for addictions are underutilized and characterized by high attrition rates suggesting they may not meet the needs of a proportion of individuals with addiction-related problems including problem drinking, smoking, substance use and problem gambling. Internet-based therapy has emerged as a new treatment modality for psychological disorders and health issues and this review is the first attempt to summarize and evaluate the evidence of the effectiveness of Internet therapy for addictions. Extensive literature searches were conducted to identify studies meeting the criteria of delivering structured Internet-based treatment programs for addictions that incorporated a component of trained therapist interaction. Only nine studies met criteria for inclusion with seven representing a randomized controlled trial. These included seven papers reporting on tobacco-cessation programs, one Internet-based therapy for pathological gambling, and one treatment program for substance abuse. A range of therapeutic models, treatment components and outcome measures was included across these studies. Positive treatment effects were reported following completion of therapy and at longer-term follow-up. The review concluded that Internet-based therapies for addictions are effective in achieving positive behavioral changes but that more research is required to determine the comparative effectiveness of various Internet-based therapies and their components.

Keywords Addiction, treatment, therapy, Internet, online, intervention studies, alcohol, tobacco, gambling

INTRODUCTION

Internet-based therapies involve use of structured, treatment programs delivered via the Internet that incorporate some degree of therapist interaction (Abbott, Klein, & Ciechomski, 2008). Therapist-client interactions occur most frequently via time-delayed or asynchronous communication, such as email, but also extend to include simultaneous (synchronous) communication, such as chat-based exchanges or instant messaging, and video conferencing. In some instances, Internet-based therapy is also enhanced through telephone or brief face-to-face support from therapist although the majority of client work is completed online.

One application of Internet-based therapy (abbreviated as *Internet therapy*) that deserves investigation is in the treatment of addictions. Internet therapy has potential benefit for a range of substance (alcohol, tobacco, illicit drugs) and non-substance behavioral addictions (problem and pathological gambling). Internet therapy offers several advantages including availability, convenience and accessibility, cost-effectiveness, anonymity and privacy, that are particularly relevant for those seeking help for addictions, but may not be inclined to utilize traditional services (Monaghan & Blaszczynski, 2009a; 2009b). There has been increasing debate as to the validity of categorizing non-substance-related repetitive disorders as addictive disorders similar to substance dependence (Petry, 2006; Potenza, 2006, 2009). However, this is resolving into a proposal to include 'disordered gambling' in the Substance Related Disorders abuse section in Diagnostic and Statistical Manual of Mental Disorders –V (DSM-V; American Psychiatric Association, 2010; Holden, 2010).

In pre-empting changes to DSM-V, we made the decision to apply the term ‘addiction’ more inclusively to cover substance and behavioral addictions; specifically illicit substance and alcohol abuse and dependence, and problem and pathological gambling. As Internet therapy is an emerging treatment option with relatively few published studies, our rationale was to increase the number of evidence-based studies available for review, and to extrapolate conclusions reached to the broader domain of behavioural addictions. The purpose of the current review, therefore, was to evaluate and summarise existing evidence regarding the effectiveness of Internet-therapy for the general class of addictive disorders

Internet-based therapy is becoming increasingly recognized as a plausible treatment option for addictions for a number of reasons. First, this delivery-method increases treatment uptake and retention in populations characterized by low-treatment seeking and high attrition rates (Cunningham, 2007). Less than 25% of people with addiction-related problems ever enter formal treatment, and of those who do, attrition rates are exceedingly high (Melville, Casey, & Kavanagh, 2007; Miller & Miller, 2009; Stark, 1992). Although some individuals recover without specialist treatment, and others may benefit from brief contact, high attrition rates suggest that current therapy options are either not attractive to clients or do not meet their needs (McLellan, 2006). Second, inquiries about seeking Internet therapy are easier than for face-to-face interventions given the fact that no direct personal contact is required. This allows individuals at various stages of change (Prochaska & DiClemente, 1982) to investigate treatment options, without experiencing shame or guilt that may be associated with disclosing the presence of a disorder, missing assessment sessions or dropping out of therapy. Third,

there is support for the effective use of cognitive-behavioral therapy (CBT) and motivational interviewing (MI) interventions in the treatment of addictions including drug and alcohol abuse and dependence and problem gambling (Anton et al., 2006; Carlbring, Jonsson, Josephson, & Forsberg, 2009; Carroll et al., 2006; Martins & McNeil, 2009; MTP Research Group, 2004). These methods are readily adapted to therapist-guided Internet-based exercises to be completed by clients with therapist feedback. Furthermore, online provision of these therapies can offer a more consistent delivery of interventions to clients; an important consideration given treatment effectiveness and clinical trials require clinical fidelity and consistency in implementation (Carroll & Rounsaville, 2007). Fourth, cost-effectiveness of Internet interventions with minimal therapist input compares favorably with face-to-face interventions (Crone et al., 2004; Klein, Richards, & Austin, 2006; Mihalopoulos et al., 2005). Finally, Internet therapies offer accessible, convenient therapy for those who may be unable to access therapy, for example due to geographical location, time or childcare constraints, or those unwilling to access therapy due to pride, fear of stigma, or desire to improve with minimal assistance. Subsequently, there appears to be a growing demand for Internet therapy for addictions (Cloud & Peacock, 2001; Cunningham, Humphreys, & Koski-Jannes, 2000; Saitz et al., 2004).

Despite this potential, treatment providers and regulators have legitimate concerns about efficacy of Internet therapy for addictions, legal and ethical issues, costs and feasibility of Internet therapies and extent to which individuals will use these services. From a research perspective, collecting data from Internet therapy is easier than for

traditional interventions as all records are already electronically transcribed and data is available for each client.

A meta-analysis of the effectiveness of Internet-based psychotherapeutic interventions (Barak, Hen, Boniel-Nissim, & Shapira, 2008) reviewed 92 studies revealing that such interventions have an average medium effect size of 0.53. The type of disorder treated important with psychological disorders appears better suited than those that are primarily physiological or somatic (e.g., weight loss) in nature. Smoking cessation had an effect size of 0.62 while treatments for problem drinking were slightly less effective with an effect size of 0.48; however, more participants were included in the smoking cessation studies (n=5,460) than drinking interventions (n=35). Barak et al. (2008) found that the effects of Internet-based interventions persist post-treatment.

Consistent with the findings reported in other meta-analytic studies (Lambert & Ogles, 2004), Barak et al. (2008) reviewed 14 studies that directly compared Internet therapies and traditional face-to-face therapy for the same problem, with participants randomly being assigned to each treatment mode. There was no statistically significant difference between the average weighted effect sizes for each modality leading these authors to conclude that “*Internet based therapy on the average is as effective or nearly as effective as face-to-face therapy.*” (Barak et al., 2008) p.30.

In the following sections we will evaluate each Internet therapy program for addictions outlining its clinically significant outcome on the basis of measured or self-reported client behavior, diagnostic indicators, and/or overall improvements in functioning and life satisfaction. We will also discuss whether therapies are unique to the disorder being treated, or whether the outcomes may be generalized to other Internet-

based addiction treatments. At the outset it is acknowledged that this is still a very young field in development with limited empirical evidence. However, it is important to review the early foundation to understand and guide its advancement, growth, and projected directions. This is of critical importance to inform funding bodies and policy makers as well as researchers and treatment providers.

METHOD

Inclusion Criteria

Studies were included if they met the following criteria: (i) clients received a structured therapeutic intervention for a substance or non-substance-related addiction including, alcohol or substance abuse and dependence, or problem or pathological gambling; (ii) the study included five or more patients; (iii) the therapeutic intervention was delivered over the Internet; (iv) the intervention involved at least minimal therapist contact over the course of the treatment program (including telephone and face-to-face support); (v) the effectiveness of treatment was based on at least one assessed outcome; (vi) the outcome variables were measured before and either during or immediately following the intervention (additional follow-up outcomes also included).

Literature Search

A computer database search of Medline, PsychINFO, Web of Science, Scopus, PubMed, and Google Scholar was conducted, using the following keywords: online, internet, therapy, counseling/counseling, and treatment. We also reviewed the online bibliography posted on the member's area of the International Society for Research on Internet Interventions, a regularly updated source. All searches were limited to papers published prior to September, 2009.

Classification of Studies

Titles and abstracts of 43,426 papers were reviewed manually to determine if they met inclusion criteria for the review. Table 1 shows the number of papers reviewed in each database. Due to the large number of results generated by Google Scholar, only the first 600 papers were reviewed. Most papers were excluded based on the title or information contained in the abstract. Where necessary, the complete paper was obtained and assessed for classification.

Insert Table 1 about here

Papers were excluded if: (i) they were not in a relevant field; (ii) were duplicates of a previously collected paper; (iii) the intervention was not a therapy programs, i.e. self-help, personalized feedback, peer-support forms, prevention or harm-minimization interventions, education or information or non-expert advice; (iv) treatment was not for an addiction; (v) programs were not completed via the Internet (e.g., computer-based

interventions, bibliotherapy); (vi) reported results based on the same data set as another included paper, effectively representing the same or a preliminary study; and (vii) were not in English.

Information extraction and summary

Information from the nine identified intervention studies was extracted using standardized criteria adapted from the US Guide to Community Preventive Services (Center for Disease Control, 1999) and included study design, sample, intervention characteristics, variables measured and main effects. Data extraction forms were piloted on a sample of preliminary studies and refined.

Study Quality Assessment Checklists and Procedures

The quality of primary studies was assessed by considering the extent to which studies minimized bias and maximized internal and external validity based on CRD Guidelines and the Cochrane Reviewers' Handbook (Alderson, Green, & Higgins, 2004; Khan, ter Riet, Glancille, Sowden, & Kleijnen, 2001). The Australian National Health and Medical Research Council (NHMRC) study design hierarchy (reported by Kitchenham, 2004), shown in Table 2, was used as a basis for ranking studies based on the study design.

Insert Table 2 about here

RESULTS

Information extracted from the nine identified intervention studies is summarized in Table 3.

Study design

Two studies (Carlbring & Smit, 2008; Woodruff, Conway, Edwards, Elliott, & Crittenden, 2007) were randomized controlled trials (RCT) that included a non-treatment (waitlist) control group. Five studies were randomized trials that compared two interventions, one of which was intended to act as an active control (Abroms, Windsor, & Simons-Morton, 2008; Brendryen, Drozd, & Kraft, 2008; Japuntich et al., 2006; King et al., 2009; Mermelstein & Turner, 2006). Two studies included treatment users who self-selected to participate in a research evaluation with no comparison or control group (Hotta et al., 2007; Zbikowski, Hapgood, Smucker Barnwell, & McAfee, 2008).

Sample characteristics

The majority of the studies evaluated programs specifically for tobacco cessation (Abroms et al., 2008; Brendryen et al., 2008; Japuntich et al., 2006; Hotta et al., 2007; Mermelstein & Turner, 2006; Woodruff et al., 2007; Zbikowski et al., 2008), with one study examining Internet treatment for problem and pathological gamblers (Carlbring & Smit, 2008) and one for substance abuse (King et al., 2009). The target population was primarily treatment-seeking adults, although three papers evaluated programs developed specifically for adolescents or young adults (Abroms et al., 2008; Mermelstein & Turner, 2006; Woodruff et al., 2007) and one targeted university employees (Hotta et al., 2007).

In all, studies examined 12,597 participants, 11,888 of whom received an intervention, 11,376 received Internet therapy and 1,221, allocated to no-treatment control groups. The number of clients in each study ranged from $n = 37$ to $n = 11,143$ (mean = 1399.7 SD = 3656.1, median = 136). All studies included both male and female participants and reported mean ages of participants, although three (Hotta et al., 2007; King et al., 2009; Woodruff et al., 2007) did not report the standard deviation for age.

Country where study was undertaken

Two-thirds of the studies were conducted in the United States (US) while one study was carried out in Sweden, one in Norway, and one in Japan. One US-based study included all registered users of a tobacco-cessation site who had been referred by employers or health insurance companies. Each US-based study was limited to residents of a single regional area and most trials recruited participants in person, often through treatment centers or schools/universities. Recruiting participants in person may not generate a realistic sample of online therapy users such as those not willing to seek face-to-face help. Future research should utilize self-selected users of online therapy.

The Norwegian and Swedish studies required participants to be based in these countries and the Japanese study was limited to employees of a particular university. Limiting participation in online therapy programs to residents of a particular jurisdiction may overcome problems associated with duty-of-care and licensing of therapists; however, it also reduces the potential benefits of Internet therapy, including providing therapy to

regions where support may not be available and providing therapy to a geographically diverse population.

Type of intervention

Given the recency of online therapy programs for addictions, no single model of therapy appears to be widely utilized with the use of variable control groups making it difficult to compare the effectiveness of treatment across trials. CBT was the most commonly reported interventions with four programs claiming its use (Abroms et al., 2008; Brendryen et al., 2008; Carlbring & Smit, 2008; Japuntich et al., 2006). Four programs provided direct contact with therapists for support and encouragement via telephone (Brendryen et al., 2008; Carlbring & Smit, 2008; Mermelstein & Turner, 2006) or email (Abroms et al., 2008) exchange. Five interventions facilitated peer-based social support by enabling contact between treatment participants through discussion forums (Japuntich et al., 2006; Zbikowski et al., 2008), emails (Hotta et al., 2007) or group therapy sessions (King et al., 2009; Woodruff et al., 2007). Information to assist in quitting was provided by the majority of programs on websites (Brendryen et al., 2008; Carlbring & Smit, 2008; Japuntich et al., 2006; Hotta et al., 2007; Mermelstein & Turner, 2006; Zbikowski et al., 2008), some of which included interactive tools and exercises for education and practical strategies (Carlbring & Smit, 2008; Japuntich et al., 2006; Zbikowski et al., 2008). Programs also reported incorporating motivational interviewing (MI) strategies (Hotta et al., 2007; Mermelstein & Turner, 2006; Woodruff et al., 2007) and behavioural approaches (Woodruff et al., 2007) in their programs. No trial reported on effectiveness of different online components.

Of the seven tobacco trials, four included access to smoking cessation websites (Brendryen et al., 2008; Japuntich et al., 2006; Mermelstein & Turner, 2006; Zbikowski et al., 2008), three included counseling telephone calls to supplement website use (Brendryen et al., 2008; Mermelstein & Turner, 2006; Zbikowski et al., 2008) and one included printed self-help workbooks in addition to website use and telephone counselling (Carlbring & Smit, 2008). One smoking cessation program for young adults used tailored emails in addition to in-person counseling and self-help kits (Abroms et al., 2008). A Japanese University conducted cessation program utilizing support emails between group participants in addition to group therapy and nicotine patches (Hotta et al., 2007). Another program for adolescent smokers conducted group therapy sessions online in a virtual world (Woodruff et al., 2007).

Among the other interventions, one study provided an Internet therapy program for pathological gamblers supplemented by weekly telephone counseling calls (Carlbring & Smit, 2008) and one trial of Internet-based substance abuse therapy utilised video-conferencing to conduct twice weekly online group therapy sessions (King et al., 2009).

Data collection methods and variables analysed

Two studies were evaluated by self-report surveys alone as an outcome measure (Brendryen et al., 2008; Woodruff et al., 2007), whereas others were assessed by several measures, including self-report, health and biometric measures, website tracking data or therapy program compliance, and psychological assessment scales or clinical interviews. Given the variability between studies in the outcomes reported and samples included it was not possible to conduct a meta-analysis. Such variability in study aims and methods

made comparison of results across studies very difficult and indicates the need for some standardization of methods used for conducting and evaluating online interventions for addictions. It is acknowledged that the newness of this field makes it difficult to reach consensus on conducting trials and it is hoped that this critical review can be used to assist the process.

The majority of studies included did not report results of demographic variables or other participant characteristics that may have influenced treatment effectiveness. Of those that did, there was some evidence that Internet therapy was more effective for women than men. Mermelstein and Turner (2006) found that among adolescent smokers, females were significantly more likely to have quit than males at the end of treatment and at 3-month follow-up. Females were also significantly more likely to be abstinent at 3 months, as were lighter smokers, younger and non-White participants (Mermelstein & Turner, 2006). Similarly, Zbikowski et al. (2008) reported that female smokers were significantly more likely than male smokers to utilize online discussion forums and complete a greater number of supplementary telephone counseling calls. Further analysis showed that older callers were significantly more likely to complete more calls than younger callers (18 – 25 years) and younger participants used the online intervention significantly less often than middle-age participants (41-60 years). Moderate smokers used the online intervention significantly more often than light or heavy smokers and also used discussion forums more often than light smokers (Zbikowski et al., 2008). Finally, participants eligible for tobacco cessation treatment through their employer were more likely to use the online smoking therapy intervention than those eligible for treatment through their health insurance plan (Zbikowski et al., 2008). The only other study to

analyze demographic variables found that smoking cessation rates did not differ by gender; however at 6 months, older participants were more likely to be abstinent (Japuntich et al., 2006).

Methodological adequacy

Overall, there were limitations to the methodological adequacy of all the studies, although several contained important strengths. Based on the NHMRC study design hierarchy, seven studies were classified as Level II; random allocation of samples and inclusion of control (or comparison) groups (Abroms et al., 2008; Brendryen et al., 2008; Carlbring & Smit, 2008; Japuntich et al., 2006; Hotta et al., 2007; King et al., 2009; Mermelstein & Turner, 2006; Woodruff et al., 2007), and two were classified as Level IV (Hotta et al., 2007; Zbikowski et al., 2008); absence of random allocation or control groups. Although one trial of online therapy for pathological gambling (Carlbring & Smit, 2008) did include a control group, no comparisons were able to be made for treatment effects at follow-up given that this wait-listed group was eventually provided with therapy.

As a no-treatment control group was not included in some studies (Brendryen et al., 2008; Hotta et al., 2007; Japuntich et al., 2006; Hotta et al., 2007; King et al., 2009; Mermelstein & Turner, 2006; Woodruff et al., 2007; Zbikowski et al., 2008) it is not possible to determine if results may be accounted for by other factors such as inclusion in research, changes in motivation or life changes. None of the trials evaluated specific components of Internet-based therapy to determine which aspects led to the favorable outcomes associated with the intervention.

Several studies had relatively small samples sizes with less than 100 participants (Abroms et al., 2008; Carlbring & Smit, 2008; King et al., 2009), and recruited from restricted populations, for example students recruited from schools, colleges (Abroms et al., 2008; Woodruff et al., 2007) or employees of a university (Hotta et al., 2007), thereby limiting conclusions drawn and the extent to which results can be generalized to other populations.

According to the Cochrane Collaboration guidelines (Waters et al., 2006), selection biases mean that subjects may not be representative of the population for which the intervention is intended. To enable random allocation to conditions several studies actively recruited individuals to participate in a treatment-outcome research trial (Abroms et al., 2008; Brendryen et al., 2008; Carlbring & Smit, 2008; Hotta et al., 2007; Japuntich et al., 2006; Hotta et al., 2007; Woodruff et al., 2007) to evaluate effectiveness of the online interventions. In these cases, samples are unlikely to mimic real-life users due to the active recruitment used, willingness of participants to undergo random-allocation to treatment, and in some cases (Japuntich et al., 2006; Woodruff et al., 2007) compensation for participants. In contrast, another study (Zbikowski et al., 2008) evaluated clients who self-selected to use the online intervention. For this study, random allocation was not possible as all participants were evaluated as a group, however, before and after treatment comparisons were possible. Both methodologies have the potential to contribute valuable results, however these limitations should be acknowledged by authors and efforts should be made to conduct both forms of trials.

High rates of withdrawals and dropouts mean that the subjects remaining in the study may not be representative of the population from which they were derived. In the

trial with greatest resemblance to real-world usage of the Internet intervention (Zbikowski et al., 2008) only 50.9% of respondents completed the evaluation survey, which may introduce a response bias into results. Similarly, in the interventions aimed at adolescents only 65% (Mermelstein & Turner, 2006) and 73% (Woodruff et al., 2007) of the original participants completed follow-up measures and there was a tendency for non-response to be higher among intervention participants (Woodruff et al., 2007), limiting the conclusions that can be drawn.

In some studies, reliability and validity of the self-report measures used were not addressed and there are inherent limitations in the accuracy of self-report data (Brendryen et al., 2008; Carlbring & Smit, 2008; Zbikowski et al., 2008). Some studies used biochemical verification in addition to self-report data (Abroms et al., 2008; Japuntich et al., 2006; King et al., 2009; Mermelstein & Turner, 2006), although this can only be conducted on those who present in person and may be of limited use in detecting sporadic smoking.

Effectiveness

With regard to intervention effectiveness, the majority of trial reported positive results for the Internet therapy. Two studies (King et al., 2009; Zbikowski et al., 2008) reported no statistically significant results between interventions, although one (King et al., 2009) compared face-to-face group therapy to online group therapy demonstrating that the Internet therapy was as effective as face-to-face therapy. In this study, 70% (n=37) of Internet therapy participants achieved at least two weeks consecutive illicit substance abstinence and there was 100% attendance to return to less-intensive care. Furthermore,

clients in the online intervention expressed a preference for this mode of treatment (King et al., 2009). Six studies reported significantly greater self-reported smoking quit-rates or abstinence at the end of the treatment trial for participants in the Internet intervention (Abroms et al., 2008; Brendryen et al., 2008; Hotta et al., 2007; Hotta et al., 2007; Mermelstein & Turner, 2006; Woodruff et al., 2007; Zbikowski et al., 2008) as compared to controls and several trials found significant improvements in smoking at 3-month (Abroms et al., 2008; Mermelstein & Turner, 2006), 6-month (Abroms et al., 2008; Zbikowski et al., 2008) and 12-month (Hotta et al., 2007; Woodruff et al., 2007) follow-ups. For example, at 6-month follow-up evaluation 30-day tobacco quit rates were 41% using responder analysis and 21% using intent-to-treat analysis (Zbikowski et al., 2008). Another study reported 20% repeated-point tobacco abstinence at 3, 6, and 12 month follow-up (Brendryen et al., 2008). In another trial self-reported seven-day tobacco abstinence was 31% at 3-month, 25% at 6-months (Abroms et al., 2008), and one study found at 12-month follow-up 53% of participants had sustained abstinence from smoking for one year (Hotta et al., 2007).

Online treatment components appear to be effective as website usage was significantly related to abstinence and quit-rates at post-treatment (Japuntich et al., 2006; Mermelstein & Turner, 2006; Zbikowski et al., 2008) and 6-month follow-up (Japuntich et al., 2006). Similarly, Hotta and colleagues (2007) found that writing and sending emails early in treatment was a significant predictor of successful smoking abstinence at 12-month follow-up. Mixed results were found for the addition of telephone counseling calls, which were not related to smoking abstinence for one trial (Mermelstein & Turner, 2006) but significantly increased the likelihood of successful smoking quit rates in

another trial (Zbikowski et al., 2008). These disparities may be accounted for by the population sampled as Mermelstein and Turner (2006) cited difficulties in reaching adolescents at home on the phone and engaging them for more than a few brief minutes, whereas, in Zbikowski and colleagues' (2008) trial, clients initiated the call to counselors, indicating their desire to talk. The Internet-based gambling program with telephone counseling calls (Carlbring & Smit, 2008) was found to significantly reduce pathological gambling at post-treatment and 6, 18, and 36-month follow-ups. Furthermore, anxiety and depression scores reduced and quality of life appeared to increase for treatment participants. This was the only study to include effect sizes at post-treatment, 6, 18, and 36-month follow-up ($d_s = 0.83; 2.58; 1.96; 1.98$), which indicated that treatment effects were large and sustained. Follow-up data revealed that 68% of the original sample had not gambled during the past month at 6-months, 62% at 18 months, and 56% at 36 months. The failure to measure and include effect sizes by the other intervention studies limits the conclusions that can be drawn with regards to treatment effectiveness. It would be expected that future studies would include effect size data to facilitate comparison between research trials and treatment options.

DISCUSSION

There was a lack of consistency across studies in the type of Internet-based therapy provided with the use of multiple modes of therapy characteristic across research trials. The most commonly used therapies included CBT and MI, modes of treatment that have been previously used successfully in the treatment of addictions and lend themselves well to Internet-based adaption. This is supported by findings from a meta-analysis of Internet

treatment options that found CBT was much more effective than other approaches including psycho-education and behavioral therapies (Barak et al., 2008). Unfortunately trials reviewed did not evaluate treatment component effectiveness, however, as the multiple clinical methods and techniques employed all appeared to have positive treatment outcomes effects, this suggests that an eclectic approach to Internet-based therapy may be appropriate.

One finding that did emerge was a potential link between client engagement and interaction and treatment success. Several trials reported that clients who appeared to actively use the available treatment options, including websites, emails, and telephone calls, were more likely to have successful treatment outcomes. Furthermore, the problem gambling Internet therapy program included a motivational enhancement approach that appeared to have a positive effect on participants (Carlbring & Smit, 2008); however, the specific impacts of the motivational component were not separated from overall treatment effects. Additionally, a review of substance abuse treatment attrition found that clients were likely to continue longer if the treatment was conveniently located, they received rapid initial response and individual attention and when seen in comfortable environments (Stark, 1992). Internet therapy facilitates the provision of these variables, which may be capitalized on to increase treatment utilization and success. These results highlight the importance of including motivational components in treatments and providing multiple methods in which clients can seek to engage in treatments to suit various communication and interactive preferences.

As the majority of studies did not report on demographic characteristics, it is difficult to conclude who might have the greatest potential benefits from these

interventions. Future studies should clarify whether sex and age in particular has an impact on Internet therapy outcome as well as education and socioeconomic status of participants. Of the studies that did comment on these variables, it appears that women were more likely than men to benefit from Internet therapy, which may be moderated by women being more involved in treatment utilization. Mixed results were found for the effect of age on smoking cessation, although there is evidence that youth may be an ideal audience for Internet-based interventions for addictions (Monaghan & Wood, 2010). A review of available evidence suggests that Internet therapy appeals to adolescents and young adults who are familiar with the technology and have a preference for seeking help and support online due to the convenience and privacy (Monaghan & Wood, 2010). However, in order to be effective, Internet therapy must be specifically tailored for youth to increase utilization and effectiveness of available services. A review of Internet interventions found that youth and oldest adults seem to be less effectively treated as compared to young (19 – 24) and older (25 – 39) adults (Barak et al., 2008), confirming that a single intervention is unlikely to be effective for all age groups. As few specific interventions exist for children and adolescents (Amstadlter, Broman-Fulks, Zinzow, Ruggiero, & Cercone, 2009) this may be an area for future development.

Consideration of the current environment and context for help-seeking for addictions provides insight into the rationale for the demand for and effectiveness of Internet therapy. From a theoretical perspective, CBT appears to be the most successful mode of treatment for addictions (Babor et al., 2003; Finney & Moos, 1998; Petry et al., 2006; Toneatto & Ladouceur, 2003) and these approaches appearing to be transferred with success to Internet-based therapy programs (Barak et al., 2008). In Internet therapy,

clinician input is markedly reduced compared to face-to-face treatment, with feedback delivered, and decision-trees determined, by the computer. In a review of all Swedish trials of online therapy, Andersson et al. (2008) concluded that Internet therapy saved as much as 50-80% of therapist time. However, time spent by the client is not reduced; in fact Internet therapy may be more time consuming for clients than face-to-face therapy, as texts are used in homework assignments and clients continuously report progress and obtain feedback if exercises fail. This increased client involvement in therapy may increase self-efficacy, the belief that one can enact required behaviors for change, which is alleged to mediate changes in gambling behavior (Hodgins, Peden, & Makarchuk, 2004).

Greater self-efficacy may also increase ownership and responsibility for change, assisting clients to move through the stages of change (Prochaska & DiClemente, 1982) and increasing motivation and commitment to behavioral change. Internet therapy is consistent with the stages of change model, which conceptualizes behavioral change as occurring through identifiable stages (pre-contemplation, contemplation, action and maintenance) and that motivation to change can be influenced by stage-specific interventions (Prochaska & DiClemente, 1982). For example, the increased convenience of accessing therapy online and treatment flexibility allows individuals to investigate therapy options without experiencing the shame of failing to complete face-to-face therapy sessions. Furthermore, as Internet therapy is cost-effective for clients, they may seek additional sessions as needed to manage relapses following treatment completion.

Client satisfaction and therapeutic alliances may also contribute to the success of Internet therapy. In a direct comparison of clients who received Internet and face-to-face

counseling, online clients achieved higher global functioning scores than face-to-face clients but no significant differences were found in the amount of client change (Murphy et al., 2009). Furthermore, results of a client satisfaction survey found that online counselors were equally effective in establishing the essential components of a working counseling relationship including therapeutic alliance (Murphy et al., 2009). Similarly, comparative research trials have found that Internet therapy clients reported experiencing greater ease self-disclosing, deeper and smoother exchanges and equal or greater working alliances with online therapists that were more positive as compared to face-to-face therapy clients (Cook & Doyle, 2002; Kiropoulos et al., 2008; Leibert, Archer, Munson, & York, 2006; Reynolds, D'Arcy, Stiles, & Grohol, 2006). The higher impact ratings for online therapy may be related to email communication, which allows both clients and therapists greater reflection and editing ensuring that the wording is clear and concise and provides a record for later consideration. Written communication may also allow clients to achieve greater clarity and distances from thoughts and emotions (Murphy & Mitchell, 1998). Finally, online counseling appears to make therapists appear more readily, easily and conveniently accessible (Barak, 1999) with greater flexibility of session times and capacity for timely responses, increasing client satisfaction and fostering rapport building. It is important to note that the above studies are limited by small sample sizes, but they provide some support for the conceptual understanding of the success of Internet therapy.

The current evaluation has a number of limitations. Most notable is the paucity of data available for analysis. Despite an increasing number of studies discussing Internet-based interventions for the treatment of addictions, only a small number of these

represented suitable trials that included therapist support and met inclusion criteria. Interventions that did not include therapist contact were excluded as these represented too broad a range of self-help strategies, many without strong outcome measures. The intention of the current review was to concentrate on Internet-based therapies as opposed to brief or self-guided interventions that included online components. Notwithstanding the small number of empirical studies available, a review of this new form of therapy is important to track the progress and development of these interventions in their infancy. This review will inform existing and subsequent trials of Internet therapy programs for addictions. There was also a lack of comparability across studies due to the wide range of outcomes measured and methodological differences. The newness of this field has precluded the establishment of a gold standard treatment evaluation method and this limits the extent to which trials and treatments can be compared and contrasted. Furthermore, as noted, it was not possible to determine the effectiveness of various treatment components as Internet-based therapies were evaluated as a whole. Therefore, it is difficult to determine whether the treatment effects were unique to the population studied, or whether they could be generalized to other forms of addiction.

Given the scarcity of studies appropriate for inclusion in this review there are clearly a number of issues in this important area of research. First, there is an obvious need to conduct more intervention studies. Second, there is a need to improve the methodological inadequacy of studies undertaken, by selecting rigorous study designs and dealing carefully with issues pertaining to recruitment of appropriate and sufficiently large samples, randomization, and participant retention. Methodological flaws in treatment studies limit the firm scientific knowledge that can be concluded about the

treatment (Toneatto & Ladouceur, 2003). Other important design components to consider include the use of direct behavioral measures as opposed to non-validated self-report ratings to evaluate outcomes; collecting baseline data to assess the actual treatment impact and additional treatment seeking behavior in addition to use of Internet therapy to control for outside therapeutic assistance. It is also important for standardized measures to be used to avoid inconsistency in definitions of treatment success and enable treatments to be compared in terms of outcomes.

None of the studies included in the review considered the mediation or process of behavioral change. It is assumed that changes observed in the behavior in question (for example, smoking, gambling, or alcohol consumption) is a result of the techniques and interventions administered during the Internet therapy. This assumption should be empirically tested for example by including measures of relevant cognitions and beliefs to properly test the constructs proposed to mediate changes in behavior (Toneatto & Ladouceur, 2003).

Our review also suggests that future research trials should pay more attention to measurement issues. As noted above, it was difficult to draw inferences across aggregated studies because of the non-comparability of instruments used to measure treatment outcomes. Wherever possible, self-report data should be confirmed through biochemical testing or clinician interviews. This would enable the level of accuracy to be estimated for purely Internet-based studies. Follow-up data should also be collected where possible to understand the long-term impacts of Internet-based therapy. Clients who did not complete the therapy program should be included in follow-up studies to

determine the impact of partial program completion, including whether they subsequently engaged in any form of treatment.

A combination of research methodologies may be necessary to enable controlled research trials that evaluate treatment component effectiveness to be conducted alongside evaluations of implemented treatments with clients recruited without incentives or randomization. Use of multiple research methodologies will control for extraneous variables and research and participant biases when the results are compared. Future research should also begin to focus on subgroups of addiction populations, for example youth and older adults as well as considering different techniques to increase treatment effectiveness among men and women. Addressing these important research issues will increase the opportunities for building on existing knowledge to produce an effective research framework for the future. Increasing the quality of research will enable effective clinical interventions to be implemented to assist those with addiction-related problems.

In conclusion, the first review of the effectiveness of Internet-based therapy for addictions indicates that this mode of treatment delivery may be effective in enabling appropriate behavioral change among clients. This is a very important finding for the addictions field given that a large proportion of individuals with substance and non-substance abuse problems and disorders do not seek treatment and there are high attrition rates among those that do (Cunningham, 2007; Melville et al., 2007; Miller & Miller, 2009; Stark, 1992). This indicates that existing treatment options are not suitable or desirable for all individuals with addiction-related problems and new modes of therapy should be considered. The widespread and growing availability of the Internet presents an

opportunity for broad dissemination and improved access to interventions (Cunningham et al., 2005; Copeland & Martin, 2004).

This review has also highlighted the need for further research to determine if treatment effects can be generalized between disorders. Future research must also examine the specific components that should be included to increase the effectiveness of treatment and evaluate the process variables that may mediate behavior change. Such studies should include a representative sample of sufficient size to enable detection of treatment effects as well as influencing demographic variables and participant characteristics. Increasing the methodological validity and scope of treatment interventions will result in more effective Internet therapies through the development of appropriate components and techniques to improve the delivery of treatments, and replication and implementation by other treatment researchers. Use of the Internet is rapidly increasing and this medium is becoming progressively more necessary to reach and serve consumers. This medium has enormous potential to provide a highly influential tool to assist individuals in overcoming their addictions in a manner that appropriately meets client's expectations and needs.

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Table 1 Number of papers appearing in results of keywords search for computer databases

Database	Number of papers searched
PsychINFO	2,452
Web of Science	5,244
Scopus	13,765
Medline/Web of Knowledge	12,714
PubMed	8,651

Table 2 Australian NHMRC Study design hierarchy

Level I	Evidence obtained from a systematic review of all relevant randomised trials
Level II	Evidence obtained from at least one properly-designed randomised controlled trial
Level III-1	Evidence obtained from well-designed pseudo-randomised controlled trials (i.e. non-random allocation to treatment)
Level III-2	Evidence obtained from comparative studies with concurrent controls and allocation not randomised, cohort studies, case-control studies or interrupted time series with a control group.
Level III-3	Evidence obtained from comparative studies with historical control, two or more single arm studies, or interrupted time series without a parallel control group
Level IV	Evidence obtained from case series, either post-test or pretest/post-test

Table 3 Study characteristics

Study	Target population	n (% male)	Mean age (years)	Type of interventions	Outcome measures	Main Effects
Mermelstein & Turner (2006)	Adolescent Smokers US Volunteers	351 (46.2 %)	16.4 (SD=1.1)	Assigned randomly to: IG1: standard 10 session group-based program IG2: above plus 1 phone call during Quit week, 4 booster telephone calls and access to smoking cessation website	Self reported: -Average daily cigarette consumption -past 30 days smoking - motivation to quit - website usage Biochemical: -carbon monoxide measures Website data: -tracking data	IG2: -Greater 7-day quit rates at end of treatment (confirmed by carbon monoxide assessments) 3-month follow-up: - sig. greater quit rate and abstinence
Japuntich et al., (2006)	Adult Smokers US	284 (45.1 %)	40.8 (SD=12.1)	Assigned randomly to: IG1: bupropine plus counselling IG2: bupropine plus counselling plus access to smoking cessation	Self reported: -7-day abstinence Biochemical: -carbon monoxide measures Website data: -tracking data	No sig. difference between IG1 & IG2 Website use sig. related to abstinence at 3- and 6-months post-quit

Zbikowski et al., (2008)	Adult Smokers US Tx-seeking	11143 (46%)	43.0 (SD=10.8)	website IG1: -smoking cessation website -5 telephone counselling calls -20 tailored emails -printed self-help workbook -cessation medication information	Self- reported: -tobacco use -30-day abstinence -program satisfaction Website data: -tracking data Phone calls: -number of calls completed	Quit rates at 6-months follow-up were 41% (responder analysis) and 21% (intent- to-treat analysis) Website use sig related to increased call completion and abstinence at 6-months follow-up Satisfaction with service was high
Carlbring & Smit (2008)	Adult Pathological Gamblers Sweden Tx-seeking	66 (94%)	31.9 (SD=9.8)	Assigned randomly to: IG: -8 Internet- based CBT modules -8 telephone counselling calls	-Clinical interview - PG screen (NODS) - Anxiety and depression scale (HADS) -Quality of life inventory	IG: -sig. reduced gambling problems, anxiety and depression and improved QOL at post- treatment and 6, 18 and 36 months follow-up
King et al., (2009)	Adult Opioid- dependent outpatients US Tx-seeking	37 (57%)	40.6	CG: waitlist Assigned randomly to: IG1: 1-hr online therapy group x2	Self- reported: -program satisfaction Clinician reported:	No sig. difference between IG1 & IG2 IG1 participants

				per week	-counselling adherence	reported strong preference for Internet-based therapy
				IG2: FTF weekly group counseling	-step completion Biochemical: -urine analysis	
Brendryen et al., (2008)	Adult Smokers Norway Tx-seeking	396 (49.7%)	36.2 (SD=10.3)	Assigned randomly to: IG1: -smoking cessation website -daily emails -SMS text messages -daily interactive voice response messages to cellphones IG2: self-help printed booklet	Self-reported: -7-day abstinence -Nicotine dependence (FTND) Program adherence: -website tracking data -interactive voice response messages received	IG1: -sig higher repeated point abstinence rates at 1, 3 & 6-months -improved adherence to NRT; Higher self-efficacy
Abroms et al., (2008)	College students Smokers US Tx-seeking	83 (54.2%)	19.8 (SD=1.3)	Assigned randomly to: IG1: -FTF counselling session -young-adult oriented self-help kit -20 tailored emails	Self-reported: -7-day abstinence -quantity and frequency of cigarette consumption -program satisfaction -Nicotine dependence	IG1: -quit for more consecutive days at 3, and 6-month follow-ups -more engaged in the program -rated treatment more favourably

				IG2: -FTF counselling session -self-help kit	(FTND) -Depression (CES-D) Biochemical: -salivary cotinine analysis	
Hotta et al., (2007)	Adult University Employees Smokers Japan	101 (98%)	45	IG: -7 Group therapy sessions - nicotine patch prescription (14 free) -read and write support emails -64 email newsletters -self-help booklet	Self-reported: -continuous abstinence Clinician measured: -compliance -toxicity -smoking status Biochemical: -carbon monoxide measures	-53% sustained smoking cessation for 1 year -sending emails in first week was sig. related to smoking cessation
Woodruff et al., (2007)	Adolescent Smokers US	136 (54%)	16	Schools were randomly assigned to: IG: -7x 45-minute virtual world group sessions -4-online surveys CG: 4-online surveys	Self-reported: -past-week abstinence -quantity and frequency of cigarette consumption -lifetime quit attempts -readiness to quit -program satisfaction	IG: -sig. greater immediate post treatment past-week abstinence and reduced past-week smoking -sig. greater number of times quit at post, 3 & 12-month follow-up

Tx-seeking = Treatment seeking; IG = intervention group; CG = control group; sig. = statistically significant; CBT = cognitive behavioural therapy; FTF = face-to-face; PG =

pathological gambling; NODS = NORC Diagnostic *Screen* for *Gambling* Problems;
HADS = Hospital Anxiety & Depression Scale; FTND = Fagerstrom Test for Nicotine
Dependence; CES-D = Center for Epidemiologic Studies Depression scale