

**COMPARING CHANGES IN ERRONEOUS BELIEFS/PERCEPTIONS, SUBJECTIVE AROUSAL
AND HEART RATE BETWEEN COGNITIVE THERAPY AND IMAGINAL DESENSITIZATION IN
THE TREATMENT OF PATHOLOGICAL GAMBLING**

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Acknowledgements

Financial assistance for this Project was provided by the New South Wales Government from the Casino Community Benefit Fund. The views expressed in this Report, however, are those of the authors. The authors wish to extend their grateful appreciation for the support provided by the Trustees and administrative staff of the Casino Community Benefit Fund in funding this important research.

Ethics Declaration:

Ethics approval for this study was provided by:

- ◆ The University of Sydney Human Research Ethics Committee: HREC 01/05/38)
- ◆ Western Sydney Area Health Service: HREC SAC2001/1/6/4.11 (1249)

Abstract

Randomised controlled outcome studies have demonstrated the comparable effectiveness of cognitive therapy and imaginal desensitisation (relaxation-based technique) in the treatment of pathological gambling. This study was undertaken in an attempt to determine if these treatments exert their therapeutic effect through common modes of action, either altering distorted cognitions or reducing arousal.

A sample of twenty pathological gamblers were randomly allocated to one of two treatment groups: eleven to cognitive therapy and nine to imaginal desensitization, and a semi-structured interview, battery of psychometric measures and visual analogue scales, and heart rate measures were recorded at pre-treatment baseline, mid and end of therapy sessions and at one month follow-up. Consistent with other studies, there was a high rate of attrition (50%) with only ten completing the full course of treatment and six completing the follow-up assessment. The resulting small sample size due to attrition precluded adequate statistical analyses from being conducted on the data.

However, results showed a tendency for the scores on the gambling beliefs questionnaire, a measure of irrational beliefs, to show a consistent decrease for the cognitive therapy group during treatment as compared to the imaginal desensitization group. Scores tended to stabilize in that they did not show a continued decrease from end of treatment to follow-up. In respect to the treatment groups, visual analogue scale scores showed a consistent decrease in the urge to gamble and excitement associated with gambling across treatment for the cognitive therapy group. There was also a relatively consistent increase in perceived self-control from commencement of treatment to follow-up.

In contrast, the imaginal desensitization group evidenced a consistent rise in perceived self-control over the course of treatment but this was not reflected in any change in level of urges or excitement experienced in response to gambling stimuli. This is contrary to expectations and the hypothesised mode of action for this form of treatment.

It is strongly emphasised that these are tentative findings but preliminary data seems to suggest that cognitive therapy is effective in reducing irrational beliefs with reductions in urges and excitement associated with such changes, while in contrast, imaginal desensitization is associated with an increase in self-control that is mediated by variables other than changes in subjective arousal or cognition. If these findings hold to be true with increased sample sizes and replication, targetting irrational cognitions directly may have a secondary effect on arousal, urges and excitement while the mechanism of imaginal desensitization does not operate through its hypothesised mode of action but is mediated through some other process that is yet to be established.

OUTCOME AND PROCESSES IN THE COGNITIVE AND BEHAVIOURAL TREATMENT OF PATHOLOGICAL GAMBLING

Introduction

A range of effective treatment interventions have been applied in the treatment of pathological gambling. These range from the early psychoanalytically oriented therapies, behavioural techniques including aversive therapy, systematic desensitization, imaginal desensitization, covert sensitization, stimulus control, stimulus and cue exposure, and behavioural counselling, cognitive and cognitive-behavioural, and more recently, psychopharmacological therapies (See Blaszczynski, 1993; Sharpe, 2002; Lopez,-Viets & Miller, 1997; Petry, 2004).

While the results of the better designed comparative treatment outcome studies indicate support for brief, individual and manualized cognitive behavioural strategies, and emerging support for psychopharmacological interventions (Toneatto & Millar, 2004), no single intervention can offered as the ‘best practice’ approach in guiding clinicians. To advance the field, it is important to establish the efficacy of interventions and to identify processes leading to successful outcome if we are to establish effective treatments for pathological gambling. Deconstructing the various components of a specific intervention and separating therapist non-specific effects from those conceptually and theoretically linked to its hypothesized mode of action will lead to the development of efficient and effective treatment interventions.

The purpose of this study, therefore, was to investigate the underlying hypothesized processes contributing to therapeutic change in the treatment of pathological gambling. For our purpose, we chose two specific interventions, the behavioural technique of imaginal desensitization and cognitive therapy because they are the two most commonly used empirically validated treatment approaches in the management of pathological gambling shown to be effective through randomized clinical trials.

Before proceeding to a description of the theoretical foundation of these two therapeutic approaches, we will provide a brief overview of the literature on outcomes. We will

concentrate on psychological interventions and direct readers interested in psychopharmacological interventions to the excellent reviews by Goudriaan, Oosterlaan, de Beurs and Van den Brink, (2004) and the clinical trials reported by Grant, Kim, Potenza et al, (2003) and Kim, Grant, Adson and Shin (2001).

Outcomes rates in the treatment of pathological gambling

Despite the inherent methodological problems that are often associated with the design and implementation of the majority of existing treatment evaluation studies, for example, lack of randomized controlled trials (Toneatto & Ladouceur, 2003; Toneatto & Millar, 2004), evidence suggests that pathological gambling is a treatable condition in the short and relative long term. We refer the reader to a number of comprehensive reviews that outline the relative effectiveness and success rates of a range of psychological interventions for pathological gambling (Walker, 1992; Jackson, Thomas, & Blaszczynski, (2003), Blaszczynski, (1993), Blaszczynski & Silove, 1993; Lopez-Viets & Miller, (1997); Ladouceur & Toneatto, 2003). In general, these reviews report successful outcomes rates for the treatment of pathological gambling that vary from 7% for Gamblers Anonymous (Brown, 1986) and 65% to 72% for multimodal (Russo, Taber, McCormick & Ramirez, 1984; Taber, McCormick, Russo, Adkins & Ramirez, 1987; Schwartz & Lindner, 1992; Lesieur and Blume (1991). Higher rates in the range of 70% to 86% for behavioural and cognitive-behavioural therapies are reported (McConaghy, Armstrong, Blaszczynski & Alcock, 1983; Blaszczynski, McConaghy & Frankova, 1991; Ladouceur, Sylvain, Boutin, Lachance, Doucet, Leblond et al, 2001; Sylvain, Boutin, Lachance, Doucet, & Leblond, 2003).

Variations in these reported outcome rates reflect inconsistencies in diagnostic and inclusion criteria, and indices used to determine successful outcome (Blaszczynski, 1993; Jackson, Thomas, & Blaszczynski, 2003) across studies. Some studies use unselected consecutive patients seeking treatment from specialist clinics while others rely on clients responding to recruitment advertisements placed in print media. To identify cases, semi-structured clinical interviews, DSM-based (American Psychiatric Association, 1980, 1987, 1994) or Gamblers Anonymous checklists and standardized psychometric

instruments are used. In most studies where multiple measures are used, the rate of concordance between measures in identifying cases is seldom questioned or reported.

Perhaps one of the more disconcerting aspects of these outcome studies is the absence of any clearly defined index of successful response to interventions. Studies have used a variety of proxy measures. These include pre- to post- changes in gambling behaviour expressed in vaguely defined terms of expenditure, frequency and duration of gambling; scores on inappropriately applied screening instruments such as the SOGS; improvement in financial position without reference to time-lag effects caused by capacity for debt repayment; comorbid psychopathology; reduction in erroneous cognitions; and general concepts of quality of life.

The use of the SOGS, one of the most commonly used validated measures, to assess outcome is from the outset, flawed. Lesieur and Blume (1987) designed the instrument to identify probable pathological gamblers attending a substance abuse facility for treatment, with diagnosis confirmed by a second-wave clinical interview. There is no empirical evidence to confirm the instrument's sensitivity in assessing change following treatment. Even a superficial examination of the item contents, over half of which emphasize behavioural aspects of the condition, would alert one to the fact that these are subject to external influences rather than therapeutic gains. For example, items assessing guilt over current gambling, lying about winning and borrowing money does not apply in situations where gamblers are under surveillance by partners or where they have no access to gambling funds. These do not reflect positive therapeutic achievement but external contingencies limiting gambling behaviour.

In addition, SOGS is based on DSM-III-R (American Psychiatric Association, 1987) criteria and has not been updated to reflect current criteria included in the latest revision of DSM-IV-TR (2000).

Few studies take into consideration the need to measure changes reflecting the core component of the construct of pathological gambling, that is, poor decision-making

strategies that result in the failure to resist the urge to initiate or to terminate a session once commenced.

A further important consideration to bear in mind in determining outcome rates is that we remain somewhat ignorant of the natural course of pathological gambling and spontaneous remission rates. As Abbott, Williams and Volberg (2000) and Hodgins and El-Guebaly (2000) have noted, not all pathological gamblers require treatment with approximately 70% indicating recovery without formal therapy, a figure consistent with that reported for other substances. Furthermore, Slutske, Jackson and Sher (2003) have also shown that while the base percentage of problem gamblers remains relatively constant, there is considerable variation in concordance between cases at any given time. That is, that some cases remit while new cases emerge to take their place resulting in the consistent point-prevalence rate.

Epidemiological studies have consistently reported rates of 0.2% to 1.7% for pathological gambling in community sample. However, as noted by the Productivity Commission (1999) at a given time, only a small percentage of problem gamblers are either seeking treatment, in treatment or express a desire to obtain treatment. Again, these cases are not static and may shift in accordance with external and internal factors that influence pre-contemplation and action stages of change, and readiness and willingness to seek treatment. Therefore, taking into consideration the above issues, if we are to demonstrate the effectiveness of specific therapeutic interventions it is necessary to show that treatment outcome rates are higher than spontaneous remission rates.

Processes versus outcome in therapy

A treatment shown to be effective may not be exerting its therapeutic effect in accordance with its hypothesized mode of action. Many diverse factors independent of the presumed therapeutic ingredient advanced by a particular theoretical model that influences response to treatment including a range of non-specific therapist related factors and motivation to change.

It is apparent that we do not have a clear understanding of which variables contribute to therapeutic change or that contribute to an individual's readiness for change and motivation to enter treatment. Severe financial or marital crisis often create windows of opportunity for assistance-seeking behaviours, and motivational enhancement improves compliance in treatment (Milton, Crino, Hint, & Prosser, 2002). We know that certain barriers prevent individuals with gambling problems from seeking treatment (Hodgins & El-Guebaly, 2000; Rockloff & Schofield, 2004). In a telephone survey of a community sample of 1,203 residents in Central Queensland, an explanatory factor analysis identified five such barriers: availability, stigma, cost, uncertainty and avoidance (Rockloff & Schofield, 2004). High scorers on an abridged version of the SOGS (Lesieur & Blume, 1987), that is, those experiencing more problems, endorsed availability, effectiveness and cost factors as the main barrier to treatment. Older individuals and males were more concerned with stigma. Those with higher educational levels endorsed all factors at a lower rate. The proportion of respondents experiencing problem gambling was not reported making it difficult to interpret whether responses reflected actual or perceived barriers.

Thus, while we are able to provide broad statements regarding the relative effectiveness of treatments, we are yet to understand the core psychological components, mechanisms, process or modes of action that are associated with, or form the major contribution to, positive response to treatments.

In an attempt to identify the primary factors contributing to therapeutic change, we decided to compare the postulated therapeutic processes underpinning two theoretically different but empirically validated treatment models. The models selected were behaviour therapy and cognitive therapy. A review of the literature revealed a limited number of randomized controlled trials in the treatment of pathological gambling. These were limited to behavioural and cognitive interventions; stimulus control (Echeburua & Fernandez-Montalvo, 1996; Echeburua, Fernandez-Montalvo, Baez, 2000); imaginal desensitization (McConaghy, Blaszczynski, Armstrong, & Alcock, 1983); and cognitive-behavioural therapy (Sylvain, Ladouceur, & Boisvert, 1997). The following section

describes the putative mode of action of these two major theoretical models.

Behavioural interventions: Outcomes and underlying assumptions

The underlying assumption contained in behavioural explanations is that gambling is a learnt maladaptive behaviour that can be unlearned through techniques based upon principles of operant and classical conditioning (Skinner, 1953). The acquisition of gambling behaviour follows operant conditioning principles with monetary reward delivered on unpredictable variable ratio schedules acting as the primary reinforcement. According to Skinner, the long-term net gain or loss was irrelevant in accounting for the effectiveness of this form of reinforcement schedule that was particularly resistant to extinction. His operant model relied heavily on monetary reward without consideration of other potential environmental or cognitive reinforcers.

Dickerson (1979) extended Skinner's model and postulated the presence of two available reinforcers; money won, reinforced on partial reinforcement schedules, and excitement associated with cognitions and environmental stimuli reinforced on a fixed interval schedule to account for observed betting shop behaviours such as delayed placement of bets. Later, Anderson and Brown (1984) postulated a two-factor neo-Pavlovian model emphasizing classical conditioning of environmental cues and autonomic/cortical arousal, together with the negative reinforcement associated with a reduction in aversive emotional states produced by the narrowing of attention and distraction from awareness of life problems, in accounting for the maintenance of pathological gambling patterns.

Counterconditioning

In accordance with this theoretical model, early behavioural interventions have used operant or classical conditioning aversive techniques to counter-condition the arousal/excitement associated with gambling. The most commonly applied form has been electric shocks in isolation (Barker & Miller, 1968; Goorney, 1968; Koller, 1972, McConaghy, Armstrong, Blaszczynski & Allcock, 1983) or in conjunction with supportive therapy (Seager, 1970), covert sensitization (Cotler, 1971). Covert sensitization, in which aversive imagery is substituted for aversive electrical stimuli, has

been combined with rational emotive therapy (Bannister, 1977) or stimulus control and exposure (Greenberg and Rankin, 1982). Salzmann (1982) reported the only use of a chemical substance, apomorphine, in an aversive therapy paradigm while Greenberg and Rankin (1982) supplemented exposure to gambling cues with a rubber-band technique (in which by snapping a rubber band over the wrist causes self-inflicted pain).

The outcomes reported in case series studies demonstrate the effectiveness of these behavioural interventions. In Barker and Miller's (1968) series of studies using in-vivo electric aversive therapy to treat five gamblers, a favourable response was achieved over 12 to 30 months in three cases with positive outcome following booster sessions in response to an episode of relapse in the remaining two.

Seager (1970) treated sixteen gamblers with abstinence as the stated aim. At twelve months, five were free of gambling, two improved, and one showed minor gambling. Four ceased treatment prematurely. Koller (1972) treated 20 gamblers but reported outcome on only 12 assessed and followed-up over two months to two years. Five reported cessation and one virtual cessation of gambling. Overall, Koller concluded that aversive therapy effectively modified gambling in 75% of his patients. Greenberg and Rankin (1982) treated 26 gamblers at two hospitals with stimulus control, in-vivo exposure and/or covert sensitization and rubber band aversive therapy. There was no random assignment to treatment group. Five patients attended only one session and 50% dropped out prior to completion of therapy. Follow-up conducted over nine months to four years revealed that five (19%) had gambling 'well controlled', seven (27%) controlled with periodic relapse, and the remainder continued gambling.

Given ethical considerations and concerns expressed in respect to the administration of painful stimuli, whether electric, pharmacological or imaginal in nature, to individuals suffering impaired control over behaviours, the use of aversive therapy has diminished substantially and is non-existent in the treatment of pathological gambling. Substituting for these aversive interventions are imaginal desensitization, cue and stimulus control

with response prevention, and supplementary monitoring, problem solving and stress management techniques.

Imaginal desensitization

Conceptually, imaginal desensitization is a drive-reduction procedure that allows control over recurrent appetitive behaviours by reducing levels of arousal and tension associated with attempts to resist completing a habit. Developed from McConaghy's (1980) Behaviour Completion Mechanism model, a derivative of the concept of the orienting response described by the Russian neurophysiologists Anohkin (1955) and Sokolov (1963), this model postulates a process of cortical excitation in which the repeated occurrence of a complex set of behaviours establishes a neuronal representation of that habit in the cerebral cortex. Each repetition consolidates the set of linked behaviours to form a habitual pattern of activity.

A mismatch between model and incoming stimuli creates a drive for the individual to continue engaging in the sequence of behaviours until the habit is completed. Consequently, any failure or attempt to interrupt the habit results in a state of aversive physical arousal or tension that is experienced as a persistent drive to carry out the habit. Once the habit is successfully completed, the drive is satisfied and the aversive state of arousal dissipates. The positive reinforcement associated with the appetitive behaviour and the negative reinforcement produced by the removal of the aversive arousal strengthens the neuronal model of behaviour.

In a series of comparative studies (Blaszczynski, McConaghy, Frankova, 1991; McConaghy, Blaszczynski, & Frankova, 1991), imaginal desensitization was found to have effectively diminished the strength of the compulsive drive by reducing self-reported levels of arousal, urges and scores on an anxiety scale in 70% of a small sample of treated gamblers.

In a long-term follow-up study, 120 in-patient gamblers were randomly assigned to receive either imaginal desensitization or an alternative procedure: aversion therapy,

imaginal relaxation or brief/prolonged in-vivo exposure. At 2- to 9-year follow-up (average 5 years), 79% of patients in the imaginal desensitization sample ceased or controlled their gambling as compared to 53% of those receiving the alternative procedures. These results were interpreted to suggest that imaginal desensitization had a specific effect additional to that present in the alternative therapies.

The observed outcome rates were higher than the 7% rate reported for Gamblers Anonymous (Brown, 1985) and comparable to the 20% to 86% found among multimodal approaches and cognitive-behavioural therapies (Blaszczynski & Silove, 1995).

However, Toneatto and Ladouceur (2003) critically reviewed the reported studies on imaginal desensitization and raised a number of valid observations that questioned the superiority of imaginal desensitization over other behavioural treatments. In addition, in respect to the findings reported for the five year follow-up study (Blaszczynski, McConaghy & Frankova, 1992), these authors raised the question as to whether or not 'maturing out' or exposure to other treatments in the post treatment phase posed a threat to the internal validity of the findings.

The criticisms leveled against the series of studies on imaginal desensitization highlight the need to gain a better understanding of its underlying processes. For example, Toneatto and Ladouceur (2003) pointed out the absence of pre-treatment measures of gambling urges and behaviours in the series of studies reported by McConaghy and colleagues. If the postulated mechanism of action is through reciprocal inhibition or habituation, it is imperative to measure indices of subjective and physical arousal at baseline and compare these to changes within and across treatment sessions and follow-up. If behavioural treatments are effective, there should be evidence of diminished levels of arousal in a dose dependent relationship with behavioural outcomes. Behavioural changes in the absence of reductions in states of arousal would suggest other mechanisms are in operation.

Given that the pathological gamblers seek treatment in response to crises or family pressure, many have ceased gambling in the period immediately preceding baseline assessments. This will have an impact on the recording of baseline levels of arousal. The presence of anxiety and stresses with the emotional distress caused by the consequences of gambling will artificially inflate measures of arousal. Post therapy reductions in arousal may be accounted for reduced anxiety rather than the effects of the behavioural therapy per se.

Toneatto and Ladouceur also raised the issue of threat to internal validity for the imaginal desensitization procedure on the basis that there was no attention paid to differences in exposure to gambling stimuli following cessation of treatment. They argued that differential rates of exposure between those receiving and not receiving imaginal desensitization may have an effect on habituation and non-reinforcement. However, this criticism is equally applicable to cognitive and other therapies and is somewhat unrealistic and unjustified given that researchers cannot control exposure to non-formal therapies or define these as either behavioural or cognitive in nature.

In summarizing outcomes, Toneatto and Ladouceur suggest the claim that imaginal desensitization is superior to other treatments is equivocal in that 30% ceased gambling compared to 27% receiving other interventions. They also questioned the accuracy of the interpretation made by McConaghy and colleagues that the findings supported the behaviour completion mechanism in that the data was open to a variety of alternative explanations.

Stimulus control

More recently, randomized control designs have shown stimulus control to be an effective intervention. In a series of randomized controlled trial, Echeburua and Fernandez-Montalvo (1996) compared the relative effectiveness of a six week package of behavioural and cognitive therapies, and the effects of relapse prevention in samples of slot machine players. In this Spanish study, the investigators randomly assigned 64 pathological gamblers to individual stimulus control and exposure with response prevention, group cognitive restructuring, a combination of these two interventions, or a wait-list control. The exposure-response prevention was similar to the in-vivo exposure

program conducted earlier by McConaghy and Blaszczynski and involved money management and the systematic prolonged exposure to gambling cues without acting on their impulses.

Results indicated that most patients improved following treatment, although surprisingly the highest success rate was in the stimulus control and exposure with response prevention condition. In Echeburua and Fernandez-Montalvo's study, participants allocated to the wait-list control achieved a 6-month success rate of 25% compared to a rate of 62% for group cognitive therapy, 75% for individual stimulus exposure and 37% for a combination of both approaches. At 12-month follow-up, the same proportion of individuals in the stimulus exposure and combined treatment groups reported success. For the cognitive therapy group, the proportion reduced to 37%. The authors acknowledged that the treatment delivery format for the cognitive restructuring and combined programs may not have given participants sufficient time to adequately assimilate the skills learned, but concluded that it seems more reasonable to design specific short treatments than engage clients in the multi-component treatments commonly recommended.

In their later study, Echeburua, Fernandez-Montalvo and Baez (2000) evaluated the effects of relapse prevention in a cohort of 69 gamblers using the same design and groups. While reporting positive outcomes, approximately 20% of subjects had relapsed; 47% controls; 17% response prevention; & 22% group response prevention.

Toneatto and Ladouceur (2003) raised a number of criticisms of the methodology, particularly regarding compromised validity of comparing individual to group formats, integrity of treatment administration and absence of adequate pre-treatment estimates of abstinence.

While the results of the response prevention appeared promising, there are sufficient design problems that need to be addressed before the results can be taken to support stimulus control response prevention to be the behavioural intervention of choice in treating gamblers.

Mode of therapeutic action: behaviour therapy

There are two fundamental assumptions implicit in behavioural explanations of gambling:

1. Firstly, that physical and subjective correlates of arousal form a core component of the intrinsic process associated with gambling, with excitement forming the primary positive reinforcement agent.

The removal of aversive states of arousal represents a negative reinforcement and is also postulated to act as an important reinforcer.

The presence of partial reinforcements is particularly relevant in explaining persistence in gambling in that contingencies of reinforcement delivered according to such schedules produce the highest rate of responses, increases in response rate immediately following a reinforcer, and are highly resistant to extinction.

Given that pigeons and rats display the same pattern of responding under similar contingencies of reinforcement, alternative cognitive explanations such as the gambler's fallacy or cognitive regret are not necessary or adequate to account for persistence in play.

2. Secondly, that removing the arousal associated with gambling through processes of counterconditioning, reciprocal inhibition or habituation through exposure and response prevention will be effective in leading to a reduction in gambling behaviour.

Let us examine the evidence in support of these assumptions.

While pathological gamblers are not sensation seekers although the mixed research suggests that they are disproportionately high in the intensity-seeking form of sensation seeking, there is evidence to indicate that gamblers do experience intense levels of subjective excitement and physical arousal as measured by heart rate and skin conductance changes.

Sharpe (2002), reviewed the literature on arousal in presenting her biopsychosocial model of gambling and in summarizing her conclusions, we find that:

- Autonomic arousal is associated with pathological gambling
- Findings in the domain of neurotransmitter activity lend support to increased levels of physical arousal in gamblers
- Arousal is greatest in real life as compared to laboratory settings
- That horse racing and casino betting may be more associated with arousal in contrast to electronic gaming machines where the shift is to reduce high states of arousal

Negative reinforcement, that is, the removal of noxious stimuli has been also been accepted as representing an important factor that complements the reinforcing effects of excitement produced by winning in consolidating gambling behaviors. It is a theme that repeatedly permeates a number of explanatory models. In this regard, Anderson and Brown (1984), followed closely by Jacobs (1986), were among the first to suggest either a neo-Pavlovian model or general theory of addictions that emphasized classical conditioning of autonomic arousal, and the role of negative reinforcement, through the mechanism of a narrowing of attention or drive to eliminate aversive states of hypo or hyper-arousal in gambling. In one of my earlier papers, I supported this view in arguing that the reinforcing effects of a reduction in anxiety states and an augmentation of hypo-arousal were crucial determinants shaping involvement in low as opposed to high skill gaming.

However, operant and classical conditioning explanations are insufficient in themselves to account for the transition from controlled to uncontrolled levels of gambling or more importantly, to explain why in problem gamblers, the punishing effects of losses and negative emotional states reported in the latter phases of gambling sessions fail to exert any operant or classical reinforcing effects. For example, many problem gamblers frequently report a reduction in excitement over the duration of a session, complain of boredom, a relief when all money is lost and the session can terminate, and intense remorse, regret and depression in the immediate post-gambling time-frame. Setting aside

the concept of discounting the relative strength of proximal versus distal reinforcers, behavioural theories should, at best be able to explain such features.

In addition, as argued by Sharpe (2002), there is a relationship between arousal and the presence of irrational cognitions such that it complicates the matter by suggesting a complex interaction between the two, most likely with cognitive events mediating levels and interpretation of arousal. There is now a considerable body of evidence in support of the hypothesis that gambling acts as a negative reinforcement through a process of emotional numbing and dissociation with Jacobs (1988), demonstrating that the majority of problem gamblers experience dissociative states.

Accordingly, most behavioural treatments have used various techniques derived from operant or classical conditioning techniques in an attempt to counter-condition the arousal/excitement associated with gambling, reciprocally inhibit arousal responses, or to produce habituation through a process of repeated exposure and response prevention.

In summary, non-randomized studies of aversive therapy techniques applied singly or in combination produce success rates varying between 20% and 60% at best.

Cognitive interventions: Underlying assumptions

Cognitive explanations of gambling are based on the argument that erroneous perception, irrational belief schemas and misunderstanding of randomness, mutual independence and probabilities, lead to the misattribution of causal connections between chance events and unrealistic estimates of the likelihood of winning (Toneatto & Sobell, 1990; Ladouceur & Walker, 1996; Toneatto, Blitz-Miller, Calderwood, Dragonetti, & Tsanos, 1997; Walker, 1992; Sharpe & Tarrier, 1993; Sylvain, Ladouceur, & Boisvert, 1997). Toneatto et al. (1997) and Ladouceur and his colleagues (Ladouceur & Gaboury, 1988; Ladouceur, Gaboury, Dumont, & Rochette, 1988; Gaboury & Ladouceur, 1989) have consistently found that up to 80% of problem gamblers seeking treatment described a range of irrational verbalization or cognitive distortions with a mean number of 3.5 cognitive distortions per subject

The primary cognition underlying gambling is the misconception that one can win. Felscher, Derevensky and Gupta (2004) showed that there was a linear relationship between level of gambling and perceived probability of winning among gamblers while Ladouceur (2003) found a trend for the strength in conviction in winning increased over sessions for n = 15 problem, but not n = 15 non-problem, VLT players recruited through advertisements. He used the thinking aloud technique to assess irrational self-statements and found that 81% of problem gamblers as compared to 68% non-problem gamblers exhibited such thoughts before play with 41% and 27% during play, respectively. Ladouceur interpreted the findings to support the notion that chasing losses was linked to increases in conviction over sessions as a consequence of erroneous perceptions related to expectations of winning, that is, the influence of cognitive regret and the gambler's fallacy.

These irrational beliefs, coupled with others such as biased recall of previous wins, the maintenance of over-valued belief regarding luck, accession to superstitious behaviours, misunderstanding of probability theory, and exaggerated confidence in special skills, knowledge or other attributes that provide them with a winning 'edge', leads gamblers to chase losses.

There is a considerable amount of empirical evidence to support the contention that problem gamblers can be differentiated from recreational gambling on a wide variety of characteristics that can be broadly categorized into those related to personal skill and judgment (illusions of control: Langer, 1975), ability to influence outcomes (superstitious rituals and beliefs: Joukhador, Maccallum, & Blaszczynski, 2000), selective recall and biased evaluation of outcomes (Gilovich, 1983; Gilovich & Douglas, 1986), and erroneous perceptions regarding randomness and the independence of events (Gaboury & Ladouceur, 1988; Coulombe, Ladouceur, Desharnais, & Jobin, 1992; Walker, 1992). Toneatto, et al. (1997) reduced 13 such identified cognitive distortions into five classifications under three similar higher-order categories: control, reframing, and prediction.

The effectiveness of cognitive therapy in reducing gambling behaviour is demonstrated by case studies and randomized control trials.

In one of the early reports, Bannister (1977) concurrently applied rational emotive therapy, covert sensitization and Valium in the case of a 46 year old married male sports gambler. The cognitive oriented rational emotive therapy was designed to enhance a sense of internal locus of control, to correct self-statements that abdicated responsibility over behaviour, and to engender the link between gambling and its negative impact.

Toneatto and Sobell (1990) used Beck's model in modifying gambling-related assumptions and beliefs in a 47 year old male with a 26 year history of gambling. Ten weekly sessions led to a significant reduction in frequency from seven gambling sessions per month to three episodes over the six-month follow-up period. The absence of pre- and post-treatment measures precluded an assessment of changes in cognitive activity. Although encouraging, results need be interpreted with caution as the subject was atypical of gamblers in general, presenting for treatment for an alcohol addiction problem with a co-existing history of indecent assault and exposure. Gambling appeared incidental to his primary disorder. He did meet DSM-III criteria but he made no prior attempt to cease gambling and "...expressed an interest in learning to curb his gambling"(p.498).

Breen, Kruegelbach and Walker (2001) found that following a 28 day inpatient cognitive therapy program, post-treatment Gambling Attitude and Beliefs Survey scores decreased significantly and were no different from scores obtained by a student control sample. However, it is not clear whether irrational belief structures targeted during therapy were those specifically assessed by the Gambling Attitude and Beliefs Survey, or the extent to which the scale score correlated with changes in overt gambling behaviour. Having demonstrated that cognitive changes do occur following cognitive therapy, these authors correctly note that this is a preliminary step towards validating the cognitive perspective that belief structures maintain problem gambling.

The randomized controlled trials conducted by Sylvain et al. (1997) and Ladouceur et al. (2001) coupled with studies demonstrating that relevant information during play reduces erroneous perceptions and modifies behaviour (Benhsain, Taillefer, & Ladouceur, 2004) supports the effectiveness of cognitive therapy in modifying cognitions and behaviour. In Sylvain et al.'s (1997) controlled trial, 29 gamblers were randomly allocated to a manualized cognitive-behavioural intervention comprised of cognitive therapy, problem solving, social skills training and relapse prevention, or to a four month waiting list control group. At the core of their approach was the fundamental assumption that the desire to win was the primary motivation underlying participation in gambling at any level. Erroneous beliefs regarding randomness were considered instrumental in developing illusions of control that influenced gamblers to apply strategies and skills to increase their winnings.

Post treatment results showed that the active intervention produced significant improvement across a range of dependent variables including gambling behaviour, SOGS scores, and perceptions of self-control and pre-occupation. Eighty-six percent of treated gamblers no longer met DSM-II-R or SOGS criteria at end of treatment. As Toneatto and Ladouceur (2003) note, there was no attempt made to ascertain the extent to which irrational beliefs were modified in accordance with the target objective of the cognitive therapy applied, the relationship between behavioural outcomes and cognitive changes, or the level or change in arousal associated with urges to gamble (they assessed estimates of desire but not strength of urge to gamble). Whether the intervention actually corrected targeted erroneous perceptions and whether such corrections were correlated in a dose-dependent relationship with indices of improvement, remains to be established. Because of the combination of cognitive and behavioural components present in their treatment package, it is not possible to tease out the relative contribution of each component or their interaction.

In their later study using a similar design and outcome variables, Ladouceur et al. (2001) limited their intervention to cognitive therapy in conjunction with relapse prevention. Of

217 potential recruits, 88 meeting criteria and agreeing to participate were allocated to the treatment and wait-list control. In total, 29 were assigned to the control group with 35 completing the active treatment. A similar proportion, 86%, of treated gamblers no longer met criteria at post treatment.

Despite evidence that suggests that cognitive approaches result in positive treatment outcome, the mechanism or process of such change is still unclear. Although it is attractive to attribute changes to the effects of cognitive corrections to irrational and erroneous beliefs, it remains unclear whether such changes contributed to a reduction in arousal associated with gambling. It is important to exclude the possibility that shifts in cognition result in exposure to gambling stimuli without concomitant increases in arousal and that it is the habituation or the absence of arousal that ultimately is the active ingredient leading to therapeutic change. It remains to be demonstrated that a causal relationship exists between changes in the level of irrational cognition and subsequent behavioural indices that is independent of the potential mediating effects of arousal before we can state with certainty that the active ingredient of cognitive therapy is alterations in cognitions. It is possible that cognitive dissonance may act to alter cognitions in response to gambling. As Walker (1992) aptly notes, gambling may maintain irrational thinking rather than the reverse. To be convincing, cognitive distortions should be shown to covary with indices of gambling severity and be absent in non-pathological gamblers.

The majority of gamblers commence gambling prior to age 20 years but maintain controlled levels for many years before succumbing to pathological cycles. It is relevant, therefore, that cognitive theorists explain what factors generate cognitive distortions and the process leading to the transition from normal to dysfunctional cognitions.

Process of change: Cognitive or arousal based?

The issue of processes underlying treatment and its concordance with the conceptual principles underlying the theoretical model on which interventions are based is an important consideration that is yet to be addressed in the literature. To what the degree

does a particular therapy produce behavioural changes in accordance with its proposed theoretical constructs and processes for change? For example, cognitive therapy is hypothesized to produce behavioural change through mechanisms of altered irrational or distorted beliefs systems, yet limited reports have included measures designed to assess changes in beliefs from pre-to post treatment, and the extent to which observed behavioural outcomes are causally related to cognitive changes.

As noted by Sharpe (2002), arousal has been hypothesized to play a central role in behavioural and cognitive therapies. Therefore, it cannot be discounted that both therapies achieve changes in both cognitive schemas and levels of arousal in a desynchronous manner. Cognitive therapy may be effective due to initial changes in cognition which allow exposure without reinforcement leading to habituation of arousal; while a reduction in arousal following behavioural treatments subsequently lead to cognitive shifts.

Recently, a randomised controlled one-month outcome study found that both interventions achieved a comparable success rate of around 70% (Blaszczynski, Maccallum & Joukhador, 2000). In this comparative pilot study designed to investigate the processes of change in behavioural and cognitive therapy, 68 treatment-seeking gamblers were allocated to one of three conditions: imaginal desensitization (n = 21); cognitive therapy (n = 26) and combined imaginal and cognitive therapy (n = 21). All met DSM-IV criteria for pathological gambling and obtained a mean SOGS score of 12 (SD = 2.1).

A 65-item gambling beliefs questionnaire was constructed containing statements describing concepts related to 12 categories of irrational and distorted cognitions and erroneous perceptions drawn from frequently reported items in the literature. The categories included: illusion of control, erroneous beliefs of winning, entrapment/gamblers fallacy, superstition, impaired control, the near miss, memory bias, biased evaluation, positive state, relief, winning is a solution to problems, and denial.

At pre-and one-month post treatment assessment, participants were coded as being abstinent, controlled or uncontrolled according to the level of their gambling behaviour during the month prior to assessment. “Abstinent” was defined as no gambling on problem form during the one-month prior to assessment. “Controlled” was defined as spending no more than \$20 per week and spending no more than intended to at any one session. “Uncontrolled” was defined as repeated failure to resist the urge to gamble, spending more than intended and chasing losses. Participants were asked to complete visual analogue self-ratings of urge, control and preoccupation and to rate the degree to which they believed each statement in the gambling belief questionnaire, on a 5 point scale ranging from 0 = not at all to 4 = very much. Statements from each category were placed in random order within the questionnaire. A high score reflect greater levels of cognitive distortions and unhelpful beliefs. Pathological gamblers have been shown to score significantly higher on this scale than social gamblers (Joukhador, et al, 2004).

Results showed that there was no difference between the three treatment conditions on the pre-treatment total gambling beliefs scale score. A group by time repeated measures analysis of variance indicated that, on average, mean scores for this scale decreased significantly from pre to post with no difference between treatment conditions in the size of this change. That is, as predicted, cognitive therapy was associated with a decrease in gambling-related cognitive distortions from pre to post treatment.

There appeared to be a dose-dependent relationship between level of cognitive distortion and clinical outcome among subjects responding to treatment. Subjects rated as showing signs of moderate and significant improvement displayed similar changes in pre to post treatment levels of cognitive distortions. However, the general level of distortion was higher among subjects showing moderate improvement as compared to those showing significant improvement, suggesting a connection between levels of distortion and gambling behaviour. The casual relationship between changes in behaviour and changes in cognitions requires further investigation.

Interestingly, however, the individuals who received imaginal desensitization without cognitive therapy also showed a similar reduction in levels of unhelpful gambling related

beliefs raising questions over the mode of action of this technique. Further research is needed to clarify if imaginal desensitization reduces gambling behaviour in the manner hypothesized by its conceptual model, that is, by reducing the arousal triggered by gambling related cues, or whether it produces change through alterations in cognitive activity.

From a conceptual perspective, it is important to determine if the processes underlying treatment effects are consistent with the theoretical model explaining the development of pathological gambling. At a clinical level, compared to cognitive therapy, the imaginal desensitisation technique is a cost-effective intervention that requires minimal therapist demands and one that lends itself to self-directed home-practice. To refine and improve these treatments, it is imperative to know how and why each intervention works.

The aim of the study, therefore, is to compare pre- and post-treatment changes in irrational/erroneous cognitive beliefs and levels of subjective arousal rate following cognitive therapy or imaginal desensitisation. These two specific interventions were chosen on the basis that they are demonstrated to be effective through the use of randomised controlled long term outcome study designs (Sylvain, Ladouceur & Boisvert, 1997; McConaghy, Armstrong, Blaszczynski & Allcock, 1983). The objective of the study is to identify the psychological processes leading to the successful outcome of imaginal desensitisation and cognitive therapy for pathological gambling. Knowledge of the mechanism of action underlying these techniques will lead to a greater conceptual understanding of the factors leading to the development and maintenance of pathological gambling.

The specific hypotheses to be tested are:

- (1) That imaginal desensitisation will produce a reduction in subjective arousal and heart rate responses following exposure to gambling imagery.
- (2) That cognitive therapy will lead to changes in the level and strength of conviction of irrational beliefs and erroneous perceptions held toward gambling.

- (3) That changes in subjective arousal and heart rate responses will be greater for imaginal desensitisation as compared to cognitive therapy.
- (4) That changes in irrational and erroneous cognitive beliefs will be greater for cognitive therapy as compared to imaginal desensitisation.

METHOD

Participants

Participants were a series of problem gamblers seeking treatment at a university teaching hospital department of psychology. They were either referred by mental health agencies for treatment or had responded to an advertisement placed in the local newspaper or a monthly club newsletter calling for volunteers to participate in a treatment research project. A letter was circulated to clinicians and counsellors in specialist gambling counselling services informing them of the research project and requesting assistance by referring eligible clients for treatment. The media advertisements were directed toward recruiting local community residents and placed in two district newspapers with wide circulations in the metropolitan areas where the Hospital and University were located, and members of a large regional registered clubs within a community serviced by the Western Sydney Area Health Service.

The recruitment rate was disappointing with a total of 20 eligible participants agreeing to enter treatment. There were 11 (55%) males and 9 (45%) females.

The sociodemographic characteristics for the total sample are displayed in Table 1.

Table 1: Sociodemographic characteristics of n = 20 pathological gamblers participating in the study

Socio-demographic variable		Frequenc	(%)	
		y		
<u>Marital status</u>	Single	11	(55.0)	
	Married/defacto	6	(30.0)	
	Separated	1	(5.0)	
	Divorced	2	(10.0)	
<u>Social economic status</u>	Professionals	1	(5.0)	
	Associate professionals	2	(10.0)	
	Tradesperson and related	2	(10.0)	
	Intermediate clerical sales and service	6	(30.0)	
	Intermediate production and transport	1	(5.0)	
	Elementary clerical sales and service	6	(30.0)	
	<u>Unemployed</u>	Yes	10	(50.0)
		No	10	(50.0)
<u>Government benefit</u>	Disability allowance	1	(5.0)	
	Family assistance	1	(5.0)	
	Sickness allowance	2	(10.0)	
	Sole parent allowance	1	(5.0)	

Of the unemployed, five (50%) were unemployed for less than one month. The mean period of unemployment was 4.6 months (SD = 4.4 months).

Slightly over half the sample (55%) achieved tertiary level qualifications. Table 2 displays the education level of participants.

Table 2: Highest level of education in n= 20 pathological gamblers

Educational level	Frequency	%
Secondary to year 9/third form	2	10.0
Year 10/intermediate certificate	4	20.0
HSC or equivalent	3	15.0
TAFE/technical	6	30.0
University	5	25.0

Just over half the sample were born in Australia with 80% (n = 16) reporting that the main language spoken at home was English.

Table 3: Country of birth of participants in the study

Country of Birth	Frequency	Percent
Australia	11	55.0
Croatia	3	15.0
England	2	10.0
Greece	1	5.0
New Zealand	1	5.0
Singapore	1	5.0
Yugoslavia	1	5.0

Random allocation

Participants were randomly allocated to one of two groups: cognitive therapy and imaginal desensitization. To assign participants randomly, the group number (i.e., one = cognitive therapy; two = imaginal desensitisation) was written on a piece of paper and placed in a box. Numbers were then selected out of the box and entered into a list. Participants were then allocated to the group represented by the next number on the list. The same number was used to assign the next participant under conditions where the original participant declined to participate in the study.

The distribution of gender by group is shown in Table 4. Chi-square analysis revealed that there was no significant difference in the distribution of males and females between the two groups ($X^2 = 0.9$, $df = 1$, NS).

Table 4: Gender distribution by treatment group for n = 20 pathological gamblers

		Treatment group		Total
		<u>Cognitive therapy</u>	<u>Imaginal desensitization</u>	
<u>Sex</u>	Male	5	6	11
	Female	6	3	9
<u>Total</u>		11	9	20

The mean age of the total sample was 35.0 (SD = 8.3). The mean age for the cognitive therapy group was 37.2 (SD = 8.5) and for the imaginal desensitization, 32.3 (SD = 7.7), a difference that did not reach significance ($F=1.76$, $df = 1, 18$, $p = .21$ NS).

The mean South Oaks Gambling Screen (SOGS: Lesieur & Blume, 1987) score for the gambling sample was 13.5 (SD = 3.2). The mean SOGS score for the cognitive therapy group was 14.4 (SD = 2.5) and 12.5 (SD = 3.9) for the imaginal desensitization group. There was no significant between group scores on this variable ($F = 1.49$, $df = 1,16$, NS).

Participants endorsed an average of 8.5 (SD = 1.2; median = 8; range 5 – 10) DSM-IV items.

Not unexpectedly since the SOGS is a derivative of DSM diagnostic criteria, the DSM-IV and SOGS scores for the sample were found to be significantly correlated ($r = .77$, $p < .001$, two-tailed).

PROCEDURE

Participants referred to the research project received a Participant Information Sheet explaining the nature and purpose of the study. They were informed that they would be

randomly allocated to one of two treatments, both of which had been previously demonstrated to be effective and that if they failed to respond to treatment, they would be offered the alternative form. Those agreeing to participate signed a Consent Form. All participants were clinically assessed for suitability for treatment.

Participants were excluded if they manifested signs or symptoms of acute psychosis, insufficient competency in English to complete cognitive therapy and psychometric measures, were at immediate risk for suicide and if gambling was secondary to another primary comorbid condition, for example substance abuse.

The first session was devoted to the clinical assessment and administration of the semi-structured interview and battery of psychometric measures designed to assess socio-demographic details, gambling history, alcohol use, visual analogue scales to assess urge to gamble and excitement.

Psychophysiological measures were assessed at baseline for both groups, and during sessions for the imaginal desensitization group. These measures were repeated at the beginning of sessions and at follow-up. The psychophysiological instrument used to measure heart rate was a Polar Precision Performance Version 2.10 portable heart rate monitor with capabilities for downloading to laptop computer database.

Participants were instructed as to how the electrodes were to be placed around their chest and secured in place by a velcro strap. The researcher left the room while the participant placed the electrodes under their garments. The device was then calibrated and a ten minute period for habituation was completed. The sequence of recording data was as follows:

- The heart rate monitor was fitted to the patient and they were instructed to sit quietly for 10 minutes to enable their heart rate to settle and provide a base-line reading.
- After 10 minutes the participant was asked to close their eyes and imagine as clearly as possible, a neutral scene presented to them. The scene involved a description of the

participant entering and walking through their local shopping centre. This scenario lasted 3 minutes. These descriptions were provided by each participant and included their favourite venue, type of machine, and typical expenditure levels.

- The participant was then asked to rest quietly for 5 minutes.
- The participant was then given guided imagery where they were presented with the description of their entering a familiar gambling situation (i.e., entering their favourite venue, walking to a selected machine, placing a bet, and commencing to gamble).
- This scene was presented for 3 minutes before one of two outcomes were described.
- For half the, this participants, the scene ended in a large win preceded by a period of betting with increasing amounts.
- For the other half, the description involved continual losses until all gambling funds were depleted.
- The participant was then asked to rest quietly for 5 minutes.
- Finally the patient was asked to imagine a second gambling scenario for 3 minutes (a losing scenario if the previously scenario involved winning, and vice versa for those given a losing outcome).
- The sequence of Win/Loss or Loss/Win was kept constant for each patient across all recording sessions.

The procedure involved the following time-frame for recording of psychophysiological responses:

- 0 - 10 minutes: resting quietly
- 10 - 13 minutes: shopping scenario
- 13 - 18 minutes: resting quietly
- 18 - 21 minutes: gambling scenario 1
- 21 - 26 minutes: resting quietly
- 26 - 29 minutes: gambling scenario 2

For the imaginal desensitization group, the heart rate monitor was left on for the remainder of the session whilst the patient listened to the imaginal desensitization instructions delivered by audio-tape.

The independent variable was treatment condition, and the dependent variables were heart rate, subjective estimates of arousal, visual analogue scales assessing urge, control and preoccupation, and presence of erroneous cognitions.

Treatment conditions

The cognitive therapy assists gamblers in identifying and correcting erroneous beliefs and perceptions held toward gambling and probabilities of winning. The structure and format of the cognitive therapy was based on a cognitive therapy manual used in clinical practice and demonstrated to be equally effective as the imaginal desensitization technique (Maccallum, Blaszczynski, & Joukhador, 1999). The cognitive therapy will include six one-hour weekly sessions of individual cognitive therapy.

The imaginal desensitisation comprised ten thirty-minute sessions administered over a period of six weeks. To standardize delivery of instructions, a set of pre-recorded audiotapes containing guided relaxation and gambling imagery for use with electronic gaming and horse race gambling were used. Using this schedule, the total amount of contact therapy time for each group was approximately equivalent.

Participants were assessed on four occasions, before treatment, at the mid-point of treatment, following treatment and again one-month later. At one-month post treatment, the same assessment procedure was repeated: subjective arousal and heart rate responses to the imagery task and questionnaires. Treatment outcome was to be assessed by level of gambling behaviour (frequency, duration and expenditure) and responses to visual analogue scales measuring urge, preoccupation and degree of self-control over gambling urges and behaviour.

Measures

Participants were administered a semi-structured interview schedule and self-report questionnaires.

1. Semi-structured gambling interview schedule (Blaszczynski, 2000): This interview was designed to elicit details regarding personal gambling demography, history of psychological treatments received for gambling, and substance use, and is a shortened version of one that has been used extensively in previous ethics approved treatment studies (Blaszczynski, 1998-2000). The interview contains items that allow for a DSM-IV diagnosis of pathological gambling.

2. The Gambling Beliefs Questionnaire (Joukhador, Blaszczynski, & Maccallum, 2004). This is a 48-item gambling belief questionnaire that assesses beliefs and attitudes held toward gambling, biased memories, and the probability of winning. Participants are asked to rate the strength of their beliefs on a 5 point scale (anchor points ranging from 0 = not at all, 4 = very much). The questionnaire contains statements describing key concepts related to 12 categories of irrational and distorted cognitions and erroneous perceptions frequently reported in the literature (Toneatto, 1999). The categories related to 12 areas include:

- Illusion of control (9 statements): The belief that individuals are able to influence outcomes of chance-determined events through personal skill, strategies or systems.
- Erroneous beliefs of winning (4 statements): Beliefs that individuals are on a winning streak or can win at gambling.
- Entrapment/gamblers fallacy (12 statements): Continued gambling despite losses due to the belief that a win is imminent.
- Superstition (8 statements): Belief that ritual behaviours or lucky objects influence gambling outcomes...
- Impaired control (5 statements): Belief that individuals have no control over gambling behaviour.
- The “Near miss” (3 statements): Belief that a near win or near miss signals that a win is close.
- Memory bias (3 statements): Evidence of the tendency to recall wins and to forget losses.

- Biased evaluation (7 statements): Attribution of wins to personal skill factors and losses to external or chance factors.
- Positive state (3 statements): Belief that gambling induces a positive or relaxed state.
- Relief (5 statements): Belief that gambling will relieve an unpleasant affect or mood state such as stress or boredom.
- Money equals a solution to problems (4 statements): Belief that winning money at gambling will solve the individual's life problems.
- Denial (2 statements): Belief that the individual does not have a gambling problem.

3. The State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983): This is an extensively used 40-item self-report measure of state and trait anxiety that possesses sound test-retest reliability and validity. Scores at one month has been shown to be a good predictor of response to treatment at twelve months (McConaghy, Armstrong, Blaszczynski, & Allcock, 1983).

4. Visual analogue scales. A series of visual analogue scales will be used to assess subjective estimates of the strength of urges, preoccupation and perceived level of self-control over gambling behaviour, and levels of subjective arousal in response to gambling imagery. These scale included a 10-point scale with anchor points set as 'not at all' to 'all the time', 'no control' to 'complete control' and 'no urge to very strong urge', and subjective estimate of the level of current arousal.

5. Heart rate monitor. A standard portable heart rate Polar Precision Performance v2.10 monitor was used in the study. This is a standard and non-invasive instrument commonly used in measuring heart rate. A belt containing electrodes is placed around the chest of the participants. The data is collected on a telemetry wrist watch and downloaded to a laptop computer.

RESULTS & DISCUSSION

Gambling demographics

Consistent with the literature, the majority of participants (n = 18 (90%)) reported problems associated with gambling on electronic gaming machines. For the remainder, two (10%) reported problems with horse race wagering and one (5%) with casino table games. Only three (15%) participants reported problems with more than one form of gambling.

Table 5 shows the descriptive statistics for age of onset of gambling, years of problem gambling, days since last gambled before entry into treatment, and amount of money gamblers intended to take to each session.

Table 5: Descriptive statistics for gambling characteristics for n = 20 pathological gamblers

		N	Mean	Std. Dev.	Min	Max
<u>Age of onset of gambling</u>	Cognitive therapy	11	23.27	5.3	17	32
	Imaginal Desensitization	9	23.67	7.8	15	39
	Total sample	20	23.45	6.3	15	39
<u>Years of problem gambling</u>	Cognitive therapy	11	8.64	8.6	1	32
	Imaginal Desensitization	9	3.67	2.3	1	9
	Total sample	20	6.40	6.9	1	32
<u>Days since last gambled</u>	Cognitive therapy	11	9.64	14.3	1	50
	Imaginal Desensitization	9	19.33	38.0	1	120
	Total sample	20	14.00	27.2	1	120
<u>Money taken intending to gamble</u>	Cognitive therapy	11	\$204	\$157	\$50	\$500
	Imaginal Desensitization	9	\$388	\$608	\$50	\$1800
	Total sample	20	\$287	\$421	50	\$1800

A series of one-way analyses of variance revealed no significant between group differences on these gambling related variables. However, it should be noted this nil difference between groups for the period of time since having last gambled and the money taken to gamble with each session may be accounted for by the large variance and small sample size.

In contrast to earlier studies suggesting that 90% of pathological gamblers commenced gambling prior to age 20, the median age for commencement of gambling in this sample was 21 years with a range from ages 15 to 39. This finding may be a function of the small sample size, biased referrals or a reflection of the fact that the majority of gamblers reported electronic gaming machine play and therefore were restricted by legal age limits from accessing this form of gambling.

In respect to patterns of play, 2 (10%) reported binge episodes while the majority, 18 (90%) reported gambling on a relatively regular basis. To determine tolerance for gambling, participants were asked if their level of gambling had increased, decreased or remained unchanged over the time that they had been gambling. Slightly less than half (n = 9 (45%) reported no change or a decrease in gambling levels. Consistent with this finding, 10 of the 11 participants (50% of the total sample) reported that increases in gambling were motivated by the need to increase excitement levels. This proportion is similar to that found in another CCBF funded study exploring withdrawal and tolerance phenomenon (Blaszczynski, Sharpe, & Walker, 2004).

The finding that only 50% of participants manifest symptoms of tolerance, raises questions about discriminative validity of the criterion item contained in DSM-IV-TR (A.P.A., 2004) assessing this phenomenon, that is, the need to increase money in order to achieve the same level of arousal.

All participants in the sample reported chasing losses with 17 (85%) indicating that the desire to escape emotional states or improve their mood motivated their gambling.

Participants were asked to provide an estimate of gambling-related debt. While this is an inaccurate measure given the difficulty in differentiating debts incurred as a direct result of borrowing to gamble from debts generated by shortfalls in daily living expenses as a result of gambling losses. Nevertheless, estimates of debt provide a rough index of the financial situation and pressures to which the participant is exposed. The mean debt for the total sample was \$12,775 (SD = \$18,253; median \$5,000) with no significant between group difference (cognitive therapy: mean = \$11,000 (SD = 14,295); imaginal desensitization: mean = 14,944 (SD = 22,940)).

Participants were asked to provide an indication of the percentage of free time and income they allocated to gambling. Descriptive statistics are given in Table 6 below. On average, the sample allocated less than half of their discretionary leisure time and approximately 80% of their income on gambling. This estimate of gambling expenditure is extremely high and indicates that either participants in this sample were at the high end of severity for pathological gambling or that they provided an overestimate of the true proportion of income allocated to gambling. Data from other sources suggest that gamblers are inaccurate in providing information on amount of money 'spent gambling' (Blaszczynski, Dumlao, & Lange, 1998).

The percentage of time spent gambling was significantly lower for the imaginal desensitization compared to the cognitive therapy group ($F = 4.32$, $df = 1,18$, $p = .5$)

Table 6: Estimated time and income allocated to gambling by n = 20 pathological gamblers

		N	Mean (%)	Std. Dev.
Percentage of free time devoted to gambling	Cognitive therapy	11	52.7	21.6
	Imaginal desensitization	9	32.3	22.0
	Total	20	43.5	23.6
Percentage of income committed to gambling	Cognitive therapy	10	82.0	30.0
	Imaginal desensitization	9	74.4	26.0
	Total	19	78.4	27.7

Estimates of strength of urge, control and preoccupation over gambling

Participants were asked to rate the strength of gambling urges, perceived capacity for self-control and level of preoccupation for the immediate past six-month period by completing a ten-point visual analogue scale with the following respective anchor points: ‘1 = not much of an urge’ – ‘10 = a very strong urge’; ‘1 = out of control’ – ‘10 = completely in control’; and ‘1 = not at all – 10 = almost all the time’.

Result for each group and the total sample are given in Table 7 below. There were no between group differences on these scores indicating that the groups were comparable in the extent to which they were preoccupied and experienced urges and a sense of control over their gambling.

Table 7: Subjective estimates of urge, control and preoccupation for n = 20 pathological gamblers

		N	Mean	Std. Deviation	95% Confidence Interval for Mean	
					<u>Lower Bound</u>	<u>Upper Bound</u>
<u>Level of urge to gamble</u>	Cognitive therapy	11	6.5	3.1	4.5	8.6
	Imaginal desensitization	9	6.7	2.8	4.5	8.8
	Total sample	20	6.6	2.9	5.2	8.0
<u>Level of self-control</u>	Cognitive therapy	11	4.4	2.6	2.7	6.2
	Imaginal desensitization	9	4.8	2.7	2.7	6.8
	Total sample	20	4.6	2.6	3.4	5.8
<u>Preoccupied with gambling</u>	Cognitive therapy	11	.9	.3	.7	1.1
	Imaginal desensitization	9	1.0	0	1.0	1.0
	Total sample	20	.9	.2	.8	1.0
<u>Level of preoccupation</u>	Cognitive therapy	11	5.6	2.0	4.3	7.0
	Imaginal desensitization	9	6.3	2.2	4.7	8.0
	Total sample	20	5.9	2.1	5.0	6.9

Dissociation during gambling

Jacobs (1986) advanced a general theory of addictions to account for persistence in gambling in the face of negative consequences. A component of his model was the phenomenon of dissociation, a condition characterized by altered states of consciousness manifested by trance-like states, time and memory distortions and ego-state changes. Dissociation was argued to play a central role on repetitive gambling by its capacity to promote emotional escape from aversive affective psychological states, that is, negative reinforcement. Anderson and Brown (1984) was among the first to argue that the excitement of gambling was sufficient to narrow focus of attention.

To determine the extent of dissociation within the sample, the five item Jacobs Dissociation scale was administered to participants. The descriptive statistics are provided in . Three quarters or more of the participants reported high rates of trance-like states, loss of time perspectives, with half or less reporting black-outs or identity changes.

Table 8: Frequency of participants endorsing Jacobs (1986) 'dissociation' items

	Frequency	%
<u>In a trance whilst playing poker machines</u>	Never	1 5.0
	Occasionally	3 15.0
	Frequently	12 60.0
	All the time	4 20.0
	Total	20 100.0
<u>Taken on another identity whilst playing</u>	Never	2 10.0
	Rarely	3 15.0
	Occasionally	5 25.0
	Frequently	6 30.0
	All the time	4 20.0
Total	20 100.0	
<u>Lost track of time whilst playing</u>	Occasionally	5 25.0
	Frequently	14 70.0
	All the time	1 5.0
	Total	20 100.0
<u>Memory blackout whilst playing</u>	Never	6 30.0
	Rarely	3 15.0
	Occasionally	7 35.0
	Frequently	4 20.0
	Total	20 100.0

Treatment seeking behaviour

Participants were asked to indicate their goals in respect to treatment outcome, that is, abstinence, control or uncertainty. Eighty percent (n = 16) of participants reported a desire to achieve abstinence with 15% (n = 3) wanting control and the remaining 5% (n = 1) expressing uncertainty over what they wanted to achieve. As shown in Table 9, a chi-

square analysis found no difference in the proportion of each group seeking abstinence as compared to control.

Table 9: Proportion of gamblers expressing abstinence, control or uncertainty as their treatment goal

Goal for treatment	Treatment group		Total
	Cognitive therapy	Imaginal desensitization	
Abstinence	10	6	16
Controlled	1	2	3
Uncertain	0	1	1
Total	11	9	20

Eighty percent (n = 16) of the sample reported that they had sought professional treatment for their gambling behaviour in the past with 95% (n = 19) also indicating that they had tried unsuccessfully to control gambling on their own accord.

Participants were asked to rate their level of motivation in currently ceasing their gambling by completing a ten-point visual analogue rating scale with anchor points set at '1 = little or no motivation' and '10 = highly motivated'. The mean rating for motivation was 8.6 (SD = 1.6) for the total sample suggesting that they were relatively highly motivated to overcome their gambling problems. There was no significant difference on rated motivation between groups: cognitive therapy: mean = 8.4 (SD = 1.9); imaginal desensitization: mean = 9.0 (SD = 1.1).

Substance consumption

We were interested in the extent to which the participants consumed alcohol, tobacco and caffeine given the high rates of comorbidity with these substances reported in the literature.

Participants reported that they consumed an average of 6.4 (SD = 10.6) standard drinks per week with no significant between group differences emerging: cognitive therapy:

mean = 5.3 (SD = 11.9); imaginal desensitization: mean = 7.7 (SD = 9.3). Of those consuming alcohol, 3 (15%) indicated that they had a current problem with alcohol, and one participant (5%) reported a past history of alcohol problems. This figure is lower than that of 20% to 40% generally reported in the majority of studies on comorbid substance abuse in gamblers. Two of the three with self-reported alcohol problems indicated that they had sought treatment for their alcohol problems from a private psychiatric facility.

Twenty percent (n = 4) of participants stated that they consumed alcohol frequently or all the time immediately prior to or during the course of a gambling session. Approximately a third (n = 6 (30%)) stated that they never drank alcohol in association with gambling, and eight (40%), rarely so.

In contrast, the majority of participants (n = 14 (70%)) reported that they smoked cigarettes with 6 (30%) indicating that they smoked 30 or more cigarettes per day. The mean number of cigarettes consumed daily by participants for the sample was total was 22.6 (SD = 12.9). The groups differed significantly on this variable with those allocated to the cognitive therapy group reporting a mean of 34.2 (SD = 8.0) compared to a mean of 13.88 (SD = 8.0) for the imaginal desensitization group ($F = 22.124$, $df = 1, 12$, $p = .001$, 95% CI = 15.1 – 30.0).

The relation between gambling and smoking was explored by asking participants to indicate whether or not their consumption increased, decreased or remained the same during the course of a gambling sessions. Consistent with reports of an association between cigarette consumption and gambling, just over half the sample (n = 11 (55%)) stated that their consumption increased. Two (10%) reported a decrease and one (5%) no change in consumption rates.

As shown in Table 10, there were no between group differences in the number of cups of coffee, tea or cola consumed on a daily basis. Twenty-five percent (n = 5) of participants stated that they consumed in excess of 4 cups of coffee daily while slightly less, 20% (n = 4) indicated that they did not consume any coffee.

Table 10: Daily levels of coffee, tea and cola consumed by pathological gamblers

		N	Mean	Std. Deviation
Cups of coffee/day	Cognitive therapy	11	4.2	2.6
	Imaginal desensitization	9	2.0	2.2
	Total	20	3.2	2.6
Cups of tea/day	Cognitive therapy	11	1.6	2.2
	Imaginal desensitization	9	1.1	3.3
	Total	20	1.4	2.7
Cups of cola/day	Cognitive therapy	11	1.7	3.3
	Imaginal desensitization	9	1.3	2.2
	Total	20	1.5	2.8

In respect to non-prescription drugs, 25% (n = 5) of the total sample admitted to smoking marijuana with only one of these participants doing so on a daily basis. The remaining four indicated they smoked occasionally. No other illicit substance use was reported.

Seventy-five (n = 15) participants were not taking any current medication. Of the remainder, two (10%) were taking Zoloft, and one each, Effexor, Cipramil or an analgesic for pain relief.

Urge, control and preoccupation at baseline

To obtain an estimate of current baseline level of urge, current urge compared to that when gambling, control, and excitement, participants were asked to complete a visual analogue scale with the following anchor points: ‘1 = no urge present – 10 = very strong urge’; ‘1 = very much less – 10 = very much more’; ‘1 = no control – 10 very strong control’; and ‘1 = no excitement present – 10 = very strong’.

The descriptive statistics are listed in Table 11. One-way analyses of variance failed to detect any significant differences between the two treatment groups on any of these variables.

The ratings for current urge is high (maximum score obtainable) and higher than that compared to periods of heavy gambling. This difference might reflect differences in current gambling, levels of distress or an artefact of poor recall and attribution. It is possible that gamblers during heavy periods do not perceive their urge to be great or control to be low until such time as they reach a crisis and then recognize their difficulties in controlling behaviours. This needs further clarification.

Table 11: Visual analogue ratings for urge, control and excitement for n = 20 pathological gamblers

		N	Mean	Std. Deviation
<u>Current urge to gamble</u>	Cognitive therapy	11	5.5	3.6
	Imaginal desensitization	8	4.2	2.5
	Total	19	5.0	3.2
<u>Current urge compared to when gambling heavily</u>	Cognitive therapy	11	4.1	3.3
	Imaginal desensitization	8	2.2	1.7
	Total	19	3.3	2.8
<u>Current degree of self-control</u>	Cognitive therapy	11	5.6	3.0
	Imaginal desensitization	8	6.2	2.0
	Total	19	5.9	2.6
<u>Current degree of excitement</u>	Cognitive therapy	11	5.3	3.1
	Imaginal desensitization	8	4.4	2.7
	Total	19	4.9	2.9

Cognitive beliefs

To determine changes in the amount of irrational beliefs held by gamblers at baseline, the 48-item Gambling Beliefs Questionnaire was administered to participants. This scale

provided a composite estimate of the number and strength of irrational beliefs and was used to determine pre-to-post changes in cognitive activity. Presently there are no norms available for non-pathological gamblers although the scale was found to discriminate between social and pathological gamblers (Joukhador, Maccallum, Blaszczynski, 2000). The mean total score on this measure for each group and the total sample is shown in .

Table 12: Total Score for the Gambling Beliefs Questionnaire for n = 20 pathological gamblers

	N	Mean	Std. Dev.	Min.	Max.
Cognitive therapy	10	122.1	38.5	72	190
Imaginal desensitization	9	128.4	27.6	70	158
Total	19	125.1	33.0	70	190

Data collection for mid therapy, end of therapy and follow-up

A statistical analysis of the comparative time-frames for the various measures, that is, mid-therapy, immediately at the end of therapy and follow-up was not meaningful given the small cell sizes per sample. For example, we commenced by determining whether or not treatment was effective by investigating changes across time in respect to self-reported levels of control over gambling, changes comparative to the period when gambling was heavy, degree of self-control, and level of excitement experienced.

Data was available for six participants from the cognitive therapy, and four from the imaginal desensitization groups at mid-therapy and only four and two respectively for the end of therapy and one month follow-up time frames. The small sample size does not permit valid statistical analyses on any of the remaining variables collected; urges, control, excitement, cognitions or heart rate responses. Therefore this data was not analysed for between group or across time differences. Descriptive data is provided for relevant variables.

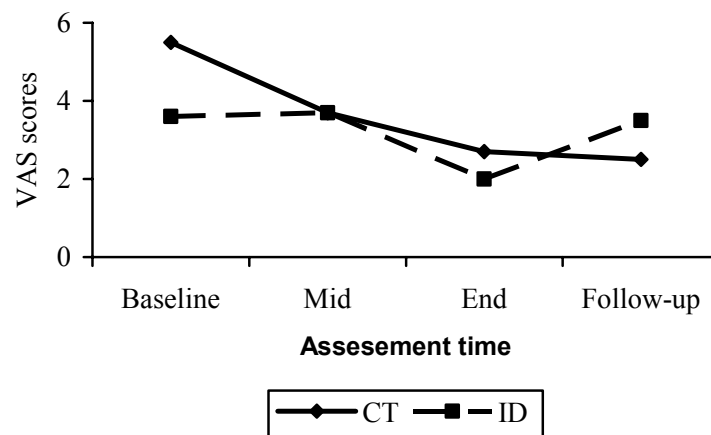
The descriptive statistics for urge, control, and excitement are presented below in Table 13.

Table 13: Descriptive statistics for urge, control and excitement at different measurement points in treatment for the n = 20 pathological gamblers

Time frame	Variable	Group	N	Mean	S.D.
<u>Mid therapy</u>					
	Urge to gamble	Cognitive therapy	6	3.7	2.8
		Imaginal desensitization	4	3.7	2.9
		Total	10	3.7	2.7
	Urge compared to when gambling heavily	Cognitive therapy	6	2.8	2.2
		Imaginal desensitization	4	2.0	1.4
		Total	10	2.5	1.9
	Degree of self-control	Cognitive therapy	6	7.5	2.3
		Imaginal desensitization	4	7.5	2.4
		Total	10	7.5	2.2
	Degree of excitement	Cognitive therapy	6	3.5	2.8
		Imaginal desensitization	4	2.7	1.7
		Total	10	3.2	2.3
<u>End therapy</u>					
	Urge to gamble	Cognitive therapy	4	2.7	2.1
		Imaginal desensitization	2	2.0	1.4
		Total	6	2.5	1.8
	Urge compared to when gambling heavily	Cognitive therapy	4	1.7	1.0
		Imaginal desensitization	2	2.0	0
		Total	6	1.8	.7
	Degree of self-control	Cognitive therapy	4	6.0	3.4
		Imaginal desensitization	2	7.5	2.1
		Total	6	6.5	2.9
	Degree of excitement	Cognitive therapy	4	3.2	2.1
		Imaginal desensitization	2	3.0	0
		Total	6	3.2	1.6
<u>Follow-Up</u>					
	Urge to gamble	Cognitive therapy	4	2.5	1.9
		Imaginal desensitization	2	3.5	3.5
		Total	6	2.8	2.2
	Urge compared to when gambling heavily	Cognitive therapy	4	1.7	1.5
		Imaginal desensitization	2	2.0	0
		Total	6	1.8	1.2
	Degree of self-control	Cognitive therapy	4	8.0	2.2
		Imaginal desensitization	2	9.0	1.4
		Total	6	8.3	1.9
	Degree of excitement	Cognitive therapy	4	2.7	2.1
		Imaginal desensitization	2	3.0	1.4
		Total	6	2.8	1.7

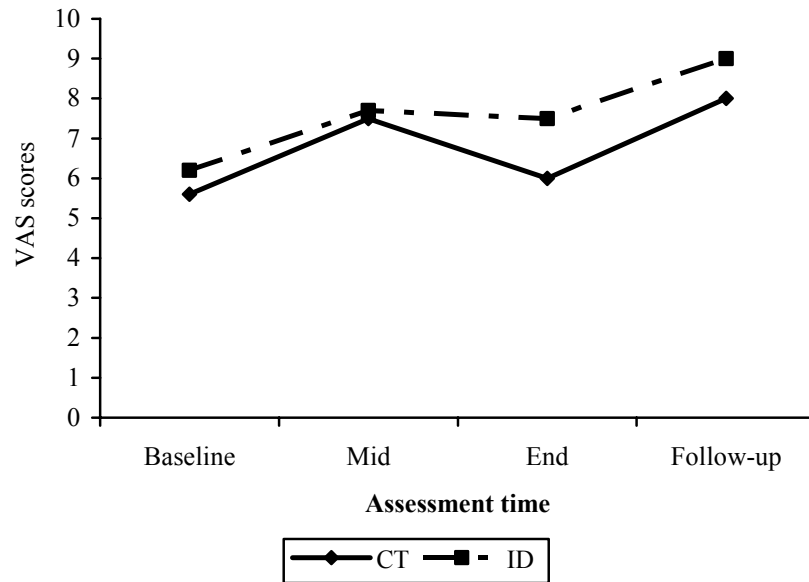
Changes in scores were in the expected direction revealing that participants were responding positively to treatment. For the total sample, self-reported urges decreased from a mean of 5.0 at baseline to a mean of 2.8 at follow-up indicating reduction in the strength of gambling urges experienced.

**Reported changes in urge to gamble for
cognitive therapy and imaginal
desensitization**



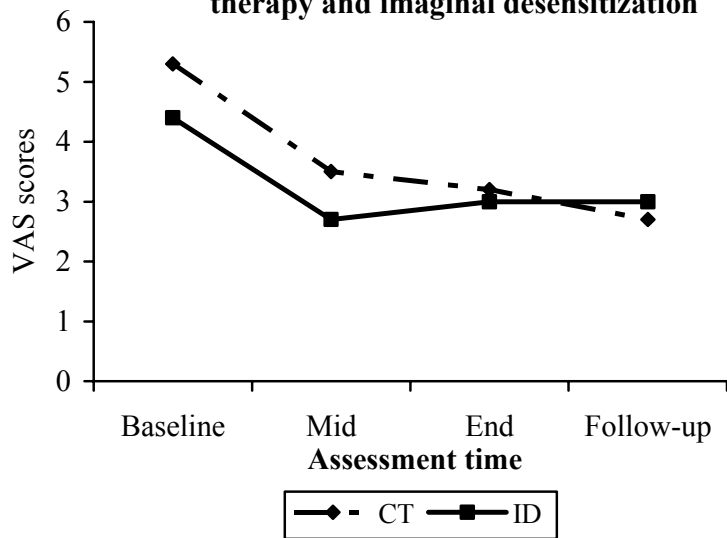
Similarly, with respect to perceived self-control, mean levels changed from 5.9 at baseline to 8.3 at follow-up indicating improved self-reported ability to control urges.

Reported changes in perceived self-control for cognitive therapy and imaginal desensitization



The level of excitement decreased from 4.9 at baseline to 2.8 at follow-up.

Percieved changes in excitement for cognitive therapy and imaginal desensitization



Participants were required to compare their current level of urge compared to when they were gambling heavily. Consistent with expectations, the degree of urge was estimated to

be less at follow-up compared to baseline. Overall, the responses to the visual analogue scale can be interpreted to suggest that positive treatment effects were emerging but whether or not this was significant across time or between groups cannot be determined given the small sample size.

In respect to the treatment groups, visual analogue scale scores showed a consistent decrease in the urge to gamble and excitement associated with gambling across treatment for the cognitive therapy group. There was also a relatively consistent increase in perceived self-control from commencement of treatment to follow-up.

In contrast, the imaginal desensitization group evidenced a consistent rise in perceived self-control over the course of treatment but this was not reflected in any change in level of urges or excitement experienced in response to gambling stimuli. This is contrary to expectations and the hypothesised mode of action.

The scores on the Gambling Beliefs Questionnaire are shown in Table 14.

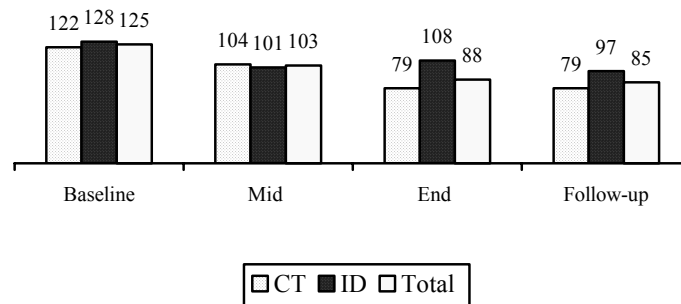
Table 14: Gambling Beliefs Questionnaire score at mid, end and follow-up therapy for pathological gamblers

Time frame	Group	N	Mean	Std. Dev.
<u>Mid therapy</u>	Cognitive therapy	6	104.7	34.2
	Imaginal desensitization	4	101.7	7.6
	Total	10	103.5	25.9
<u>End therapy</u>	Cognitive therapy	4	79.0	16.5
	Imaginal desensitization	2	108.5	.7
	Total	6	88.8	19.9
<u>One month follow up</u>	Cognitive therapy	4	79.7	22.9
	Imaginal desensitization	2	97.0	9.9
	Total	6	85.5	20.3

As found with the self-reported estimates of urge, control and excitement, the total score for the Gambling Beliefs Scale showed a consistent decrease from 125 at baseline to 104

at midtherapy, and 88 at end of therapy. Minimal further changes occurred at one month follow-up.

**Chart 1:
Changes in Gambling Belief Scores
from baseline to follow-up**



It would appear that there is a tendency for the cognitive therapy group to show a greater decrease in irrational beliefs across time as compared to the imaginal desensitization group. The imaginal desensitization group showed an initial decline followed by an increase at the end of treatment and return to mid therapy levels at follow-up. It is possible that the end of therapy increase was an artifact of sample size and therefore there is nothing conclusive that can be said beyond the notion that both treatments showed a decline in the number of irrational beliefs.

Conclusions

The results of the present study are preliminary in nature give the small sample size. However, the data that is available is interesting in that it shows a tendency for the scores on the gambling beliefs questionnaire, a measure of irrational beliefs, to decrease consistently for the cognitive therapy group during treatment as compared to the imaginal desensitization group. That scores tended to stabilize from end of treatment to follow-up may suggest that an asymptote is reached where cognitions are corrected or modified to their maximum and will continue to influence behaviours only in so far as cognitive skills are applied, or alternatively, that changes in cognition occur within therapy and that

therapy needs to continue with regular booster sessions. This can only be addressed with longer term follow-up studies.

In respect to the treatment groups, visual analogue scale scores showed a consistent decrease in the urge to gamble and excitement associated with gambling across treatment for the cognitive therapy group. There was also a relatively consistent increase in perceived self-control from commencement of treatment to follow-up.

In contrast, the imaginal desensitization group evidenced a consistent rise in perceived self-control over the course of treatment but this was not reflected in any change in level of urges or excitement experienced in response to gambling stimuli. This is contrary to expectations and the hypothesised mode of action for this form of treatment.

It is strongly emphasised that these are tentative findings but preliminary data seems to suggest that cognitive therapy is effective in reducing irrational beliefs with reductions in urges and excitement associated with such changes, while in contrast, imaginal desensitization is associated with an increase in self-control that is mediated by variables other than changes in subjective arousal or cognition. If these findings hold to be true with increased sample sizes and replication, targetting irrational cognitions directly may have a secondary effect on arousal, urges and excitement while the mechanism of imaginal desensitization does not operate through its hypothesised mode of action but is mediated through some other process that is yet to be established.

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