THE PSYCHOLOGY OF GAMING AND GAMBLING

by

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Overview

This thesis is submitted in partial fulfilment of the requirements for the degree of Doctorate of Clinical Psychology (Clin.Psy.D) at the University of Birmingham. The thesis consists of two volumes.

Volume I

This volume has three parts. This first part consists of a systematic literature review investigating the evidence of computer-assisted cognitive behavioural therapy and motivational feedback interventions for problem gamblers. The review supports the use of these interventions in reducing problem gambling. This is followed by an empirical study exploring the mediating effects of motivators for playing online games on play time and psychological wellbeing. Increased play time was associated with poorer psychological wellbeing, especially when there is a greater motivation for escapism. The negative impact of 'escapist' gaming was strengthened for individuals with low self-esteem. Finally, a public domain briefing document provides an accessible summary of the literature review and empirical paper.

Volume II

Five clinical practice reports are presented in this volume. The first report details the case of a 39-year-old male experiencing social anxiety and low-mood, formulated from cognitive-behavioural and systemic perspectives. The second report presents a service development project, designed to evaluate the long-term conditions training for staff. The third report details a single-experimental design applied to the case of an 86-year-old male with panic attacks and low mood to evaluate a cognitive-behavioural intervention. The fourth report describes a case study of a 16-year-old male with social anxiety and low mood. The fifth is an abstract of an oral presentation given to describe the case of a 40-year-old male with mild learning disability, low mood and anger difficulties.

All names and identifying features have been changed to maintain confidentiality.

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And most of all, to God - thank you. Psalms 119:115 “Your word is a lamp to my feet and light to my path”.

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Volume I

Literature Review

A systematic review of the effectiveness of computer-assisted cognitive behavioural therapy and motivational feedback interventions for problematic gambling

Abstract

Background: A range of psychosocial interventions have demonstrated effectiveness in reducing problem gambling. However, only a small percentage of problem gamblers seek treatment due to factors including long waiting lists, the fear of stigma, and the financial cost involved. Distance-based support and computerised treatments provide potential avenues for problem gamblers to obtain support.

Aims: Two of the most common treatments for problematic gambling include cognitive behavioural therapies and motivational interviewing interventions. The current review therefore aimed to evaluate the effectiveness of the computer-based formats, specifically computer-assisted cognitive behavioural therapy and motivational feedback interventions for problematic gambling.

Methods: Systematic searches of electronic databases were conducted using a search term strategy specific to problem gambling and computerised psychological interventions. The studies were screened against set inclusion criteria, and subsequently appraised for their methodological quality using the National Institute of Clinical Excellence quality framework.

Results: Thirteen studies evaluating computer-assisted cognitive behavioural therapies and feedback interventions were identified. The majority of computer-assisted cognitive behavioural interventions reported positive treatment effects. Computer-assisted motivational feedback interventions were also found to be effective, although the treatment effect seemed to be short-lived.

Conclusions: This review supports the use of computer-assisted cognitive behavioural therapies and motivational feedback interventions in reducing problem gambling. Further good quality randomised controlled trials are needed before more firm conclusions about efficacy can be made.

Keywords: systematic review, problem gambling, computer-assisted, online, cognitive behavioural therapy, motivational feedback interventions

1.0 Introduction

The legalisation of gambling has led to a concomitant widespread market proliferation and to increased access to multiple forms of gambling (Abbott, Volberg, Bellringer & Reith, 2004; Toneatto & Ladouceur, 2003). A prevalence study has estimated that around 1% of the UK adult population experience gambling problems (Sproston, Erens & Orford, 2000). There is also cause for concern over gambling problems in the younger population, with existing studies highlighting that the prevalence rate of problem gambling amongst adolescents is almost doubled when compared to the adult rate (Derevensky & Gupta, 2004; Ipsos MORI, 2009). An estimated 5% of college students in the USA and Canada meet the criteria for problem gambling (Shaffer, Hall & Vander Bilt, 1999). These statistics are a cause for concern, as problematic gambling, if left unaddressed, may lead to potentially detrimental social consequences, something which can become an increasingly significant problem when considering the increasing access to gambling (Monaghan & Blaszczynski, 2009).

For the purposes of this review, the term 'problem gambling' is used to describe individuals experiencing adverse consequences as a result of their gambling, but who may not meet the criteria for a diagnosis of pathological gambling. Conversely, 'pathological gambling', classified as an impulse control disorder, is defined as "the loss of control over gambling, deception about the extent of one's involvement with gambling, family and job disruption, theft, and chasing losses or an effort to win back money lost whilst gambling" (DSM IV, American Psychiatric Association, 2000).

Whilst there are many well-developed psychosocial treatments for problem gambling (Pallesen, Mitsem, Kvale, Johnsen & Molde, 2005), only a small percentage (7-12%) of problem gamblers seek treatment (Ladouceur, 2005). Long waiting lists, a shortage of therapists, the fear of stigma, and the fear of the financial cost involved are some of the deterrents to seeking face-to-face treatment (Hodgins & el-Guebaly, 2000; Evans & Delfabbro, 2005). As such, distance-based support treatment and counselling programmes are becoming increasingly popular ways for problem gamblers to obtain much needed support (Danielsson, Eriksson & Alleback, 2014).

A practical way of providing access to such treatments is through the use of computers. Proponents for computer-based interventions argue that the latter can counteract the aforementioned challenges by providing cost-effective interventions that can be widely

available, accessible, convenient, and anonymous (Monaghan & Blaszczynski, 2009). While the majority of the literature on computer-assisted interventions have targeted addiction disorders for tobacco, substance, and alcohol abuse (Moore, Fazzino, Garnet, Cutter & Barry, 2011), more recent attention has been given to an examination of the effectiveness of computer-assisted treatments for problem gambling (Gainsbury & Blaszczynski, 2011b).

Two of the most common computer-assisted interventions for problem gambling are computerised cognitive behavioural therapies (cCBT) and computer-assisted motivational feedback interventions (Gainsbury & Blaszczynski, 2011b, Miller Soverign & Krege, 1988). This is because the more traditional forms of therapy that these interventions are adapted from (i.e. CBT and motivational interviewing respectively) possess a robust evidence base for treating addictions in general (Gooding & Tarrier, 2009; Carlbring, Jonsson, Josephson & Forsberg, 2009).

Efforts have been made to uncover the underlying mechanisms for behavioural change in CBT and motivational interviewing (MI) for addiction treatment. Using mediation analysis, researchers discovered that self-efficacy and coping strategies promoted in CBT, along with the therapeutic alliance, are some of the active ingredients for change in addiction recovery (Longabaugh, 2002; Kiluk, Nich, Babuscio & Carroll, 2010). For MI, research has demonstrated that components such as reflecting, affirmation, client control, normative feedback, and change talk (e.g. reasoning, commitment to change) are predictors of outcomes for substance use (Gaume, Gmel, Faouzi & Daeppen, 2008; Lundahl, Kunz, Brownell, Tollefson & Burke, 2010; Amrhein, Miller, Yahne, Palmer & Fulcher, 2003). Some of these components, such as strategies promoting self-efficacy and coping, and providing normative feedback may be delivered by computers. This could in part explain why computerised treatments have been developed and are being tested in the last decade for their efficacy in treating addictions such as problematic gambling.

There may however be some challenges to the online implementation of CBT and MI. For example, the forging of a therapeutic alliance, which is an essential component in traditional face-to-face CBT, may be difficult to establish in an online setting due to minimal therapist-client contact. Further, the use of change talk in MI, which involves some level of interactive communication between therapist and client, may be difficult to enact through an online medium. The nature of therapeutic effects is sophisticated, layered and nuanced, and this may mean that certain components from these interventions are less transferable online. It is

therefore important to examine how effective computer-assisted CBT and motivational feedback interventions are in treating problematic gambling.

1.1 The evidence so far

While there is no literature that has specifically assessed computer-assisted CBT and motivational feedback interventions for problematic gambling, two closely related reviews have examined the effectiveness of internet-delivered treatments for multiple addictions, albeit the predominant focus on substance abuse and tobacco addiction (Gainsbury & Blaszczynski, 2011a; Chebli, Blaszczynski & Gainsbury, 2016). Altogether, four studies examining the efficacy of online interventions for problem gambling were included in the reviews (Carlbring, Degerman, Jonsson & Andersson, 2012; Carlbring & Smit, 2008; Castrén et al., 2013; Myrseth, Brunborg, Eidem & Pallesen, 2013). The primary treatment approach employed in these studies was computerised CBT involving some level of therapist contact over the course of the treatment programme. However, other forms of computer-assisted interventions that involve almost no therapist contact or that are relatively brief (e.g. personalised normative feedback interventions), have demonstrated effectiveness for treating problematic gambling (e.g. Celio & Lisman, 2014; Martens, Arterberry, Takamatsu, Masters & Dude, 2015).

1.2 Aim

As computer-assisted technologies can be a medium to deliver self-guided and interactive treatment programmes, the purpose of the current review is to systematically evaluate the existing evidence for the effectiveness of computer-assisted cognitive behaviour therapies and motivational feedback interventions for problematic gambling. The next section will describe the methodology in terms of the search strategy employed.

2.0 Method

2.1 Search strategy

A computer database search for references was conducted on Medline (including PubMed), PsychINFO and Embase using the procedure described in Table 1.

2.2 Inclusion and exclusion criteria

The included studies met the following criteria:

I. The theme of the article considered problem gambling (may be of varying severity);
II. Participants received therapeutic interventions that were computer-assisted;
III. The effectiveness of the treatment was based on at least one assessed quantitative outcome;
IV. The quantitative outcome variables to have been measured before and following the intervention (including additional follow-up points);
V. The article was published in an academic peer reviewed journal.

2.3 Classification of studies and exclusion

The retrieved studies identified by the search strategy described were then ranked on the basis of their study design, in line with the National Institute of Clinical Excellence (NICE) Algorithm for classifying studies[1] (NICE, 2012). Any studies categorised as level three (i.e. non-analytic studies) or as level four (i.e. expert opinion) were excluded, as were articles that were not written in English.

2.4 Quality criteria

The advantage of the revised NICE framework is that it provides evaluated criteria for multiple experimental designs, which contrasts with other quality criteria (e.g. Deeks et al., 2003; Moher, Schulz & Altman, 1999). It was therefore anticipated that it would be possible to critically appraise the majority of the study designs used, to determine the effect of an intervention on an outcome, with this revised tool.

The framework contains 24 checklist items grouped into the following categories: population, method of allocation, outcomes, and analysis. Each item is scored on one out of five responses:

[1] Please refer to Appendix 1 for the NICE algorithm for the classification of studies (NICE, 2012).

'strong', 'moderate', 'poor', 'not applicable', 'not reported'. The NICE framework[2] (NICE, 2012) then provides a summary section, where the overall quality of each paper is assessed in terms of its internal and external validity—the overall quality of each paper is rated as *poor* (few or no checklist criteria have been fulfilled, where they have not been fulfilled, the conclusions are likely or very likely to alter), *moderate* (some of the checklist criteria have been fulfilled, or have not been adequately described, the conclusions are unlikely to alter), or *strong* (all or most of the checklist criteria have been fulfilled, where they have not been fulfilled, the conclusions are very unlikely to alter).

Table 1. Search terms used in electronic database search

Group A	Group B	Group C
Psychological therapy Cognitive Therapy Cognitive Behavioural Therapy Motivational feedback Normative feedback Personalised normative feedback Personalised feedback	Computer-based Computer-assisted Computer-delivered Computerised Online Internet Web-based	Problem* gambl* Patholog* gambl* Gamb*

Note: keywords used to describe the interventions, the mode of delivery, and the outcomes were selected. Search terms were mapped onto subject headings where possible, and free text words were automatically expanded. The keywords for the interventions (group A), the mode of delivery (group B), and the outcomes (group C) were combined using the Boolean operators AND or OR. Beyond the electronic searches, the reference sections of each of the included articles were examined to find further relevant articles.

[2] For the description of the NICE framework checklist responses, please refer to Appendix 2

3.0 Results

3.1 Search results

Searches of Medline, PsychINFO and Embase databases provided a total of 642 citations. After removing duplicates, 426 records remained. Of these, 398 were excluded after screening the title and abstracts as the articles did not meet the inclusion criteria. The full text of the remaining 28 articles was examined, and 17 articles did not meet the inclusion criteria. The reasons for their exclusion are listed in Table 2. Two studies were included by screening the reference list of relevant articles.

Table 2. Studies excluded from review and reasons for exclusion

Reasons for exclusion	**Study**
Study protocol	Cunningham et al., 2016 Hodgins et al., 2013
Non-analytic studies (e.g. case reports, qualitative studies, reviews)	Zhang, Yi, & Cheok, 2016 Gainsbury & Blaszczynski, 2011a Gainsbury & Blaszczynski, 2011b Griffiths & Cooper, 2003 Monaghan & Wood, 2010 Rodda, Lubman, Dowling, Bough & Jackson, 2013 Marchica & Derevensky, 2016 Chebli et al., 2016
Dissertations	Lostutter, 2009 Swan, 2014
Interventions not computer-assisted	Diskin & Hodgins, 2009 Hodgins, Currie, el-Guebaly, & Peden, 2004 Hodgins, Currie, Currie, & Fick, 2009 Larimer et al., 2012

	Takushi et al., 2004

A total of thirteen studies were included in the review. Figure 1 describes the systematic search process. Of the thirteen papers identified, eight were randomised controlled studies and five were non-randomised studies.

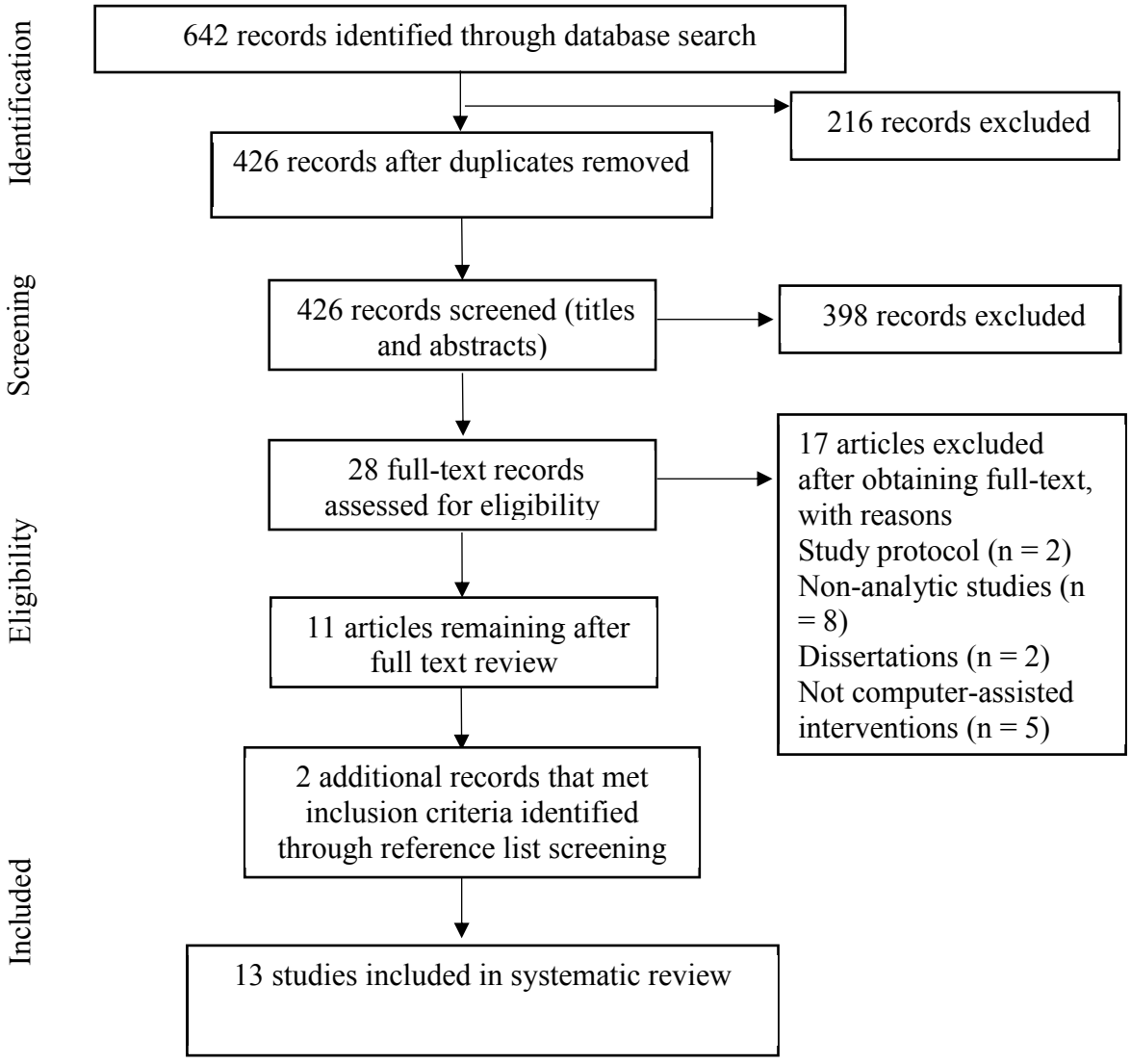

Figure 1: Overview of search strategy

3.2 Description of the included studies

The description of the studies is summarised in Table 3.

3.2.1 Setting

Studies that were included were conducted in different countries including the United Kingdom (Auer & Griffiths, 2015a; 2015b), the United States of America (Celio & Lisman, 2014; Martens et al., 2015; Neighbors et al., 2015), Canada (Cunningham, Hodgins & Toneatto, 2011; Cunningham, Hodgins, Toneatto & Murphy, 2012), Italy (Canale et al., 2016), France (Luquiens, Lagadec, Tanguy & Reynaud, 2015), Sweden (Carlbring et al., 2012; Carlbring & Smit, 2008), Finland (Castrén et al., 2013), and Norway (Myrseth et al., 2013). Participants were recruited from a range of settings (e.g. community and clinical samples from high schools, colleges, online gambling service providers).

3.2.1 Participants and inclusion criteria

The age of participants ranged from 14 to 62. A higher proportion of overall participants were male in eleven studies (85%). Only the sample in one study had a slightly greater female to male ratio (Cunningham et al., 2011). Auer and Griffiths (2015a) did not report the participants' demographic characteristics as they were provided anonymous data sets by an online gambling service provider.

Nine studies utilised standardised gambling screening measures as part of their inclusion process (69%). Three of these recruited participants who were strictly classified as pathological gamblers according to the DSM criteria (Carlbring et al., 2012; Carlbring & Smit, 2008, Cunningham et al., 2011). The six remaining studies utilised validated problem gambling screening measures (e.g. South Oaks Gambling Screen; Canadian Problem Gambling Index). Three studies included participants who were classified as problem gamblers (Myrseth et al., 2013; Cunningham et al., 2012; Luquiens et al., 2015). Two studies recruited college participants who were classified as either problem or at-risk gamblers (Martens et al., 2015; Neighbors et al., 2015), while the remaining study included participants who were classified as pathological, problem or at-risk gamblers (Castrén et al., 2013).

The remaining four studies did not utilise standardised gambling screening measures as part of the inclusion process. Of these, three studies had broad inclusion criteria (Auer & Griffiths, 2015a; 2015b; Celio & Lisman, 2014). For example, Celio and Lisman (2014) recruited college

students who had participated in at least one gambling activity in the past month. The remaining study did not specify any inclusion criteria pertaining to the severity of gambling but compared outcomes between frequent and non-frequent gamblers in their analyses (Canale et al., 2016).

The majority of studies did not specify gambling type as an inclusion criterion (n =11, 85%). One study only recruited online poker gamblers (Luquiens et al., 2015), while one study analysed data sets of online gamblers who played online slot machines (Auer & Griffiths, 2015a).

3.2.2 Interventions

Computer-assisted cognitive behavioural interventions

Five studies used computerised cognitive behavioural interventions (CBT) (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013; Luquiens et al., 2015; Myrseth et al., 2013). These computerised CBT treatment programmes adhered to the theoretical underpinnings of traditional CBT, adapted from existing CBT self-help treatment manuals for problem gambling (e.g. Ladouceur & Lachance, 2006).

The computer-based CBT interventions comprised either eight or nine modules. The interventions lasted from six to nine weeks. The content across the computerised CBT interventions was similar, with the initial modules aimed at motivational enhancement by bringing to awareness the ambivalence concerning gambling behaviours and thereafter setting goals for treatment. The bulk of the treatment centred on modifying gambling erroneous thoughts, identifying high-risk situations, and developing a relapse prevention plan. Following the completion of each module, homework assignments were given to participants to complete in between modules.

Apart from the computerised component, there was some form of therapist contact involved in all five studies. In four studies, trained therapists provided weekly telephone consultations, with emails sent to participants addressing any questions (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013; Myrseth et al., 2013). The remaining study had a trained psychologist provide personalised guidance throughout the intervention (Luquiens et al., 2015).

In terms of comparison treatments, the study conducted by Luquiens et al. (2015) was different from the rest in that it compared the efficacy of two active interventions, namely cCBT and personalised normative feedback (PNF) interventions. The intervention groups received either the PNF intervention, a computerised CBT intervention without guidance, or a computerised CBT intervention with guidance from a trained psychologist.

Computer-assisted motivational feedback interventions

Seven studies used computer-assisted motivational feedback interventions. Four studies delivered feedback interventions via the computer (Auer & Griffiths, 2015a; 2015b; Celio & Lisman, 2014; Neighbors et al., 2015), while three studies delivered feedback via computerised summary printouts (Cunningham et al., 2011; 2012; Martens et al., 2015).

Six of the studies were evaluations of PNF interventions (Auer & Griffiths, 2015b; Celio & Lisman, 2014; Cunningham et al., 2011; 2012; Martens et al., 2015; Neighbors et al., 2015). The normative feedback technique is one of the central elements of Motivational Interviewing (Miller, 1983); it aims to help problem gamblers evaluate their gambling behaviour by comparing it against others in the general population. The core components of the PNF interventions include: (a) participants' own gambling behaviour; (b) participants' perception of gambling norms; and (c) the actual gambling behaviour norms in the general population.

In addition to the aforementioned components, additional information was provided in some of the PNF interventions. For example, two studies provided information regarding participants' gambling behaviours relative to their same sex counterparts (Cunningham et al., 2011; Neighbors et al., 2015). In order to examine whether the normative component of the PNF intervention was the active ingredient in the intervention, Cunningham et al. (2012) included a comparison group that received only personalised feedback; all normative comparison information was removed.

The study by Auer and Griffiths (2015a) compared the effectiveness of a feedback intervention and a simple information-based message. The feedback intervention differed from the rest of the aforementioned studies in that it lacked the personalised feedback component; participants were presented with a standardised pop-up message after 1,000 online slot machine games. The message read: "we would like to inform you that you have just played 1,000 slot games. Only a few people play more than 1,000 slot games. The chance of winning does not increase with the duration of the session. Taking a break often helps, and you can choose the duration

of the break". The simple information-based message asked if the player wanted to continue or stop the gambling session after 1000 slot games.

Mixed interventions

One study incorporated both personalised feedback and CBT into their web-based intervention (Canale et al., 2016). In this study, both the intervention and comparison group received personalised feedback about their gambling behaviours (without normative information), although the intervention group also received three weeks of online CBT training. The web-based intervention was adapted from an existing computer-based intervention for alcohol abuse (Disperati et al., 2015).

3.2.3 Study design

Of the studies included in the review, the majority adhered to a randomised controlled design (n = 8, 62%). Of these, five of the studies had one intervention group and one comparison group (Canale et al., 2016; Carlbring & Smit, 2008; Celio & Lisman, 2014; Cunningham et al., 2011; Neighbors et al., 2015). The remaining three studies offered alternative interventions to their comparison groups (Cunningham et al., 2012; Luquiens et al., 2015; Martens et al., 2015).

The remaining studies were non-randomised (n = 5, 38%). Of these, three were interrupted time-series studies which followed one group of participants over time and analysed pre-post data of outcome variables aiming to determine treatment effectiveness (Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013). The remaining two studies were cohort studies comparing two independent pre-post intervention data sets provided by online gambling operators (Auer & Griffiths, 2015a; 2015b). One of the studies included a matched control group which comprised online gamblers who used the same online gambling service but who did not receive the intervention (Auer & Griffiths, 2015b).

3.2.4 Outcome measures

Gambling outcomes were measured in a variety of ways: gambling frequency, gambling related problems, gambling expenditure, gambling attitudes, quantity lost and won, social consequences, and gambling related thoughts.

The most common measures used to measure outcome included the South Oaks Gambling Screen (SOGS; Lesieur & Blume, 1987) and the Canadian Problem Gambling Index (CPGI;

Ferris & Wynne, 2001), also known as the Problem Severity Gambling Index (PGSI); seven studies (54%) used one of these measures. Gambling outcomes were also measured using the National Opinion Research Centre DSM Screen for Gambling Problems (NODS; Gerstein et al., 1999), the Gambling Attitudes Scale (GAS; Delfabbro & Thruoo, 2003), the Gambling Quantity and Perceived Norms Scale (Neighbors et al., 2002), the Gambling Problems Index (Neighbors et al., 2002), and the Gambling Beliefs Questionnaire (GBQ; Steenbergh, Meyers, May & Wehlan, 2002).

Five studies included additional self-constructed items that measured a variety of gambling outcomes including gambling frequency, gambling quantity, deposit, compulsivity, losses, debt, social support, dissociative gambling, impaired control of gambling, gambling urge, the mean number of dollars lost per month, the mean number of days gambling per month, the greatest dollar amount gambled per day (Carlbring et al., 2012; Castrén et al., 2013; Cunningham et al., 2011, 2012; Martens et al., 2015).

One study measured gambling outcomes through two computer-based risk tasks framed as 'gambling opportunities' that assessed cognitive and behavioural change (Celio & Lisman, 2014). Three studies looked at actual gambling behavioural change in a real-world setting (Auer & Griffiths, 2015a; 2015b; Luquiens et al., 2015). The study by Auer and Griffiths (2015a) measured gambling outcome in a real-world setting by observing whether individuals ceased their online gambling session following the feedback intervention. Auer and Griffiths (2015b) monitored money and time spent on an online gambling website post-intervention. In addition to using the PGSI as an outcome measure, Luquiens et al. (2015) collected secondary gambling data from an online gambling website.

Other non-gambling related outcome measures included the Quality of Life Inventory (QOLI; Frisch, Cornell, Villanueva & Retzlaff, 1992), the Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983), the Measure of Identification with Groups (Roccas, Sagiv, Schwartz, Halevy & Eidelson, 2008), and the Symptom Checklist-90-Revised (SCL-90-R; Derogatis, 1994).

Table 3. Characteristics of included studies

Characteristics of included studies using computer-assisted cognitive behavioural therapy (n = 5)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Carlbring & Smit, (2008)	Randomised controlled study Sweden Recruitment through media announcements	DSM criteria for pathological gambling, gambled at least once in past 30 days Screened using NODS[3]	Total (n = 66) Mean age: 31.9 (SD = 9.8) Range: 18-57. Male: 94%	8 modules with information, exercises and ended with essay-style questions Weekly telephone call by therapist	Waitlist control	NODS, HADS[4], Quality of Life inventory 6, 18, 36 months follow-up	Significant reduction in pathological gambling, anxiety, depression, and quality of life over time Effects sustained at various follow-up points
Luquiens et al., (2015)	Randomised controlled study France Active poker gamblers on the Winamax website	Problem gamblers Screened using PGSI[5]	Total (n = 1122) Mean age: 34.7 (SD = 10.1) Range: not stated Male: 92.7%	Either PNF[6], email with self-help CBT[7] programme with no guidance, or self-help CBT programme with therapist guidance	Waitlist control	PGSI, secondary gambling outcome data 6 and 12 weeks follow-up	No significant difference in treatment efficacy between groups

[3] National Opinion Research Centre DSM Screen for Gambling Problems
[4] Hospital Anxiety and Depression Scale
[5] Problem Severity Gambling Index
[6] Personalised normative feedback
[7] Cognitive behavioural therapy

Table 3
Characteristics of included studies using computer-assisted cognitive behavioural therapy (n = 5)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Carlbring et al., (2012)	Interrupted time series Sweden Recruitment through newspapers	DSM criteria for pathological gambling, gambled at least once in past 30 days Screened using NODS	Total (n = 284 Mean age: 32.2 (SD = 8.8) Range: 18-62 Male: 81%	8 modules with information, exercises and with essay-style questions Weekly telephone call by therapist	None	NODS, HADS, Quality of Life inventory 6, 18, 36 months follow-up	Significant reduction in pathological gambling, anxiety, depression, and quality of life over time Effects sustained at various follow-ups
Castren et al., (2013)	Interrupted time series Finland Recruitment through advertisements on gambling website and helplines	No inclusion criteria Pathological gamblers: 64% Problem gamblers: 14% At risk gamblers: 10%	Total (n = 471 Mean age: 34.5 (SD = 11.8) Range: not stated Male: 69%	8 modules with information, exercises and ended with essay-style questions Weekly telephone call by therapist	None	NODS, MARD-S[8], gambling related questions Post-treatment, 6 months follow-up	Significant reduction in gambling related problems, urge, impaired control, alcohol consumption, social consequences, gambling-related cognitive erroneous thoughts, and depression Effects sustained at 6-month follow-up

[8] The Montgomery–Åsberg Depression Rating Scale

Table 3
Characteristics of included studies using computer-assisted cognitive behavioural therapy (n = 5)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Myrseth et al., (2012)	Interrupted time series Norway Recruitment through hospital website, helpline, national TV, health professionals, national gambling website	Problem gamblers Screened using SCL-90R[9], SOGS-R[10], GBQ[11]	Total (n = 80) Mean age: 35.7 (SD = 10.24) Range: 19-59 Male: 87.5%	9 web-based assignments Weekly telephone call by therapist	None	SCL-90R, SOGS-R, GBQ Post-treatment, 3-month follow-up	Significant reduction in symptoms of pathological gambling, cognitive distortions, and general psychological distress

[9] Symptom Checklist-90-Revised
[10] South Oaks Gambling Screen
[11] Gambling Beliefs Questionnaire

Table 3
Characteristics of included studies using computer-assisted motivational feedback interventions (n = 7)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Neighbors et al., (2015)	Randomised controlled study USA Recruitment through college	Problem gamblers and at risk gamblers Screened using SOGS	Total (n = 252) Mean age: 23.11 (SD = 5.34) Range: not stated Male: 59.5%	Computer delivered PNF Controlled laboratory setting	Attention-control feedback group	SOGS, Gambling quantity and Perceived Norms Scale, Gambling Problem Index, Measure of identification with groups 3 and 6 months follow-up	Significant reduction in perceived norms, actual quantity lost, gambling problems All intervention effects except reduced gambling problems remained at the 6-month follow-up
Martens et al., (2015)	Randomised controlled study USA Recruitment through college	Problem gamblers and at-risk gamblers Screened using SOGS and BBGS[12] (Gebauer et al., 2010) Gambled at least once in past 60 days	Total (n = 333) Mean age: 21.9 (SD = not stated) Range: not stated Male: 60%	Computerised PNF summary printout or education-only information (EDU) Controlled laboratory setting	Waitlist control (assessment only)	SOGS, CPGI[13], questions on gambling frequency and quantity 3-month follow-up	Significant reduction in dollars gambled and gambling problems for both PNF and EDU groups compared to assessment only group at 3-month follow-up

[12] Brief Biosocial Gambling Screen
[13] Canadian Problem Gambling Index

Table 3
Characteristics of included studies using computer-assisted motivational feedback interventions (n = 7)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Celio & Lisman, (2014)	Randomised controlled study USA Recruitment through college	Students who participated in at least one gambling activity during past 30 days	Total (n = 136) Mean age: 19 (SD = 1.35) Range: 18-30 Male: 55%	Computer delivered PNF Controlled laboratory setting	Attention-control feedback group	Two computer-based risk tasks 1-week post-intervention	Significant reduction in perception of other students' gambling and lower risk-taking performance on the two analog measures of gambling at 1-week follow-up
Cunningham et al., (2009)	Randomised controlled study (pilot) Canada Recruitment through newspaper	DSM criteria for pathological gambling	Total (n = 49) Mean age = 44.35 (SD = not stated) Range: not stated Male: 48%	Computerised PNF summary printout	Waitlist control	CPGI, two items on gambling expenditure 3-month follow-up	Significant reduction in total amount of money spent CPGI scores and maximum amount of money spent on one occasion did not reach significance

Table 3
Characteristics of included studies using computer-assisted motivational feedback interventions (n = 7)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Cunningham et al., (2012)	Randomised controlled study Canada Recruitment random digit telephone survey	Problem gamblers and at risk gamblers Screened using PGSI	Total (n = 209) (52.6% male) Mean age: 46.6 (SD = 13.9) Range: not stated Male: 52.6%	Computerised PNF summary printout or computerised partial feedback printout (excluding normative feedback component)	Waitlist control	PGSI, three items on gambling expenditure 3, 6, 12-months follow-up	No significant difference in treatment efficacy of PNF Significant reduction in number of days gambled from baseline to 12-month follow-up for partial feedback condition
Auer & Griffiths, (2015a)	Cohort study UK Data sets provided by online gambling operator	Online gamblers who played 1000 consecutive online slot machine games	Total (n = 23,110 data sets) Mean age = not stated Range: not stated Male: Not stated	Normative and self-appraisal feedback in a pop-up message	Simple pop-up message without normative and self-appraisal components	Online gamblers who ceased playing after pop-up message	Twice the number of online gamblers who received the normative and self-appraisal feedback stopped gambling compared to comparison group

Table 3
Characteristics of included studies using computer-assisted motivational feedback interventions (n = 7)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Auer & Griffiths, (2015b)	Cohort study UK Opt-in system via email Data sets provided by online gambling operator	Online gamblers who had gambled on the gambling website in past 2-weeks prior to registration	Total (n = 1119) Mean age = not stated Range: not stated Male: 80%	Computer delivered PNF Information about wins and losses, playing duration, number of playing days, and games played	Matched control group (matched on age, gender, playing duration, theoretical loss)	Actual data on playing duration and theoretical loss 14-day follow-up	Significant reduction in time and money spent gambling for PNF condition compared to matched control group

Table 3
Characteristics of included studies using computer-assisted mixed interventions (n = 1)

Study	Study design/ country/ recruitment	Inclusion criteria	Sample	Psychological intervention	Comparator	Psychological outcomes; measures. Timing of measurements	Psychological outcome findings
Canale et al., (2016)	Randomised controlled study (cluster randomisation by school classes) South Italy Recruitment through high school	No inclusion criteria	Total (n = 168) Mean age: 15.01 SD = 0.60 Range: 14-18 Male: 58%	Personalised feedback and 3 weeks of web-based intervention (CBT)	Personalised feedback	SOGS, Gambling Attitude Scale 2-month follow-up	Significant reduction in gambling problems relative to control No significant group differences in gambling frequency, expenditure, and gambling attitudes Frequent gamblers showed most significant reduction in gambling problems, frequency, gambling attitudes but not gambling expenditure

3.3 Quality Appraisal

The methodological quality of the studies is summarised in Table 4. For clarity, each study is colour coded based on its assessed internal and external validity.

The section below describes how the studies were evaluated using the NICE quality framework (NICE, 2012). The checklist contains 24 items grouped into the following four categories: population, method of allocation, outcomes, and analysis. The overall quality of the studies was then evaluated in terms of its internal and external validity.

3.3.1 Population

The representativeness of the selected population and sample were assessed on three items.

Source population

The majority of studies provided brief descriptions of the source population by giving information such as the country, region, or setting where recruitment took place (n = 8, 62%); these studies were rated as 'moderate'. Only five studies provided a clear description of the demographic characteristics of gamblers in the source population of the specific country, region or setting; these studies were rated 'strong' for this item (Auer & Griffiths, 2015b; Castrén et al., 2013; Celio & Lisman, 2014; Martens et al., 2015; Neighbors et al., 2015).

Eligible population

While most studies described the recruitment procedures for the eligible population, recruitment was performed via a single source (e.g. media advertisement) (n = 8, 62%); these studies were assessed as 'moderate'. Four studies recruited participants from multiple sources (e.g. national newspapers, national TV, gambling websites), which limited the possibility that important groups were underrepresented; these studies were rated 'strong' for this item (Carlbring et al., 2012; Castrén et al., 2013; Cunningham et al., 2012; Myrseth et al., 2013). Conversely, one study that recruited from a high school in a less known city in Italy did not describe how that school was selected; the study was graded 'poor' for this item (Canale et al., 2016).

Selected participants

The majority of studies adequately described the selection methods and criteria for inclusion or exclusion (n = 11, 85%). These studies however did not provide any analysis on the differences between the individuals who were included or excluded from the studies; the eleven studies were rated as 'moderate'. Some of these studies also had strict eligibility criteria, with more participants excluded than included in the study (Carlbring & Smit, 2008; Celio & Lisman, 2014; Luquiens et al., 2015; Martens et al., 2015; Myrseth et al., 2013; Neighbors et al., 2015). Two studies provided an analysis regarding the differences between included participants and those who were excluded, ensuring that any differences were controlled for in the analysis of the results; these studies were rated 'strong' for this item (Carlbring et al., 2012; Cunningham et al., 2012). Four studies screened for other mental health related difficulties such as depression (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013; Myrseth et al., 2013). Of these, Carlbring and Smit (2008) excluded pathological gamblers who suffered from moderate or severe depression.

3.3.2 Method of allocation to intervention

The quality of the method of allocation to intervention was assessed on nine items.

Allocation to intervention (or comparison)

Of the eight randomised controlled studies, seven allocated participants into intervention or comparison groups randomly and randomisation was appropriate and fair (i.e. each participant had an equal chance of being assigned to either intervention or control conditions). The seven studies were rated 'strong' on this item. The remaining randomised controlled study employed cluster randomisation which was performed through the randomisation of twelve high school classes (Canale et al., 2016). While this was done to limit contamination of treatment effects, it increases the likelihood that group differences will exist after randomisation; this study was given the 'moderate' rating on this item. The five non-randomised studies were rated as 'not applicable' on this item (Auer & Griffiths, 2015a; 2015b; Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013).

Description and appropriateness of interventions and comparisons

All the studies clearly described interventions and comparisons in sufficient detail for studies to be replicated (n = 13, 100%). For the randomised controlled studies (n = 8, 62%), the control groups were either made up of a single waitlist control or a comparison group that engaged in a task irrelevant to treatment (e.g. an attention-control task). None of the studies compared the intervention with a treatment-as-usual (TAU) condition. Having a TAU condition is not only ethical, but allows for the comparison of this novel type of treatment to existing treatment methods. Four randomised controlled studies employed a single waitlist control group (Carlbring & Smit, 2008; Cunningham et al., 2011; 2012; Luquiens et al., 2015). One limitation of a single waiting list control is the inability to control for non-specific therapeutic effects. All the eight randomised controlled studies were rated as 'moderate' for this item. Of the five non-randomised studies, three studies that used a single group were rated 'not applicable' on this item (Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013). The pre-intervention data sets that were provided by online gambling operators were used as comparison groups in Auer and Griffiths' studies (2015a; 2015b). Both studies share the same limitations as the aforementioned studies and were also graded as 'moderate' on this item.

Concealment of allocation

Five randomised controlled studies (38%) clearly described the randomisation procedure where allocation was performed using a true random number service, or a computerised allocation system; these studies were rated 'strong' on this item (Carlbring & Smit, 2008; Cunningham et al., 2011; 2012; Luquiens et al., 2015; Neighbors et al., 2015). The remaining three randomised controlled studies (23%) did not report how randomisation was performed (Canale et al., 2016; Celio & Lisman, 2014; Martens et al., 2015). The five non-randomised studies were rated as 'not applicable' on this item (Auer & Griffiths, 2015a, 2015b; Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013).

Blinding

The majority of the studies did not involve blinding as the delivery and assessment of intervention were done primarily via the computer with little to no researcher contact (n = 11, 85%); these studies were rated 'not applicable' on this item. When investigators were required to assess outcomes or provide assistance to the participants in the lab, procedures were

implemented to minimise detection bias; two studies ensured this and were rated ‘strong’ on this item (Carlbring & Smit, 2008; Neighbors et al., 2015).

Adequacy of exposure to intervention (and comparison)

This item examined whether the participants were exposed to the treatment sufficiently in order for it to have the desired effect. This was examined in terms of how robust the treatment was, and its fidelity.

All five studies that employed cCBT interventions adhered to a structured protocol adapted from existing CBT treatment manuals (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013; Luquiens et al., 2015; Myrseth et al., 2013). Seven studies used computer-assisted motivational feedback interventions and six of them evaluated PNF interventions. While some of the PNF interventions varied in content and in terms of how the information was presented, all included the key components of PNF (i.e. participants’ own gambling behaviours, perception of gambling norms, and actual gambling norms). The remaining study by Auer and Griffiths (2015a) provided normative feedback without the personalised component. The intervention employed in Canale et al.’s study (2016) integrated components of cCBT and personalised feedback. Altogether, the quality of the cCBT and the computer-assisted motivational feedback interventions appeared to be robust.

Given the nature of online studies, there may be some difficulties in ensuring treatment adherence. Treatment fidelity was accounted for in seven studies (54%). Four of these studies reported treatment adherence levels of at least 70% for participants exposed to either the cCBT or the PNF interventions; these studies were rated ‘strong’ on this item (Celio & Lisman, 2014; Martens et al., 2015; Myrseth et al., 2013; Neighbors et al., 2015). Three studies that evaluated cCBT interventions reported treatment adherence levels of around 50%, with only about half of the participants completing the computerised CBT modules; these studies were rated as ‘poor’ on this item (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013). One study could not measure for treatment fidelity in the intervention group due to a technical error in the measure (Cunningham et al., 2012). The remaining five studies (38%) did not report treatment fidelity (Auer & Griffiths, 2015a; 2015b; Canale et al., 2016; Cunningham et al., 2011; Luquiens et al., 2015). Without adequate fidelity checks, it is not known how much of the results can be attributed to the effects of the intervention.

Contamination

All eight randomised controlled studies controlled for contamination by ensuring that comparison groups did not receive the intervention; these studies were rated 'strong' on this item. Readers should be however cautioned that four of these studies recruited participants from single educational institutions, raising concerns regarding cross-contamination between groups (Canale et al., 2016; Celio & Lisman, 2014; Martens et al., 2015; Neighbors et al., 2015). This is because there is a possibility that students in the comparison group may be made aware of the intervention through interacting with students from the intervention group. Canale et al. (2016) tried to limit the possibility of contamination by randomising high school students based on their classes rather than individually. Three out of the five non-randomised controlled studies that used a single group were rated 'not applicable' on this item (Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013). The remaining two non-randomised studies were cohort studies (Auer & Griffiths, 2015a; 2015b). While the study by Auer and Griffiths (2015a) reported a between-subjects design, authors acknowledged cross-contamination between groups (i.e. some participants in the comparison group also received the intervention); the study was assessed as 'poor' on this item. The other study by Auer and Griffiths (2015b), which included a matched control group, ensured that there was no cross-contamination between groups; the study was therefore rated 'strong' on this item.

Fairness in both intervention and comparison groups

'Fairness' refers to groups being treated equally by researchers (i.e. considered in terms of any important differences between the groups aside from the intervention received). All eight randomised controlled studies ensured that participants in the intervention or the comparison groups were treated fairly, and therefore were rated 'strong' on this item (n = 8, 62%). All participants in the waitlist condition received the intervention upon the completion of the study, or within the follow-up timeframe. Of the five non-randomised studies, three studies were rated 'not applicable' for this item (Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013). The two remaining non-randomised studies conducted by Auer and Griffiths (2015a; 2015b) did not report whether participants who did not receive the feedback interventions received it following the studies' completion.

Dropouts and Withdrawals

The dropout rates in internet-based trials are typically high (Mathieu, McGeechan, Barratt & Herbert, 2013). There were four studies that had an attrition rate of less than 20% and provided an analysis of dropouts versus non-dropouts (n = 4, 31%); these studies were considered 'strong' on this item (Celio & Lisman, 2014; Cunningham et al., 2011; Martens et al., 2015; Neighbors et al., 2015). While three studies had attrition rates of around 20-30%, the researchers provided an analysis of dropouts versus non-dropouts and they were therefore also rated 'strong' (Carlbring et al., 2012; Myrseth et al., 2013; Cunningham et al., 2012). Four studies that had attrition rates of more than 20%, and/or did not include an analysis detailing the differences between dropouts and non-dropouts were rated as 'moderate' on this item (Canale et al., 2016; Carlbring & Smit, 2008; Castrén et al., 2013; Luquiens et al., 2015). Ratings were not applicable for the two studies that were conducted by Auer and Griffiths (2015a; 2015b) as retrospective data sets were provided by online gambling operators for analysis.

Relevance to UK Practice

As computer-assisted interventions for gambling are in their preliminary stages of research, there are currently no UK practice standards or guidelines for the selected studies to be compared against. All studies were therefore given the 'not applicable' rating for items assessing the adherence to UK treatment practices (n = 13, 100%).

3.3.3 Outcomes

Six items were used to assess the quality in which outcomes were evaluated.

Reliability and validity of measures

Most studies utilised valid and reliable gambling measures as their primary determinant for gambling outcomes (e.g. SOGS, CPGI, NODS), and were therefore rated as 'strong' for this item (n = 10, 77%). Some of these studies included self-constructed questionnaire items to measure for other gambling outcomes (e.g. gambling quantity, frequency, urge). The study conducted by Celio and Lisman (2014) used two computer-based risk tasks framed as 'gambling opportunities' to assess behavioural change. While this is a novel alternative to utilising self-report gambling measures, the psychometric properties of the measure are less

well known and it would have been useful to report their convergence with existing gambling outcome measures. This study was therefore rated ‘moderate’ on this item.

Auer and Griffiths (2015b) measured gambling outcome by tracking real-world gambling data of participants on an online gambling website following intervention (e.g. time spent gambling, money spent). While this provides an accurate method of tracking real-world gambling data, it is unknown whether participants engaged in other forms of gambling-related activities during the evaluation phase; this study was rated as ‘moderate’ on this item. The remaining study by Auer and Griffiths (2015a) was rated ‘poor’ on this item as gambling outcome was solely determined through the act of stopping an online gambling session following the normative feedback intervention. There may be other confounding variables influencing players’ decisions to halt their sessions which may not have been directly influenced by the intervention. This raises unaddressed questions about the validity of this method of evaluating gambling outcome.

Completion of outcome measures

Four studies indicated outcome measure completion rates of over 80% at various follow-up points, ranging from post-intervention to six months; these studies were assessed as ‘strong’ (Celio & Lisman, 2014; Cunningham et al., 2011; Martens et al., 2015; Neighbors et al., 2015). Five studies that reported an outcome completion rate of 60-80% at various follow-up points, ranging from two months to 36 months, were graded ‘moderate’ (Canale et al., 2016; Carlbring et al., 2012; Carlbring & Smit, 2008; Cunningham et al., 2012; Myrseth et al., 2013). Two studies were given ‘poor’ ratings as less than 10% of participants completed measures at the final follow-up point (Castrén et al., 2013; Luquiens et al., 2015). While the study by Luquiens et al. (2015) had high attrition rates and low outcome completion rates for the PGSI, the researchers were able to collect data of other gambling outcome variables such as compulsivity, deposits, and mean loss per gambling session, due to the automatic collection of participant data through a gambling website. The two studies conducted by Auer and Griffiths (2015a; 2015b) were provided real-world gambling data of online gamblers and did not require participants to complete any outcome measures; these studies were rated as ‘not applicable’ on this item.

Assessment of important outcomes

Two studies assessed important gambling-related outcomes but relied on a single self-report measure (NODS) (Carlbring et al., 2012; Carlbring & Smit, 2008). These studies included the HADS and QOLI as secondary measures but could have included additional gambling outcome measures to examine the different domains of gambling behaviour; these studies were assessed as 'moderate'. The study conducted by Luquiens et al. (2015) was also given a 'moderate' rating as only a single outcome measure was used (PGSI), while the outcome completion rates were poor at multiple follow-up points. While researchers were able to collect secondary gambling outcome data, technical difficulties prevented them from collecting data on the duration of time spent gambling and the number of days gambled in the past thirty days. The study conducted by Celio and Lisman (2014) operationalised gambling behaviour using a computerised risk-taking task. While the researchers were able to capture important aspects of gambling behaviour (i.e. risk-taking behaviour and expenditure), they could have supplemented this with standardised gambling outcome measures; this study was rated as 'moderate' for this item.

Eight studies (62%) were considered 'strong' on this item as they operationalised gambling outcomes in multiple ways (e.g. money spent, gambling urge, gambling frequency) and/or administered validated measures that accounted for these outcomes. Further, some of these studies included self-constructed questions, measuring other gambling-related outcomes (e.g. gambling debt, dollars spent gambling) (Auer & Griffiths, 2015b; Canale et al., 2016; Castrén et al., 2013; Cunningham et al., 2011, 2012; Martens et al., 2015; Myrseth et al., 2013; Neighbors et al., 2015). It should however be noted that the majority of the studies relied primarily on retrospective self-reported data. The remaining study conducted by Auer and Griffiths (2015a) was assessed as 'poor' because gambling outcome was solely determined by whether online gamblers ceased their gambling sessions following the presentation of normative feedback.

Relevance of outcomes

All studies included outcome measures that were relevant to what the authors intended to measure and were given 'strong' ratings for this item (n = 13, 100%).

Follow-up times in intervention and comparison groups

The majority of studies reported similar follow-up times for both the intervention and the comparison groups, and therefore received a 'strong' rating (n = 7, 54%). The study by Carlbring and Smit (2008) had a three-month follow-up for both the intervention and the control groups but only six, eighteen, and 36 month follow-ups for the intervention group; this study was assessed as 'moderate'. The five non-randomised cohort studies were rated as 'not applicable' on this item (Auer & Griffiths, 2015a; Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013).

Meaningfulness of follow-up time

In general, addiction studies evaluating the effectiveness of treatment assess outcomes at twelve-months post-intervention or further (Roth & Finch, 2013). Eleven studies (85%) were considered 'moderate' on this item as follow-up times were capped at twelve months or less. Additional follow-up points could be included to assess longer-term outcome, especially for studies evaluating cCBT, where there may be the possibility of latent effects of treatment. Two of the studies which employed computer-assisted PNF interventions did not measure outcomes directly post-intervention, but measured outcomes at three months and further (Cunningham et al., 2011; 2012). However, the brief nature of a PNF intervention may mean that its effects can be observed directly post-intervention. Two studies were found to be 'strong' as they had follow-up times up to 36 months post-intervention (Carlbring et al., 2012; Carlbring & Smit, 2008).

3.3.4 Analysis

The quality of analysis was assessed on six items.

Confounders between groups at baseline

Of the eight randomised controlled studies, studies were rated as 'strong' if the authors either reported that groups were balanced at baseline or that confounders were adjusted for in the analysis; six studies (46%) achieved this and were rated 'strong' (Canale et al., 2016; Celio & Lisman, 2014; Cunningham et al., 2011, 2012; Martens et al., 2015; Neighbors et al., 2015). The remaining two randomised controlled studies did not report equivalence in groups at baseline with regards to potential confounders (Carlbring & Smit, 2008; Luquiens et al., 2015).

While Auer and Griffiths (2015b) employed a cohort design, they included a matched control group based on characteristics such as age, gender, and gambling duration when analysing the efficacy of the PNF intervention; this study was graded as 'strong' on this item. Auer and Griffiths (2015a) were provided anonymised pre-post intervention data sets and researchers were unable to account for potential confounders between groups; the study was assessed as 'poor' on this item. The remaining three non-randomised studies were rated 'not applicable' on this item (Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013).

Intention to treat analysis

Five studies (38%) were assessed as 'strong' as they included dropouts or those who failed to complete the intervention in the final analysis (Carlbring & Smit, 2008; Cunningham et al., 2011; Luquiens et al., 2015; Martens et al., 2015; Myrseth et al., 2013). Six studies (46%) did not report intention to treat (Canale et al., 2016; Carlbring et al., 2012; Castrén et al., 2013; Celio & Lisman, 2014; Cunningham et al., 2011; Neighbors et al., 2015). Auer and Griffiths (2015a; 2015b) analysed the data sets provided by online gambling operators which recorded real-life gambling data; both studies were therefore rated 'not applicable' on this item.

Power

Studies that reported a power calculation at the conventionally accepted standard of 0.8 were graded as 'strong'; three studies reported this and were thus rated as 'strong' (Cunningham et al., 2012; Martens et al., 2015; Neighbors et al., 2015). Six studies (46%) did not provide a power calculation but had moderate to large sample sizes; these were rated as 'moderate' (Auer & Griffiths, 2015a; 2015b; Canale et al., 2016; Carlbring et al., 2012; Castrén et al., 2013; Celio & Lisman, 2014). Four studies (31%) that did not report a power calculation and had either smaller sample sizes or high attrition rates were rated as 'poor' (Carlbring & Smit, 2008; Cunningham et al., 2011; Luquiens et al., 2015; Myrseth et al., 2013).

Effect size

The majority of studies provided effect size estimates (n = 10, 77%); these studies were rated as 'strong'. Two studies did not report an effect size due to insignificant treatment effects (Cunningham et al., 2012; Luquiens et al., 2015). The remaining study failed to report effect size after indicating a significant treatment effect (Castrén et al., 2013).

Analytical methods

The analytical methods were assessed as appropriate if: (1) the differences in follow-up times were accounted for; (2) a cluster design analysis was performed when appropriate; (3) a subgroup analysis was pre-specified. There were no important differences in terms of follow-up times that studies did not account for in the analysis. The studies did not adopt a cluster design and any subgroup analyses were pre-specified prior to the intervention. The analyses conducted for the majority of studies were appropriate and well-described, and were therefore considered 'strong' on this item (n = 12, 92%). The study by Auer and Griffiths (2015a) analysed group differences by comparing the odds ratio between groups and this may create a biased interpretation regarding the effectiveness of the intervention; the study was rated 'moderate' on this item.

Precision of intervention effects

The majority of studies reported exact p-values or provided confidence intervals of effect estimates for intervention effects, and were therefore graded as 'strong' for this item (n = 9, 69%). Four studies did not provide exact p-values and were rated as 'moderate' for this item (Auer & Griffiths, 2015a; 2015b, Cunningham et al., 2011; 2012).

3.3.5 Summary of quality

The NICE quality framework evaluates the overall quality of studies based on their internal and external validity.

Internal validity

Three studies (23%) were considered 'strong' in terms of internal validity (Cunningham et al., 2012; Martens et al., 2015; Neighbors et al., 2015); these studies were randomised controlled studies that managed to limit potential sources of bias adequately, and accounted for these biases in their analyses.

The majority of studies were considered to be of 'moderate' quality in terms of internal validity (n = 10, 77 %). This was due to factors such as having small to moderate sample sizes, moderate outcome completion rates, moderate levels of treatment fidelity, or lacked control groups. It was however assessed that the conclusions derived from these studies were unlikely to be

altered solely based on these limitations, and hence these studies were graded as ‘moderate’ for internal validity.

Of the ten papers that were assessed as ‘moderate’ for internal validity, three papers were at the borderline between ‘moderate’ and ‘poor’. The study by Castrén et al. (2013) had a high attrition rate, lacked an intention to treat analysis, and lacked a comparison group. The most significant of these factors which could have affected the results was the high attrition rate of over 50%. The authors however foresaw the possibility of high drop-out rates and accounted for this in their power calculation; this translated to the recruitment of a large initial sample of 471 participants. Even after accounting for the 50% attrition rate, 224 participants completed the treatment. This is still a substantive size for analysis, and the study highlighted positive treatment effects for participants who completed the intervention. The researchers however did not conduct an analysis between dropouts and non-dropouts, and it is therefore not known if the two groups differed based on certain characteristics. The study was rated as ‘moderate’ for internal validity.

The study by Auer and Griffiths (2015a) scored in the ‘poor’ category on multiple items of the NICE criteria. This paper reported a between-subjects design but acknowledged cross-contamination between the comparison and intervention groups. The researchers had little control over the data they were receiving from the online gambling operator. It is also not known whether the intervention and comparison groups differed on variables such as sex, age, income, or levels of gambling severity. Another limitation of this study was the manner in which outcome was evaluated. These limitations were however judged as unlikely to alter the evidenced treatment effect. As such, the paper was rated as ‘moderate’ for internal validity. Readers should however be cautioned regarding the way the groups were compared (i.e. the odds ratio), as this may create a biased interpretation of the effectiveness of the intervention.

While the randomised controlled study conducted by Luquiens et al. (2015) was given ‘moderate’ and ‘strong’ ratings on most criteria, the study had an extremely high attrition rate (83%) with one group consisting of eight participants at a follow-up point. This meant that the outcome completion rates for the PGSI was very low. Further, the implementation of the intention to treat analysis, where dropouts were recorded as having no improvement following intervention, may have potentially led to the lack of treatment efficacy. The authors were however able to collect secondary outcome data regarding ongoing participant gambling activity (e.g. compulsivity, deposits, mean losses) via a gambling website, minus data on

gambling frequency due to technical difficulties. Given the concordance of the lack of treatment efficacy shown by both secondary gambling outcome data and the PGSI, it was assessed that these limitations are unlikely to alter the conclusions derived.

External validity

Three studies that recruited from multiple sources and employed appropriate inclusion criteria were rated as 'strong' on external validity (Castrén et al., 2013; Cunningham et al., 2012; Myrseth et al., 2013). Three studies that examined the college gambling population and recruited from large colleges were also rated as 'strong' for external validity (Celio & Lisman, 2014; Martens et al., 2015; Neighbors et al., 2015). The two studies conducted by Auer and Griffiths (2015a; 2015b) were assessed as 'strong' for ecological validity as they were provided real world gambling data sets from online gambling operators. The paper by Luquiens et al. (2015) was also assessed as 'strong' for external validity as secondary gambling outcome data was collected by tracking real-world gambling data on a gambling website. Altogether, nine studies were rated 'strong' for external validity (69%).

Studies that recruited via a single source (e.g. newspapers) or had modest sample sizes that were largely representative of the studied population were rated 'moderate' for external validity (Carlbring et al., 2012; Carlbring & Smit, 2008; Cunningham et al., 2011).

Canale et al.'s study (2016) was assessed as 'poor' for external validity as recruitment took place in a lesser known city in the South Italy region, and authors failed to specify how the high school was selected. Readers should note that the sample in most studies was made up of volunteers, and the nature of volunteering has its biases such as recruiting gamblers who were already motivated to change.

Table 4. Validity of the included studies

Validity of the included studies using computer-assisted cognitive behavioural therapy (n = 5)

Study	Internal validity	External validity
Carlbring & Smit, (2008)	+ (Moderate) Sources of bias were minimised where possible Limitations: Small sample size, moderate treatment fidelity	+ (Moderate) Limitations: Recruitment from a single source, small sample size
Luquiens et al., (2015)	+ (Moderate) Sources of bias were minimised where possible Limitations: High attrition rate, low outcome completion rate, no fidelity check, short follow-up period	++ (Strong) Strong ecological validity as the study collected gambling data from an online gambling website
Carlbring et al., (2012)	+ (Moderate) Sources of bias were minimised where possible Limitations: No control, moderate treatment fidelity, no ITT analysis	+ (Moderate) Limitations: Recruitment from a single source, modest sample size
Castren et al., (2013)	+ (Moderate) Sources of bias were minimised where possible Limitations: No control, low outcome completion rate, no ITT analysis, moderate treatment fidelity, no effect size	++ (Strong) Recruitment from multiple sources, appropriate inclusion criteria
Myrseth et al., (2012)	+ (Moderate) Sources of bias were minimised where possible Limitations: No control, modest sample size, short follow-up period	++ (Strong) Recruitment from multiple sources, appropriate inclusion criteria

Validity of the included studies using computer-assisted motivational feedback interventions (n = 7)

Study	Internal validity	External validity
Neighbors et al., (2015)	++ (Strong) Sources of bias were minimised where possible Limitations: No ITT analysis	++ (Strong) Recruitment from a large educational institution
Martens et al., (2015)	++ (Strong) Sources of bias were minimised where possible	++ (Strong) Recruitment from a large educational institution
Celio & Lisman, (2014)	+ (Moderate) Sources of bias were minimised where possible Limitations: Lack of standardised gambling measures, short follow-up period, no ITT analysis	++ (Strong) Recruitment from a large educational institution
Cunningham et al., (2011)	+ (Moderate) Sources of bias were minimised where possible Limitations: Small sample size, non-representative sample, no fidelity check, no ITT analysis	+ (Moderate) Limitations: Recruitment from a single source, volunteer nature of sample may not be representative
Cunningham et al., (2012)	++ (Strong) Sources of bias were minimised where possible	++ (Strong) Participants recruited using a general population telephone screener, appropriate inclusion criteria
Auer & Griffiths, (2015a)	+ (Moderate) Sources of bias were minimised where possible Limitations: No key information on sample, unmatched data sets, cross-contamination between groups, no fidelity check, poor method of outcome evaluation, analysis was performed by comparing the odds ratio between groups	++ (Strong) Strong ecological validity as the study was provided real world gambling data from an online gambling operator

Auer & Griffiths, (2015b)	+ (Moderate) Matched pair design next best approach in overcoming non-randomly selected target group members Limitations: Lack of fidelity check, ambiguity regarding other gambling website usage during the evaluation period, short follow-up time	++ (Strong) Strong ecological validity as the study was provided real world gambling data from an online gambling operator

Validity of the included studies using computer-assisted mixed interventions (n = 1)

Study	Internal validity	External validity
Canale et al., (2016)	+ (Moderate) Sources of bias were minimised where possible, confounders at baseline accounted for Limitations: No ITT analysis, small number of classes selected, no fidelity check	- (Poor) Limitations: Limited generalisability due to selective sampling (modest sample from the South Italy high school), no information provided on how the high school was selected

4.0 Discussion

The present review aimed to evaluate the effectiveness of computer-assisted cognitive behavioural therapies (CBT) and motivational feedback interventions in reducing problematic gambling. The findings of the review are summarised and discussed below along with recommendations for future research.

4.1 Computer-assisted cognitive behavioural interventions

Five studies evaluated outcomes related to computer-assisted CBT. Four of these reported significant treatment effects in reducing gambling-related activities at various follow-up points, with some studies also showing a reduction in psychopathology and general psychological distress. Positive treatment effects were observed immediately following intervention (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013; Myrseth et al., 2013), at three-months follow-up (Myrseth et al., 2013), at six-months follow-up (Carlbring et al., 2012; Carlbring & Smit, 2008; Castrén et al., 2013), and at eighteen and 36 months follow-ups (Carlbring et al., 2012; Carlbring & Smit, 2008). Carlbring et al. (2012) and Carlbring and Smit (2008) also reported statistically significant reductions in depression and anxiety, as well as improved quality of life compared to pre-treatment. The studies conducted by Myrseth et al. (2013) and Castrén et al. (2013) both reported a reduction in gambling erroneous thoughts and general psychological distress, with the latter study also reporting a reduction in gambling urge, impaired control of gambling, alcohol consumption, social consequences and depression. Only one out of the four studies included a control group (Carlbring & Smit, 2008). These four studies were appraised as 'moderate' for internal validity.

The remaining study which compared computerised CBT and personalised normative feedback (PNF) interventions showed no significant effect of either intervention on problem gambling (Luquiens et al., 2015). The authors acknowledged that the lack of treatment effect may be due to factors such as the inclusion of non help-seeking problem gamblers. This randomised controlled study was assessed as 'moderate' for internal validity.

The content of the computerised CBT interventions showed a degree of homogeneity as most were adapted from the same evidence-based self-help treatment manuals (e.g. Ladouceur & Lachance, 2006). The balance of the evidence reviewed therefore appears to be in favour of computer-assisted cognitive behavioural interventions for treating problematic gambling.

While the majority of the findings demonstrated significant treatment effects, the results should be interpreted with caution, as most of the studies lacked a comparison group, relied primarily on self-reported data, had moderate levels of treatment fidelity, and reported attrition rates above 20%. Future studies should factor the high attrition rates of online interventions into the power calculation so as obtain adequate sample sizes. In addition to larger sample sizes, future studies should aim to reduce dropout; it is possible that increased therapist contact through telephone or email may help to promote treatment adherence thereby reducing dropouts. The lack of a control group may suggest that treatment effects may be attributed to other factors such as maturation, history, or other nonspecific therapeutic factors that could potentially confound the results. These limitations were similarly reported in a recent review evaluating internet-based interventions for addictive behaviours (Chebli et al., 2016). Due to the aforementioned factors and the paucity of research on computerised CBT for gambling problems, it is recommended that further randomised controlled trials should be conducted before definitive conclusions are drawn regarding the effectiveness of treatment. The studies however provide a strong basis for the development of future computerised CBT trials for problem gamblers.

4.2 Computer-assisted motivational feedback interventions

Seven studies evaluated the use of computer-assisted motivational feedback interventions. Of these, six employed personalised normative feedback (PNF) interventions, while all but one reported significant treatment effects of PNF interventions on various gambling outcomes at different follow-up points. The study by Auer and Griffiths (2015b) reported a significant reduction in terms of time and money gambled post-intervention. Two studies reported a significant reduction in money spent gambling and gambling-related problems at three-months follow-up (Martens et al., 2015; Neighbors et al., 2015), with the latter study also reporting that all treatment effects except reduced gambling problems were sustained at six-months follow-up. The pilot study by Cunningham et al. (2011) reported a significant impact of the intervention on reducing money spent gambling, but not on gambling problems at three-months follow-up. Celio and Lisman's study (2014), which measured gambling outcome through two computer-based risk tasks, found a significant treatment effect of PNF on lowering risk-taking performance on these tasks after one week. These studies were graded 'moderate' (n = 3) and 'strong' for internal validity (n = 2).

While these five studies demonstrated positive treatment effects, a randomised controlled trial assessed to have 'strong' methodological quality found no evidence for the impact of the PNF intervention at three, six, twelve months follow-ups (Cunningham et al., 2012); the study did however report that the participants who received partial feedback (i.e. personalised feedback without the normative feedback component) had a significant reduction in the number of gambling days. The results of one randomised controlled trial should however not be taken as proof that the PNF intervention is ineffective without consistent corroboration by findings from other randomised trials. The results of Cunningham et al.'s study (2012) prompts an interesting research direction to determine which ingredients in the PNF intervention serve as therapeutic mechanisms motivating reductions in problem gambling.

The remaining study which evaluated a normative feedback intervention found a significant treatment effect of the intervention in reducing gambling behaviour (Auer & Griffiths, 2015a); the study was assessed as 'moderate' for internal validity. Readers should however be cautioned of the limitations of the study such as the lack of information about the data sets provided by the online gambling operator and the way gambling outcome was evaluated.

Three studies recruited participants from one single location for both study arms (i.e. single school), raising concerns regarding contamination between treatment and control groups (Celio & Lisman, 2014; Martens et al., 2015; Neighbors et al., 2015). It might be possible to reduce this potential bias by using cluster designs, where the centre is the unit of analysis as opposed to the individual participant being the unit of analysis. However, this may be difficult to implement in practice as it would require a large number of schools which may not be feasible.

One may predict that brief motivational feedback interventions will have a limited, short-term impact on the severity of participants' problem gambling; this was evidenced by positive treatment effects up to six-months follow-up. It is recommended that future research should examine the properties of the motivational feedback intervention to determine which aspects contribute to a sustained treatment effect in reducing problem gambling. An important strength is that five out of seven studies employed a randomised controlled design, providing more credence to the efficacy of computer-assisted motivational feedback interventions. Overall, the balance of evidence appears to be in favour of the short-term benefits of computer-assisted motivational feedback interventions. Specifically, feedback interventions incorporating personalised and normative feedback components appear to be particularly effective.

4.3 Mixed interventions

Canale et al. (2016) evaluated a web-based intervention that included both components of personalised feedback and CBT; the authors reported that participants in the intervention group demonstrated a reduction in gambling problems compared to the group that only received personalised feedback at a two-month follow-up. There were however no differences in gambling frequency, expenditure, and attitudes towards gambling between groups. In addition, the study reported that participants who were considered frequent gamblers were more amenable to the intervention, and reported a reduction in gambling problems and frequency post-intervention compared to non-frequent gamblers. The study was however assessed as 'moderate' for internal validity due to various limitations. The sample size was modest and the way the high school in the South Italy region was selected is not known. This form of sampling may hinder generalisability as the sample is not likely to truly represent gambling patterns in high school students. Furthermore, the authors did not specify any inclusion criteria and the sample most likely consisted of mostly non-clinical gamblers. While authors accounted for gambling frequency in their analysis, and subsequently found positive treatment effects for frequent gamblers (i.e. those that gambled at least once a week at baseline) compared to non-frequent gamblers, it is not known whether the treatment is effective for adolescents who may be classified as pathological or problem gamblers.

The findings from this study provide partial support for the effectiveness of computer-assisted interventions integrating both personalised feedback and CBT components. However, due to its limitations, firm conclusions regarding treatment efficacy cannot be derived from this study alone. The novelty of incorporating both motivational feedback interventions and CBT components should nonetheless be further investigated in future research. One potential use of such interventions would be to include PNF in the initial online screener, as part of motivational enhancement, before cCBT is implemented as the main intervention.

4.4 Limitations and future research

Unlike the wide evidence base for traditional face-to-face CBT and MI treatments for problematic gambling, the current available evidence base for the computerised versions of these interventions is relatively limited. This was evidenced through the handful of studies found on computer-assisted CBT (n = 5), motivational feedback interventions (n = 7), and mixed interventions (n = 1). Given that the review provides preliminary support of positive

treatment effects of computer-assisted CBT and motivational feedback interventions, their effectiveness should be further explored in future research.

A potential limitation in the literature so far involves the lack of cultural diversity represented in the studies, with all the studies conducted in either Western or Scandinavian countries. Men are also overrepresented in the studies, with only one study reporting a larger female to male ratio. Prevalence studies have consistently reported that the problem gambling rate amongst males is doubled compared to females (Williams, Volberg & Stevens, 2012). This may explain why the gender distribution in the majority of samples from the selected studies was predominantly male. However, it is possible that the conclusions drawn might have differed if the results had been considered in accordance with specific genders.

The majority of studies did not specify gambling type as an inclusion criterion and recruited participants who engaged in different types of gambling. It is therefore not known whether online treatment is less or more effective for individuals with a particular gambling preference, or whether problem gamblers who engage in less popular forms of gambling are well represented in the studies. It may be possible that problem gamblers who conduct their gambling online may be more receptive and amenable to online treatment. Future research should therefore account for gambling type when examining the efficacy of online interventions for problem gambling.

The inclusion criteria for gambling severity varied across studies; this ranged from recruiting pathological gamblers to college students who gambled at least once in the past month. While this may be, the majority of studies (n = 9, 69%) utilised well validated gambling screening measures and recruited participants who were at the more severe end of the gambling spectrum (i.e. problem or pathological gamblers), helping to avoid recruiting those with less severe problems. However, given the small amount of studies, it is not known whether treatment efficacy would vary based on the severity of the gambling problem. More research needs to be done in this area, but also studies need to clearly define participants based on the severity of their gambling problem. Also, adhering to well developed and validated measures such as the National Opinion Research Centre DMS Screen for Gambling Problems (NODS), the Canadian Problem Gambling Index (CPGI), and the South Oaks Gambling Screen (SOGS), may allow for better comparability across studies.

Individuals with problem gambling may present with other coexisting mental health difficulties. The majority of studies did not screen for problem gamblers suffering from coexisting psychiatric conditions such as depression (n = 9, 69%). Of the four studies that screened participants for coexisting mental health difficulties, the study by Carlbring and Smit (2008) excluded participants suffering from moderate or severe depression. The other three studies that demonstrated treatment efficacy of cCBT for problem gambling also highlighted a reduction in psychopathology and psychological distress (Carlbring et al., 2012; Castrén et al., 2013; Myrseth et al., 2013). However, due to the small amount of studies, the treatment efficacy of online interventions for treating coexisting mental health problems cannot be firmly established yet. It is not known whether computerised interventions that target problem gambling behaviour would simultaneously resolve any underlying mental health problems that may be perpetuating the gambling behaviour. This could be a potential area of future research.

Lastly, the majority of studies measured gambling outcomes at twelve-months or less. Ideally, future studies could examine whether treatment effects can be sustained over longer periods of time as there may be the possibility of latent effects in therapeutic treatment. However, it is acknowledged that longer follow-up periods would be expensive and would require more resources which may not always be available or feasible.

4.5 Conclusion

The studies reviewed provide some early evidence that computer-assisted CBT and motivational feedback interventions can have positive effects on a range of gambling related outcomes, with positive treatment effects being sustained at various follow-up points up to 36 months. These two intervention types were selected due to the treatment efficacy demonstrated by CBT and MI in conventional face-to-face treatments for problem gambling. While only a handful of efficacy studies were found in this area, the studies provided preliminary evidence for the efficacy of these treatments which as suggested should be explored further. Future research could also evaluate other innovative, technology-driven forms of treatment for problem gambling such as peer web-based therapeutic support (e.g. Wood & Griffiths, 2007; Wood & Wood, 2009). The results from the present review should support and inform future research on computerised interventions for problematic gambling, as this mode of therapy delivery may reduce the barriers for those who seek professional help.

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Empirical Paper

The psychology of online gaming: Play motivations and wellbeing

Abstract

Background: The majority of research on online gaming has demonstrated the negative impact of increased play time on psychological wellbeing. The present study examined this relationship, focusing on the Multiplayer Online Battle Arena (MOBA) gaming genre. This relationship was considered with respect to motivators for playing as well as resilience factors.

Aims: The association between play time and psychological wellbeing was explored for a MOBA game (Defence of the Ancients 2). A cross-sectional, online questionnaire design was employed to examine the relationship between average hours played per week and psychological wellbeing. Five previously reported motivators for playing were tested as mediating variables including 'socialisers', 'completionists', 'competitors', 'escapists', and 'smarty-pants'. An exploratory analysis was conducted to determine the moderating effects of self-esteem and self-efficacy on 'escapist' gaming and psychological wellbeing.

Methods: A sample of 165 participants were recruited through opportunity sampling and snowballing methods. Measures included demographic details, play time, psychological wellbeing, motivators for playing, self-esteem, self-efficacy, and social desirability.

Results: A correlation was found with higher levels of play time associated with poorer psychological wellbeing. This relationship was partially mediated by the 'escapist' motivation. Self-esteem was found to moderate the negative impact of 'escapist' gaming on psychological wellbeing.

Conclusions: Increased MOBA play time was associated with poorer psychological wellbeing, especially when there is a greater motivation for escapism. The negative impact of 'escapist' gaming was strengthened for individuals with low self-esteem. The relevant research and the associated clinical implications are discussed.

Keywords: Multiplayer Online Battle Arena (MOBA); online games; problematic gaming; motivators for playing; escapism; self-esteem; self-efficacy

1.0 Introduction

The internet has made the reality of a global networked society possible and it therefore comes as no surprise that online games have emerged as a space where individuals can co-construct a shared gaming experience. The number of people using online platforms for gaming has increased exponentially during the last decade; a report by ComScore (2007) suggested that almost 217 million people play games online annually. With the proliferation of online games, there has been increasing concern over the excessive use of gaming and the ramifications on psychological wellbeing. This has been the predominant focus of the related research, with the majority of studies elucidating the disadvantages and risks of online games (e.g., Ng & Wiemer-Hastings, 2005; Peters & Malesky, 2008; Whang & Chu, 2007; Young, 2004).

The most extensively researched online gaming genre in the recent literature involves Massively Multiplayer Online Role Playing Games (MMORPGs). Studies have demonstrated that low self-esteem, depressive symptoms, problematic gaming behaviour, and poorer general health are some of the reported consequences resulting from the problematic use of MMORPGs (e.g. Ng & Wiemer-Hastings, 2005; Smyth, 2007; Porter, Starcevic, Berle & Fenech, 2010). While recent research has primarily centred on MMORPGs, there are other gaming genres that are deserving of empirical attention. One emerging gaming genre, in the context of which the present study is situated, involves Multiplayer Online Battle Arena (MOBA) games. The MOBA gaming genre has experienced a rapid rise in popularity over the past five years (Pereira, 2014). The shift from MMORPGs to MOBA games is evidenced through MOBA's greater active player population and international recognition as a competitive sport. Even though MOBA games share features with MMORPGs such as multiplayer online interaction and single character control, MOBA games are distinct in terms of their game mechanisms and lack the role-playing element found in MMORPGs. In MOBA games, players compete as part of a team against another team in a match lasting around 30-60 minutes. The match ends when a team destroys the opponent team's base. Unlike the expansive virtual worlds in MMORPGs, MOBA games only offer a single virtual arena where players battle it out until a team emerges victorious. While MMORPGs allow for a significant investment into a single character (e.g. levelling up, customisation options, etc.), characters in MOBAs reset after each match.

Research findings in the MMORPG genre appear to suggest a relationship between increased play time and negative psychological wellbeing. Specifically, Kuss, Louws and Reinout (2012) suggested that the immersive properties found in MMORPG gameplay, namely escapism (i.e.

avoidance of real-life problems), role-playing (i.e. adopting an in-game persona), and character customisation (i.e. personalisation of character), are associated with more problematic outcomes. However, it is not known if playing MOBA games, which are distinct from MMORPGs in terms of its game mechanics while sharing only some of the immersive properties of MMORPGs, are likewise associated with poorer psychological outcomes. It is therefore worthwhile to explore the association between playing online games and psychological wellbeing in the context of other gaming genres such as MOBAs, and whether other factors influence this relationship.

1.1 Impact of online games

Research in online gaming tends to emphasise its negative impact on psychological wellbeing (Messias et al., 2001; Mentzoni et al., 2011; Gentile et al., 2011). MMORPGs seem to feature most in the discourse on problematic gaming outcomes (e.g. Caplan, Williams & Yee, 2009; Young & de Abreu, 2011), with studies suggesting that MMORPG players are more vulnerable to negative psychological and physical outcomes (Kuss et al., 2012; Ng & Wiemer-Hastings, 2005; Lo, Wang & Fang, 2005; Morgan & Cotten, 2003; Liu & Peng, 2009).

Less attention has been given to an investigation of the positive impact of online gaming on psychological wellbeing. Some evidence has emerged suggesting that gaming is associated with positive advantages such as helping players develop social skills, foster a social support network, enhance positive affect, and improve wellbeing (Griffiths 2009; Ducheneaut et al. 2006; Williams et al. 2006; Longman et al. 2009; Wang, Khoo, Liu & Divaharan, 2008). Despite the large amount of literature pointing towards the disadvantages of gaming, limitations such as small effect sizes, the predominant use of correlational study designs, and a lack of negative side effects for most players warrants further investigation (Smyth, 2007; Ryan, Rigby & Przybylski, 2006). Considering the variation in evidence, it is imperative to further evaluate the relationship between online gaming and psychological wellbeing, as there may be important factors that can influence the direction and strength of this relationship.

1.2 Motivations for playing

Examining the impact of online gaming without understanding the reasons as to why individuals engage in the game in the first place may lead to oversimplified conclusions regarding the harms and benefits of gaming. Gaming in general serves to satisfy certain needs and it is therefore important to investigate the topic from a motivational perspective.

Demetrovics et al. (2011) posit that behaviour is largely determined and influenced by motives. The investigation into motivational factors is not new and has been examined in the field of addiction studies. For example, motivations for drinking were found to account for 50% of the variance in adolescent alcohol use (Kuntsche, Knibbe, Gmel & Engels, 2005). Given this, understanding the motives and needs underlying why individuals play online games may lead to greater insight into the relationship between excessive use and psychological wellbeing.

Khan et al. (2015) developed a scale examining players' motivations for playing games in the context of MOBA and MMORPG gaming genres. The authors argued that while other scales exist (e.g. Yee, 2006), they are limited in terms of their focus on specific gaming genres or lack of behavioural validation. Khan et al. (2015) conducted an exploratory factor analysis for items taken from past scales assessing the motivations for playing various video games (Sherry, Lucas, Greenberg & Lachlan, 2006; Yee, 2006). From the analysis, six factors were extracted which reflected six distinct types of players: 'socialisers' (i.e. playing to socialise with others); 'completionists' (i.e. playing to complete every aspect of the game); 'competitors' (i.e. playing to win); 'escapists' (i.e. playing to escape from real life); 'story driven' (i.e. playing because of the story development); and 'smarty-pants' (i.e. playing to enhance their intelligence). The scale was thereafter validated in two different gaming genres– League of Legends which is a MOBA game, and Chevaliers' Romance 3 which is an MMORPG.

'Escapist' players are defined as individuals who use gaming to escape from real life (Khan et al., 2015; Li, Liau & Koo, 2011). Several studies have highlighted that the motivation for escapism and immersive gaming are associated with negative psychological and social outcomes (e.g. Kirby, Jones & Copello, 2014; Caplan et al., 2009; Stetina, Kothgassner, Lehenbauer & Kryspin-Exner, 2011). Griffiths (2010) identified that adults who engaged in gaming to escape from real-life problems experienced negative consequences on wellbeing compared to adults who played to socialise. Similarly, Stetina et al. (2011) discovered that while 'escapist' gaming may act as a coping strategy for dealing with real-life difficulties, this was associated with more problematic outcomes. More recently, Kirby et al. (2014) identified the role of players' motivation as mediating the relationship between the amount of time spent playing MMORPGs and psychological wellbeing. Yee's (2006) three motivators for playing MMORPGs (Achievement, Social Interaction, and Immersion) were tested as mediators between play time and psychological wellbeing. The study found that increased play is associated with poorer psychological wellbeing, specifically where there is greater player

motivation for immersion and escapism. There appears to be a substantive amount of evidence pointing towards a negative association between using games to escape from real-life problems and poor mental health.

The negative outcomes associated with 'escapist' gaming may be mitigated by resilience factors. The literature on resilience factors has demonstrated how self-esteem can act as a defence mechanism by protecting individuals from experiences that are harmful (Pearlin & Schooler, 1978; Spencer, Josephs & Steele 1993; Thoits, 1994). Thoits (1994) postulates that self-esteem protects individuals from threats to the self while attempts to resolve the problem are made. Similarly, self-efficacy, which is having the self-belief that one can overcome challenging environmental demands, has been demonstrated to promote effective coping strategies when dealing with stressors in life (Jerusalem & Schwarzer, 1992; Bandura, 1982). Conversely, individuals with low self-esteem (or self-efficacy) may be more prone to the negative effects of 'escapist' gaming. It would therefore be important to examine the role of resilience factors such as self-esteem and self-efficacy in moderating the impact of 'escapist' gaming.

It is possible that some motivations for play may have a positive impact on psychological wellbeing. For instance, a sense of achievement and accomplishment harnessed through playing games has been shown to positively affect psychological wellbeing (e.g. Seligman, 2008; Kaplana & Maehrb, 1999). Kaplana and Maehrb (1999) have found that when individuals engage in an activity with the purpose of developing skills and gaining competence, they were found to be more likely to invest in the task; this was shown to be associated with improved psychological wellbeing. Khan et al. (2015) described 'completionists' as individuals who are motivated to complete every aspect of the game and to explore every element. In contrast, 'competitors' are motivated to win and are driven to master in-game mechanics in order to optimise their performance (Khan et al., 2015). It may be true then that a sense of achievement, derived from either winning or completing multiple aspects of the game, is associated with improved psychological wellbeing.

The 'socialiser' motivator for playing is defined as the motivation to interact with other players, to bond with existing friends and to make new friends while playing online games (Khan et al., 2015). It has been suggested in the research literature that the motivation related to social interaction may provide the means to improved psychological wellbeing. For example, there is evidence pointing towards an association between supportive social networks and positive

psychological wellbeing (Kawachi & Berkman, 2001; Longman et al., 2009; Moak & Agrawal, 2009; Thoits, 2011). Several studies identified positive effects of playing online games on increasing social contacts. For example, playing computer games can facilitate social contact, by providing more opportunities to develop new friendships and to expand network diversity (Kobayashi, 2010; Williams, 2006). Cohen (2004) found that integration within a social network may also directly produce positive psychological states, including a sense of purpose, belonging, and security.

Individuals may also play online games with the intention of enhancing their intelligence; this was defined as the 'smarty-pants' motivator for play identified in Khan et al.'s study (2015). Video games have been used as platforms for online learning and education (e.g. Squire, 2003; Squire & Jenkins, 2003; Gros, 2007). Childress and Braswell (2006) have demonstrated that playing MMORPGs can be used to facilitate learning and to foster interaction. However, it is not known whether playing with the aim to enhance intelligence is positively or negatively associated with psychological wellbeing.

Based on the literature on motivation, the reasons that individuals engage in gaming appear to be important when evaluating the impact of playing on psychological wellbeing. The consensus seems to be that the escapism motivation may contribute to poorer psychological wellbeing. While there is some suggestion that motivations for playing such as competition, game completion, and socialising may positively impact on psychological wellbeing, Kirby et al. (2014) did not find any evidence for the mediating effects of Yee's (2006) achievement or social interaction motivators when examining play time and its relation to psychological wellbeing in MMORPGs. Given the variation in evidence, achievement related motivators (i.e. 'completionists' and 'competitors'), social related motivators (i.e. 'socialisers'), and intelligence enhancing motivators (i.e. 'smarty-pants') should be further explored in terms of their mediating effect between play time and psychological wellbeing in MOBA games.

In clinical work, an assessment of an individual's coping mechanisms can provide insight regarding the way difficulties are managed. While some coping mechanisms are adaptive and may function as protective factors, other types of coping may be detrimental and may thus exacerbate a pre-existing mental health problem (e.g. addiction-related difficulties). Similarly, individuals who engage in extended periods of online gaming to escape from real-life difficulties may experience negative side effects regarding their mental health. The present study aims to point out a possible area that clinicians can attend to whilst assessing how service

users cope with mental health related difficulties.

1.3 Aims of the study

Multiplayer Online Battle Arena (MOBA) games have seen a rapid rise in popularity during the past five years, and currently boast a greater and more active player population compared to the most popular MMORPG, World of Warcraft (Pereira, 2014). Defence of the Ancients 2 (DOTA 2) is one the most popular MOBA games with an active monthly player population of thirteen million players (Wolmarans, 2016). The game consists of two teams of five players competing on a virtual battlefield; the team that pushes into the opposition's base first wins. This is akin to a rugby game with five player teams on a very large field.

DOTA 2 has earned widespread recognition, elevating the game to becoming an international E-Sport – a form of professional video gaming competition (Sjoblom & Hamari, 2016). Most recently, DOTA 2 broke the record as the most profitable E-sport competition, with over twenty million USD in prize pool money (Swatman, 2016). The widespread publicity garnered from these competitions has added to the already expanding player base. Further, with such lucrative incentives, more players around the globe have been aspiring to become professional gamers, and therefore invest even more hours into gaming. Unfortunately, it is at high intensities of play that players report more negative outcomes. As such, the present research focused on the impact of increased play time on psychological wellbeing. The study aimed to add to the sparse but growing research on MOBA games, in order to determine whether the findings on the relationship between play time and psychological wellbeing corroborate the findings reported in other game genres such as MMORPGs.

Yee's study (2006) identified that MMORPG players tend to be within the age range of eleven to 68 years, with the average player being 26 years old. A similar demographic pattern was found in other studies on gaming (e.g. Griffiths, Davies & Chappell, 2003; Williams, Yee & Caplan, 2008). To obtain a representative sample of adult users of the game, individuals aged18 years of age and above were targeted for the present study so it would allow for better generalisability to the MOBA player population.

The aim of the present study was therefore to examine the relationship between the amount of time spent playing DOTA 2 and psychological wellbeing. Kahn et al.'s motivations for play (2015) were tested as possible mediating factors in this relationship. Five out of six motivations for play were tested as mediating variables; the 'story-driven' sub-scale did not appear to be

relevant to DOTA 2 players following the study's pilot testing and was therefore not used in the present study. The pilot test is described later in the methodology. Overall, it was hypothesised that:

1) Greater time spent playing DOTA 2 would be associated with poorer psychological wellbeing.

2) In line with the findings from Kirby et al. (2014),

    a. Khan et al.'s (2015) 'escapist' motivator for playing would mediate the association between play time and psychological wellbeing.

3) Using Khan et al. (2015) motivators for playing, the 'socialisers', 'completionists', 'competitors', and 'smarty-pants' motivators for playing would be explored as mediators between play time and psychological wellbeing.

Additionally, the potential moderating effects of self-esteem and self-efficacy between motivation for play and psychological wellbeing would be explored.

2.0 Method

2.1 Pilot test

An initial pilot test was conducted with twenty regular DOTA 2 players. The aim of the pilot test was to gather feedback on the mechanics of the questionnaires and determine the relevance of Khan et al.'s motivations for play (2015) for the DOTA 2 game. Khan et al.'s motivators for playing (2015) were validated with players from a different MOBA game (League of Legends) and it was therefore important to determine if they were relevant to DOTA 2 players. From the qualitative feedback gathered, most participants involved in the pilot testing identified with all the sub-scales except for the 'story-driven' motivator for playing; they collectively reported that the game lacked a narrative component and found questions pertaining to the 'story-driven' motivation irrelevant. A decision was made following pilot testing to remove two-items from Khan et al.'s (2015) scale that examined the 'story-driven' motivation for play.

2.2 Design

The study employed a cross-sectional design to explore the association between average time per week spent playing and psychological wellbeing. Five previously established motivators

for playing were tested as mediating variables (i.e. 'socialisers', 'completionists', 'competitors', 'escapists' and 'smarty-pants'). Resilience factors (i.e. self-esteem and self-efficacy) were used in the exploratory analysis.

2.3 Participants

Participants were recruited using opportunity sampling and snowballing methods. Given that questionnaires were completed online and that DOTA 2 is played worldwide there were no constraints regarding locality. Participants were people who perceive themselves to be regular DOTA 2 players. There was no restriction placed upon play time across the sample of players. Hence, the inclusion criteria were:

1) Adults, aged eighteen and over, who perceive themselves as regular DOTA 2 players;

2) Fluency in the English language, in order to be able to accurately and appropriately fill in the questionnaires;

3) A score of less than seven on the short version of the Social Desirability Scale.

Using the power analysis tables provided by Fritz and MacKinnon (2007), a sample size of 71 participants allows for the identification of mediation of medium effect size (i.e. with path coefficients of at least .39), with a power of 0.80. Effects of this magnitude are sufficiently robust for the development of practical clinical interventions, and therefore sample sizes in excess of 70 participants would strike an acceptable balance between research precision and clinical utility.

One hundred and sixty-five participants took part in the study (155 males and ten females). To control for social desirability, participants who scored seven or above (out of ten) on the social desirability scale were excluded from further analyses (n = 16, 9.7%). Analyses were conducted for 149 participants (142 males and seven females).

2.4 Measures

Play time[14] was assessed via self-report, in terms of gameplay days per week, hours per day and hours per week. Data on play time were cross-referenced to ensure valid responding and

[14] Please refer to Appendix 7 for the questions on play time

consistency. The distribution for play time was positively skewed with the median play time at 18 hours per week.

2.4.1 Psychological wellbeing

Goldberg and Hillier's (1979) General Health Questionnaire (GHQ-28) was used as a measure of Psychological Wellbeing. The 28-item version is recommended for both research and clinical purposes (Jackson, 2007). The questionnaire contains four subscales; Somatic Problems, Anxiety and Insomnia, Social Functioning and Depression. Each item is scored on a four-point Likert scale (from zero = no difficulties to three = much greater difficulties than usual). A higher score is indicative of poorer psychological wellbeing. The Cronbach's Alpha Score for the scale is 0.9 (Failde, Ramos & Fernandez-Palacin, 2000).

2.4.2 Motivations for play

Kahn et al.'s (2015) Trojan Player Typology scale is a 15-item questionnaire used to identify players' motivation for playing DOTA 2. Play motivators include 'socialisers', 'completionists', 'competitors', 'escapists', 'story driven', and 'smarty-pants'. Participants were required to record their extent of agreement with statements relating to various aspects of gameplay. Each item is scored on a five-point Likert scale, where zero implied 'strongly disagree' and five implied 'strongly agree'. As mentioned, the 'story-driven' motivation was removed following pilot testing due to its lack of relevance to DOTA 2 players. Khan et al. (2015) reported that the Cronbach's Alpha reliability coefficients for each motivation are 'Socialisers' (.69), 'Completionists' (.67), 'Competitors' (.75), 'Escapists' (.70), and 'Smarty-pants' (.79) respectively.

2.4.3 Self-esteem

Rosenberg's (1965) Self-Esteem Scale was used as a measure of self-esteem. The self-esteem scale is a ten-item questionnaire in which respondents indicate on a four-point Likert scale (from one = strongly disagree to four = strongly agree) the extent of their agreement of the statements. Higher scores indicate higher self-esteem. Rosenberg (1965) reported that the scale had good internal consistency (.77). A varied selection of independent studies using such samples as– parents, men over 60, high school students, and civil servants, – showed alpha coefficients ranging from 0.72 to 0.87.

2.4.4 Self-efficacy

Schwarzer and Jerusalem's (1995) Generalised Self-Efficacy Scale was used as a measure of self-efficacy. The self-efficacy scale is a ten-item questionnaire, in which respondents indicate on a four-point Likert scale (from one = not true at all to four = exactly true) the extent of agreement with the statements. A higher score is indicative of higher self-efficacy. Schwarzer and Jerusalem (1995) reported that the scale has good internal consistency (.82 to .93) for the samples studied.

2.4.5 Social desirability

The short version of the Social Desirability Scale (SDS; Strahan & Gerbasi, 1972) was used as a measure of socially desirability. The scale included ten true/false statements designed to reveal social desirability in the respondent. Higher scores indicate a greater tendency to present oneself in a positive manner. Fischer and Fick (1993) reported that the short version of the SDS has good internal consistency (.88) and is highly correlated with the original scale (.96) developed by Crowne and Marlowe (1960).

2.5 Procedure

The research study was advertised to players of DOTA 2, both via game forums (internet webpages set up for groups of players to discuss issues) and social media sites (e.g. DOTA 2 Facebook pages). Players who were interested in the study were directed to a webpage with more information and consent criteria. Participants were only allowed to proceed with the study after they consented with the criteria statements. The survey was set up using an online survey programme, Limesurvey (Schmitz, 2015).

No data were stored by the Limesurvey programme until participants 'submitted' their responses at the end of the questionnaires. Participants were also given the opportunity to return to the website at any point to complete the questionnaires. This meant that participants could consider their decision to take part in the study for as long as they required, and withdraw at any point until submitting. Participants were prompted to complete any unanswered questions at the end of each page before continuing to the next page. Participants were not required to provide any identifiable information, and no IP (Internet Provider) addresses were stored by the programme.

Demographic questions were presented first, followed by the General Health Questionnaire, the Motivations for Play Questionnaire, the Rosenberg Self-Esteem Scale, the Generalised Self-Efficacy Scale, and the Social Desirability Scale. Counterbalancing the order of questionnaires was considered. There is no evidence in the relevant literature suggesting that the stated questionnaires would influence responses based on their presentation order. Kirby et al. (2014), who conducted a study with a similar set of measures, did not perform a counterbalancing of questionnaires. Considering the pragmatics and utility of counterbalancing questionnaires, a decision was made against doing this.

Questionnaire completion took approximately twenty minutes. Upon completing the questionnaires, participants were provided with the opportunity to contact the researcher for more details on the study or to request to be notified about the outcome of the study.

2.6 Data analysis

Scores obtained from populations defined by unusual characteristics may not always adhere to a normal distribution. In such instances, the deviation from normality is often reflective of a non-normal distribution of scores in the reference population and may therefore not highlight the idiosyncratic aspects of sampling. Accordingly, correcting the sample distribution for normality would not be appropriate. Traditionally, nonparametric statistical procedures have been utilised for the analysis of such data. However, nonparametric statistical procedures are associated with limitations such as the loss of statistical power for inferential statistical tests, and may thus be applicable only to a limited range of analytical questions (Howell, 2012). An alternative method involves the use of bootstrap confidence intervals as a replacement for traditional (parametric) asymptotic probability values. Bootstrap CIs have the advantage of increased statistical power, by virtue of confidence intervals that are robust to the violation of parametric assumptions (Moore & McCabe, 2005). Bootstrap CIs were therefore used for inferential tests. Unless otherwise stated, bootstrap results are based on 5000 bootstrap samples and the bias corrected and accelerated bootstrap confidence intervals are provided.

A zero-order correlation was used to determine the relationship between the independent variable (average number of hours spent playing per week) and the dependent variable (psychological wellbeing). To determine the potential mediating effect of motivations for playing, Preacher and Hayes' (2004; 2008) model of mediation was used (see Figure 2). Apart from calculating multiple mediator values simultaneously, the model takes into account the

violation of parametric inference assumptions by reporting bias corrected and accelerated bootstrap confidence intervals. Preacher and Hayes (2004; 2008) have argued that this method is more robust than non-parametric statistical procedures and has a higher statistical power than the standard Sobel Test.

The relationship beween motivations for play and resilience factors (self-esteem and self-efficacy) was analysed using Preacher and Hayes (2004; 2008) mediation moderation model. The model explores the potential interaction effect between self-esteem (and self-efficacy) and motivations for play on psychological wellbeing.

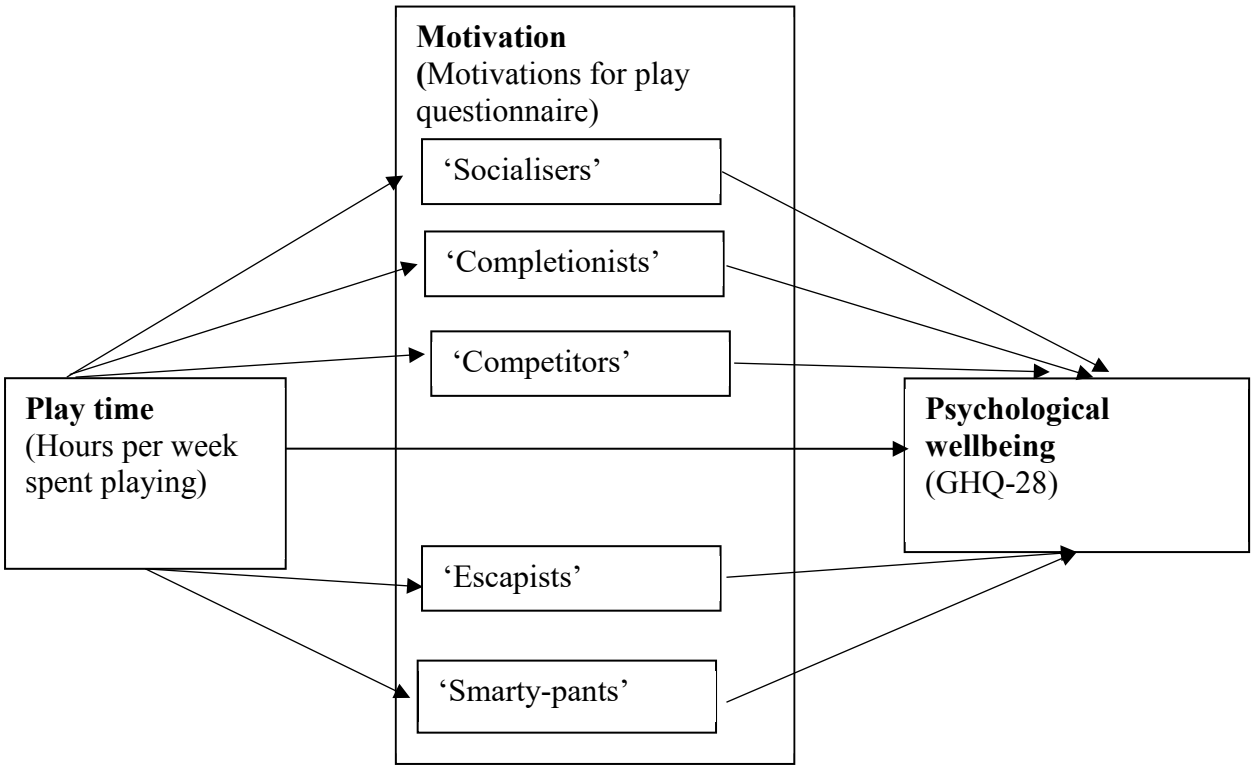

Figure 2: Visual representation of the mediation model

3.0 Results

3.1 Sample characteristics

The results were analysed for 149 participants. The participants' demographic information is presented in Table 5. The sample comprised 142 males (95.3%) and seven females (4.7%). The average age of the sample was 23.2 years, with an age range from 18 to 44 years. Participants originated from 30 countries although the largest number was from the UK (28%).

Table 5. Summary of sample demographic variables

	Categories	N (%)
Gender	Male	142 (95.3)
	Female	7 (4.7)
Relationship Status	Single	114 (76.5)
	Married	5 (3.4)
	Cohabiting	21(14.1)
	Divorced	1 (0.7)
	Other	8 (5.4)
Employment	Full time employment	44 (30)
	Part time employment	19 (12.8)
	Unemployed	8 (5.4)
	Student	77 (51.7)
	Stay at home parent	1 (0.7)

The pattern of DOTA 2 play for the sample is summarised in Table 6. The majority of participants indicated that they had been playing the game for more than four years (34.2%). Eighty-four percent of participants reported having played the game for two years or more, and thus the majority of participants would be considered experienced players. The mean level of game experience recorded by participants was level 100.28 (SD = 56.9), which indicates that they had invested a significant amount of time playing the game. It is these levels of playing that are of most interest to the study as this is where problems may occur. Participants reported playing the game for an average of 22.74 hours per week.

Table 6. Pattern of play

		Mean (SD)	Range
Age		23.2 (4.67)	18-44
Play Pattern	Hours per week	22.74 (16.19)	1-70
	Years playing		<1->4
	Days per week	5.22 (1.69)	1-7
	Hours per day	3.99 (2.26)	1-10
Game experience	Experience level	100.28 (56.89)	0-435

The analysis of gender differences and time spent playing (average hours per week) revealed no significant differences ($t = -0.39$, 95% CI [-13.03 to 8.98]). There was also no correlation found between the average hours played per week and participants' age ($r = -0.141$, $n = 149$, $p = 0.086$).

The General Health Questionnaire (GHQ-28) was utilised to determine psychological wellbeing and findings are presented in Table 7. The total score of the GHQ represents overall wellbeing and a higher score is indicative of poorer psychological wellbeing. The mean GHQ

score for the sample was 21.80 (SD = 12.90) and scores ranged from three to 56. The presence of mental health difficulties or 'caseness' of the sample was determined via the 'GHQ method of scoring' (Goldberg, Williams & Williams, 1988). Using this method, the Likert scores (0-1-2-3) were recoded (0-0-1-1) and a total score exceeding the cut-off of six was considered indicative of 'caseness'. In the sample, 27.5% (n = 41) of the participants exceeded the cut-off.

The GHQ-28 consists of four subscales. The mean score for each subscale was as follows: Somatic Problems (M = 4.85, SD = 3.26), Anxiety and Insomnia (M = 5.44, SD = 4.11), Social Functioning (M = 7.26, SD = 3.06), and Depression (M = 4.23, SD = 4.93). There were no significant differences found between gender and the total GHQ score (t = -0.94, 95% CI [-9.17 to 3.22]), the Somatic Problems subscale (t = 0.25, 95% CI [-2.20 to 2.97]), the Anxiety and Insomnia subscale (t = -1.99, 95% CI [-3.60 to 0.004]), the Social Functioning subscale (t = -0.61, 95% CI [-2.98 to 2.10]), and the Depression subscale (t = -0.39, 95% CI [-13.03 to 8.98]). No significant correlations were found between age and the total GHQ score (r = -0.051, 95% CI [-0.19 to 0.09]), the Somatic Problems subscale (r = -0.02, 95% CI [-0.15 to 0.12]), the Anxiety and Insomnia subscale (r = -0.05, 95% CI [-0.20 to 0.11])), the Social Functioning subscale (r = -0.04, 95% CI [-0.17 to 0.10]), and the Depression subscale (r = -0.06, 95% CI [-0.19 to 0.09]).

Table 7. Summary of test variables

		Mean (SD)
GHQ-28	Total	21.80 (12.9)
	Somatic	4.85 (3.26)
	Anxiety & Insomnia	5.44 (4.11)
	Social functioning	7.26 (3.06)
	Depression	4.23 (4.93)
Self-Esteem	Total	27.97 (5.10)
Self-Efficacy	Total	29.75 (5.46)
Play Motivation	Socialisers	10.56 (2.7)
	Completionists	11.75 (2.19)
	Competitors	10.48 (2.55)
	Escapist	6.02 (2.34)
	Smarty-pants	6.17 (2.01)

Rosenberg's Self-Esteem Scale (1965) was used to measure global self-worth. A high score is indicative of higher self-esteem. The mean score was 27.97 (SD = 5.10) and scores ranged from 17 to 40. There were no significant differences found in self-esteem scores between genders (t = 0.32, 95% CI [-2.15 to 3.67]). There was also no significant correlation found between self-esteem and age (r = 0.06, 95% CI [-0.10 to 0.20]).

The General Self-Efficacy Scale (1995) identifies individuals' belief in terms of their ability to respond to difficult situations or setbacks. A higher score represents higher self-efficacy. A mean score of 29.75 (SD = 5.46) was obtained and the scores ranged from sixteen to 40. Males and females were not found to significantly differ in terms of self-efficacy scores (t = 0.41, 95% CI [-1.62 to 3.19]). Age was also not found to be significantly correlated with self-efficacy (r = 0.15, 95% CI [-0.06 to 0.31]).

3.2 The association between play time and psychological wellbeing

The impact of play time on psychological wellbeing was evaluated in terms of the relationship between the average number of hours played per week and the total GHQ score. A significant positive correlation was obtained between play time and GHQ scores (r = 0.43, 95% CI [0.28 to 0.57]). Results suggest that as the amount of play time per week increased, the greater the GHQ scores were (i.e. poorer psychological wellbeing), accounting for approximately 18% of the variance.

Significant positive correlations were also found for each of the GHQ subscale scores; Somatic Problems (r = 0.40, 95% CI [0.22 to 0.55]), Anxiety and Insomnia (r = 0.36, 95% CI [0.20 to 0.50]), Social Functioning (r = 0.32, 95% CI [0.17 to 0.47]), and Depression (r = 0.37, 95% CI [0.22 to 0.52]). Altogether, the results indicated that a greater number of hours spent playing DOTA 2 is associated with poorer levels of overall psychological wellbeing.

3.3 Mediation analysis

Preacher and Hayes' (2004; 2008) mediation analysis procedures were used to explore the relationship between play time and psychological wellbeing, with the motivations for play as potential mediators. Five mediated paths were included in the model tested ('socialisers', 'completionists', 'competitors', 'escapists', and 'smarty-pants'). The significance of the mediated pathways was evaluated using bootstrap bias corrected and accelerated confidence intervals and beta values, as described previously.

In the unmediated null model, the effect of play time on psychological wellbeing was $\beta = 0.35$, 95% CI [0.23 to 0.46]. This was reduced to $\beta = 0.22$, 95% CI [0.12 to 0.32] when the mediating effect of the motivators were included. Therefore, the sum of the indirect effects within the mediation model was $\beta = 0.12$, 95% CI [0.03 to 0.22].

Figure 3 illustrates the individual path coefficients for each motivator for playing and the associated significance tests. In terms of the overall mediation effects, the 'socialiser' motivator was not found to be significant (β = 0.003, 95% CI [-0.01 to 0.03]). Similarly, the paths mediated by the 'completionist' motivator (β = 0.01, 95% CI [-0.01 to 0.04]), 'competitor' motivator (β = -0.003, 95% CI [-0.03 to 0.02]), and 'smart-pants' motivator (β = -0.003, 95% CI [-0.02 to 0.01]) did not show a significant overall effect. Only the path mediated by the 'escapist' motivation yielded a significant overall effect (β = 0.12, 95% CI [0.05 to 0.20]). Accordingly, a partial mediation effect was observed.

These results indicated that the 'escapist' motivation significantly mediated the relationship between play time and psychological wellbeing. The positive beta value indicates that the greater number of hours spent playing, alongside increased escapism, is related to poorer psychological wellbeing. However, the association between play time and psychological wellbeing was not fully mediated by the 'escapist' motivator, indicating that there may be other variables not accounted for by the model that mediate this relationship.

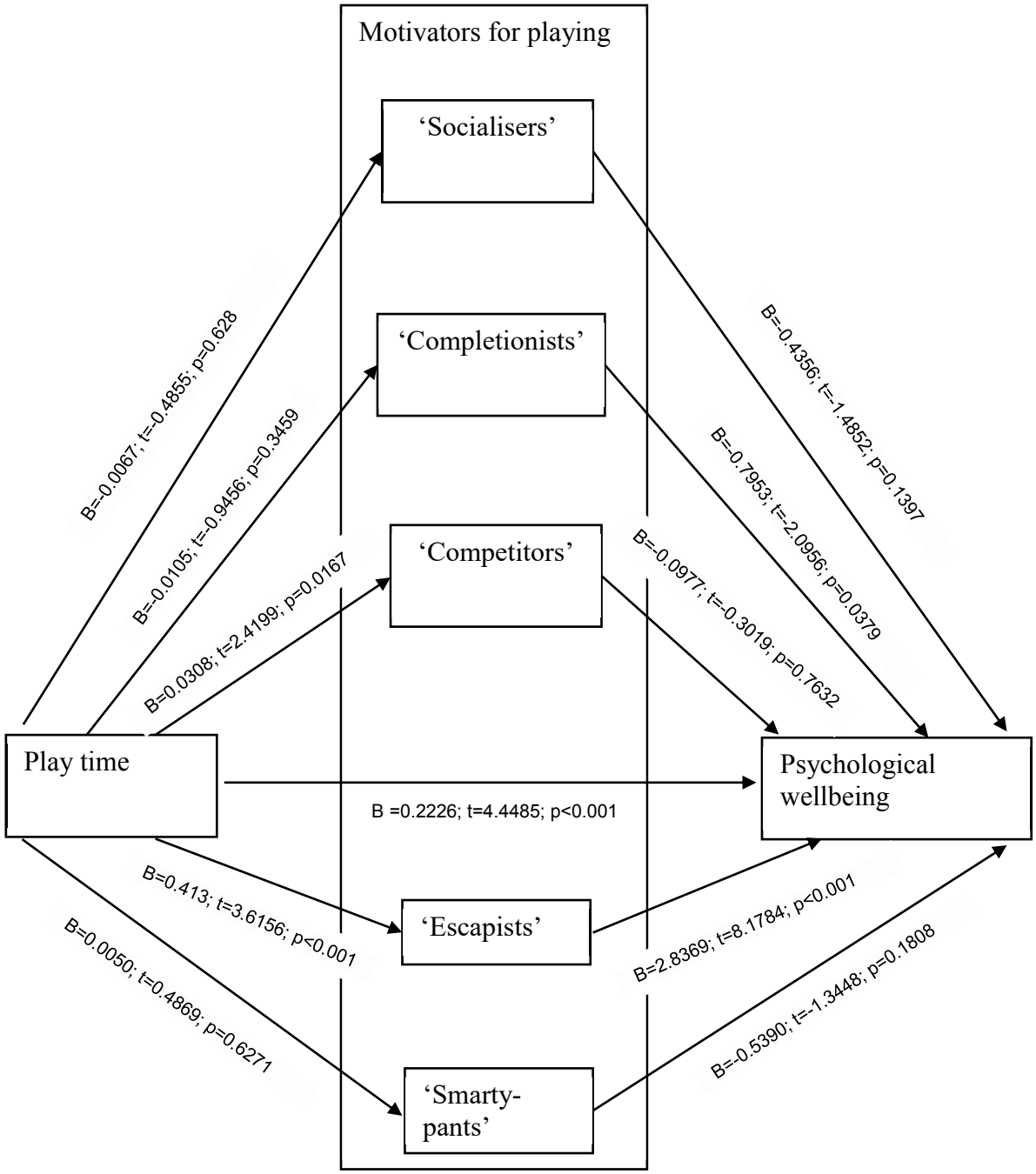

Figure 3: Mediation model with statistical effects of pathways

3.4 Exploratory analysis

The mediation analysis revealed that increased play time, accompanied by escapism, is related to increased psychological difficulties. An exploratory analysis was thereafter conducted to determine whether resilience factors such as self-esteem and self-efficacy moderated the negative impact of the 'escapist' motivator for playing on psychological wellbeing. Preacher and Hayes' (2004; 2008) mediator moderator analysis procedure was used to explore the

potential interaction effect between self-esteem (and self-efficacy) and escapism on psychological wellbeing. In order to aid the interpretation of the interaction effect, self-esteem was reverse coded, so that a positive score would indicate low levels of self-esteem. The product of self-esteem and the 'escapist' motivation was then calculated. The same procedure was replicated for the construct of self-efficacy and its interaction with escapism.

The results yielded a positive interaction effect between escapism and self-esteem (β = 0.18, 95% CI [0.05 to 0.30]). It can therefore be concluded that the relationship between the 'escapist' motivator for play and psychological wellbeing is moderated by the level of self-esteem. The positive beta value indicates that individuals with low self-esteem who play the game to escape have poorer psychological wellbeing overall.

The mediator moderator analysis however did not reveal a significant interaction between escapism and self-efficacy (β = 0.09, 95% CI [-0.02 to 0.21]). The results suggest that the relationship between the 'escapist' motivator for play and psychological wellbeing is not moderated by self-efficacy.

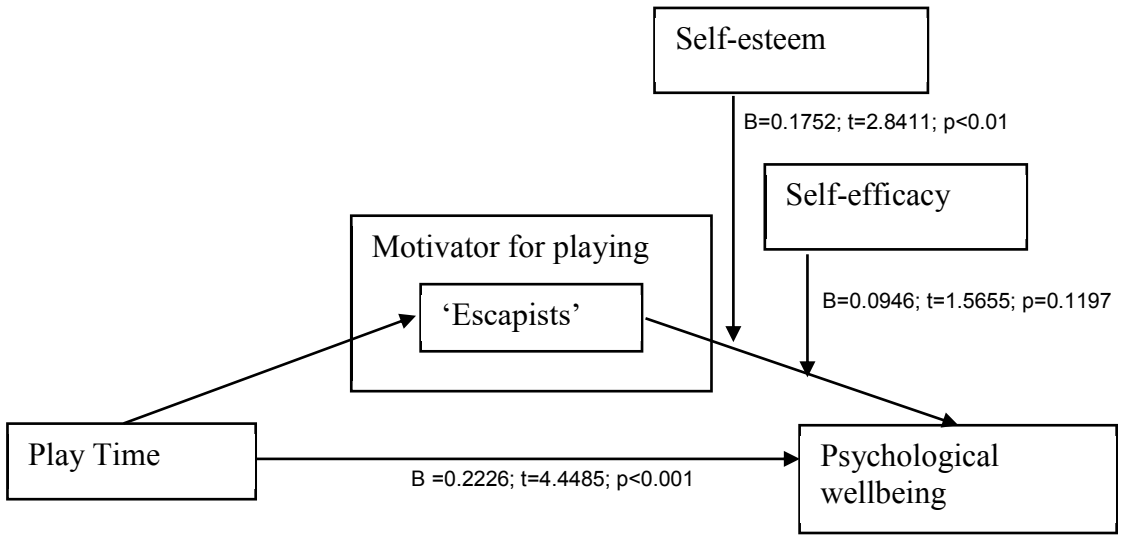

Figure 4: Moderator model with statistical effects of pathways

4.0 Discussion

The present study aimed to examine the relationship between the amount of time spent playing Multiplayer Online Battle Arena (MOBA) games and psychological wellbeing, with motivators for playing as potential mediating factors. The study's results suggest that increasing play time is associated with poorer psychological wellbeing, and that this relationship is mediated by the 'escapist' motivation. Further, the study also found that self-esteem acted as a moderator for escapism and psychological wellbeing; low levels of self-esteem, alongside increasing escapism, was associated with poorer psychological wellbeing. The findings are discussed in further detail.

From the sample, 27.5% of participants met the criteria for a diagnosable mental health problem. This is a slightly elevated statistic compared to the prevalence rates of mental health difficulties in the UK population, which are estimated to be around 17% of the population (Mind, 2007). The higher proportion of online gamers suffering from mental health difficulties is likewise reflected in other studies examining mental health amongst online gamers (e.g. Kirby et al., 2014; Williams et al., 2008).

A significant positive correlation was found between the hours spent playing DOTA 2 per week and GHQ scores; a higher number of hours spent playing the game was found to be associated with poorer psychological wellbeing. The R-value of 0.43 is indicative of a moderate effect size and 18% of the variance in psychological wellbeing can be explained by the amount of time spent playing the game. Similarly, the R-values obtained from the GHQ subscale scores and psychological wellbeing explained 10% to 16% of the variance. The results suggest that there is an increased likelihood of mental health difficulties amongst individuals who invest a significant amount of time playing DOTA 2. While the moderate effect size provides some evidence for mental health risks associated with increased play time, it cannot fully explain why some individuals who invest as much time into the game do not experience negative outcomes. Accordingly, examining the role of motivators for playing may help to explain this and help identify individuals who might be more prone to mental health difficulties.

Khan et al.'s (2015) motivators for playing were considered in the context of this relationship. Specifically, five motivators were tested as mediators— 'socialisers', 'completionists', 'competitors', 'escapists' and 'smart-pants'. Previous research has found that individuals who play MMORPGs as a means to escape from real-life difficulties are at most risk of negative

outcomes (Brockmyer et al, 2009; Caplan et al, 2009; Liu & Peng, 2009; Griffiths, 2010; Kirby et al., 2014). The primary aim of the present study was therefore to investigate if this would hold true in the context of the MOBA gaming genre. The findings from the present study demonstrated that playing DOTA 2 as a means for escapism mediated the relationship between play time and psychological wellbeing. Specifically, individuals who used the game to escape from real life were found to have poorer psychological wellbeing. The remaining four motivators for play did not mediate the relationship between play time and psychological wellbeing.

The results from the present study and from Kirby et al.'s (2014) study have consistently found a negative association between 'escapist' gaming and mental health problems. Khan et al. (2015) described 'escapist' players as individuals who use games to escape from real life. The element of fantasy that online games offer may provide an experience immersive enough for players to use as a means of avoiding real-life problems. 'Escapist' gaming may therefore be used as an avoidant coping strategy for real-life difficulties (Stetina et al., 2011). The link between avoidant coping strategies and negative outcomes has been studied in the literature; avoidant coping strategies have been shown to have an association with negative consequences, such as depression or increased stress (Blalock & Joiner, 2000; Holahan, Moos, Holahan, Brennan & Schutte, 2005). Similarly, the literature on problem gambling has established a link between escapism and negative outcomes (De Castro, Fong, Rosenthal & Tavares, 2007; Reid et al., 2011). Accordingly, when an individual uses gaming as a coping mechanism to escape from real-life problems, the association between longer play time and poorer mental health is strengthened.

Unlike the expansive virtual worlds in MMORPGs and the long-term investment in a single character, MOBA games only offer a single virtual arena and character statistics reset after a victory or a loss. The research in MMORPGs appears to suggest that the escapist properties are more pronounced given the opportunity for immersion in a virtual realm and the experience of a different life through a game character (Yee, 2006). However, the current study's findings challenge this conclusion; these findings suggest that playing MOBA games (that do not offer the kind of expansive virtual environment or character immersion akin to that of MMORPGs), is still associated with poorer mental health when an individual plays the game to escape from real life. It may be possible that MOBA games offer a different type of player immersion. Unlike MMORPGs, which allow players to explore virtual environments and complete

objectives at their own pace, MOBA game matches are brief (30-60 minutes) and are usually extremely intense. There is rarely time to pause during matches and the stakes are high, where even the smallest mistake can result in a loss. Further, MOBA games emphasise team-work and require players to constantly coordinate their own play with their team. Players are therefore required to be extremely focused for the entire span of the match. Whilst conceptually different from the player immersion described in MMORPGs, this high intensity of gameplay may offer a different type of immersive experience for MOBA players. Accordingly, players who are immersed at this level and use the game to escape from real-life difficulties may be more likely to experience negative consequences in terms of their psychological wellbeing.

The present study identified that the relationship between play time and psychological wellbeing is not fully mediated by the 'escapist' motivation. This suggests that there are other variables contributing to this relationship that are not accounted for by the model. Kirby et al.'s study (2014) reported that there was no direct effect of play time on psychological wellbeing when the mediated variables were accounted for (i.e. character customisation, escapism and problematic use). There may be other variables not accounted for in the model used in the present study that likewise mediate the relationship between play time and psychological wellbeing, which could be explored in future research.

For both the present study and Kirby et al.'s study (2014), motivation for play appears to be a critical factor in understanding the effects of online gaming and mental health. Both studies show high consistency in identifying escapism as negatively associated with mental health, and are also consistent in failing to identify other motivations for play as significant contributors. These results were found to be consistent across different samples and gaming genres (MOBA and MMORPG respectively). Furthermore, the use of different motivation questionnaires further strengthens the generalised conclusion that playing online games to escape from real life is associated with poorer mental health. Therefore, the length of play time and its association with mental health should be understood with respect to individuals' motivation for playing.

In terms of the role of resilience factors, self-esteem was found to be a moderator for escapism and mental health. In other words, the negative effects of using games to escape from real-life problems are influenced by an individual's self-esteem. Self-esteem is defined as an individual's perception of their self-worth (Rosenberg, 1965). Individuals with low self-esteem were found to be more vulnerable to the negative psychological effects of 'escapist' playing.

Martyn-Nemeth et al. (2009) reported that low self-esteem was associated with avoidance coping and depressive mood. Similarly, Chapman and Mullis (1999) reported that adolescents with lower self-esteem utilised more avoidant coping strategies compared to adolescents with higher self-esteem. It is possible that individuals who already suffer from low self-esteem play online games as a way to avoid real-life threats to themselves, and this form of coping, via avoidance, leads to poorer mental health. Alternatively, playing online games as a means of avoiding real-life problems may prevent individuals from learning new strategies to tackle self-esteem challenges, and therefore may contribute to low self-esteem and poorer mental health.

These explanations are not exhaustive and there may be a host of alternative explanations regarding the way self-esteem influences the relationship between escapism and psychological wellbeing. Furthermore, the way that different levels of self-esteem influence the strength of the relationship between 'escapist' gaming and psychological wellbeing it is not known. This may be explained by a simple linear relationship, with decreasing levels of self-esteem increasing the adverse effects of 'escapist' gaming. Alternatively, it is also possible that a more complex relationship may be present. It should be noted that this is beyond the scope of the present study and conclusions regarding the precise nature of this relationship should be addressed in future research.

Self-efficacy is defined as an individual's belief in their ability to overcome environmental challenges and demands (Schwarzer & Jerusalem, 1992). Self-efficacy was not found to moderate the relationship between escapism and psychological wellbeing. One possible explanation is that 'escapist' gaming may be considered as an avoidant coping strategy, and individuals with low self-efficacy may not turn to online gaming as a means of avoidance coping due to their lack of belief in their coping abilities and resources. This may potentially explain the lack of a relationship between self-efficacy, escapism, and psychological wellbeing. However, a *trend* towards significance was observed. Confidence intervals were close to being significant, and if they had been significant, would share the same direction as self-esteem. Future research can further explore the moderating effects of self-efficacy in better powered studies.

4.1 Strengths and limitations of this research

The present study's strengths and limitations should be considered when interpreting the findings. A correlational design was selected as it was most appropriate for investigating the

relationship between playing MOBA games and psychological wellbeing. It should be noted that in correlational study designs, causality cannot be determined. For example, while it makes sense that individuals who play to escape and invest a significant number of hours playing MOBA games are likely to develop mental health problems, this cannot be concluded from the present study. A longitudinal study design is more appropriate for conclusions on causality to be drawn. A previous study that employed a longitudinal design found that the existence of greater impulsivity, in addition to a larger amount of time spent playing, together with low social competence, were risk factors for pathological gaming, contributing in turn to poorer mental health outcomes (Gentile et al., 2011). This finding provides some support for the direction of the relationship between play time and psychological wellbeing.

A cross-sectional study design was utilised with data collected over a single time period. The data were collected during the summer holiday period which may have affected the amount of time the participants spent playing the game. Given that 51.7% of the sample comprised students, it is possible that the holiday period may have influenced play time. It is therefore recommended that the study is replicated at various time points throughout the year. A longitudinal study could help establish any observable patterns or changes over time.

The present study had a modest sample size and its sample demographics were similar to those in Kirby et al.'s study (2014). However, the sample size was considerably smaller compared to Kirby et al.'s study (2014), which included over 500 participants. While the present study is similar to other studies focusing on the MMORPG genre in terms of a sample comprising of predominantly male online gamers (e.g. Griffiths et al., 2003; Kirby et al., 2014; Yee, 2006), the gender distribution was extremely skewed towards males in the present study (20:1). The majority of the sample was from the UK and it is not known whether results would be generalisable to online gamers in different geographic locations, as motivations for play may vary based on cultural factors. The present study is situated amongst the growing literature on MOBA games, and its results warrant attention. As this is the first study to examine the association between MOBA players' play motivation and psychological wellbeing, the results should be replicated within this gaming genre. The present study excluded participants under the age of eighteen years. However, the impact of games on age may vary for children and adolescents (e.g. Griffiths, Davies & Chappell, 2004). To improve the generalisability of the study, future research should replicate this design with multiple age groups to determine the impact of age on the findings.

The present study utilised a self-report and the integrity of the responses to questionnaires should be considered. A stereotype may exist regarding portraying gaming in a negative light, which may have thus influenced the participants to under-report any mental health outcomes related to their excessive use. While this is a possibility, participants' responses were well spread and varied. Additionally, the inclusion of the social desirability scale helped to control for social desirability; any participants who responded in a socially desirable manner were excluded from the analysis.

It could be argued that online methodologies limit participation to individuals who have computers and internet access. Given however that this study's targeted population was online gamers, this critique is not applicable to the present research. Further, Wood, Griffiths and Eatough (2004) have discussed the multiple benefits associated with using online methodologies for video gaming research— worldwide accessibility, a potential wide range of participants, efficiency, and the fact that participants can complete questionnaires anywhere, at their own pace.

4.2 Clinical implications and future research

It is common practice for clinicians to assess individuals' coping mechanisms, as maladaptive coping strategies may inadvertently maintain or exacerbate a mental health problem. This is demonstrated through the use of substances or alcohol to escape from real-life difficulties. Findings from this study suggest that 'escapist' gaming, which may be considered as an avoidant coping strategy, is associated with poorer mental health. With the advent of technology and the internet, it is likewise prudent for clinicians to be on the lookout for the maladaptive use of online games as a means of escaping from real-life problems. Finally, bearing in mind the moderating effects of self-esteem, interventions targeted at enhancing self-esteem may help buffer the negative impact of 'escapist' gaming on mental health.

It would be valuable for future research to consider the employment of a longitudinal design to draw conclusions on causality for the relationships identified in the present study. Further, as 'escapist' gaming was only found to partially mediate the relationship between play time and psychological wellbeing, other mediating variables could be considered, for example self-regulation and individuals' cognitive abilities. Resilience factors such as self-esteem should be explored further in terms of how exactly they moderate the negative impact of 'escapist' gaming on mental health. Finally, as this is the first study in the MOBA gaming genre to examine the role of motivators for playing and the association between play time and

psychological wellbeing, it may be beneficial for this study to be replicated with different MOBA games at different time points for better generalisability.

4.3 Summary of conclusions

Most literature exploring online gaming tends to focus predominantly on MMORPGs. This focus has been justified based on MMORPGs' popularity; but new gaming genres have now emerged, and MOBA games currently represent the most popular genre in online gaming (Wolmarans, 2016). The present study therefore helps to shed some light on the relationship between play time in MOBA games and psychological wellbeing.

While some evidence exists showing that increased play time is associated with poorer psychological wellbeing, the 'escapist' motivator for playing was found to mediate this relationship. Increased MOBA gameplay was associated with poorer psychological wellbeing, specifically where there is greater motivation for escapism. The association between 'escapist' gaming and poor psychological wellbeing was strengthened for individuals with low self-esteem.

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Public Domain Briefing Document

The psychology of gaming and gambling

Public Domain Briefing Document

The psychology of gaming and gambling

This document provides an overview of the thesis submitted in partial fulfilment of the requirements of the degree of Doctorate of Clinical Psychology (Clin.Psy.D) at the University of Birmingham. A summary of a systematic review of the effectiveness of computer-assisted cognitive-behavioural therapy and motivational feedback interventions for problem gambling is provided. Following this, an overview of a research paper exploring the role of motivators for playing online games and how this influences the relationship between play time and mental health is presented.

Overall context

Computers and the internet are now mediums for the delivery of innovative psychological interventions. Computer-assisted cognitive behavioural therapy and motivational feedback interventions are two novel treatments for problematic gambling. However, there is no up-to-date review of the published research to examine the effectiveness of these computer-assisted interventions.

The internet has also created opportunities for people around the world to connect with each other and one way they do so is through online games. Online games have become increasingly popular in the last decade. Research has shown how playing online games is associated with negative consequences such as poor mental health. However, this does not explain why the majority of gamers experience little to no negative effects. This suggests a more complex relationship between play time and mental health. One factor that may influence this relationship is the motivation for playing and this is examined in this paper. This research has the potential to add to the growing literature on the impact of online gaming on mental health.

Literature Review

Introduction

A variety of psychological treatments have been shown to help reduce problem gambling. However, only a small percentage of problem gamblers seek treatment due to for example long waiting lists, the fear of stigma and financial cost. Distance-based support and computerised treatments may be useful potential avenues for problem gamblers to obtain support. Two of the most common treatments for problem gambling include cognitive-behavioural therapies and motivational interviewing interventions. However, little is known about the effectiveness when given in computer-based formats, specifically computer-assisted cognitive-behavioural therapy and motivational feedback interventions. The current review aimed to address that gap in knowledge and explore if computer-assisted cognitive behavioural interventions and feedback interventions are helpful in reducing problematic gambling.

Method

A search of the relevant published research studies identified 13 studies, of which five evaluated computer-assisted cognitive behavioural interventions, seven evaluated motivational feedback interventions, and one evaluated an intervention that incorporated both cognitive-behavioural and motivational feedback elements. The review assessed study findings according to population, research method used, analyses and results. The overall quality of each study was then assessed.

Findings

The majority of computer-assisted cognitive-behavioural interventions reported positive effects in reducing problematic gambling. Computer-assisted motivational feedback interventions were also found to be helpful, although treatment effects lasted a shorter period of time.

Conclusions

This review supports the use of computer-assisted cognitive behavioural therapies and motivational feedback interventions when trying to reduce problem gambling. However, due to the relatively small number of studies published in this area, further good quality randomised controlled trials are needed before firm conclusions about treatment helpfulness can be made.

Research Study

Introduction

The majority of research studies on online gaming point towards the negative impact of increased play time on mental health. However, many people who spend a lot of time playing online games report that they experience little to no negative consequences. This suggests that there are other factors that should be examined when we consider the relationship between play time and mental health. One such factor is players' motivation for playing. This study explored this in the context of the Multiplayer Online Battle Arena (MOBA) gaming genre.

Method

The association between play time and psychological wellbeing was explored for a MOBA game titled Defence of the Ancients 2 (DOTA 2). Online questionnaires were used to gather information on play time, motivations for playing, self-esteem (i.e. an individual's perception of their self-worth), and self-efficacy (i.e. an individual's belief in their ability to overcome difficulties in life). Participants were recruited from multiple sources (e.g. Facebook, DOTA 2 online forums). A total of 165 participants were recruited. Questionnaire data was analysed to determine if motivators for playing the game affected the relationship between play time and mental health. In addition, the study explored if the negative impact of online gaming is affected by self-esteem or self-efficacy.

Findings

A negative association was found between play time and psychological wellbeing. In other words, an increasing amount of time spent playing the game was linked with poorer mental health. This effect was more pronounced for individuals who were motivated to play the game to escape from real-life problems. In addition, the study found that individuals with low self-esteem, who played the game to escape from real-life difficulties, had poorer mental health. The study did not find any link between self-efficacy and the impact of online gaming.

Conclusion

It is concluded that spending more time playing MOBA games was related to poorer mental health, specifically when there is a greater motivation to play to escape from real-life problems. The association between escapist gaming and poor mental health was strengthened for

individuals with low self-esteem. Based on the results, the reasons why individuals play online games appear to be important when trying to determine the impact of playing online games on mental health.

Appendices

Literature Review

Appendix 1: NICE algorithm for the classification of studies (NICE, 2012)

Level of evidence	Type of evidence
1^{++}	High-quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1^{+}	Well-conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias
1^{-}	Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias*
2^{++}	High-quality systematic reviews of case–control or cohort studies High-quality case–control or cohort studies with a very low risk of confounding, bias or chance and a high probability that the relationship is causal
2^{+}	Well-conducted case–control or cohort studies with a low risk of confounding, bias or chance and a moderate probability that the relationship is causal
2^{-}	Case–control or cohort studies with a high risk of confounding bias, or chance and a significant risk that the relationship is not causal*
3	Non-analytic studies (for example, case reports, case series)
4	Expert opinion, formal consensus

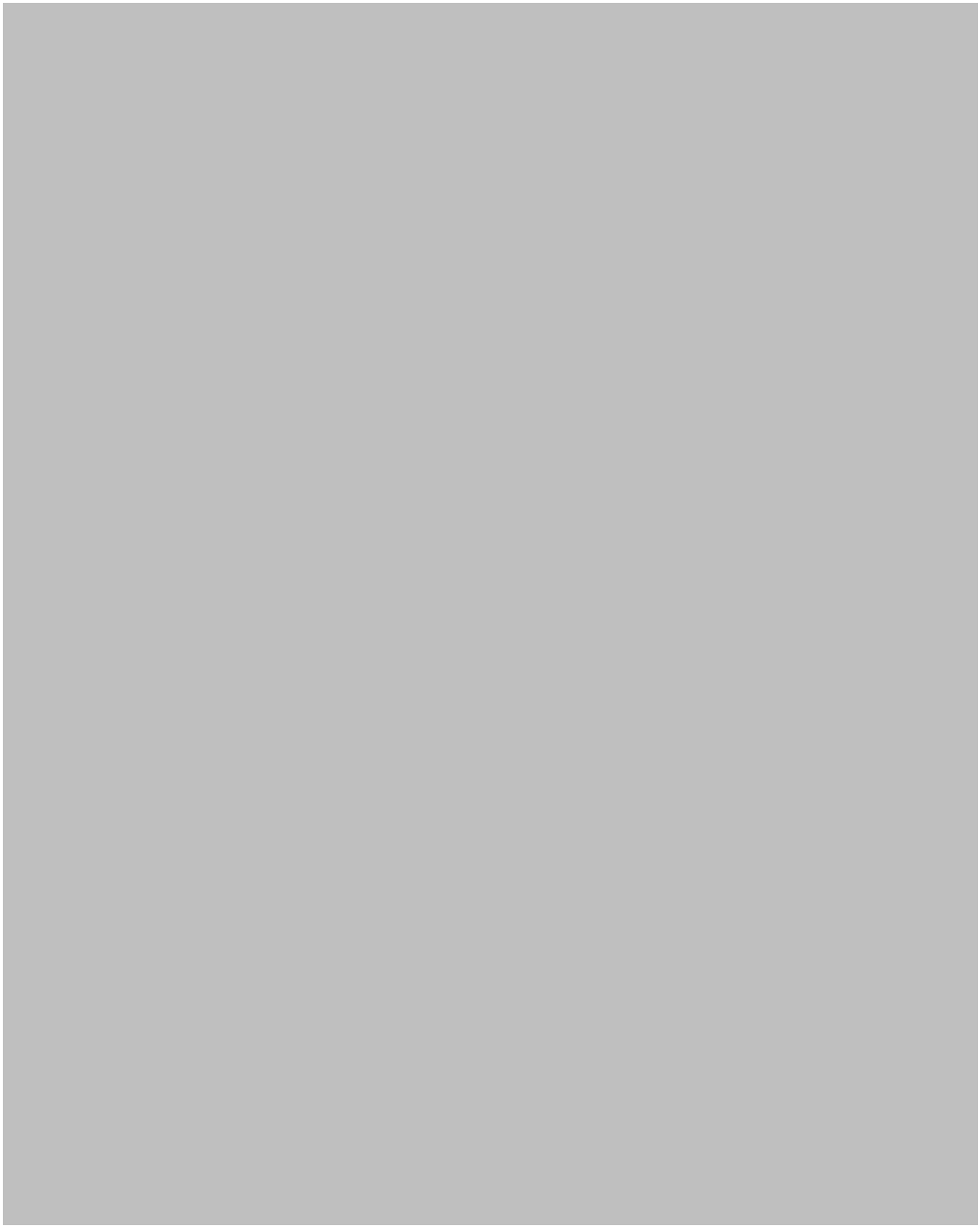
Appendix 2: NICE framework checklist responses (NICE, 2012)

++	Indicates that for that particular aspect of study design, the study has been designed or conducted in such a way as to minimise the risk of bias.
+	Indicates that either the answer to the checklist question is not clear from the way the study is reported, or that the study may not have addressed all potential sources of bias for that particular aspect of study design.
–	Should be reserved for those aspects of the study design in which significant sources of bias may persist.
Not reported (NR)	Should be reserved for those aspects in which the study under review fails to report how they have (or might have) been considered.
Not applicable (NA)	Should be reserved for those study design aspects that are not applicable given the study design under review (for example, allocation concealment would not be applicable for case control studies).

Appendices

Empirical Research Paper

Appendix 3: Ethical approval email



Appendix 4: Detailed description of Khan et al.'s motivations for play

Kahn, A. S., Shen, C., Lu, L., Ratan, R. A., Coary, S., Hou, J., ... & Williams, D. (2015). The Trojan Player Typology: A cross-genre, cross-cultural, behaviorally validated scale of video game play motivations. *Computers in Human Behavior*, *49*, 354-361.

'Socialisers': Socialisers play video games so that they can build and maintain social relationships. One would expect a socialiser to have more social relationships in the game.

'Completionists': Completionists like to explore every element of the game to the maximum extent. It would be expected that completionists would want to try out as many different champions as possible.

'Competitors': Our scale for competitors measures a player's desire to win the game and engage in behaviours that contribute to victory. Examining from the survey data, people who have a high desire to win would likely to describe themselves as competitive and be confident in their combat abilities.

'Escapists': Escapist players are those that use games to escape from real life. While this resembles Yee's (2006b) immersion dimension and Sherry et al.'s (2006) fantasy dimension, it focuses on the element that one engages in fantasy as a mechanism to escape from real life.

'Story-driven': The story-driven scale addresses players' desire for interesting stories in the gaming world, and to learn about the backgrounds of the game characters. While no server side behavioural measures were found to relate to this concept, a series of self-reported behaviours were found to be positively correlated with the story-driven scale.

'Smarty-pants': The smarty-pants dimension addresses players' desire to play video games in order to improve their brainpower and enhance their intelligence.

Appendix 5: Research information provided to participants

Recruitment advertisement (posted onto social media sites, game forums, etc.):

UNIVERSITY OF BIRMINGHAM

The Psychology of Online Gaming: Play Motivations and Wellbeing

I am a Trainee Clinical Psychologist at the University of Birmingham.

As a DOTA 2 player myself, I wanted to carry out some research into the effects of playing the game on wellbeing. Some people argue that playing games are harmful and some say that they are beneficial. From my experience, there are some players who have experienced difficulties but many others who experience little to no problems. I therefore want to find out if the reasons why people play the game affects wellbeing.

That is why I am asking for your help.

Anyone who plays DOTA 2 on a regular basis and who is 18 years of age and above is encouraged to take part in the study. The questions will be in English so fluent English language is also required.

Any answers will be confidential as you will not be asked to give any names or identifying information. None of your answers will be stored until you submit your survey so you can stop taking part at any point during the survey. Once you have submitted, your data will be put into a database and will not be identifiable to you.

The survey will take approximately 20 minutes to complete. Please answer all of the questions honestly as there is no right or wrong answer.

The results will be written up into my Final Year Thesis, with a view to publication in a scientific journal.

If you have any further questions you wish to ask about the study before taking part, please contact me via e-mail : xxxxxxxxxxxxxxxxx

If you would like to take part in this study, please visit

Appendix 6: Research consent agreement

The Psychology of Online Gaming: Play Motivations and Wellbeing

0% 100%

Consent

Please read these statements carefully and ensure you agree before you take part in the study.
Check the box if you agree to all the statements in order to take part in the study.

*

1. I have understood the information about the study above and had time to consider this and ask any questions of the researcher via email
2. I understand that my participation is voluntary and I can end the survey at any point until I 'submit' my answers
3. I understand that the data collected during this survey will remain confidential and will only be looked at by the researcher and members of the research team from the University of Birmingham
4. I agree to take part in the study and understand that completing the survey will be considered as consent

◯ Yes ◯ No

Appendix 7: Research measures

Questions on play time

1) Approximately how long have you been playing DOTA?
2) In the past six months, on average how many days during the week have you played DOTA 2?
3) In the past six months, on average, how many hours per day have you played DOTA 2?
4) In the past six months, on average, how many hours per week have you spent playing DOTA 2?

General Health Questionnaire (GHQ-28) items

Motivations for Play questionnaire

The Trojan Player Typology, reliability and loadings.

Dimension	*LoL*	*CR3*
Socializers	α = .69	α = .67
I like to chat with my friends while playing a video game	.71	.71
I like to use voice communication when I play	.67	.73
It's important to me to play with a tightly knit group	.59	.55
Completionists	α = .67	α = .75
I like to master all elements of a game	.72	.71
I like to figure out how the game works inside and out	.65	.71
I like to try everything that is possible to do in a game	.57	.71
Competitors	α = .75	α = .82
Winning is a big reason for me to play video games	.77	.89
I play to win	.74	.89
It is important to me to be the fastest and most skilled person playing the game	.62	.59
Escapists	α = .70	α = .63
I like to do things in games which I cannot do in real life	.76	.76
Video games allow me to pretend I am someone/somewhere else	.71	.61
Story-driven	α = .70	α = .84
I like to the feeling of being part of a story	.75	.89
I like stories in a game	.74	.82
Smarty-pants	α = .79	α = .89
Games make me smarter	.82	.91
I play games to enhance my intellectual abilities	.80	.90

LoL = *League of Legends* (MOBA), North America.
CR3 = *Chevalier's Romance 3* (MMO), China.

Self-esteem questionnaire

**Starred items are reverse scored

1. On the whole, I am satisfied with myself.
2. At times I think I am no good at all.**
3. I feel that I have a number of good qualities.
4. I am able to do things as well as most other people.
5. I feel I do not have much to be proud of.**
6. I certainly feel useless at times.**
7. I feel that I'm a person of worth, at least on an equal plane with others.
8. I wish I could have more respect for myself.**
9. All in all, I am inclined to feel that I am a failure.**
10. I take a positive attitude toward myself.

Self-efficacy questionnaire

1. I can always manage to solve difficult problems if I try hard enough.
2. If someone oppreses me, I can find means and ways to get what I want.
3. It is easy for me to stick to my aims and accomplish my goals.
4. I am confident I could deal efficiently with unexpected events.
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.
6. I can solve most problems if I invest the necessary effort.
7. I can remain calm when facing difficulties because I can rely on my coping abilities.
8. When I am confronted with a problem, I can usually find several solutions.
9. If I am in a bind, I can usually think of something to do.
10. No matter what comes my way, I'm usually able to handle it.

Social desirability scale (short version)

1. I'm always willing to admit it when I make a mistake.
2. I always try to practice what I preach.
3. I never resent being asked to return a favor
4. I have never been irked when people expressed ideas very different from my own.
5. I have never deliberately said something that hurt someone's feelings.
6. I like to gossip at times.
7. There have been occasions when I took advantage of someone.
8. I sometimes try to get even rather than forgive and forget.
9. At times I have really insisted on having things my own way.
10. There have been occasions when I felt like smashing things.

Appendix 8: Research descriptives

Sample nationality/location

Argentina	1	France	2	Poland	1
Australia	3	Germany	9	Romania	2
Austria	2	India	2	Russia	3
Belgium	1	Indonesia	7	Singapore	18
Bulgaria	3	Italy	2	Slovenia	1
Brazil	4	Kuwait	1	Sweden	3
Canada	2	Lithuania	1	Turkey	2
Chile	1	Malaysia	1	UAE	1
Croatia	2	Netherlands	2	UK	42
Finland	1	Philippines	3	USA	26

Descriptive Analyses

	N	Range	Minimum	Maximum	Mean	Std. Deviation	Variance
Location	149						
Age	149	27	18	44	23.18	4.666	21.771
Gender	149	1	1	2	1.95	.212	.045
Employment Status	149						
Relationship Status	149						
Years playing game	149						
Days per week	149	6	1	7	5.22	1.688	2.849
Hours per day	149	9	1	10	3.99	2.260	5.108
Hours per week	149	69	1	70	22.74	16.189	262.083

Appendix 9: Research statistical analysis

Correlation Analyses
(For age comparison and effect of hours on wellbeing)

				Age	Hours per week	GHQ Somatic	GHQ Anxiety & Insomnia	GHQ Social	GHQ Depression	Total GHQ	Self-esteem	Self-efficacy
Age	Pearson Correlation			1	-.141	-.019	-.048	-.042	-.055	-.051	.057	.146
	Sig. (2-tailed)				.086	.818	.560	.610	.505	.536	.493	.075
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		0	.002	.001	.003	.003	.001	.002	-.003	-.006
		Std. Error		0	.067	.071	.081	.069	.070	.071	.077	.093
		95% Confidence Interval	Lower	1	-.265	-.156	-.203	-.174	-.190	-.187	-.101	-.056
			Upper	1	-.006	.125	.113	.095	.086	.095	.202	.310
Hours per week	Pearson Correlation			-.141	1	.397**	.359**	.321**	.373**	.433**	-.301**	-.405**
	Sig. (2-tailed)			.086		.000	.000	.000	.000	.000	.000	.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		.002	0	-.002	.001	.001	.002	.001	.000	.001
		Std. Error		.067	0	.081	.078	.075	.074	.076	.076	.078
		95% Confidence Interval	Lower	-.265	1	.224	.200	.171	.222	.275	-.444	-.547
			Upper	-.006	1	.545	.502	.462	.518	.573	-.148	-.241
GHQ Somatic	Pearson Correlation			-.019	.397**	1	.734**	.501**	.576**	.825**	-.437**	-.473**
	Sig. (2-tailed)			.818	.000		.000	.000	.000	.000	.000	.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		.001	-.002	0	-.001	.000	.000	.000	.001	.003
		Std. Error		.071	.081	0	.040	.056	.053	.027	.064	.072
		95% Confidence Interval	Lower	-.156	.224	1	.648	.384	.465	.769	-.555	-.600
			Upper	.125	.545	1	.804	.603	.673	.873	-.306	-.317
GHQ Anxiety & Insomnia	Pearson Correlation			-.048	.359**	.734**	1	.470**	.676**	.874**	-.645**	-.562**
	Sig. (2-tailed)			.560	.000	.000		.000	.000	.000	.000	.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		.003	.001	-.001	0	-.001	-.001	-.001	.001	.001
		Std. Error		.081	.078	.040	0	.067	.049	.023	.044	.056
			Lower	-.203	.200	.648	1	.335	.574	.825	-.724	-.664

		95% Confidence Interval	Upper	.113	.502	.804	1	.591	.767	.913	-.553	-.440
GHQ Social	Pearson Correlation			-.042	.321**	.501**	.470**	1	.596**	.741**	-.434**	-.351**
	Sig. (2-tailed)			.610	.000	.000	.000		.000	.000	.000	.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		.003	.001	.000	-.001	0	-.001	-.001	.001	.000
		Std. Error		.069	.075	.056	.067	0	.060	.038	.066	.073
		95% Confidence Interval	Lower	-.174	.171	.384	.335	1	.468	.658	-.555	-.485
			Upper	.095	.462	.603	.591	1	.700	.807	-.298	-.204
GHQ Depression	Pearson Correlation			-.055	.373**	.576**	.676**	.596**	1	.884**	-.686**	-.468**
	Sig. (2-tailed)			.505	.000	.000	.000	.000		.000	.000	.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		.001	.002	.000	-.001	-.001	0	.000	.001	-.001
		Std. Error		.070	.074	.053	.049	.060	0	.018	.041	.056
		95% Confidence Interval	Lower	-.190	.222	.465	.574	.468	1	.845	-.761	-.577
			Upper	.086	.518	.673	.767	.700	1	.913	-.599	-.355
GHQ Total	Pearson Correlation			-.051	.433**	.825**	.874**	.741**	.884**	1	-.681**	-.560**
	Sig. (2-tailed)			.536	.000	.000	.000	.000	.000		.000	.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		.002	.001	.000	-.001	-.001	.000	0	.001	.001
		Std. Error		.071	.076	.027	.023	.038	.018	0	.044	.058
		95% Confidence Interval	Lower	-.187	.275	.769	.825	.658	.845	1	-.760	-.666
			Upper	.095	.573	.873	.913	.807	.913	1	-.588	-.436
Self-esteem	Pearson Correlation			.057	-.301**	-.437**	-.645**	-.434**	-.686**	-.681**	1	.654**
	Sig. (2-tailed)			.493	.000	.000	.000	.000	.000	.000		.000
	N			149	149	149	149	149	149	149	149	149
	Bootstrap[c]	Bias		-.003	.000	.001	.001	.001	.001	.001	0	.001
		Std. Error		.077	.076	.064	.044	.066	.041	.044	0	.042
		95% Confidence Interval	Lower	-.101	-.444	-.555	-.724	-.555	-.761	-.760	1	.568
			Upper	.202	-.148	-.306	-.553	-.298	-.599	-.588	1	.730
Self-efficacy	Pearson Correlation			.146	-.405**	-.473**	-.562**	-.351**	-.468**	-.560**	.654**	1
	Sig. (2-tailed)			.075	.000	.000	.000	.000	.000	.000	.000	

N			149	149	149	149	149	149	149	149	149
Bootstrap[c]	Bias		-.006	.001	.003	.001	.000	-.001	.001	.001	0
	Std. Error		.093	.078	.072	.056	.073	.056	.058	.042	0
	95% Confidence Interval	Lower	-.056	-.547	-.600	-.664	-.485	-.577	-.666	.568	1
		Upper	.310	-.241	-.317	-.440	-.204	-.355	-.436	.730	1

**. Correlation is significant at the 0.01 level (2-tailed).

c. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

Gender Comparisons (Independent t-test and bootstrap)

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Days per week	Equal variances assumed	.164	.686	.332	147	.741	.217	.656	-1.078	1.513
	Equal variances not assumed			.369	6.770	.723	.217	.589	-1.185	1.620
Hours per day	Equal variances assumed	2.063	.153	-.668	147	.505	-.586	.877	-2.318	1.147
	Equal variances not assumed			-.913	7.237	.390	-.586	.641	-2.091	.920
Hours per week	Equal variances assumed	.504	.479	-.387	147	.700	-2.431	6.286	-14.853	9.992
	Equal variances not assumed			-.446	6.836	.669	-2.431	5.448	-15.376	10.515
GHQ Somatic	Equal variances assumed	.000	.992	.246	147	.806	.312	1.267	-2.192	2.816
	Equal variances not assumed			.242	6.581	.816	.312	1.291	-2.781	3.405
GHQ Anxiety & Insomnia	Equal variances assumed	4.468	.036	-1.136	147	.258	-1.807	1.591	-4.950	1.336
	Equal variances not assumed			-1.992	8.269	.080	-1.807	.907	-3.887	.273
GHQ Social	Equal variances assumed	.155	.694	-.610	147	.543	-.724	1.187	-3.070	1.621
	Equal variances not assumed			-.567	6.514	.590	-.724	1.277	-3.790	2.341
GHQ Depression	Equal variances assumed	2.261	.135	-.363	147	.717	-.696	1.915	-4.481	3.089
	Equal variances not assumed			-.568	7.701	.586	-.696	1.226	-3.543	2.151
GHQ Total	Equal variances assumed	4.000	.047	-.582	147	.562	-2.915	5.010	-12.817	6.986

	Equal variances not assumed			-.944	7.865	.373	-2.915	3.090	-10.061	4.230
Self-esteem	Equal variances assumed	1.183	.279	.317	147	.752	.62777	1.98327	-3.29163	4.54716
	Equal variances not assumed			.430	7.217	.680	.62777	1.46087	-2.80575	4.06128
Self-efficacy	Equal variances assumed	2.448	.120	.405	147	.686	.86016	2.12226	-3.33392	5.05424
	Equal variances not assumed			.703	8.209	.501	.86016	1.22345	-1.94868	3.66900

Bootstrap for Independent Samples Test

		Mean Difference	Bootstrap[a]				
			Bias	Std. Error	Sig. (2-tailed)	95% Confidence Interval	
						Lower	Upper
Days per week	Equal variances assumed	.217	.008	.595		-.995	1.345
	Equal variances not assumed	.217	.008	.595		-.995	1.345
Hours per day	Equal variances assumed	-.586	.011	.646		-1.849	.776
	Equal variances not assumed	-.586	.011	.646		-1.849	.776
Hours per week	Equal variances assumed	-2.431	.095	5.489		-13.033	8.982
	Equal variances not assumed	-2.431	.095	5.489		-13.033	8.982
GHQ Somatic	Equal variances assumed	.312	.000	1.317		-2.201	2.966
	Equal variances not assumed	.312	.000	1.317		-2.201	2.966

GHQ Anxiety & Insomnia	Equal variances assumed	-1.807	.003	.922		-3.596	.004
	Equal variances not assumed	-1.807	.003	.922		-3.596	.004
GHQ Social	Equal variances assumed	-.724	.011	1.293	.546	-2.982	2.101
	Equal variances not assumed	-.724	.011	1.293		-2.982	2.101
GHQ Depression	Equal variances assumed	-.696	.007	1.213		-3.017	1.703
	Equal variances not assumed	-.696	.007	1.213		-3.017	1.703
GHQ Total	Equal variances assumed	-2.915	.020	3.107	.313	-9.173	3.220
	Equal variances not assumed	-2.915	.020	3.107		-9.173	3.220
Self-esteem	Equal variances assumed	.62777	.00334	1.47435		-2.15024	3.67340
	Equal variances not assumed	.62777	.00334	1.47435		-2.15024	3.67340
Self-efficacy	Equal variances assumed	.86016	-.01780	1.22588		-1.61747	3.19189
	Equal variances not assumed	.86016	-.01780	1.22588		-1.61747	3.19189

a. Unless otherwise noted, bootstrap results are based on 5000 bootstrap samples

Mediation Analysis

```
Run MATRIX procedure:

************* PROCESS Procedure for SPSS Release 2.16.1 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 4
    Y = TGHQ
    X = PlayTime
   M1 = TSocial
   M2 = TComple
   M3 = TCompet
   M4 = TEscape
   M5 = TSmart

Sample size
        149

**************************************************************************
Outcome: TSocial

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .0400      .0016     7.3268      .2357     1.0000   147.0000
.6280

Model
             coeff         se          t          p       LLCI       ULCI
constant    10.7088      .3833    27.9409      .0000     9.9514    11.4662
PlayTime     -.0067      .0137     -.4855      .6280     -.0338      .0205

Covariance matrix of regression parameter estimates
           constant   PlayTime
constant      .1469     -.0043
PlayTime     -.0043      .0002

**************************************************************************
Outcome: TComple

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .0778      .0060     4.8163      .8941     1.0000   147.0000
.3459

Model
             coeff         se          t          p       LLCI       ULCI
constant    11.9846      .3107    38.5675      .0000    11.3705    12.5987
PlayTime     -.0105      .0111     -.9456      .3459     -.0326      .0115

Covariance matrix of regression parameter estimates
           constant   PlayTime
constant      .0966     -.0028
PlayTime     -.0028      .0001

**************************************************************************
```

```
Outcome: TCompet

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .1957      .0383     6.3014     5.8558     1.0000   147.0000
.0167

Model
             coeff         se          t          p       LLCI       ULCI
constant     9.7817      .3554    27.5202      .0000     9.0793    10.4841
PlayTime      .0308      .0127     2.4199      .0167      .0057      .0560

Covariance matrix of regression parameter estimates
           constant   PlayTime
constant      .1263     -.0037
PlayTime     -.0037      .0002

**************************************************************************
Outcome: TEscape

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .2858      .0817     5.0536    13.0724     1.0000   147.0000
.0004

Model
             coeff         se          t          p       LLCI       ULCI
constant     5.0815      .3183    15.9641      .0000     4.4524     5.7105
PlayTime      .0413      .0114     3.6156      .0004      .0187      .0638

Covariance matrix of regression parameter estimates
           constant   PlayTime
constant      .1013     -.0030
PlayTime     -.0030      .0001

**************************************************************************
Outcome: TSmart

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .0401      .0016     4.0669      .2370     1.0000   147.0000
.6271

Model
             coeff         se          t          p       LLCI       ULCI
constant     6.0544      .2855    21.2028      .0000     5.4901     6.6187
PlayTime      .0050      .0102      .4869      .6271     -.0153      .0252

Covariance matrix of regression parameter estimates
           constant   PlayTime
constant      .0815     -.0024
PlayTime     -.0024      .0001

**************************************************************************
Outcome: TGHQ

Model Summary
```

```
          R       R-sq        MSE          F        df1        df2
p
      .7182      .5158    84.1334    25.2114     6.0000   142.0000
.0000

Model
              coeff         se          t          p       LLCI       ULCI
constant    17.9254     5.8508     3.0638      .0026     6.3595    29.4913
TSocial      -.4356      .2933    -1.4852      .1397    -1.0155      .1442
TComple      -.7953      .3795    -2.0956      .0379    -1.5456     -.0451
TCompet      -.0977      .3235     -.3019      .7632     -.7372      .5419
TEscape      2.8369      .3469     8.1784      .0000     2.1512     3.5227
TSmart       -.5390      .4008    -1.3448      .1808    -1.3313      .2533
PlayTime      .2226      .0500     4.4485      .0000      .1237      .3215

Covariance matrix of regression parameter estimates
           constant    TSocial    TComple    TCompet    TEscape     TSmart
PlayTime
constant    34.2317     -.7586    -1.0700     -.5166     -.9465     -.2865
-.0092
TSocial      -.7586      .0860     -.0197     -.0047      .0211      .0020
-.0004
TComple     -1.0700     -.0197      .1440     -.0273      .0074     -.0356
.0021
TCompet      -.5166     -.0047     -.0273      .1047      .0054     -.0259
-.0036
TEscape      -.9465      .0211      .0074      .0054      .1203     -.0053
-.0049
TSmart       -.2865      .0020     -.0356     -.0259     -.0053      .1606
-.0001
PlayTime     -.0092     -.0004      .0021     -.0036     -.0049     -.0001
.0025

************************** TOTAL EFFECT MODEL ****************************
Outcome: TGHQ

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .4329      .1874   136.3964    33.8969     1.0000   147.0000
.0000

Model
              coeff         se          t          p       LLCI       ULCI
constant    13.9259     1.6537     8.4213      .0000    10.6579    17.1939
PlayTime      .3452      .0593     5.8221      .0000      .2281      .4624

Covariance matrix of regression parameter estimates
           constant   PlayTime
constant     2.7346     -.0800
PlayTime     -.0800      .0035

***************** TOTAL, DIRECT, AND INDIRECT EFFECTS ********************

Total effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .3452      .0593     5.8221      .0000      .2281      .4624

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .2226      .0500     4.4485      .0000      .1237      .3215
```

```
Indirect effect of X on Y
            Effect    Boot SE   BootLLCI   BootULCI
TOTAL        .1227      .0486      .0303      .2216
TSocial      .0029      .0077     -.0072      .0261
TComple      .0084      .0122     -.0068      .0443
TCompet     -.0030      .0105     -.0275      .0157
TEscape      .1171      .0368      .0506      .1966
TSmart      -.0027      .0068     -.0242      .0062
(C1)        -.0055      .0132     -.0387      .0155
(C2)         .0059      .0132     -.0219      .0326
(C3)        -.1142      .0361     -.1944     -.0508
(C4)         .0056      .0091     -.0082      .0288
(C5)         .0114      .0154     -.0192      .0421
(C6)        -.1087      .0346     -.1843     -.0462
(C7)         .0111      .0120     -.0077      .0407
(C8)        -.1201      .0388     -.1997     -.0463
(C9)        -.0003      .0122     -.0226      .0296
(C10)        .1198      .0357      .0552      .1977

Normal theory tests for specific indirect effects
            Effect         se          Z          p
TSocial      .0029      .0075      .3887      .6975
TComple      .0084      .0106      .7904      .4293
TCompet     -.0030      .0109     -.2771      .7817
TEscape      .1171      .0356     3.2864      .0010
TSmart      -.0027      .0072     -.3752      .7075

Specific indirect effect contrast definitions
(C1)    TSocial    minus      TComple
(C2)    TSocial    minus      TCompet
(C3)    TSocial    minus      TEscape
(C4)    TSocial    minus      TSmart
(C5)    TComple    minus      TCompet
(C6)    TComple    minus      TEscape
(C7)    TComple    minus      TSmart
(C8)    TCompet    minus      TEscape
(C9)    TCompet    minus      TSmart
(C10)   TEscape    minus      TSmart

******************** ANALYSIS NOTES AND WARNINGS ************************

Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     5000

Level of confidence for all confidence intervals in output:
    95.00

------ END MATRIX -----
```

Moderator Analysis

```
Run MATRIX procedure:

************* PROCESS Procedure for SPSS Release 2.16.3 *****************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 14
    Y = TGHQ
    X = PlayTime
    M = TEscape
    V = SEinv

Sample size
        149

**************************************************************************
Outcome: TEscape

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .2858      .0817     5.0536    13.0724     1.0000   147.0000
.0004

Model
              coeff         se          t          p       LLCI       ULCI
constant     5.0815      .3183    15.9641      .0000     4.4524     5.7105
PlayTime      .0413      .0114     3.6156      .0004      .0187      .0638

**************************************************************************
Outcome: TGHQ

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .7846      .6156    65.8619    57.6569     4.0000   144.0000
.0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     6.5173     5.2787     1.2346      .2190    -3.9165    16.9511
TEscape      -.6720      .9442     -.7117      .4778    -2.5383     1.1943
PlayTime      .1468      .0442     3.3202      .0011      .0594      .2341
SEinv         .0823      .3919      .2100      .8340     -.6923      .8569
int_1         .1752      .0617     2.8411      .0051      .0533      .2971

Product terms key:

 int_1    TEscape     X     SEinv

****************** DIRECT AND INDIRECT EFFECTS ************************

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .1468      .0442     3.3202      .0011      .0594      .2341

Conditional indirect effect(s) of X on Y at values of the moderator(s):
```

```
Mediator
            SEinv     Effect    Boot SE   BootLLCI   BootULCI
TEscape     7.9200      .0295      .0262     -.0127      .0957
TEscape    13.0268      .0665      .0256      .0264      .1303
TEscape    18.1337      .1034      .0339      .0438      .1788

Values for quantitative moderators are the mean and plus/minus one SD from
mean.
Values for dichotomous moderators are the two values of the moderator.

******************** INDEX OF MODERATED MEDIATION ************************

Mediator
            Index   SE(Boot)   BootLLCI   BootULCI
TEscape      .0072      .0032      .0022      .0148

******************** ANALYSIS NOTES AND WARNINGS *************************

Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     5000

Level of confidence for all confidence intervals in output:
    95.00

------ END MATRIX -----



Run MATRIX procedure:

************* PROCESS Procedure for SPSS Release 2.16.3 ******************

          Written by Andrew F. Hayes, Ph.D.       www.afhayes.com
    Documentation available in Hayes (2013). www.guilford.com/p/hayes3

**************************************************************************
Model = 14
    Y = TGHQ
    X = PlayTime
    M = TEscape
    V = SEfinv

Sample size
        149

**************************************************************************
Outcome: TEscape

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .2858      .0817     5.0536    13.0724     1.0000   147.0000
.0004

Model
             coeff         se          t          p       LLCI       ULCI
constant     5.0815      .3183    15.9641      .0000     4.4524     5.7105
PlayTime      .0413      .0114     3.6156      .0004      .0187      .0638
```

```
**************************************************************************
Outcome: TGHQ

Model Summary
          R       R-sq        MSE          F        df1        df2
p
      .7184      .5161    82.9181    38.3917     4.0000   144.0000
.0000

Model
              coeff         se          t          p       LLCI       ULCI
constant     3.6704     4.9522      .7412      .4598    -6.1179    13.4587
TEscape      1.3012      .8268     1.5738      .1177     -.3330     2.9355
PlayTime      .1483      .0518     2.8612      .0048      .0459      .2508
SEfinv       -.0116      .4152     -.0278      .9778     -.8322      .8091
int_1         .0946      .0604     1.5655      .1197     -.0248      .2141

Product terms key:

 int_1    TEscape     X     SEfinv

****************** DIRECT AND INDIRECT EFFECTS *************************

Direct effect of X on Y
     Effect         SE          t          p       LLCI       ULCI
      .1483      .0518     2.8612      .0048      .0459      .2508

Conditional indirect effect(s) of X on Y at values of the moderator(s):

Mediator
            SEfinv     Effect    Boot SE   BootLLCI   BootULCI
TEscape     5.7823      .0763      .0299      .0291      .1523
TEscape    11.2483      .0976      .0319      .0421      .1707
TEscape    16.7143      .1190      .0388      .0511      .2040

Values for quantitative moderators are the mean and plus/minus one SD from
mean.
Values for dichotomous moderators are the two values of the moderator.

****************** INDEX OF MODERATED MEDIATION ************************

Mediator
             Index   SE(Boot)   BootLLCI   BootULCI
TEscape      .0039      .0025      .0002      .0100

****************** ANALYSIS NOTES AND WARNINGS *************************

Number of bootstrap samples for bias corrected bootstrap confidence
intervals:
     5000

Level of confidence for all confidence intervals in output:
    95.00

------ END MATRIX -----
```