

**AN INVESTIGATION OF IMPAIRED CONTROL
IN GAMBLING BEHAVIOUR: WITH SPECIFIC
REFERENCE TO IMPAIRED CONTROL
AS A DIAGNOSTIC CRITERION IN
THE DSM-III "PATHOLOGICAL GAMBLING"**

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DECLARATION

I declare that this thesis reports my original work, that no part of it has been previously accepted or presented for the award of any degree or diploma by any university. To the best of my knowledge no material previously published or written by another person is included, except where due acknowledgement is given.

Tony Barker

This thesis describes original research carried out by the author in the Department of Psychology of the Australian National University during 1986.

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ABSTRACT

This thesis reports the results of an investigation into impaired control in problem and non-problem gamblers. Impaired control occupies a focal position in the medical model perspective of pathological gambling. It is the central pathognomic feature which is required to qualify problem gambling as a mental disorder and to satisfy the DSM-III diagnosis of pathological gambling. Despite the importance of the concept there have been few studies on self-control in gambling behaviour.

An instrument was developed to measure subjectively assessed self-control in poker machine players. The questionnaire was used to examine the effectiveness of self-control in differentiating problem and non-problem poker machine players, the influence of various factors in self-control in poker machine playing and the question whether perceived self-control is a continuous concept or whether there are qualitative differences between problem and non-problem poker machine players.

The self-control instrument comprised a framework involving two levels of self-control decisions, decisions to begin gambling and decisions to persist at gambling when losing. The items in the questionnaire represent internal and external factors which have featured in research on impaired control in gambling and in alcohol consumption.

The self-control scale and another questionnaire on demographics and actual gambling behaviour were administered to 26 problem gamblers and 40 non-problem gamblers. The results indicated that the instrument has good internal reliability and is a valid measure of self-control. The scales were shown to effectively differentiate between problem and non-problem poker machine players. The results support the use of the

concept of impaired self-control as a diagnostic criterion in problem gambling.

The findings indicated that problem gamblers reported greater difficulty in maintaining self-control in situations when playing and losing than in situations involving a decision to begin a session or not. Cognitive and emotional factors were subjectively appraised as having a bigger influence on impaired control in problem poker machine players than external factors. The results support research that suggests the importance of negative emotions and belief in a chasing strategy in the relapses of problem gamblers. For non-problem players the main factors involved in impaired control were subjective excitement and a belief in the ability to predict wins. These may be predisposing factors towards the development of increasing impaired control in poker machine players.

Increasing levels of involvement in poker machine playing were found to be positively correlated with increasing difficulties in self-control. There was evidence that other important factors were also involved. Despite the clarity of the discrimination between the gambling groups on the self-control axis, the self-control findings do not resolve the issue of whether self-control is a continuous or discontinuous concept. The study highlights the limitations of current statistical techniques in answering this question.

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1. INTRODUCTION

1.1 Excessive Gambling in Australia

There is little empirical evidence on the incidence and costs of excessive gambling in Australia. An examination of the available statistics on gambling expenditures coupled with estimates of the number of compulsive or pathological gamblers suggest that problems stemming from excessive gambling are widespread in Australia. There are implications from the social and economic information that excessive gambling may be an important social issue in Australian society.

In terms of actual expenditure on legal gambling, Haig's (1985) analysis of expenditures in Australia and other countries led him to the conclusion that Australia had the highest per capita level of spending on gambling of the advanced western countries. (Information for the USA was not available and was not included in the analysis.) Estimates of the actual numbers of compulsive gamblers in Australia can vary considerably. For N.S.W. alone it has been suggested there may be up to 30,000 compulsive gamblers (Mooney, 1984).

Dickerson (1984) estimated the number of compulsive gamblers in Australia at around 80,000 gamblers. This estimate was based on a commonly quoted prevalence figure of 0.77% of the adult population, derived from a U.S. study by Kallik, Suits, Dielman and Hybels (1979). The accuracy of this prevalence figure is open to question. It has been criticized on a number of grounds (Nadler, 1985; Orford, 1985) including the adequacy of the sampling and methods of measurement used. Two recent studies in the U.S. have suggested that the prevalence rates for pathological gamblers may be higher. Culleton (cited in Taber, Collachi & Lynn, 1986)

reported an incidence of pathological gambling among Ohio adults of 2.5% and Volberg and Steadman (1986) estimated the number of "probable" pathological gamblers in New York State at between 0.7% and 2.1% of the adult population.

In a recent survey of poker machine players and off-course bettors in the A.C.T., Dickerson and Hinchy (1986) estimated prevalence rates for four levels of excessive gambling. The levels were based on an increasing strictness of criteria used to define excessive gambling. Their estimates ranged from 0.25% of the population for the most strict level to 1.73% for the most liberal level. The most strict level of excessive gambling was defined in terms of: a regular habit of gambling (once a week or more), loss of control both within and between gambling sessions, excessive losses resulting in debts and having as a preferred goal abstinence or cutting back and previous attempts to achieve this. In terms of a definition of excessive gambling they considered this level to be the most psychologically adequate. When applied to the current Australian population estimate of 16 million (ABS, 1986) this yields a figure of about 40,000 excessive gamblers.

In regard to the social costs involved, the consequences of excessive gambling may include the effects of marital breakdown, the number of working days lost through gambling as well as the costs to society of various criminal offences. Added to this is the significant individual and family distress which occurs. If the suggestion is correct that a gambler entering treatment has an adverse effect on some ten other significant people in the gambler's life (Politzer & Morrow, 1980) then the impact of the adverse effects of problem gambling is widespread through society.

It has been advocated that some forms of gambling are more likely than others to encourage persistence. A major consideration for this view

has been the frequency and rapidity of the gambling sequence (Dickerson, 1984). The rapid sequencing of poker machine play may be one reason for its relative appeal to gamblers as well as a reason for placing it as one of the forms of gambling more frequently associated with excessive gambling.

Poker machines are legal and widespread in clubs throughout N.S.W. and the A.C.T. and in these areas they generate the largest tax revenue of all forms of gambling (ABS, 1981). The results of two surveys reflect the degree of the problem some poker machine players have in controlling their expenditures. Caldwell (1985) cited the results of his 1972 study which found that up to a quarter of the poker machine players surveyed had difficulty in controlling the amount they spent. A study comparing poker machine players with TAB gamblers (Dickerson, Fabre & Bayliss, 1985) indicated that 62% of the TAB gamblers never spent more than they planned to at the TAB while only 26% of the poker machine players kept to their planned expenditure on poker machines. Evidence of the particularly persistent financial and personal problems experienced by individual compulsive poker machine players seeking treatment have been cited in studies by Barker and Miller (1966) and Koller (1972).

Despite the lack of empirical research on the consequences of excessive gambling there is sufficient evidence to suggest that excessive or compulsive gambling in Australia has the potential to create problems which affect large numbers of people. Furthermore in N.S.W. and the A.C.T. excessive gambling on poker machines is an important part of this problem.

1.2 Focus of the Present Study

Poker machines as a form of gambling are the sole focus of this study for two main reasons. One being their potential as a social problem and the other reason concerns the suggestion that various forms of gambling may attract different sorts of gamblers and may involve different behavioural determinants. The popularity of poker machines as a form of gambling in the A.C.T. and N.S.W. and the difficulties that some people have in controlling their expenditure on poker machines have been referred to in the introduction above. These factors in combination suggest that poker machine gamblers may represent one of the more important groups, particularly in N.S.W. and the A.C.T., when looking at problems associated with excessive gambling.

Evidence for a second reason for focussing on poker machine gambling is provided by two recent research studies. Blaszczyński, Winter and McConaghy (1985) investigated baseline B - endorphin levels in pathological gamblers and their results indicated that horse-race gamblers had significantly lower baseline levels compared with poker machine players and a control group. They postulated that different motivations may be involved in the selection of and persistence at different forms of gambling such as horse-racing and poker machine playing. Similarly, in a study of off-course bettors, Dickerson, Hinchy and Fabre (in press) found that male bettors were significantly lower on Zuckerman's (1979) sensation seeking scales (Form V) than existing population norms. They speculated that off-course betting may be favoured by low sensation seekers. The implication from these studies is that sub-groups of gamblers may exist. This raises the issue that research into gambling behaviour should not assume that gambling is a homogeneous activity nor that variables and

behavioural determinants common to one form of gambling will be common to all gambling. For this reason it was considered more appropriate to look at a homogeneous group of gamblers, such as poker machine players, in investigating excessive gambling behaviour.

For the current study poker machine players seeking treatment have been recruited to investigate various aspects of self-control in their gambling behaviour. Data from the study has been collected by way of subjective reporting from the gamblers. Since all of the problem gamblers in the study have the stated intention of either reducing or stopping their expenditure on poker machine playing, alternatives to subjective reports such as observation or experimental manipulation of variables while playing, were considered to be unethical.

A criticism of some past research on compulsive gamblers (Dickerson, 1984) has been the over-reliance for information on Gamblers Anonymous (G.A.) members. It has been suggested that the reliability of the subjective reporting of G.A. members may be affected in two ways. The strong emphasis on G.A. principles and ideas which continuing members are exposed to may result in the development of current attitudes and beliefs which are quite different from when the G.A. member was involved in excessive gambling. And secondly, information from G.A. members who have abstained from gambling for some time may be liable to inaccuracies of memory.

A recent study which compared treatment and prevalence data on pathological gamblers from a single geographic area in the U.S.A. (Volberg & Steadman, 1986) also has drawn attention to the dependence of some previous gambling studies on G.A. members. The authors concluded from their results that this over-reliance has contributed to the emergence of

incorrect demographic profiles of pathological gamblers. They suggested the scope of future research should be broadened to include pathological gamblers other than those who have recovered or are recovering. The focus of the present study is on poker machine players who have recognised that their gambling is a problem in the last twelve months and either still play poker machines regularly or have gambled on machines recently.

1.3 Definitions of Problem Gamblers

It is important to clarify the different terms used to describe problem gamblers as the various definitions have implications for an understanding of the behaviour of gamblers. Gambling behaviour can be thought of as a spectrum involving the amount of time and money spent by gamblers. At one end there would be people who gamble infrequently and with small amounts of money. At the other end there would be frequent gamblers who outlay large amounts of money and time and a number of these may seek help to reduce or stop their gambling.

Various terms have been used to describe problem gamblers at the high frequency end of the gambling spectrum. Some of these include "compulsive", "addictive" and "pathological" gamblers (see Dickerson, 1984). The use of the particular term "pathological gambler" as defined in DSM-III (APA, 1980), emanated from the medical perspective and implied that these gamblers represented a distinct typology.

When referring to gamblers, it has been suggested (Walker, 1985) that there is an advantage in using the terms low frequency and high frequency gamblers which were initially coined by Dickerson (1979). Walker believed that these terms appeared to be more nearly neutral on the question of whether there are distinctive types of gamblers. For the purposes of this

study the terms high and low frequency gamblers are used in differentiating gambling behaviour except when referring to any study in which a specific definition of gambling has been used. A further term, problem gambler, is used to denote the gamblers in this study who have acknowledged they have a gambling problem and have sought or are seeking help to reduce or stop their gambling.

In the alcohol research literature, Heather and Robertson (1983) have drawn attention to the necessity for clarification of terms used in describing various drinking behaviours. They regarded the issue of terminology as not merely one of semantics but, as with gambling, they maintained that the use of particular terms raised empirical and conceptual issues. In their review of the alcohol literature they used the term "problem drinker" to differentiate a client population who in the main have not been exposed in the past to treatment for alcohol problems and were recruited mainly from media advertising and medical referrals, from the existing population of chronic clinic alcoholics. There is a parallel with the use of the term in the present study in that most of the problem gamblers involved sought treatment as a result of media publicity or GP referrals and for many it was their first attempt to seek professional help.

1.4 Problem Gambling - Medical and Dimensional Models

There are a number of different models which can be used to define and classify behavioural disorders such as problem gambling. The most frequently used is the typological or medical model. This model describes distinct disorders and suggests that for each there is a clinical entity with specific causes and treatments. The two main classifications of mental disorders which are in current use, the Diagnostic and Statistical Manual

(DSM-III) (American Psychiatric Association, 1980) and the International Classification of Diseases (ICD-9) (World Health Organization, 1977), derived their theoretical underpinnings from the typological perspective.

The use of a particular diagnostic model will have implications for the direction of research, treatment and theory of the disorders which they attempt to classify (Strauss, 1973). In a review of diagnostic models, Strauss was particularly critical of the use of the most widely accepted system, the typological model, without questioning some of the implications involved with its use. He suggested that one of its by-products was that it fostered the definition of discrete pathognomic characteristics as diagnostic criteria. The description of such criteria often suggested that the characteristics represent discrete phenomena. As a result symptoms which are often described in this way are rarely interpreted as exaggerations of normal human behaviour. In a similar vein Orford (1985) criticized the medical model because of its over-emphasis on clinical populations and its neglect of non-clinical populations.

The formal classification of problem gambling as a mental disorder occurred in 1980 with the inclusion of "pathological gambling" as an impulse disorder in DSM-III. Incorporation in DSM-III brought pathological gambling within the medical model of classification, it assumed that there are signs and symptoms which cluster, sometimes in different ways, to form a diagnosable entity. The implication was that pathological gamblers are in some way qualitatively different from other gamblers. In the DSM-III impulse disorders group, which includes pathological gambling, the central pathognomic criterion to make a diagnosis is the inability to control an impulse related to the behaviour in question. For pathological gambling the main behavioural feature which is

used to differentiate pathological gamblers from other gamblers is the inability to maintain control over impulses to gamble.

The dimensional model is often proposed as an alternative to typological classification (Eysenck, Wakefield & Friedman, 1983; Robins & Helzer, 1986; Strauss, 1973). In the dimensional system individuals are located along one or more dimensions which represent aspects of their behaviour. For example the alcohol dependence syndrome proposed by Edwards and Gross (1976) represented a move from a simple categorization of "alcoholic" and "non-alcoholic" to a dimensional model of levels or degrees of alcohol abuse. Strauss (1973) maintained that the increasing evidence for continuous rather than dichotomous variables in psychiatry meant that psychiatric classification would be served better by a dimensional model.

Eysenck, Wakefield and Friedman (1983) argued in a similar way to Strauss for dimensional rather than typological diagnostic systems. They proposed that many behavioural problems such as problem gambling are inappropriately included under the rubric of mental illness as in DSM-III. They argued that these types of problems are usually more extreme examples of behaviour shown by typically "normal" people. These infrequent, extreme behaviours form continua with the more frequent "normal" behaviours. Identification of the continua involved will allow certain behavioural deficiencies to be measured more appropriately along scales or dimensions.

This type of argument has been suggested in regard to gambling. Dickerson (1984) offered the hypothesis that similarities rather than differences are more common in comparisons of problem gamblers and other, particularly high frequency, gamblers. The main differences for

those gamblers who do seek help tended to be quantitative in that they tended to use larger stakes and may have larger debts.

In line with this analysis Dickerson (1984) proposed self-control as an important dimension of gambling. Control over gambling expenditures will vary between individuals and within the same person depending upon the situation. However he suggested that generally self-control will be more difficult to sustain as the rate of gambling increased.

1.5 DSM-III

As part of the focus of this study concerns the DSM-III group, "pathological gambling" and the basis of its inclusion in the DSM-III nosology, it is important to consider some of the features of DSM-III including the definition of a mental disorder.

DSM-III was published by the American Psychiatric Association (APA) in 1980. It represented the end product of the efforts of a task force assembled by the APA in 1974.

The main impetus for the development of DSM-III arose from dissatisfaction with its predecessor DSM-II and the plans of the World Health Organisation (WHO) to create a revised International Classification of Disease (ICD-9) system. The intention of the APA and WHO was to make the two classification systems more compatible. This remains an ongoing objective. In May 1983 a work group was appointed by the APA to revise DSM-III based on clinical experience gained since its publication.

The APA identified three major goals of the DSM-III task force (DSM-III, APA, 1980). They were to create meaningful diagnostic categories that would allow treatment and management decisions in varied settings. A second goal was to create reliable diagnostic categories which

were acceptable to clinicians and researchers of varying theoretical orientations. And finally the DSM-III classifications were to be consistent with research data bearing on the validity of diagnostic categories.

The task force considered that one of the more important issues for them was to determine the meaning of the term "mental disorder". Neither DSM-II nor ICD-9 included a definition of mental disorder and this omission had constituted one of the more frequent criticisms of the diagnostic manual. After considerable debate a definition was agreed upon and it was used by the task force to determine what conditions to include in the classification and how to define boundaries of various disorders (Spitzer, Williams & Skodal, 1980).

In DSM-III a mental disorder is conceptualized as "a clinically significant behavioural or psychological syndrome or pattern that occurs in an individual and that is typically associated with either a painful symptom (distress) or impairment in one or more important areas of functioning (disability). In addition, there is an inference that there is a behavioural, psychological or biological dysfunction and that the disturbance is not only in the relationship between the individual and society" (DSM-III, APA, 1980, p.6).

Spitzer and Williams (1980) clarified the three main aspects of this definition. Behavioural manifestations of interest are distinct in that they must cluster meaningfully into syndromes and the conditions are "clinically significant" in that they are not so mild as to rarely require professional intervention. On the second aspect, the behavioural syndrome should be undesirable, that is it is typically associated with either distress or a disability. And finally there must be a dysfunction, that is to say, something wrong with the person. However, if this functional disturbance

is limited to a conflict between a person and society then it may represent social deviance and is not by itself a mental disorder.

Schact and Nathan (1977) drew attention to the difficulty of differentiating between the "inference that there is a behavioural, psychological, or biological dysfunction in the person" and problems which appear to be primarily related to the interaction between the person and society. This aspect of the definition of mental disorder has been used to criticize the inclusion of some of the new disorders in DSM-III. For many of these disorders, including pathological gambling, there is a lack of evidence to identify the pathognomic feature which is involved in the problem behaviour. On the basis of Spitzer and William's (1980) criteria for a mental disorder the failure to satisfy one or more of their three criteria should be sufficient to invalidate the inclusion of the problem behaviour in DSM-III and its classification as a mental illness.

1.5.1 New features in DSM-III

DSM-III represented a new approach to diagnostic classification. Three of the main changes related to its structure, the diagnostic criteria and its coverage. In terms of framework, one of the main departures from its predecessors is that DSM-III is organized around five axes. Axes I and II define the clinical syndromes and personality disorders and Axis III the pertinent physical disorders and/or conditions. Axes IV and V provide rating scales for relevant psychological stressors and the highest level of adaptive functioning achieved by the person during the preceding year.

The classification embodied an implicit hierarchical structure in Axes I and II. The DSM-III manual (DSM-III, APA, 1980) stated that disorders high in the hierarchy may have features found in disorders lower

in the hierarchy but the reverse cannot hold. Robins and Helzer (1986) maintained that in the current revision of DSM-III hierarchies will largely disappear. This action is in response to criticism of diagnostic hierarchies based on an epidemiological study (Boyd et al., 1984) involving a sample of 11,519 subjects from a community population. In this study diagnoses were made with and without DSM-III hierarchies. It was found that strong correlations between pairs of diagnoses implied by making one pre-empt the other were not always present. In fact correlations were sometimes stronger between pairs of diagnoses for which no pre-emptions were specified.

In the classification the first three axes constitute the official diagnostic assessment. Axes III and IV involve quantitative ratings on a dimension of severity of impairment. These axes are considered to be experimental at this stage (Robins & Helzer, 1986).

A second significant change is the inclusion of operationally defined diagnostic criteria for each disorder. The criteria were adapted from research criteria generated by Feighner, Robins, Guze, Woodruff, Winokur and Munoz (1972) and later extended by Spitzer, Endicott and Robins (1975). The specific criteria delineated the signs that must be present in order to make a diagnosis. This greater degree of specificity was intended to enhance diagnostic agreement among clinicians. In DSM-II model descriptions of pure cases were given but without clear-cut criteria for inclusion and exclusion. While the criteria were more definitive in regard to the classification of disorders, DSM-III was described as atheoretical in that the categories were descriptive and did not imply an etiological basis in the disorders.

Another major change for DSM-III over its predecessors lay in its

coverage. DSM-III contained over 100 new disorders that did not appear in DSM-II. Some of the increase came from the greater precision and detail used to describe existing disorders. In addition there had been a broadening of the diagnostic umbrella to include behaviours and difficulties that either escaped diagnostic attention earlier or were questionably diagnosed (Rosenhan & Seligman, 1984).

1.6 DSM-III Pathological Gambling and Impulse Disorders

The classification of pathological gambling is included in DSM-III (Axis I) under the category "disorders of impulse control not elsewhere classified". This is a residual category comprising impulse control disorders which are not found in the other classifications of impulse control, such as substance use disorders or paraphilias. As well as pathological gambling this category comprises kleptomania, pyromania, intermittent explosive disorder, isolated explosive disorder and atypical impulse control disorder.

According to DSM-III, a disorder of impulse control not elsewhere classified, is characterized by three features. There was a failure to resist an impulse, drive or temptation to perform some act that is harmful to the individual or others. There was an increased sense of tension before committing the act. And the person experienced either pleasure, gratification or release at the time of committing the act. Frosch (1977) defined an impulse as the generally unpremeditated welling-up of a drive towards some action. It usually had the qualities of hastiness, lack of deliberation and impetuosity. For clinical classification he maintained that the lack of control over the impulse was diagnostic and pathognomic. In accordance with this perspective the pathognomic element in pathological

gambling surrounded the inability to resist the impulse to gamble, that is criterion A as designated in DSM-III (see Appendix A).

The other categories in DSM-III involving disorders of impulse control are the paraphilias and substance use disorders. Taken together the three DSM-III classifications of impulse control involved a wide and varied range of behaviours. Despite the diffuse nature of the behaviours the notion of impaired control over an impulsive act was a common thread in the diagnostic criteria. For the substance use classifications it was termed mainly as an inability to stop or cut down consumption of the particular substance. The essential feature of the paraphilias was that the associated imagery or acts were insistently and involuntarily repetitive. For the impulse control disorders not elsewhere classified, Levy (1984) suggested that the cardinal manifestation which was always required to make a diagnosis in this group was that the act was not under voluntary control of the person involved. For most of the disorders the diagnostic terminology involved the wording, failure to resist an impulse to commit a particular act.

1.7 Diagnostic Criteria for Pathological Gambling

The essential diagnostic features of pathological gambling are arranged in three parts (see Appendix A). Firstly the individual is chronically and progressively unable to resist impulses to gamble. The second part concerns the compromise, disruption or damage to family, personal and vocational pursuits as indicated by at least three affirmative responses to a list of seven questions. The questions refer to whether a person has been arrested because of attempts to obtain money for gambling, default on financial responsibilities, disruption of family relationships,

illegal borrowing of money, an inability to account for losses or winnings, absenteeism from work due to gambling and the necessity for another person to provide money to relieve a desperate financial situation. The third criterion is the exclusion of antisocial personality disorder as a reason for the individual's gambling. To make a diagnosis the gambler must fit the characteristics of part I and the required number of characteristics in part II. In addition the gambler must be excluded from criteria for an antisocial personality disorder diagnosis.

1.8 DSM-III (R) and Pathological Gambling Criteria

The diagnostic criteria for pathological gambling are being revised currently as part of the general revision of DSM-III. It is intended that DSM-III(R) will be published in mid-1987. The revisions committee for the APA (Disorders of Impulse Control not Elsewhere Classified) have proposed a new set of diagnostic criteria which are specifically modelled after the criteria for substance use disorders (Lesieur, Custer & Blume, 1986).

Maladaptive gambling behaviour is indicated by at least four of the following:

- (1) frequent preoccupation with gambling or with obtaining money to gamble
- (2) often gambling larger amounts of money or over a longer period than intended
- (3) need to increase the size or frequency of bets to achieve the desired excitement
- (4) restlessness or irritability if unable to gamble
- (5) repeated loss of money gambling and returning another day to win back losses ("chasing")
- (6) repeated efforts to cut down or stop gambling

- (7) often gambling when expected to fulfil social or occupational obligations
- (8) some important social, occupational, or recreational activity given up in order to gamble
- (9) continuing to gamble despite inability to pay mounting debts or other significant social, occupational or legal problems that the individual knows to be exacerbated by gambling.

In regard to the specific criteria, (5) and (9) relate to behaviours more particularly characteristic of problem gambling. All the other criteria are modelled more directly on psychoactive substance dependence. In particular, criteria (3) and (4) are functionally equivalent to tolerance and withdrawal in the substance use disorders. The notion of "an inability to control the use of", or "stop the use of", as contained in substance use criteria equates with (2) and (6) above. Three of the proposed criteria, criteria (2), (5) and (6), have been used in the research literature as operational definitions of impaired control (see Section 1.10 - Research on Impaired Control in Gambling Behaviour).

1.9 Impaired Control and DSM-III

The concept of an inability to control an impulse is the main criterion which is essential to satisfy the DSM-III diagnosis of pathological gambling. In addition the concept is the central feature used to define the general classification of disorders of impulse control and represents an important aspect of the rationale used to include problem gambling as a disorder in DSM-III. In regard to the latter, Spitzer and Williams (1980) proposed three aspects of the DSM-III definition of mental disorder which have been used to determine the conditions that have been included in the DSM-III classification. The third of these aspects is that a functional disturbance must be present in the person. For pathological gambling the dysfunctional or pathognomic feature required to qualify gambling as a

mental disorder within DSM-III is an impairment of the gambler's control over impulses to gamble.

1.10 Research on Impaired Control in Gambling Behaviour

There have been few empirical studies which have investigated the maintenance of self-control in gambling behaviour. One of the problems in investigating this phenomenon has been to devise operational equivalents of gamblers' self-control or the inability to maintain control over their gambling practices. A number of different operational definitions have been used.

Dickerson (1984) proposed the "loss of control" concept as a dimension ranging from "chasing", spending more than planned to spending all cash in hand. Chasing was described as the subjective experience of an increased urge to bet following a losing sequence. In a U.K. study (N = 204) these three subjectively assessed variables for high and low frequency off-course bettors were compared with GA members who had been off-course bettors. Dickerson maintained, as a dimension, the concept has some face validity, as there was evidence of increasingly regular "loss of control" in the high frequency and compulsive gamblers. The evidence for the concept is diminished however as his conclusion is not statistically supported.

Also of note was the relatively high incidence of "loss of control" reported by the high frequency gamblers. Overall their reporting was only a little less high than the compulsive gamblers. In addition there was a wide range of reports across the group. Four percent of GA members recorded no experience of chasing and one in five low frequency gamblers reported they had experienced chasing.

Chasing has been investigated in another study involving off-course betting agency customers. Dickerson, Hinchy and Fabre (in press) assessed TAB customers (N=172) in a brief structured interview and by questionnaire. The survey included a question assessing the frequency of chasing and questions about other aspects of betting behaviour. Some 30% of the gamblers indicated that they occasionally chase, 14% indicated that they usually or always chase and 56% reported that they never engaged in chasing.

Table 1

Pearson Product-moment Correlations Between Chasing and Items Covering Specific and General Aspects of Control

Interview & Questionnaire items	1	2	3	4	5	6	7	8	9	10
1. Frequency losing more than afford	1.00	.28**	.41**	.12	.07	.06	.36**	.34**	.42**	.13
2. Frequency of times overspent		1.00	.19	.11	.15	.09	.16	.01	.05	.06
3. Chasing			1.00	.22	.40**	.21	.45**	.22	.35**	.27*
4. Bet placement just prior to OFF				1.00	.29**	.15	.49**	.26*	.42**	.25*
5. Select bets in agency					1.00	.31**	.48**	.09	.22	.16
6. Change bet at last moment						1.00	.20	.06	.13	.15
7. Listen/watch race in agency							1.00	.24*	.43**	.23*
8. Debts caused by betting								1.00	.40**	.21
9. Want to stop/reduce betting									1.00	.29
10. Have previously tried stopping										1.00

(* $p < .05$; ** $p < 0.01$)

Note: From "Chasing, arousal and sensation seeking in off-course gamblers" by M. Dickerson, J. Hinchy & J. Fabre, British Journal of Addiction (in press).

The study also looked at the relationship of frequency of chasing and other gambling behaviours (Table 1). Significant relationships were found between chasing and general aspects of self-control such as spending more than planned, spending more than can be afforded, wanting to reduce gambling and having tried to stop. In addition chasing was found to be significantly related to specific off-course gambling behaviours such as staying to listen to or watch the race, bet selection in the agency and placing bets just prior to the start which have been suggested as typifying "out-of-control" off-course betting (Dickerson, 1977).

"Spending more than planned" as a reflection of impaired control in gamblers has been used for two other studies. Caldwell (1985) indicated that up to one quarter of the 300 players surveyed in his 1972 study of poker machine players in a large N.S.W. Leagues Club reported losing more than they intended to spend on the machines. Dickerson, Fabre and Bayliss (1985) surveyed 192 poker machine gamblers covering a range of frequency of gambling involvements from less than once a year to those who gamble every day when the facility is open and compared them with the same cohort of TAB gamblers (N = 172) referred to above. The results indicated that 14% of the TAB patrons and 39% of the poker machine players reported spending more than they planned on three or more of the last five gambling occasions. Those who did not exceed their intended expenditure on any of the last five occasions comprised 62% of the TAB bettors but only 26% of the poker machine players. For the poker machine players a further analysis indicated significant relationships between indicators of frequency and duration of play and reported loss of control over expenditures [Table 2].

Table 2

**Inter-relationships of Frequency and Duration
with Control for Poker-Machine Players**

Frequency and duration	Correlation coefficients			
	1	2	3	4
1. Frequency per week	-	0.42**	0.30**	0.17*
2. Duration of session		-	0.42**	0.42**
3. Frequency of losing more than can afford			-	0.49**
4. Frequency of losing more than planned				-

* $p < 0.25$; ** $p < .0001$

Note: From "A comparison of TAB customers and poker-machine players" (Table 8) by M. Dickerson, J. Fabre & D. Bayliss. In *Gambling in the 80's*, J. McMillen (Ed.), 1985, Brisbane: Griffith University Reprographics.

The desire to cut down or stop gambling and the reported difficulty of attaining these objectives may be taken as another indication of the efficacy of attempts at self-control over gambling behaviour. Dickerson (1984) reported the results of surveys of both compulsive and high frequency gamblers. In a survey of regular off-course bettors 32% expressed a desire to reduce their betting outlays and 4% wanted to stop. A study of GA members indicated that 50% found it "hard" to "very hard" to give up gambling and about 20% found that stopping was "easy". A further indication of the difficulty in giving up completely is shown in Stewart and Brown's (in press) study of 232 consecutive attenders of GA groups in the U.K. Over a two year period only 7% reported that they were able to achieve the GA objective of total abstinence from gambling. The figure equated with the results of a comprehensive survey of abstinence-based treatment programs

in the U.S., detailed in the second Rand Report (Polich, Armor & Braiker, 1980). This study involved a 4 year follow-up of male drinkers who had attended Alcoholism Treatment Centres in the U.S. and found that only 7% of the total sample had been consistently abstinent during the 4 year period since their admission.

To date, three operationally defined criteria have been used as indicators of impaired control over gambling behaviour. These are chasing, spending more than intended and attempts to reduce or stop gambling. The data generated from the studies using these criteria is summarized in Table 3.

The limited empirical information offers a number of considerations relating to self-control in gambling behaviour. There is evidence of a relationship between the frequency of off-course betting and reported difficulties in maintaining control, such that more regular gamblers report greater difficulties with expenditure control. Evidence of a similar relationship for poker machine players is provided in Table 2.

A second point concerns the lack of homogeneity within problem and non-problem gamblers. Some low frequency gamblers reported problems in controlling gambling outlays on some criteria while some compulsive gamblers reported aspects of self-control on some criteria. In addition there are some within the compulsive gamblers who indicated that they found it easy to give up gambling and a number of regular gamblers who tried to abstain and found it hard.

Table 3

Summary of Impaired Control Data in Gambling Studies

Study [gamblers]		Operational criteria for impaired control				
Caldwell (1972) [poker machine players] - club members		lost more than intended during the last month % 25				
Dickerson (1984) [off-course bettors]	chasing	spending more than sometimes	planned regularly	spending all cash sometimes	cash regularly	
	%	%	%	%	%	
- low frequency	20	24	0	1	0	
- high frequency	95	23	75	51	45	
- compulsives	96	33	65	23	75	
	no desire to reduce spending	desire to reduce			want	
to stop		%	%		%	
- regulars		64	32		4	
	never tried stopping	tried and was easy	tried and was hard			
	%	%	%			
- regulars	62	6	22			
	easy to stop		hard to stop			
	%		%			
- compulsives	20		60			
Dickerson et al. (1985) [poker machine players]	spending more than planned on last 5 occasions					
	Never	1 or 2	3 or 4	5		
	%	%	%	%		
- club members	26	35	21	18		
TAB						
- customers	62	22	10	4		
Stewart & Brown (in press) [gamblers anonymous]	achieved total abstinence over 2 years % 7					
Dickerson et al. (in press) [off-course bettors]	never chase	occasionally	usually	always		
	%	%	%	%		
- TAB customers	55.7	30.4	12.7	1.3		

One parallel to the gamblers who found it easy to give up gambling may be indicated in the research of Saunders and Kershaw (1979) on spontaneous remission from alcoholism. In a community study in Scotland they investigated the recovery processes of reformed "problem drinkers" and "alcoholics". From the study they concluded that spontaneous remissions do occur and that so-called "spontaneous" processes such as marriage and job change were prominent in the factors listed as being important for recovery by the informants.

A final consideration concerns the reported difficulties many poker machine players experienced keeping to their gambling budgets, particularly when compared to TAB gamblers. This point raises a methodological issue of whether the criterion of "spending more than planned" means the same thing for different forms of gambling. Different motives for participation and the different sequences of events, stake sizes and behaviours involved in gambling activities may mean that the way in which gamblers budget their gambling outlays will vary with the type of gambling activity. For example there is evidence to suggest that poker machine players are more likely to view their form of gambling as entertainment whereas TAB bettors are more likely to regard their betting as a money-making activity (Dickerson et al., 1985). It is possible that the poker-machine player who sees gambling as a form of entertainment may be less likely to place rigid time and money controls on gambling than the TAB bettor. In addition with a potentially higher bet stake and rapid turnover of stakes, the TAB bettor is possibly in a position of losing money more quickly than the poker machine player and hence there may be more incentive to institute some sort of planning or budgeting of expenditures.

In order to demonstrate that there are qualitative differences between problem and non-problem gamblers with regard to self-control over gambling behaviour there should be a clear-cut differentiation between these groups on indicators of self-control. The evidence to date does not indicate a definite distinction between problem and non-problem gamblers on self-control in gambling behaviour.

1.11 Theories on Impaired Control in Problem Gamblers

Despite the paucity of empirical data on the notion of impaired control over gambling behaviour in problem gamblers, a number of theories have been proposed to account for the development of this phenomenon.

1.11.1 Locus of control

"Locus of control" is a psychological concept developed by Rotter (1966). It concerned an individual's beliefs about the control they had over life events. People who are high on external control expectancies are those who perceived their destinies to be primarily determined by fate, luck or important other people. Those high on internal control expectancies believed that their own efforts, skills or actions primarily determined what happened to them.

The notion of internal and external locus of control characteristics in gamblers has been proposed as an explanatory concept in interpreting problem gambling behaviour (Corney & Cummings, 1985; Dickerson, 1984). It has been suggested from the theory that people who gamble in ways which involve some sort of perceived skill might be expected to believe in an internal locus of control. Alternatively those who selected forms of gambling based more on chance might be expected to believe in an external

locus of control. It has been demonstrated that when "internals" thought performance was a function of skill they expended more effort (Rotter & Mulry, 1965). Conversely, Levitz (1971) found that subjects who persisted longer at a laboratory task and lost more money were more likely to believe the results were influenced by skill rather than chance. Following on from this research it can be proposed that internals are more likely to persist when losing as they perceive the outcome as more skill-determined. Hence those who believe in an internal locus of control could be expected to be more highly represented in problem gamblers than "externals".

Three studies have investigated locus of control characteristics in problem gamblers. In two, a study by Moran (1970) using normative data and one by Wong (1980) involving a comparison group, problem gamblers were found to rate more highly on external control characteristics. The findings appeared to contradict the results of a survey by Dickerson (1974) which found that high frequency gamblers tended to perceive their gambling as more under their own influence or skill than under external factors such as chance. In discussing the locus of control results Dickerson (1984) observed that the subjects were predominantly GA members. He speculated that because GA members are encouraged to accept divine inspiration as the major influence in their daily activities they may be more predisposed towards belief in an external locus of control.

In a third study Malkin (1981) collected data for both GA members and social gamblers and found no differences in locus of control nor on other personality characteristics. Overall the results are inconclusive and locus of control appears to offer little in the way of explanation of impaired control in problem gambling. Orford (1985) criticized the search for personality traits as single explanations for addictive behaviours. He

emphasized the idea of multiple interacting determinants of behaviour which may include features of personality as well as ecological determinants.

1.11.2 Illusion of control

A concept which is indirectly related to locus of control is Langer's notion of "illusion of control". The phenomenon is defined as "an expectancy of personal success probability higher than the subjective probability would warrant" (Langer, 1975, p.311). In a series of real-life and laboratory experiments Langer demonstrated that factors from skill situations such as competition, choice, familiarity and involvement, introduced into chance situations will cause individuals to feel inappropriately confident. As well, the more similar a chance situation is to a skill situation, the more likely it is that people will approach the chance situation with a skill orientation.

When taken with Levitz's (1971) findings that subjects who persisted longer at a laboratory prediction task and lost more money were more likely to think the outcome was determined by skill than chance, the concept has implications for why people persist at gambling when losing money. That is if a form of gambling is well known to a person, they feel a sense of involvement or competition in the game and they are able to exercise their own choice over aspects of the game then they are more likely to perceive the outcome as influenced by skill. If they perceive the gambling as more skill-determined then they will be more likely to persist. In relation to poker machines some of the player characteristics which may influence the illusion of control include the selection of a favourite machine, the belief that a particular style of playing will influence winning or the belief in an

ability to predict when a machine is about to pay.

An additional cognitive factor was illustrated in the research by Levitz (1971). In his study subjects were given feedback on their success at prediction on a laboratory gambling task. They were told they were predicting better than other people, about the same or worse. He concluded from the results that a subject's perception of doing better than others was as important in determining whether the person persisted as was the winning of money.

Two studies have attempted to assess the beliefs of gamblers regarding the amount of skill or chance involved in their gambling. In a U.K. study (Dickerson, 1974) 60% of the high frequency off-course bettors surveyed rated their bet selection as more than 50% skill. The majority of the less frequent bettors rated their selection as "all luck" or less than 25% skill. In a study of Australian TAB customers ranging across a wide variety of gambling frequencies, 44% believed their bet selection was more than 50% skill (Dickerson, Fabre & Bayliss, 1985).

In the Australian study a separate group of poker machine players were asked how much they were able to influence their winnings by the way they played. A large majority, 88%, indicated that they had no influence over their winnings. This result went against the expectations of the authors of the study. Many regular poker machine players had indicated to them during observations of their gambling sessions and in detailed interviews that they believed they were able to influence their winnings by the way they played or that they could predict when a machine was about to pay (M.G. Dickerson, personal communication, January 1987). It is difficult to gain access to this type of belief in a brief question. This is particularly the case away from the gambling environment, when to

claim that it is possible to influence or predict a random event such as the spinning wheels of a poker machine might seem illogical or irrational. Additionally Dickerson suggested that the re-phrased version of this question when rated *during* play commonly shows the illusion of control to be a component of the player's thinking.

In a sequence of laboratory experiments, Ladouceur and Mayrand (1984) failed to replicate Langer's findings. Dickerson (1985) suggested that the unrealistic nature of some laboratory settings and gambling tasks may have contributed to these failures to replicate Langer's results. The suggestion is supported by Anderson and Brown's 1984 study.

In the Anderson and Brown (1984) study the heart rate increases for students and regular gamblers were insignificant when playing blackjack for prizes in a realistic laboratory setting. However the same regular gamblers exhibited significant heart rate increases when playing in an actual casino. In addition the predicted relationship between levels of gambling involvement and scores on Zuckerman's (1979) Sensation Seeking Scale were not supported for either group in the laboratory but were strongly confirmed for the regular gamblers in the casino. The results are important for gambling research as they cast doubts upon the validity of generalizing from laboratory research to gambling behaviour in real gambling environments.

1.11.3 "The chase"

Two sociological explanations of why problem gamblers persisted when they were losing (Lesieur, 1979; Oldman, 1978) focussed on the beliefs of the gambler. For Lesieur the major contingency in becoming a compulsive gambler was the acquisition of "the chase" philosophy. This

referred to the repetitive attempts of problem gamblers to "get even tomorrow". Based on interviews with 50 GA members he typified the compulsive gambler as becoming increasingly involved in an escalating, tightening spiral of involvements and options. Increasing involvement in gambling is predicated on getting even tomorrow. Chasing was seen as logical by the compulsive gambler, he had seen it work in the past, it periodically worked for his friends. Chasing meant giving yourself a chance to get even and comes to be seen as the only way out of your problems.

This explanation corresponded with Oldman's (1978) observations of casino regulars. He argued that habitual gambling easily produced fluctuations in amounts won and lost which overrode any budgetary restraints which may be instituted. This is particularly the case if the person had few resources. He maintained it was only at the point when the regular player reached a financial crisis that the compulsive gambler "appeared". At this point only further gambling and the possibility of a big win (however remote) became the means to meet pressing financial commitments. Oldman proposed that the mechanism by which the regular gambler came to be a problem gambler lay in a defective relationship between a strategy of play and managing one's finances.

These sociological interpretations appear to have some face validity as descriptive accounts of the problem gamblers' movement towards financial crisis and deepening involvement in gambling. Their contribution towards a psychological explanation of why problem gamblers experienced impaired control over their gambling behaviour is open to question. In order to have explanatory value it must be shown that the gambler actually believes that chasing is the appropriate strategy to follow. Dickerson (1984)

maintained that despite the empirical data to suggest that most high-frequency gamblers experience chasing there is no evidence that at some point they come to believe chasing is correct. He differentiated between the belief that a large sum of money was required to pay a debt and a belief in chasing per se as a correct strategy.

1.11.4 Other cognitive factors

Two other factors related to gamblers' beliefs have been proposed as influences on gamblers self-control. Cohen (1972) investigated the gambling behaviour of roulette players. He found that the likelihood of choosing the same colour on the roulette wheel after a win was less than the likelihood of choosing the same colour after a loss. He was demonstrating what is termed the gamblers' fallacy. That is the tendency of gamblers to over-estimate the likely success of a bet following a losing sequence and the over-estimation of losing following a winning sequence. Dickerson (1984) proposed that the phenomenon of chasing observed in many high frequency gamblers may be an extreme example of the gamblers' fallacy.

The gamblers' belief in luck is another factor which may influence the motivation to gamble and persistence at gambling. Arnold (1979) maintained that few gamblers admit to being lucky but many nevertheless gamble on the basis of faith in their own good fortune. Bergler's (1957) observations of gamblers in treatment led him to describe them as habitually taking chances and full of optimism. Custer (1984) described as part of the gambler's style, an attitude of unreasonable optimism about winning, which he identified as being based on early big wins and financial rescues by friends and relatives. Dickerson (1984) maintained that the

notion of overwhelming optimism in high frequency gamblers is overly simplistic. His studies of low frequency and heavy bettors suggested that despite a general trend for regular gamblers to be more optimistic about winning, some were quite pessimistic about particular bets.

1.11.5 "Negative" affect and problem gambling

A number of studies have identified relationships between "negative" emotional states and various aspects of gambling behaviour. Two have implicated depression with gambling. Lyons (1985) found Beck Depression Inventory scores for a group of 34 compulsive gamblers were significantly higher than for a control group of 28 social gamblers. Although, the mean score for the compulsive gamblers was slightly less than the lower cut-off for mild depression as specified by Beck (1961). McCormick, Russo, Ramirez and Taber (1984) found that 76% of their sample of 50 pathological gamblers satisfied diagnostic criteria for a major depressive disorder. They were unable to determine reliably the temporal sequence of depression and gambling in their subjects. However they maintained that gambling appeared to act as an anti-depressant activity for many subjects.

A link between disturbed mood and persistence has been posited in a theoretical model of persistent gambling described by Dickerson and Adcock (1987). The central dependent variable in the model was arousal as a contributing factor to persistence. Of particular interest for their model were factors which might retard the arousal habituation process for gamblers. Drawing on research which linked disturbed mood, particularly depression, with the illusion of control (Alloy, Abramson & Viscusi, 1981; Golin, Terrel, Weitz & Drost, 1979) they suggested that both prior disturbed mood and the illusion of control could act together to increase persistence at

gambling. They reported on two preliminary investigations of their model, one involving poker machine play in a laboratory setting ($N = 44$) and in the other study subjects gambled on a poker machine in a club ($N = 36$). The relationship between prior disturbed mood and persistence received support for regular players and there was limited support for the cognitive component of the model.

The notion of emotional release as an important motivator in gambling behaviour gained some support from a study by Zimmerman, Meeland and Krug (1985). A factor analysis was conducted on the responses of 83 compulsive gamblers and 61 non-gamblers in regard to behaviours which were hypothesized to relate to pathological gambling. High scoring individuals on the factor which was clearly identified as the most important one, perceived gambling as a release from frustration and worry.

The role of emotional distress as a precipitant of relapse in GA members was investigated in a study by Cummings, Gordon and Marlatt (1980). They surveyed a relatively small sample of 19 gamblers and found that 47% of all relapses were associated with what they termed negative emotional states such as frustration, anger and depression arising from intrapersonal and/or reactions to non-personal environmental events. Another 16% of relapses were linked with emotions such as frustration, anger and jealousy arising from interpersonal conflicts. The same study also found the category of negative emotional states to be associated with the most number of relapses in alcoholics, smokers and uncontrolled eaters. Depressive episodes as a possible factor in gambling relapses received support from a study by Dell, Ruzicka and Palisi (1981). Their results indicated that 43% of their sample of 35 GA members reported having

problems with periods of depression during abstinence from gambling.

The evidence suggests that problem gamblers experience a good deal of emotional distress although it remains unclear as to whether this is a cause or consequence of gambling. More research is required to determine the influence of various emotional states on self-control in gambling behaviour.

1.1.6 Behavioural theories

A number of theories have been proposed to explain persistence at gambling when losing which are based on behavioural theories of intermittent reinforcement. Skinner (1972) assumed that cash delivered on a variable ratio reinforcement schedule was the reinforcement mechanism whereby gamblers persisted in their play until eventually they lost all. Variable ratio reinforcement schedules had proven to be strong maintainers of operant responses in laboratory research with animals (Ferster & Skinner, 1957). There are a number of problems associated with this explanation of gambling persistence. For some forms of gambling there may be lengthy time delays between a betting response and the winning cash reinforcement. This would weaken the effectiveness of the reinforcing schedule. A further problem for the explanation is how to account for the frequent punishers experienced by regular gamblers, such as lost time and money. Finally if the variable ratio reinforcement schedule is so powerful at maintaining gambling responses why is it that more or all gamblers do not make the progression on to heavy or problem gambling?

Dickerson (1984) proposed a variation to this explanation. He delineated a period of stimulus events in conjunction with cash winnings which acted as the reinforcers. It is in the period of stimulus events which

occurs immediately after a betting response, such as the spinning of the wheel of the poker machine or the running of the race, in which gamblers appear to experience the most excitement, arousal and tension. Both the excitement associated with stimulus events and cash act together in a conjunctive schedule involving both ratio and temporal aspects. The whole cycle of stimulus events will generalize to other aspects of the gambler's environment such as the noise made by poker machines, the sight of a racing form or friends talking about gambling. As the gambler's stake size escalates so does the excitement and potential winnings. The problem gambler's "training" is complete when cash itself becomes a discriminative stimulus to bet.

The argument that environmental stimuli became classically conditioned to elicit arousal responses is undermined to some extent by the results of a laboratory study ($N = 44$) in which high and low frequency poker machine players were exposed to gambling-related visual and auditory stimuli (Leary & Dickerson, 1985). Prior to playing, subjects were asked to look at a poker machine (previously concealed) and count the number of machine win noises on an audiotape of poker machines being played in a club. The results indicated there were no significant changes in arousal (as measured by changes in heart-rate) for either group. This ran counter to the suggestion that gambling stimuli became classically conditioned to elicit arousal responses. The implications of the results of this research for the classical conditioning argument of persistence at gambling should be balanced by the points that problem gamblers were not included in the study and despite the realistic setting it was a laboratory study.

1.11.7 Individual differences

Excitement often has been implicated as a motivating force in persistence at gambling. Goffman (1969) termed the subjective excitement which is readily observed in many forms of gambling as being "in the action". From his observations of gamblers he drew attention to the way in which gambling or being where the action is seemed to satisfy emotional needs in particular gamblers.

More recently excitement has been investigated as a factor involved in impaired self-control in problem gamblers from within the perspective of the psychology of individual differences. The theory of individual differences assumed that human behaviour is a function of the interaction between personality characteristics and the environment.

Anderson and Brown (1984) investigated the role of arousal or excitement as a factor in the self-control of gamblers over their gambling behaviour. They exposed a sample of regular gamblers to both real (casino) and laboratory gambling conditions. They demonstrated a highly significant correlation between the mean bet size staked and heart-rate increases when the gamblers bet in the casino. Interpreting the heart-rate increases as a measure of excitement, they have proposed that excitement produced a strong classical conditioning effect and is possibly the major reinforcer of gambling behaviour in regular gamblers. In the same study scores on Zuckerman's Sensation Seeking Scale (Form V) (SSS) were found to be highly correlated with mean bet size and mean increases in heart-rate increases in the casino. From this the authors concluded that individual differences in sensation-seeking may be involved in both the repeated seeking of the state of higher arousal and the capacity to experience it.

The implications of these findings for a model of gambling addiction was explored by Brown (1986). He proposed that addictive gamblers suffer from an insufficiently stimulating life-style. Gambling provided the means to change arousal levels and gamblers repeatedly sought these changes through gambling. It had been noted (Wray & Dickerson, 1981) that when addictive gamblers ceased gambling they experienced withdrawal symptoms. It is this repeated seeking of the arousal state which explained why gamblers lost control over their money spent during a gambling session and constantly returned to lose more.

If sensation-seeking was involved in predisposing certain people to the repetitive arousal-seeking associated with problem gambling then it had been reasoned (Zuckerman, 1979) that pathological gamblers should load highly on the SSS scale. Blaszczynski, Wilson and McConaghy (1986) tested this hypothesis on a sample of 51 pathological gamblers attending for treatment. Compared to a control population the gamblers scored significantly *lower* on two sub-scales and the total SSS (Form V). Drawing on the results of a study (McCormick et al., 1984) which found a high incidence of affective disorders in pathological gamblers, they reasoned that excitement or arousal may serve the purpose of reducing dysphoric mood or intolerable stress - related tension in pathological gamblers.

Significantly lower SSS scores for gamblers also were found in a study by Dickerson, Hinchy and Fabre (*in press*). The SSS (Form V) was administered to 156 male, off-course bettors. As a group the male bettors were significantly lower on the SSS scores than existing population norms. The authors concluded that off-course betting is favoured by low sensation-seekers. This conclusion was in the opposite direction to that expected by Zuckerman's hypothesis in regard to gamblers generally.

Within the off-course group they found weak but significant relationships between higher SSS scores and greater expenditure of time and money in betting. These results were in agreement with the direction of Zuckerman's hypothesis. From this result they suggested that the hypothesis should be refined such that once a preferred form of betting has been selected then sub-scale scores on Experience Seeking and Disinhibition as well as Total SSS are related to the measure of level of involvement in betting.

It was found that a more robust relationship linked the Boredom Susceptibility (BS) sub-scale with subjective reports of arousal. The authors speculated that boredom-susceptibility might be a possible predisposing route to impaired control in gamblers. That is if high BS scorers are more reactive to the stimulating effects of betting then frequent gambling and the resultant frequent states of extreme arousal may result in the likelihood of progress towards an addictive pattern of behaviour.

1.1.1.8 Behaviour completion mechanism

A neurophysiological model of persistence has been proposed by McConaghy (McConaghy et al., 1983). He suggested for every behaviour that becomes habitual there is a behaviour completion mechanism established in the central nervous system. Stimuli which were associated with the onset of the behaviour pattern activated this cortical mechanism. A failure then to complete the behaviour resulted in the activation of the arousal system which elicited sufficient tension or excitement to compel the completion of the act. The theory derived from a series of studies on the treatment of homosexual patients and was based on the work of a

physiologist, Anokhin (1955).

The model has been proposed as an explanation of why pathological gamblers experienced difficulties in attempts to stop gambling (Blaszczynski et al., 1986). It was suggested that appropriate cues associated with the onset of gambling activity activated the behaviour completion mechanism in the gambler. Attempts to refrain from gambling resulted in increased arousal which the gambler experienced as tension or anxiety. The change in arousal then led to an increased preoccupation with and urge to gamble.

1.12 Impaired Control in Alcohol Research

A number of researchers (Custer, 1984; Dickerson, 1984; Orford, 1985) have noted similarities between compulsive gambling, alcoholism and other so-called addictions. Just as an inability to resist a gambling impulse is a central pathognomic feature of pathological gambling in DSM-III, impaired control over the consumption of alcohol is central to the diagnosis of DSM-III alcohol abuse and dependence. The aspect of self-control and "loss of control" in alcohol consumption has been a focus in alcohol research for some time. The alcohol literature has influenced gambling research (Dickerson, in press) and there may be further contributions to be made in research on the impairment of control over behaviour.

In 1960 Jellinek defined loss of control over drinking as the inability to control the amount of alcohol consumed on a single occasion once drinking has begun. The concept of loss of control has long been a key symptom in the disease model of alcoholism. Research beginning in the 1960's focussed on the notion of loss of control by observing what actually happened to problem drinkers when they consumed alcohol. The results of these

studies led to a number of reformulations of loss of control and alcoholism.

Much of the research has been summarised by Heather and Robertson (1983). Based on the evidence they concluded that the concept of loss of control had little value as a description of alcoholics' drinking behaviour. When allowed to determine the volume and pattern of their own drinking, alcoholics did not drink to oblivion but clearly demonstrated positive sources of control over their drinking behaviour. From Heather and Robertson's point of view the most important single conclusion from these studies was that alcoholic drinking behaviour is operant behaviour. That is, it is shaped by the environmental consequences of that drinking. And leading on from this, they maintained that the results showed that a combination of psychological, social and cultural factors are important in the maintenance of problem drinking.

Keller (1972) made an important contribution to the re-formulation of the concept of loss of control in alcoholics. He maintained that the essence of the concept was that the alcoholic was unable to invariably choose whether they will or will not drink. The inability to choose arose through a process of learning, social context and particularly cue or stimulus generalization. It was under the impulsion of a cue, which may be internally or externally perceived, that the alcoholic will drink. However for the alcoholic uncertainty arose as they were not always aware that the cue or stimulus was there.

An operational definition of impaired control was offered by Storm and Cutler (1975). Loss of control was defined as applying to particular occasions when drinking occurs in a quantity and to a level of intoxication beyond the anticipated or intended level. They differentiated two main types of decisions faced by drinkers. Whether or not to participate in a drinking

occasion at all or more rarely, whether a non-drinking occasion became a drinking occasion or not. And a second type of decision occurred when a drinker decided to drink but resolved to limit consumption to a particular quantity.

This distinction has also been raised in regard to gambling. Cornish (1978) in his review of the gambling literature was critical of the frequent assumption that explanations for the initial decision to become involved in gambling also served as explanations for persistence in gambling. Most of the gambling research on impaired control has concentrated on persistence while playing. Four of the five studies summarised in Table 3 refer mainly to investigations of impaired control once gambling has begun.

Storm and Cutler maintained that the notion of control implied an intention or instruction to behave in a certain way. There also was an added implication that forces existed which ran counter to that intention. They divided these forces into impulses and controls which can be perceived as either internal or external in origin. The same tendency can be an impulse or a control depending upon past consequences and the anticipated consequences of the current behaviour. Other factors in the current situation may also come into consideration. For example the greater the degree to which an injunction to behaviour is perceived to originate externally, such as from a specific person, the more likely it will be seen as a restriction to personal freedom and the more likely it will be resisted. This categorization of internally and externally perceived factors has been used in research on impaired control in eating disorders (Leon & Roth, 1977) and to assess differential responsivity to stimuli which affect alcoholics' beverage consumption (Tucker, Vichinick & Sobell, 1979).

In conclusion Storm and Cutler argued that loss of control is a phenomenon experienced by many drinkers, by those who are in some sense pathological and by those who are not, and at many levels of habitual consumption. There were a variety of factors in the drinker's experience and in the drinking occasion itself which affected the strength of controls and the strength of impulses to drink.

In 1975 the World Health Organization brought together a group of experts to reassess the criteria for identifying and classifying alcohol-related problems. From this came the concept of the "alcohol dependence syndrome" as provisionally described by Edwards and Gross (1976). This new concept was accepted for the 9th revision of the International Classification of Diseases in preference to the term "alcoholism". This re-formulation suggested that alcohol dependence is not an all-or-none phenomenon but is a continuous variable with a number of related dimensions clustering together to make up the continuum. The leading symptom of the syndrome was an impaired control over alcohol consumption.

The alcohol dependence syndrome involved a double implication in that problem drinking was a diagnosable entity, but one that was highly variable in its manifestations. Heather and Robertson (1983) referred to its ambiguous nature in stating that if the symptomatology is continuous in the population then it is not a specific syndrome. And if the syndrome is continuous only for those allocated within the syndrome then it is all-or-none and not continuous.

Elements of the alcohol dependence syndrome were operationalised into a structured interview, the Edinburgh Alcohol Dependence Schedule, given to 109 men attending an alcoholism treatment unit (Chick, 1980b).

The objectives of the study were to test whether a core syndrome existed and whether it was unidimensional. Two elements, the subjective aspects of impaired control over drinking and "narrowed repertoire" were found to be outside the core syndrome. The impaired control criteria included, "completely unable to keep to a limit", "difficulty in preventing getting drunk", "passing out in a public place" and "difficulty cutting down".

In a prior study, Chick (1980a) had assessed the reliability of operational attempts to define the concepts incorporated in the Edinburgh Alcohol Dependence Schedule. The two items which were most difficult to operationally define, inability to keep to a limit and difficulty preventing getting drunk, related to the concept of impaired control. These items also caused problems with high "not applicable" ratings by subjects in Chick's (1980b) investigation of the core syndrome. Chick (1980b) acknowledged the difficulties involved in devising operational definitions for impaired control. He suggested this is probably mostly due to the problem of operationalising a concept which has recourse to the realm of intention and the will.

Despite the methodological problems Chick (1980b) concluded that the subjective aspects of impaired control are not part of the core syndrome, they formed a dimension in their own right. And he speculated whether the reason behind the inclusion of impaired control in the alcohol dependence syndrome was mainly to satisfy the requirements of the medical model. In concluding he stated that he did not deny that impaired control was experienced by both "problem" and "normal drinkers" but his argument was that it was not part of a core syndrome.

Hodgson (1980) carried out a series of experiments based on the concept of the alcohol dependence syndrome. The experiments investigated the possibility and efficacy of obtaining valid ratings of dependence severity.

Using a simple behavioural measure of craving, speed of drinking, the drinking patterns of severely and moderately dependent volunteers were studied in order to determine whether a dose of alcohol can prime a craving for more. The ratings of dependence were obtained from the scores on a validated, self-completion "severity of alcohol dependence" questionnaire (Stockwell, Hodgson, Edwards & Rankin, 1979).

In one experiment, severely and moderately dependent alcoholics were given priming doses under different conditions. On some days they were given tonic water and information to make them believe it was alcohol. On another occasion they were given orange juice and informed that it did contain alcohol. The main finding from a speed of drinking test held one hour after the priming doses was that differential priming effects existed for the two groups. The severely dependent subjects were influenced mainly by the content of the drink whereas the moderately dependent subjects tended to be influenced by their beliefs.

Hodgson concluded that priming effects did occur but only in the severely dependent alcoholic. Furthermore the priming effects were probably strongly influenced by physiological cues. These conclusions and two follow-up studies described by Hodgson emphasized the importance that severity of dependence assessments had for predictive significance in studies of drinking behaviour. In particular, degrees of dependence have implications for the selection of abstinence or controlled drinking as a treatment goal. He argued if the concept of loss of control is to be retained, then it is the term "impairment of control" that should be used. That is an increased probability of consuming drink or of an increase in craving.

A summary of the definitions and etiological factors which have been proposed in the research on impaired control in alcohol consumption is

provided in Table 4. From this overview of alcohol research it is possible to draw some conclusions which may have implications for gambling research. A number of the studies emphasized the contextual nature of impaired control and the importance that various factors in the drinker's situation and experience will have in influencing self-control. Also of importance, while impaired control is a central pathognomic feature in DSM-III substance use disorders, it has shifted from an all-or-nothing concept towards impaired control as a continuum which extends through "normal" and problem drinking behaviours. The possibility that there are degrees of dependence and craving has implications for determining the influence of various factors on self-control and for the setting of objectives, such as controlled drinking or abstinence, in treatment interventions.

Finally, the studies by Chick (1980a, 1980b) have drawn attention to the difficulties in operationally defining the concept of impaired control. The major problem as Chick (1980b) saw it was that self-control comes within the realm of intention and the will. Operational definitions are dependent upon the language of intention, in clarifying impaired control the problem becomes one of whether or not the subject had tried to limit drinking and failed or whether the subject had changed his or her mind. In addition there are subjects who never set limits. At one extreme there might be those who consider it pointless to set limits or at the other those who don't need to. With gambling behaviour it is arguable that in general the gambler (as opposed to the drinker) is more aware of his or her intentions as the costs of excess are more immediately acknowledged and more tangible and there is not the complicating influence of a psychogenic agent as in alcohol consumption.

Table 4

Summary of Impaired Control in Alcohol Research

Study	Definitions	Etiological factors
Jellinek (1960)	loss of control: inability to control the amount of alcohol consumed on a single occasion once drinking has begun	unknown as to whether physical and psychological processes are involved
Keller (1972)	loss of control: inability to invariably choose whether to consume alcohol or not	internal and external cues
Storm & Cutler (1975)	loss of control: when drinking occurs in a quantity and to a level of intoxication beyond that anticipated or intended	internal and external impulses or controls
Edwards and Gross (1976)	subjective awareness of compulsion to drink: control is variably and intermittently impaired	involves both a biological process and aberrant learning
Chick (1980b)	impaired control: set a limit but completely unable to keep to it; had difficulty preventing yourself getting, what you would call, drunk; passing out while drinking in a public place; difficulty cutting down	
Hodgson (1980)	impairment of control: increased probability of consuming drink or an increase in craving (craving = speed of drinking)	social and psychological variables

1.13 Theories of Substance Dependence and Problem Gambling

The observations of similarities between the behaviour of compulsive gamblers and substance addicts has raised the possibility that theories of dependence for substance disorders may contribute to an understanding of problem gambling behaviour. Two general theories of addiction merit some consideration as explanations of impaired control in gambling.

Solomon and Corbit (1974) advanced a model of addictive behaviour based on opponent-process theory. The theory proposed that when a

stimulus caused a particular affective state in a person, such as euphoria with opiate use, an opposing force was immediately set in motion which acted to dampen the response. When the stimulus was removed the response dampening process remained. This gave rise to an affective state which was the opposite of the initial affective state. In the example of opiate use, the opponent affective state would be a state of withdrawal.

The process which created the initial affective state was rapid in onset and offset and its strength habituated with use over time. The opposing process was slow to begin and finish and its strength increased with continued use. A situation occurred where the initial state, for example euphoria, was decreasing with continuing opiate use and the opponent state, withdrawal, was increasing with consumption. The motivation for continued and increasing consumption became the avoidance of the opponent affective state. In this way an addictive cycle was set up.

With gambling, arousal or excitement has been identified as a primary affective state in the gambling behaviour of high frequency and problem gamblers (Anderson & Brown, 1984; Dickerson, 1985; Dickerson & Adcock, 1986; Leary & Dickerson, 1985). In applying the opponent process theory to gambling Walker (1985) suggested that the expectation was that high frequency gamblers will show moderate levels of arousal because the primary affective process was habituating. Low frequency gamblers will show a high arousal because of a strong primary state and an opponent state which is still developing. This account of the theory for gambling does not allow for the higher arousal potential in high frequency gamblers occasioned by the higher stakes they use. Nor does it allow for other factors which might retard habituation of the primary affective state. The available empirical data suggested that the opposite to this account was

the case.

Anderson and Brown (1984) demonstrated that regular gamblers when playing in a casino showed significant increases in heart rate. They also found a significant correlation between the mean bet size staked and the heart rate increase. Leary and Dickerson (1985) used both physiological (heart rate) and subjective measures of arousal in their laboratory study of high and low frequency gamblers over three minutes of poker machine play. They found higher heart rate changes and higher subjective ratings of anxiety using Spielberger's State-Trait Anxiety Inventory (Spielberger, Gorsuch & Lushene, 1970) than the low frequency players. While heart rate changes have been consistently used in these studies and in compulsive behaviour research (Rachman & Hodgson, 1980) as a physiological measure of arousal more research is needed to determine what aspects of behaviour, changes in heart rate actually represent. There are other areas where research is needed before an adequate assessment of the theory's applicability to gambling can be made. Some of these include the influence of stake size on arousal, heart rate changes over extended gambling sessions and heart rate changes in different sub-groups of gamblers.

The opponent process theory also is used as one of two possible explanatory processes in a model developed by Leventhal and Cleary (1980). In their explanation of nicotine dependence they saw emotional regulation as the key to smoking behaviour. People smoked to regulate plasma nicotine levels because certain unpleasant emotional states became conditioned to drops in plasma nicotine levels. Solomon and Corbit suggested two processes which gave rise to this craving state. One was the opponent-process mechanism described above. The other possible process suggested that a variety of bodily sensations brought on by changes in

plasma nicotine levels may become conditioned to emotional states. People form memory schemas of these complex interactions and the elicitation of any of the components will provoke the remaining components of the memory schema. The use of smoking across a broad range of situations generalized the schemas and made them all the more difficult to break. For gamblers the model might suggest that gambling becomes linked to a variety of emotional states and gambling itself comes to serve the function of an emotional regulator.

1.14 Overview and Objectives

A number of considerations emerged from the review of the concept of self-control in the gambling literature. It was evident that impaired control occupied a focal position in the medical model perspective of pathological gambling and of impulse disorders in general. The inability to resist an impulse to gamble was the central pathognomic feature required to qualify problem gambling as a mental disorder and to satisfy the DSM-III diagnosis of pathological gambling. Impaired control in gambling behaviour also retained its importance in the proposed criteria drafted for the current revision of DSM-III. Additionally the notion of impaired control was a central feature in the diagnostic criteria for the cluster of impulse control disorders in DSM-III which included alcohol and substance use disorders as well as pathological gambling.

Despite the importance of the concept there have been only a limited number of empirical studies on impaired control in problem gambling behaviour. The research to date has used three main definitions as indicators of an impairment of control, spending more than planned, chasing and attempts to reduce or stop gambling. Results from the

research have suggested that elements of both self-control and impaired control are experienced by gamblers throughout the spectrum of gambling involvements with most reports of impaired control occurring in high frequency gamblers.

A number of researchers have drawn attention to the similarities between problem gambling and other excessive behaviours such as problem drinking. Indeed the proposed new criteria for DSM-III(R) pathological gambling draw heavily on alcohol use diagnostic criteria. Because of the salience of self-control in research on excessive drinking the alcohol literature was reviewed with regard to this concept. A number of issues which were relevant for gambling arose from this review.

Many of the operational definitions used in the alcohol research are similar to the gambling definitions and impaired control was increasingly conceptualized as a continuum which runs from normal through to problem drinking. Also it has emerged from the research that one of the more promising avenues of research concerned the recognition of degrees of dependence and the development of measures for this. This may prove to be a fruitful area for gambling research but is beyond the scope of this study. A final point concerned the complexity of factors which have been identified as being involved in self-control and impaired control in drinking behaviour. For purposes of clarification it has been found useful to differentiate factors internal and external to the person as well as drawing a distinction between self-control in situations where a person was faced with the decision to drink or not and situations where the person was drinking and must decide whether to adhere to a self-imposed limit.

1.14.1 Objectives of the study

The current study represents the first coherent investigation of self-control in a homogeneous group of gamblers, that is poker machine players, who cover a diversity of involvements from low frequency to high frequency problem gamblers. Given the importance of self-control for problem gambling behaviour, the objective is to develop a measure of subjectively assessed self-control in gamblers. This measure will be used to address a number of questions related to self-control in gambling behaviour. The questions are:

- does the measure of self-control discriminate between problem gamblers and other groups of gamblers?
- does the measure indicate that there are differences in perceived self-control under various influences to begin gambling and under various influences to persist at gambling when losing?
- does the measure indicate there are differences in subjectively assessed ratings of self-control due to the influence of internal factors and external factors?
- is there evidence that the concept of subjectively assessed self-control as measured for different gamblers with varying degrees of involvement is dimensional or discontinuous?

2. METHOD

2.1 Subjects

There were 66 participants in the study. Of these, 26 were problem gamblers who had attended or had written asking for treatment at one of two gambling programs. The 40 non-problem gamblers were recruited from first year students in Psychology at ANU as well as from the general population of poker machine players in Canberra and Sydney. All of the non-problem players fulfilled the criteria of having gambled on a poker machine in the last month and they had not sought help to give up or reduce the amount of their poker machine play. It was considered that a requirement of having played in the last month would provide a basis for the provision of sufficiently recent and accurate information, particularly for those gamblers who play infrequently.

The Psychology student poker machine players received a one half credit point towards their first year course. Other non-problem gamblers were volunteers. All information was collected in confidence. The non-student non-problem gamblers provided their information anonymously. Information from the problem gamblers was collected in such a way that only staff directly connected with either of the two gambling programs could identify the people involved.

The 26 problem poker machine players were recruited from two gambling treatment programs, one run by the ANU Psychology Department and the other run by the Psychiatric Unit of the Prince of Wales Hospital, Sydney. The ANU program was advertised as a free service for people who felt they should cut down their gambling but were having

difficulty doing so. The gamblers were recruited from two streams in the ANU project. Seven gamblers came from a high contact stream, which involved an in-depth assessment and counselling interview, an introduction to a self-help manual as well as written and telephone follow-ups. Three poker machine players came from a low contact group. These players did not receive an in-depth interview, they were sent the same self-help manual through the mail and received written and telephone follow-ups. All of the gamblers, excluding one in this program, had played poker machines regularly in the month prior to their contact with the program. One person had stopped playing poker machines and had not played for four weeks.

The Prince of Wales program provides primarily imaginal desensitization as well as aversion therapy for compulsive gamblers who request treatment. The treatment is administered during a one week admission to the psychiatric unit of the hospital, at no cost to the patient. Admissions came mainly from medical referrals and from occasional media publicity about the program. Sixteen gamblers from this treatment program provided information for the study. Six of these completed the questionnaires while attending for treatment. The others were drawn from gamblers who had attended the program in the twelve months prior to September 1986. Ten gamblers out of 36 responded to mailed questionnaires sent to them.

The non-problem gamblers were divided into two groups based on their frequency of play in the last month. A low frequency group comprised people who had played once in the last month and a regular frequency group comprised those who had played at least once a week in the last month. It was considered that the resulting three groups, low and regular

frequency non-problem gamblers and problem gamblers gave a representative reflection of various parts of the spectrum of poker machine involvement.

There were 12 males and 14 females in the low frequency group. Their ages ranged from 18 to 80 years with an average age of 32 years. In the regular group there were 6 females and 8 males. They ranged in age from 18 to 61 years with the average age at 30 years. There were 19 males and 6 females in the problem gambler group. One person in this group failed to answer the question on sex. They ranged in age from 23 to 72 years with an average age of 40 years. All subjects in the study satisfied the criterion that they all used poker machines as their only or as one of their main forms of gambling outlet.

2.2 Measures

Two questionnaires were involved in the collection of data (see Appendixes B and C). The first inventory comprised 31 questions on various aspects of demography and actual gambling behaviours. Some are behaviours that previous studies (see Table 3 and Section 1.11) have associated with excessive levels of gambling. Questionnaire 2 was developed for the current study. It comprised 19 items on the self-evaluation of the likelihood of the occurrence of a gambling response given the influence of various factors. These factors represent variables from both gambling and alcohol research which have been linked with the phenomenon of impaired self-control in gambling and alcohol consumption.

2.2.1 Questionnaire 1 - Actual gambling behaviours and demographics

In the first questionnaire the questions relating to gambling behaviours included items on the frequency of play, the subjective appraisal of cognitions surrounding poker machine play, financial data on gambling, reasons for playing poker machines, the history of their gambling involvement and questions concerning the player's control of expenditures on gambling. The questions on control of gambling expenditures were developed for this study. All other questions were selected from an interview-administered questionnaire which was completed by all problem gamblers in the high contact group of the ANU Gambling Project. Gamblers in the low contact group received an abbreviated copy of questionnaire 1 and the complete questionnaire 2 through the post. The questions from the ANU project were used to augment this study's data in order to provide more comprehensive demographic and descriptive details as well as to look at the relationship of aspects of control to other variables such as the frequency of play and player's cognitions.

There are 10 items in this questionnaire on various aspects of self-control. Question 20 concerned the frequency of planning or budgeting for expenditure on poker machine play. This question was included primarily as one indicator of the presence or absence of impulsivity in relation to gambling. Frosch (1977) defined impulsive behaviour as having the qualities of hastiness and a lack of deliberation. These characteristics run contrary to such behaviour as planning ahead or budgeting.

The second control related question, question 21, concerned the number of times the player had spent more money than planned in the last five sessions of play. This item along with question 22, asking whether the player has ever tried to reduce or stop playing have been used in the

research literature as operational definitions of impaired control (Dickerson, 1984). Question 23 is related to question 22 and is also taken from the gambling literature (Dickerson, 1984). If a player has tried to reduce or cut down on gambling, the question asked for a subjective assessment by the gambler of the difficulty in maintaining a reduction or abstinence from poker machine play.

Question 26 which asked information on whether the respondents have ever sought help to reduce or stop expenditure on gambling was presented only to non-problem gamblers. This was to assess whether gamblers met the non-problem gambling criterion, that is they had not sought help in regard to their gambling behaviour. The questions 27 to 31 related to spending more than a person could afford and specifically asked whether the gambler had obtained money from sources which would indicate a lack of financial control.

For the problem gamblers in the Prince of Wales hospital program there was an additional question on the number of weeks since they had played a poker machine. As some of these players had undergone treatment for their gambling problem, some up to 12 months prior to the survey, it was important to assess whether their answers referred to their current playing or a prior period when they were gambling.

2.2.2 Questionnaire 2 - Likelihood of occurrence of a gambling response

The second questionnaire comprised 19 items. The first item was intended as a subjective measure of the frequency of impulses to begin playing poker machines. This was a counterpart to question 21 in the first questionnaire which was a measure of impulses to persist while playing. The other 18 items related to the likelihood of starting a gambling session or

persisting while playing under various influences and situations.

The first question concerned the frequency in the previous month that the person had experienced an impulse to play poker machines while not in the gambling environment, that is the club. The question embodied a frequency scale of six alternative responses ranging from "not at all" to "every day". The question was derived from the main criterion for pathological gambling in DSM-III, that is "the individual is chronically and progressively unable to resist impulses to gamble" (APA, 1980). The words "strong feeling of wanting to play" have been substituted for "impulse to gamble" in the questionnaire. The DSM-III wording was considered technical and perhaps less readily understandable to the questionnaire respondents. A situation away from the gambling environment had been specified in order to differentiate between impulses to begin gambling and impulses that might be experienced during a gambling session.

Likelihood of occurrence of a gambling response

There are 18 other questions which related to the subjectively assessed likelihood of going to the club to play poker machines or the likelihood of persisting at playing when losing, given a number of supposed situations and influences.

The items were organized in a two part framework with the same structure in each part (see Table 5). The items and corresponding factors are set out in Appendix D. The distinction between impulses to begin and persist was based on a similar differentiation used by Hoff (1961) and Storm and Cutler (1975) in their research on impaired control in alcohol consumption and suggested by Cornish (1978) for gambling research. For

all these questions a five point Likert-type scale was provided, giving a range of responses either from "very unlikely" to "very likely" or from "very easy" to "very hard". The direction of the Likert-type scales was alternately reversed in order to offset response sets in the answers.

Table 5

Framework for items in questionnaire 2

likelihood to begin gambling	likelihood to persist at gambling
internal factors cognitive affective	internal factors cognitive affective
external factors discriminative stimuli relationships	external factors discriminative stimuli relationships

One part of the framework, likelihood to begin, presented eight items on supposed situations where the person is not gambling and away from the club and a ninth question where the person goes to a club for a non-gambling social occasion. The second part presented nine situations where a person is at a club playing poker machines and losing. For the "likelihood to begin" items, the questions invited the subjects to assess the likelihood of going to the club or the difficulty in resisting the temptation of going to the club to play poker machines given various influences or events. For the "likelihood to persist" items, the subjects were asked to assess the likelihood of getting more coins when losing or the difficulty in stopping when playing poker machines and losing, given various influences or events that have occurred. It was considered that these subjective

assessments of likelihoods and difficulties in decision making situations would indicate degrees of self-control in various gambling situations.

Within each part the items were divided into internal and external factors. This type of differentiation has been used in research on impaired control in alcohol and other addictions (Leon & Roth, 1977; Storm & Cutler, 1975; Tucker et al., 1979).

Of the internal factors there were two items for each part on "negative" emotions (as termed by Cummings et al., 1980) and one item for each part on emotions which have been termed "positive" for labelling purposes. The negative emotions included one item involving loneliness and depression and one involving disappointment and frustration. These types of emotions have been suggested in previous studies as determinants of gambling behaviour (Cummings et al., 1980; Dell et al., 1981; McCormick et al., 1984; Zimmerman et al., 1985). The items on positive emotions involved excitement while playing and using gambling as a celebratory medium. Subjective arousal or excitement has been proposed as a likely influence in gambling behaviour by a number of researchers (Anderson & Brown, 1984; Blaszczynski et al., 1986; Dickerson et al., in press; Goffman, 1969).

The other components of internal factors included one item in each part on negative cognitions and one in each part on positive cognitions. The negatively based cognitions concerned the belief that gambling was the only solution to paying urgent debts. This type of belief has been raised in the work of Oldman (1978) and Lesieur (1979) on the phenomenon of chasing in gambling. The items on positively based cognitions concerned beliefs in how lucky a person was and a belief in the ability to predict when a machine was about to pay. A number of theorists have observed the

important role of a belief in luck, or an irrational optimism, in problem gamblers' behaviour (Arnold, 1979; Bergler, 1957; Custer, 1984). Two studies have involved the gambler's beliefs regarding prediction over the gambling event (Cohen, 1972; Langer, 1975).

There are four items in each part on external factors. Three of the items are related to discriminative stimuli surrounding the playing of poker machines. The availability of a large amount of cash or access to a credit facility were mentioned in two items. Dickerson (1984) has suggested the problem gambler may eventually reach a stage where cash itself becomes a stimulus to gamble. Similarly another item supposed a situation where a person had won a large amount of money at the start of a gambling session but was losing that initial win. As well as the cash win being a potential discriminative stimulus to gamble it can also be interpreted in a similar way to the priming dose experiments used in alcohol research on impaired control (Hodgson, 1980).

A further item on external factors involved the likelihood of playing poker-machines when in a club for a non-gambling social occasion. As well as involving many of the potential sensory stimuli which may act as discriminative stimuli in gambling (Dickerson, 1984) the situation addressed a question which has been referred to in alcohol research (Storm & Cutler, 1975). It refers to one of the basic decisions involved in self-control in alcohol consumption, that is whether a social occasion becomes a drinking (or in this case gambling) occasion.

Two other items on external factors may be looked at as discriminative stimuli. One concerned being at home with friends who are talking about wins on poker machines. Dickerson (1984) proposed that the reinforcing properties of stimulus events directly associated with the

gambling sequence may generalize to other stimuli outside the gambling environment. A further question involved being at a club and losing while jackpots are being won on machines nearby. This introduces a notion explored by Levitz (1971). That is that a gambler's perception of doing better than others was as important for persistence as the winning of money.

The final two items involved the aspect of personal relationships and gambling. Both items proposed situations where friends or relatives were arguing against going to a club to gamble or persisting at gambling while at a club. Storm and Cutler (1975) have suggested that the greater the degree to which an injunction to behaviour is perceived to originate externally, the more likely it will be seen as a restriction to personal freedom and the more likely it will be resisted.

The layout of the 18 questions was organized such that on the first page there are five items on part one and four items on part two. On the other side the order is reversed with five items on part two and four items on part one (see Appendix D). Within each part the internal and external items are in alternate order. By organizing the questionnaire in this way the structure of the items is less discernible to respondents.

For both questionnaires an explanation and instruction sheet was attached (see Appendixes B and C). For the second questionnaire on impulses to gamble, respondents were asked to imagine themselves in a particular situation if they had not experienced any of those described in the questions. Gamblers recruited from the Prince of Wales program who had not played the poker machines for some time were instructed to make their answers apply to periods when they were playing, such as the last month when they were playing poker machines.

3. RESULTS

3.1 Descriptive Data

Demographics and extent of poker machine involvement

There were 12 males and 14 females in the low frequency poker machine group. Their ages ranged from 18 to 80 years with a mean age of 32 years. All subjects in this group had played poker machines once in the month prior to reporting. The usual expenditure in a session ranged from \$0.40 to \$20.00. The estimated average total outlay for the month was around \$6.00 and the estimated average time spent playing poker machines for the month was about 45 minutes.

The regular frequency group comprised 6 females and 8 males. They ranged in age from 18 to 61 years with a mean age of 30 years. Eleven of these subjects played once or twice a week and three subjects played poker machines from three to five times a week. Their usual expenditure in a session ranged from \$2.00 to \$16.00. The estimated average total outlay for the month of reporting was \$63.00. The estimated average time spent playing for the month was around seven and three quarter hours.

The problem gamblers' group comprised 19 males and 6 females. One person in this group did not answer the question on sex. The ages ranged from 23 years to 72 years with a mean of 40 years. Nine of these gamblers played poker machines from one to two times a week and 15 played three or more times a week. Two gamblers played poker machines on only one occasion in the month of reporting. The usual expenditure in a session ranged from \$25.00 to \$250.00. Their estimated

average outlay for the month was \$1336.00 and the estimated average time spent playing poker machines over the month was 38 hours.

The data on average outlay and average time spent playing were estimated for the three groups from the product of the frequency of play in the month with the gamblers' reports of usual expenditure in a session and usual duration of session, respectively. It is argued that these estimates provided a more reliable measure of the gamblers' current commitment to poker machine playing than other indicators such as the amount spent in a usual session or the duration of a usual session. For example a low frequency gambler may spend a large amount of money or gamble for a long time in a poker machine playing session but this may occur once a month or less. In order to provide a more accurate measure of the gambler's relative involvement to other gamblers it would be necessary to take into account frequency of play as well as time and financial commitment per session. This type of measure has been used in a previous gambling study for similar purposes (Dickerson et al., in press).

Motives and cognitions

For both the low frequency and regular gamblers the main motives for playing poker machines were "for entertainment" and "to be sociable". The main reasons given by the problem gamblers were "to forget your troubles" and "to win a major payout". In regard to the amount of time spent outside gambling sessions either talking or thinking about poker machines, all of both the low frequency and regular gamblers reported either none or few occasions were involved. Nearly two-thirds of the problem gamblers reported experiencing either regular

or frequent intrusive thoughts and conversations about gambling. All but three of the problem gamblers who responded to the question, "what constitutes a big win for you?", stated sums of \$100.00 or more. For the low frequency group, all but four stated sums of \$50.00 or less and 10 out of the 14 regular gamblers stated sums of \$50.00 or less.

Around 60% of the low frequency gamblers believed they could never or hardly ever either influence their winnings or predict when a machine was about to pay. Nearly 60% of the regulars believed that they could occasionally or usually influence their winnings while 35% believed they could occasionally predict when a machine is about to pay. Of the problem gamblers 35% believed they could occasionally or usually influence winnings and 20% believed they could always influence winnings. Some 70% of the problem group believed they could occasionally or usually predict when a machine was about to pay and one subject (4%) believed he could always predict when a machine was about to pay.

Self-control and impaired control

In the low frequency group 68% of the subjects reported that they never budgeted or planned their spending on playing poker machines. Of the regular gamblers, 36% never budgeted and 38% of the problem gambling group never budgeted for their poker machine finances. Those who frequently or always planned ahead or budgeted comprised 20% of the low frequency group, 50% of the regulars and 29% of the problem gamblers.

Twenty percent of the low frequency group have tried to reduce or stop their poker machine expenditures and of these, one gambler found it

hard to reduce or stop. In the regular gambling group 21% had tried to stop or reduce the money they spent on poker machines, none of these found it hard. All of the problem gamblers had tried to cut down or stop gambling on poker machines, 46% of the respondents found it hard and 42% found it very hard to accomplish their objective.

The results of the item on overspending on poker machines are shown in Figure 1. In the last five sessions of poker machine play engaged in by the subjects, nearly half of the low frequency, one-third of the regulars and one person (4%) in the problem gambling group did not spend more than they had planned to in any of the five sessions. Forty percent of the low frequency group overspent in one or two sessions and 12% overspent in three or more. In the regular group, 50% overspent in one or two sessions and 14% overspent in three or more. For the problem gamblers 8% overspent in either one or two sessions and 88% overspent in three or more sessions.

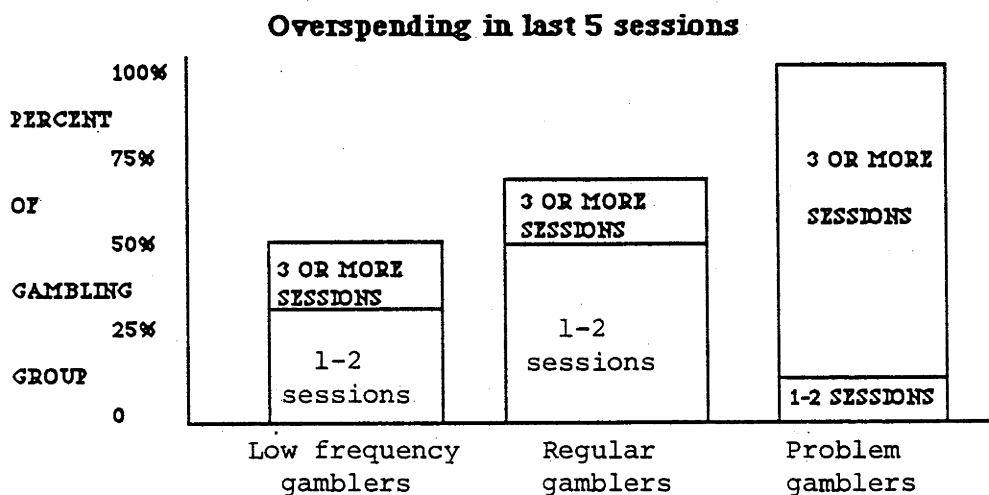


Figure 1. Percentages of low frequency, regular and problem gamblers who overspent in the five gambling sessions.

The results of the item on frequency of experiencing an urge to play poker machines are shown in Figure 2. Eighty-eight percent of the low frequency gamblers reported that there was no occasion in the last month on which they experienced a strong feeling of wanting to play poker machines. This compared with 29% of the regulars and 8% of the problem gamblers. Of those who experienced a "strong feeling of wanting to play the poker machines" in the last month, 14% of the regular group reported the feeling on one or two times a week and 14% on three or more times. The problem gamblers who reported the feeling on one or two times a week comprised 27% of the problem gamblers' group and those who reported the experience three or more times a week comprised 50% of the group.

Urge to gamble over a month

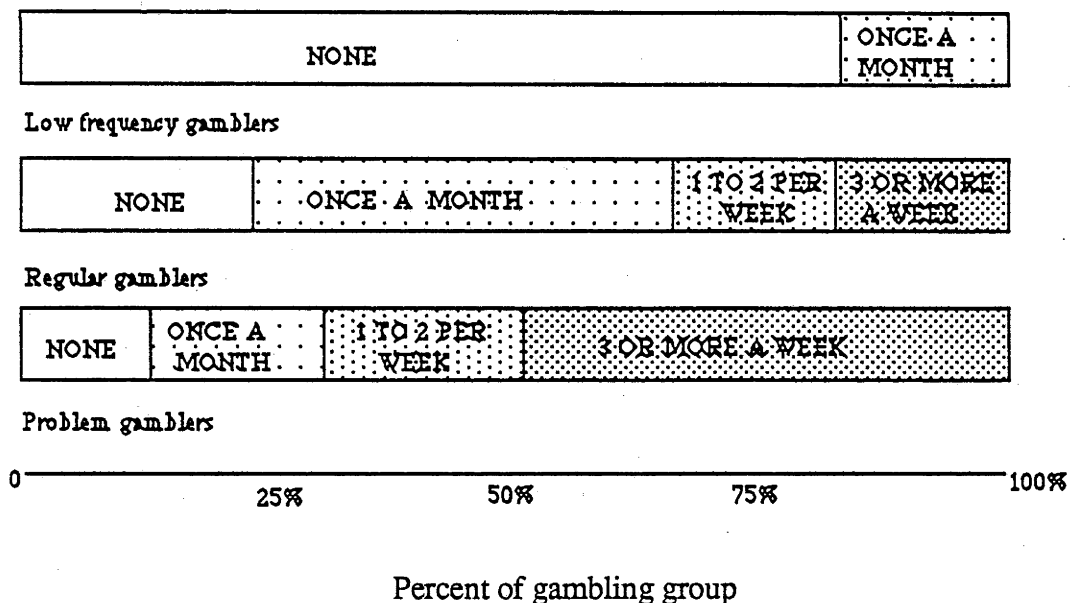


Figure 2. Percentages of low frequency, regular and problem gamblers who reported a strong feeling of wanting to play poker machines in the last month.

3.2 Examination of Sex and Age Effects

In order to examine the possible influence of sex differences on the self-control scales, a 2 x 3 analysis of variance was carried out on the self-control scale and each of the sub-scales measuring the likelihood to begin and persist at gambling. The analyses involved the three gambling groups, low frequency, regular and problem gamblers and two levels of sex. The means and standard deviations are shown in Table 5. In all three analyses there was no evidence of a sex difference effect on self-control ratings nor was there evidence of a sex difference by group interaction effect on the scales. The ANOVA summary tables are shown in Appendix E.

Table 5

Summary of Means for the Self-control Scale and Sub-scales of Likelihood to Begin and Persist by Sex (standard deviations in brackets)

Scales	Mean Scores	
	Male	Female
Low frequency		
Self-control	38.9 (11.9)	40.0 (12.8)
Likelihood to begin	18.8 (7.0)	19.3 (6.3)
Likelihood to persist	20.2 (5.9)	20.7 (7.7)
Regular		
Self-control	48.8 (9.2)	49.5 (8.5)
Likelihood to begin	24.8 (3.9)	26.2 (4.4)
Likelihood to persist	24.0 (5.9)	23.3 (5.5)
Problem		
Self-control	68.0 (13.0)	74.7 (9.2)
Likelihood to begin	32.1 (7.6)	35.5 (4.1)
Likelihood to persist	35.9 (6.3)	39.2 (6.6)

An analysis of covariance using age as a covariate was carried out on the self-control scale and each of the sub-scales measuring likelihood to begin and persist at gambling to examine the possible influence of age on the self-control scales. The F ratios for the three scales and the F ratios adjusted for the covariate age, as well as the covariate variance ratio are shown in Table 6. The regression equation as indicated by the covariate variance ratio was not significant in any of the analyses. There was little difference between the F ratios and F ratios adjusted for the covariate. It was concluded that age did not have a significant effect on the responses to the self-control items. The summary tables for these analyses are shown in Appendix F.

Table 6

Summary of F Ratios, F Ratios Adjusted for the Covariate Age and the Covariate Variance Ratio for an Analysis of Covariance on the Self-control Scale and Sub-scales Measuring the Likelihood to Begin and Persist at Gambling.

Scales	F ratios	F ratios (adj) for age	Covariate F ratios
Self-control	45.5*	41.2*	0.1
Impulse to begin	31.8*	32.6*	1.6
Impulse to persist	45.3*	39.3*	2.8

* $p < .01$

3.3 Reliability and Validity of the Self-control Scales

Cronbach alphas were calculated for the self-control scale (which was derived from the 18 items in questionnaire 2) and the sub-scales, to

determine the internal consistency, that is whether the scales were psychologically interpretable. In addition, the independence of individual sub-scales with each other was examined by calculating a correlation matrix for these sub-scales. As one indication of the validity of the scales in measuring self-control, correlations were calculated between the scales and two other indicators of self-control in gambling behaviour.

The reliability coefficient Cronbach's alpha for the self-control scale was .937. As Table 7 shows, item-total correlations for the 18 individual items confirmed the high level of internal consistency. The removal of any individual item did not lead to any marked increase in the internal consistency of the scale.

Table 7

Reliability Analysis for the Total Self-control Scale: Item-total Correlations and Alpha

Item No.	Item-total correlation	Alpha if item deleted
1	.756	.931
2	.511	.936
3	.445	.937
4	.490	.937
5	.565	.935
6	.755	.931
7	.806	.930
8	.726	.932
9	.729	.932
10	.731	.932
11	.752	.931
12	.642	.934
13	.531	.936
14	.521	.936
15	.765	.931
16	.668	.933
17	.694	.932
18	.603	.934

The alphas for the sub-scales are set out in Table 8. The item-total correlations and alphas for each scale are shown in Appendix G. Most scales showed a high degree of internal consistency. The lowest alpha was .59 for the positive internal factors sub-scale for the likelihood to persist at gambling. The score is considered to be borderline as an indication of adequate internal reliability for this scale.

Table 8

Reliability Analysis: Alphas for Self-control Sub-scales

Sub-scales	Likelihood to begin gambling (alphas)	Likelihood to persist (alphas)
Neg. internal ¹	.83	.85
Pos. internal ²	.71	.59
Internal	<u>.79</u>	<u>.84</u>
External ³	<u>.71</u>	<u>.84</u>
Total	<u>.86</u>	<u>.91</u>

Note: 1. Likelihood to begin sub-scale includes items 1, 15 and 17 (Appendix D); the persist sub-scale includes items 6, 8 and 10.

2. Likelihood to begin sub-scale includes items 3 and 5; the persist sub-scale includes items 12 and 14.

3. Likelihood to begin sub-scale includes items 2, 4, 16 and 18; the persist sub-scale includes items 7, 9, 11 and 13.

In order to determine the degree of inter-dependence between the individual scales a correlation matrix was calculated for the component scales. The results are shown in Table 9. They indicated a high degree of dependence between the sub-scales.

Table 9

Pearson Product-moment Correlations Between Sub-Scales

Sub-scales	1	2	3	4	5	6
<u>Likelihood to begin</u>						
1. negative internal	1.00	.82*	.41*	.64*	.69*	.78*
2. positive internal		1.00	.60*	.48*	.38*	.46*
3. total external			1.00	.62*	.53*	.69*
<u>Likelihood to persist</u>						
4. negative internal				1.00	.60*	.77*
5. positive internal					1.00	.67*
6. total external						1.00

* $p < .01$

From the analysis it appears the self-control scale comprised highly dependent sub-scales. In terms of a formal psychometric analysis this result could constitute an argument to dispense with the sub-scales and only use a single scale for further analysis. This is because of the high degree of inter-dependence of the sub-scales and hence the possibility that they are redundant measures of self-control. The current study however, represents the initial stage in an exploration of self-control in gambling behaviour. For the purpose of having a comprehensive investigation of the concept further analyses examined the total scale as well as sub-scales and selected items. Each item which contributed to the total scale as well as the research framework which distinguished between the likelihood to begin and persist at gambling and internal and external factors, were derived from the research literature

and represented elements which were of theoretical interest for gambling behaviour.

As one indication of the validity of the scale in measuring self-control, Pearson correlations were calculated between the scales and overspending by gamblers and reported frequency of strong feelings of wanting to gamble on poker machines (Table 10). "Spending more than planned" has been used as an indicator of impaired self-control in previous research on gambling. The item, reported frequency of a strong feeling of wanting to gamble, was developed for this study as an indicator of self-control on decisions to begin gambling. Both indicators showed strong correlations with the self-control scale and sub-scales.

Table 10

Pearson Product-moment Correlations Between Overspending and Impulse to Begin Gambling with Self-control Scales

Scales of self-control	Self-control indicators	
	Overspending	Impulse to begin
Total self-control	.66*	.75*
<u>Likelihood to begin</u>		
Neg. internal	.61*	.75*
Pos. internal	.34*	.45*
Internal	.59*	.74*
External	.46*	.66*
Total	.56*	.75*
<u>Likelihood to persist</u>		
Neg. internal	.62*	.72*
Pos. internal	.55*	.46*
Internal	.65*	.69*
External	.64*	.67*
Total	.68*	.72*

* $p < .01$

3.4 Analysis of Means of Self-control Scales

One of the objectives of the study was to determine whether an instrument to measure self-control in gambling behaviour differentiated between problem and non-problem gambling groups. As a first step in the exploration of this question analyses of variance and post hoc tests for comparison of means were carried out on the means of the self-control scale and sub-scales for the three gambling groups. This analysis also was used to indicate whether there were differences between the groups on the sub-scales representing the likelihood to begin and persist at gambling and internal and external factors associated with self-control in gambling. A subsequent step in the exploration of the question whether the scales differentiated problem and non-problem gambling groups involved a canonical variate analysis of the self-control scales (Section 3.5).

The means and standard deviations of the subjects' ratings for the total self-control scale and the component scales are shown in Table 11. The individual subject scores are set out in Appendix H.

Table 11

Mean Ratings of Self-control Scales for Gambling Groups
(standard deviations in brackets)

Scales	Gambling groups					
	Low frequency		Regular		Problem	
	begin	persist	begin	persist	begin	persist
Neg. internal	5.50 (2.69)	6.50 (3.01)	7.36 (2.56)	7.57 (2.50)	11.81 (2.50)	13.12 (1.84)
Pos. internal	5.12 (2.18)	6.35 (2.08)	6.29 (2.05)	6.29 (2.05)	7.15 (2.33)	8.31 (1.67)
Internal	10.62 (4.00)	12.85 (4.52)	13.64 (3.00)	13.86 (3.25)	18.96 (3.82)	21.42 (3.11)
External	8.42 (3.00)	7.62 (2.84)	11.71 (2.49)	9.86 (2.66)	13.92 (3.67)	14.96 (4.02)
Int. & Ext.	19.04 (6.47)	20.46 (6.79)	25.36 (4.03)	23.71 (5.50)	32.88 (6.90)	36.38 (6.41)
Total	39.50 (12.15)		49.07 (8.55)		69.27 (12.20)	

An analysis of variance for the means of the low frequency, regular and problem gambling groups on the self-control scale yielded a significant treatment effect, $F_{2,63} = 44.58$, $p < .01$. The complete ANOVA summary table is shown in Table 12.

Table 12

ANOVA Summary Table for Total Self-control Scale

Source	SS	df	MS	F
Total	20192.6	65		
Between subjects	11832.1	2	5916.0	44.58*
Within subjects	8360.5	63	132.7	

* $p < .01$

A Scheffé test was carried out on the means of the groups in order to further investigate differences in the means. The mean for the problem gambling group was found to be significantly higher than the regular gamblers' mean score, $F_{(2,63)} = 5.29$, $p < .05$. The difference in means for the regular gambling group and the low frequency group just failed to reach significance, $F_{(2,63)} = 2.51$, $p < .05$. The critical value of F for Scheffé tests performed on these means was $F_{(2,63)} = 2.51$.

A summary of the F ratios from the ANOVAs carried out on the sub-scales are shown in Table 13. The individual summary tables and Scheffé tests carried out on the group means at the 5% significance level, are shown in Appendix I. The F ratios indicated there were significant differences in all of the sub-scales.

The results of the Scheffé tests carried out on the sub-scale means for the three groups indicated that for all scales the means for the problem gamblers were greater than the means for the low frequency gamblers. The means for the problem gambling group were greater than the regular gambling group for all sub-scales except for the external factors sub-scale and the positive internal factors sub-scale in the scales

measuring the likelihood to begin gambling. For these scales there was no difference in means. On all sub-scales except two, there were no differences between the means for the low frequency and regular groups. For the external factors and total sub-scale for the likelihood to begin gambling the means for the regular group were greater than the low frequency group means.

Table 13

F Ratios for Gambling Groups' Means on Self-control Sub-scales

Likelihood to begin gambling	F ratios	Likelihood to persist at gambling	F ratios
Neg. internal	40.02*	Neg. internal	50.08*
Pos. internal	5.53*	Pos. internal	8.41*
Internal	32.85*	Internal	37.98*
External	19.48*	External	32.64*
Total	32.14*	Total	43.34*

* $p < .01$

3.5 Analysis of Individual Scores of Self-control Scales

The existence of significant differences between groups is no guarantee that the particular variables involved provide an efficient means of allotting individuals to one class or another (Hope, 1969). The differences do indicate, however, that further investigation is warranted. Canonical variate analysis provides a means for finding the weighted linear function of a set of variables which maximally discriminates between a number of specified groups. Maxwell (1971) contended that canonical variate analysis is of considerable value for checking the efficiency with which classification categories differentiate groups.

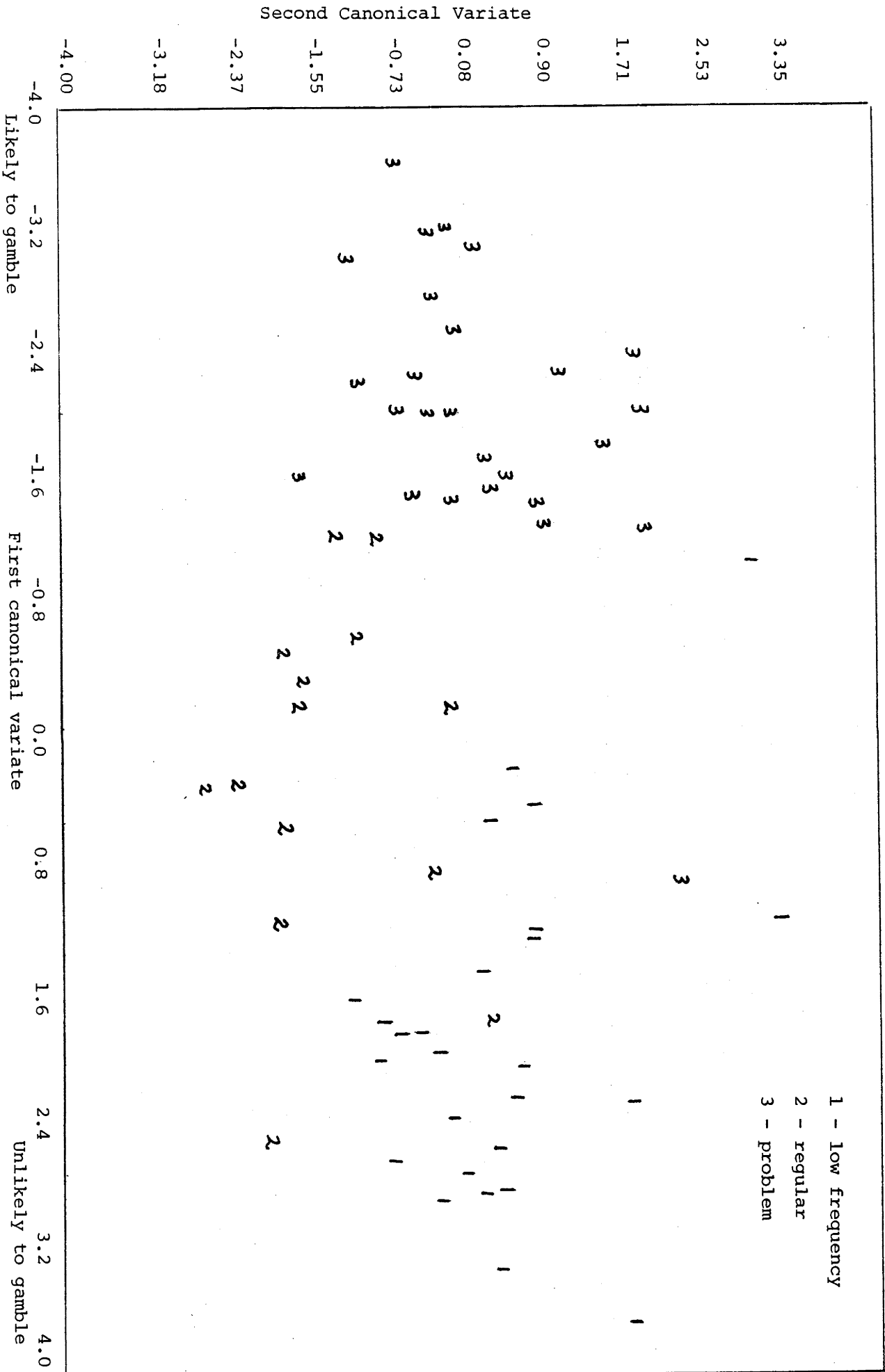


Figure 3. Canonical Variate Analysis Scaled Coefficients for Gamblers in Low Frequency, Regular and Problem Gambling Groups.

In order to further investigate how the self-control scale and component scales discriminated between the gambling groups, a canonical variate analysis was carried out on the individual scores for each group on the items which constituted the self-control scale. The scaled coefficients for each gambler from the analysis are represented in Figure 3.

The first canonical variate accounted for 86% of the variance. On this axis there was a clear discrimination between the majority of problem gamblers and the majority of non-problem gamblers. There was a small area of overlap between the problem and non-problem groups. Within the non-problem group there was a greater area of overlap with most low frequency gamblers grouped towards the "unlikely to gamble" end of the axis and regular gamblers tended towards the middle of the axis.

The score of one problem gambler was located in the non-problem area of the main axis. This subject was a 31 year old gambler who had been playing poker machines for about 9 years. He had decided to stop playing about 4 weeks prior to participation in the study. When he had been gambling regularly he usually played 3 to 5 times a week and he spent from \$20 to \$30 in a usual session. In the last year he had frequently taken from leisure funds, housekeeping funds, next week's wages in advance, his savings as well as frequently taking out loans, to finance his gambling. Previously he had tried to either reduce or abstain and he had found it easy to accomplish. The two regular gamblers in the area of overlap between the problem and non-problem gamblers both averaged about \$40 a month and the other \$64 a month outlay on poker machines. The one low frequency gambler in the area of overlap

averaged less than 2 hours of poker machine play in a month and spent about \$15 per month on poker machines.

Table 14

Item Vector Loadings for the Canonical Variate Analysis of the Self-control Scales

Item No.	Item	Loadings		Vector 1 Ranks	
		Vector 1	Vector 2	+ve	-ve
Likelihood to begin					
1	negative emotion	-0.514	-0.248		1
2	disc. stimulus	-0.203	-0.080		4
3	positive cognition	-0.156	-0.081		8
4	relationship	-0.160	-0.330		7
5	positive emotion	0.339	-0.098	2	
Likelihood to persist					
6	negative emotion	-0.231	0.134		3
7	disc. stimulus	0.087	0.497	3	
8	negative cognition	-0.266	0.852		2
9	disc. stimulus	-0.094	-0.281		11
10	negative emotion	-0.075	-0.148		12
11	disc. stimulus	-0.163	-0.058		6
12	positive cognition	-0.142	-0.254		9
13	relationship	-0.197	-0.039		5
14	positive emotion	0.464	0.472	1	
Likelihood to begin					
15	negative cognition	-0.132	-0.392		10
16	disc. stimulus	-0.065	0.241		13
17	negative emotion	0.060	0.152	4	
18	disc. stimulus	-0.062	-0.359		14

The item vector loadings which contributed to the derivation of the two axes are shown in Table 14. The rankings of the importance of the contribution of the loadings for axis I are also shown. The four main component items which in combination best differentiated the groups can be identified from these rankings. These were item 5 and item 14, both concerned with positive emotion (Appendix D), which contributed positive weights towards the calculation of axis I. Item 1 and item 8, concerned with negative emotion and negative cognition respectively (Appendix D), contributed negative weights towards axis I.

3.6 Analysis of Self-control Item Means

In order to further investigate the four items from the canonical variate analysis, which in combination, provided the best differentiation of the gambling groups, an analysis of variance was carried out on each item's group means. The objective was to determine whether there were differences in the item means between groups and to relate these back to the factors they represented.

A second group of items was selected for analyses of their group means. The items were selected on the basis of whether the low frequency or regular group means were greater than 3 on the self-control scale. That is whether a non-problem gambling group mean for a particular item fell within the "likely to gamble" range of the self-control scale. As part of the focus of the study is on impairment of self-control, these items were selected for analysis in order to investigate differences in the subjective assessment of a gambling response in the non-problem groups for internal or external factors or the two levels of likelihood, to begin and persist at gambling. All of the problem gambling group means

fell in the "likely to gamble" part of the scale.

The means and standard deviations of the selected self-control items are shown in Table 15 along with the F ratios for the ANOVAs on these means. For all items, except item 5, there was a significant treatment effect. The summary tables for the ANOVAs are shown in Appendix J. In the previous analyses of variance carried out on the self-control scale and sub-scale means (Section 3.4) it was assumed that the self-control scores were normally distributed. While the data for these individual items does not indicate otherwise, because they comprise fewer variables greater caution is required in the interpretation of the analysis of individual items. In the analysis of the self-control scale and sub-scales which comprised the addition of numbers of items, the assumption of normality is more strongly held.

Scheffé tests for comparisons of gambling group means were carried out on all items except for item 5. A summary table of the Scheffé tests is shown in Appendix K. For the canonical variate analysis items the problem gambling group mean was greater than the regular and low frequency group means for items 1 and 8. In item 1 the regular gambling group mean was greater than the low frequency mean. There were no differences between the group means for item 14.

For the other items the problem group mean was greater than the regular and low frequency group means for items 10 and 12. For items 2 and 3 the problem group mean was greater than the low frequency group mean only. For item 18 the regular group mean was found to be greater than the low frequency group mean.

Table 15

The Means of Low Frequency, Regular and Problem Gambling Groups for Selected Self-control Items (standard deviations in brackets) along with F Ratios for ANOVAs on the Means

Item No.	Item	Gambling Group			F ratios
		Low	Regular	Problem	
1	neg. emotion (begin)	1.8 (1.0)	2.9 (1.4)	4.4 (0.8)	41.2**
8	neg. cognition (persist)	1.9 (1.1)	1.8 (1.0)	4.0 (1.1)	32.4**
5	pos. emotion (begin)	2.7 (1.3)	3.2 (1.0)	3.6 (1.4)	3.1
14	pos. emotion (persist)	3.2 (1.2)	2.8 (1.3)	3.8 (1.2)	3.3*
2	discrim. stimulus (begin)	2.2 (1.3)	3.1 (1.3)	3.7 (1.5)	7.4**
3	pos. cognition (begin)	2.4 (1.2)	3.1 (1.3)	3.5 (1.3)	5.3**
10	neg. emotion (persist)	2.7 (1.6)	3.3 (1.2)	4.8 (0.4)	21.7**
12	pos. cognition (persist)	3.1 (1.3)	3.5 (1.1)	4.5 (0.7)	11.3**
18	discrim. stimulus (begin)	2.5 (1.3)	3.6 (0.7)	3.8 (1.2)	8.5**

* $p < .05$; ** $p < .01$

3.7 Examination of Level of Involvement and Self-control Means

The analysis in this section addressed the question of whether the concept of self-control should be considered as a dimension which is associated with various levels of involvement in gambling or whether the

concept is discontinuous and there are qualitative differences between self-control in problem and non-problem gamblers. The argument as to whether psychiatric classification is better served by a typological or dimensional model has been referred to in the literature review (see 1.4). Often the evidence used to support either model concerns whether the distribution of important diagnostic variables are continuous or discontinuous. A number of statistical techniques have been used to test this question and all have their limitations. One of the most common methods used to investigate whether variables lie on a continuum is factor analysis.

A common feature arising from factor analysis which is used to investigate whether a set of data lies on a continuum is a demonstration that the major factor accounts for a very substantial part of the variance. Attempts to identify discrete psychological factors through factor analysis have been questioned on the grounds that the independence of the factors is an artefact of the redundancy of variables, patient sampling as well as other methodological considerations (Lorr, 1961; Maxwell, 1971). A further difficulty with this type of analysis is the large minimum number of subjects required to establish meaningful factors. Although there is no consensus in the literature on minimum numbers, Everitt (1975) stated that any factor analysis in which the number of subjects is less than five times the number of variables should be viewed with a degree of scepticism.

In regard to excessive gambling it has been proposed (Dickerson, 1984) that the main differences between problem gamblers and other gamblers are quantitative in that the problem gamblers tend to use larger stakes and have larger debts. Corresponding with this analysis impaired

control has been proposed as an important dimension of gambling that is positively correlated with frequency of play. As an alternative to factor analysis it was considered that support for the concept of impaired control as a dimension could be investigated by an analysis of covariance of the self-control scales using indicators of level of gambling involvement, average frequency of play per month and average outlay per month, as covariates.

The F ratios for the self-control scale and sub-scales are shown in Table 16, along with the F ratios adjusted for the covariates, time spent playing per month and average outlay on gambling per month. The variance ratios for the covariates are also shown in the table. The same information for the frequency of experiencing an urge to gamble in a month and frequency of overspending in the last 5 poker machine sessions, which have been suggested as indicators of self-control in gambling, is also shown. The average time spent and outlay on gambling in the month were estimated from the product of the frequency of play in the month with the gamblers' report of usual duration of session and usual expenditure in a session, respectively. The complete summary tables are shown in Appendix L.

The covariate regression equations for time, as indicated by the variance ratios for time, were significant for all the variables except the likelihood to begin gambling. The covariate regression equations for outlay were significant for all variables except overspending. There were considerable reductions between the F ratios and adjusted F ratios for all variables however there was no change in the level of significance following adjustment. It appeared that level of involvement accounted for a large part of the high degree of variability in the self-control indicators

however a large significant portion of variability remained unaccounted for.

Table 16

Summary of F Ratios for ANOVA on Self-control Scales, Frequency of an Urge to Gamble and Frequency of Overspending, Adjusted F Ratios with Average Time Spent and Outlay in a Month as Covariates and Covariate Variance Ratios.

Self-control Scales	F Ratios	F Ratios (adj)	F Ratios Covariate
Time as a Covariate			
Self-control	44.6**	17.1**	5.1*
Likelihood to begin	32.1**	13.0**	3.4
Likelihood to persist	43.3**	16.1**	5.1*
Urge to gamble	39.4**	15.0**	5.8*
Overspending in last 5 sessions	29.5**	9.1**	4.5*
Outlay as a Covariate			
Self-control	44.7*	25.8**	6.2*
Likelihood to begin	29.8*	17.1**	5.3*
Likelihood to persist	47.6*	27.4**	5.0*
Urge to gamble	37.0*	21.0**	10.2**
Overspending in last 5 sessions	30.0*	17.4**	1.8

* $p < .05$; ** $p < .01$

3.8 Analysis of Within Gambling Group Means of Self-Control Scales

In order to examine how the likelihood of a gambling response within a gambling group was affected by either internal or external factors or by whether it was a decision to begin or persist at gambling, a

series of analyses were carried out on differences between the sub-scales within each gambling group. An initial step was to look at whether there were differences *between* the groups for within group differences. Following this analysis the investigation focussed solely on differences *within* the gambling groups.

An analysis of variance and Scheffé comparisons of means were carried out on the mean differences of sub-scales for each group to determine if there were differences between the groups on differences between sub-scales measuring the likelihood to persist and begin gambling and sub-scales measuring internal and external factors related to gambling. For the differences between total likelihood to persist minus likelihood to begin and external impulse to persist minus external impulse to begin, the problem group mean differences were greater than the regular group mean differences. There were no differences between the problem or low frequency groups, nor between the regular and low frequency groups. The ANOVA summary tables and summary of Scheffé tests are shown in Appendix M.

A series of two-tailed t tests for dependent samples were calculated for the mean of differences between sets of sub-scales within groups to test the hypothesis that the difference between two sub-scales was not significantly greater than zero. The means of the differences between scales for the three gambling groups are shown in Table 17. The t tests which indicated the differences were significantly greater than zero are shown in the table. The values of the t tests are shown in Appendix N.

Table 17

Means for Differences in Self-Control Scales for the Low Frequency, Regular and Problem Gambling Groups (standard deviations in brackets)

Differences between scales	Gambling group		
	Low	Regular	Problem
Total persist-total begin	0.16 (0.59)	-0.18 (0.49)	0.39** (0.57)
Internal (persist) - internal (begin)	0.45** (0.56)	0.04 (0.62)	0.49** (0.66)
External (persist) - external (begin)	-0.20 (0.81)	-0.46 (0.81)	0.26 (0.87)
Neg. internal (persist) - neg. internal (begin)	0.33* (0.67)	0.07 (0.98)	0.44** (0.79)
Pos. internal (persist) - pos. internal (begin)	0.62* (1.04)	0.00 (1.77)	0.58* (1.09)
Internal (persist) - external (persist)	0.67** (0.66)	0.31 (0.49)	0.56** (0.79)
Internal (begin) - external (begin)	0.02 (0.60)	-0.20 (0.84)	0.32* (0.67)
Neg. internal (persist) - pos. internal (persist)	-0.98** (1.00)	0.62* (1.30)	0.22 (0.70)
Neg. internal (begin) - pos. int. (begin)	-0.72** (1.14)	-0.69 (1.44)	0.36 (1.25)

* $p < .05$; ** $p < .01$

For problem gamblers the results show that the total likelihood to persist scores were greater than the likelihood to begin gambling scores. For all of the component scales, except for the external factors scales, a

likelihood to persist was greater. Within the likelihood to persist scale the internal factors means were greater than the external factors means. Similarly for the likelihood to begin scale internal factors were greater than external factors. Within the internal factors there was no difference between the means of positive and negative factors.

For regular gamblers there were no differences between any of the scales of a likelihood to persist and a likelihood to begin. Within the likelihood to persist scales the mean scores for the negative internal factors were higher than for the positive internal factors.

For the low frequency gamblers there was no difference between the total likelihood to begin and persist scales. For the component scales, the means for the likelihood to persist were greater than the likelihood to begin means for the negative, positive and total internal factors scales. Within the likelihood to persist scale the internal factor means were greater than the external factor means and the negative internal factors were greater than the positive internal factors. Within the likelihood to begin gambling scale the means of negative internal factors were greater than the means of positive internal factors.

4. DISCUSSION

4.1 Overview

The objective of the study was to develop an instrument to measure subjectively assessed self-control in gamblers and with this to investigate aspects of the concept of self-control in gambling behaviour. The self-control scale comprises a framework which is derived from concepts referred to in the gambling and alcohol literature. The items in the scale represent factors which have featured in research on impaired control in gambling and in alcohol consumption. The results of the study indicate that the self-control scale and sub-scales have good internal reliability. A high correlation with other measures of self-control in gambling suggests that the scale is a valid measure of that concept.

The results of analyses using the self-control measure indicate that:

- the scales differentiate between problem and non-problem gamblers and a weighted combination of the items offers a good discrimination between low frequency, regular and problem gamblers;
- problem gamblers report a greater difficulty in maintaining self-control in decisions on whether to persist at gambling when losing rather than in decisions on whether to gamble or not;
- internal factors exert a greater influence than external factors on decisions involving self-control in both situations away from gambling and when persisting at gambling when losing;
- the data is inconclusive in regard to the question whether self-control in gambling is a continuous or discontinuous concept.

The following discussion will elaborate on these findings and discuss the implications.

4.2 Self-control in Decisions to Begin and Persist at Gambling

The differences which emerged between the sub-scales measuring the likelihood of beginning gambling and persisting at gambling for problem gamblers offers a justification for using this distinction to investigate self-control in gambling behaviour. Intuitively the distinction has relevance because the determinants of self-control or impaired control in situations involving a decision whether to persist at gambling when losing may be very different from situations involving decisions whether to begin gambling or not. The example of impaired control evident in a relapse after a period of abstinence from gambling may be one such instance where the factors relating to persistence at gambling are not relevant to the determinants of the decision to return to gambling.

The results support the suggestion by Cornish (1978) that decisions to begin gambling and decisions to persist at gambling should be looked at independently. The distinction between these types of decisions requires more research to further explore the differences, such as different factors or differing impacts of factors, which are involved in the two situations. Furthermore the differentiation between decisions to begin to drink and decisions to persist in alcohol consumption may provide a useful framework for research on self-control in alcohol use. This division has been proposed in the alcohol literature (Storm and Cutler, 1975) but has not been used explicitly as a research framework.

The development of scales to measure the likelihood of a decision

to begin to gamble and the likelihood of persisting at gambling when losing raises the possibility of undertaking research into whether degrees of dependence for gambling can be identified. This is similar to a current direction in alcohol research (Hodgson, 1980). It may be feasible to specify poker machine players who are most likely to lose control while playing. This would have implications for the choice of a treatment goal such as abstinence versus controlled gambling. In addition the identification of circumstances and factors which increase the likelihood of a decision to start gambling would be helpful in counselling problem gamblers who wish to abstain.

A similarly constructed measure of self-control also might be used to investigate factors which increase the likelihood that problem gamblers will maintain self-control. Billings and Moos (1983) identified coping responses and social resources as being important for the recovery of alcoholics and items related to these could form the basis for such a measure.

The differentiation between decisions to begin and persist at gambling has similarities with concepts involved in Kuhl's (1984) attempt to conceptualize the volitional aspects of achievement motivation. Kuhl believed that the problem of volition is neglected in many areas of psychological research and he developed a theoretical framework in order to undertake research in this area.

Central to his theory is a concept he termed "action control". He proposed that the process of action control operates to shield an intention to perform a behaviour against competing action tendencies. He distinguished two types of motivation involved in action control. Choice motivation was the strength of motivation involved in choosing among

several action alternatives and may be seen as the type of motivation underlying a decision to begin or not to begin gambling. Control motivation referred to when a person is already acting and is the motivation involved in exerting an effort when attempting to put an intended action into effect. This type of motivation is more relevant for situations involving persistence.

In Kuhl's terms a failure to perform an activity, such as "not gambling", is not necessarily indicative of a motivational deficit but can be viewed as an inability to shield the intention from a competing action tendency, that is gambling. Similarly persistence at an activity, such as gambling, can be seen as a function of the ability to protect the task-oriented action tendency against competing (non-gambling) tendencies. Some of the problems associated with obtaining operational definitions of impaired control in the alcohol literature were attributed to the concept coming within the realm of volition and the will (Chick, 1980b). The type of conceptualization involved in Kuhl's framework may prove to be a useful way of accounting for volition and intentions in research on excessive behaviours.

4.3 Factors Involved with Decisions to Begin and Persist at Gambling

The means on all sub-scales for the problem gambling group indicated that the problem gamblers reported that a gambling response was likely for all the factors represented by the items. The likelihood of a gambling response was greater in decisions involving persistence at playing. The implications are that many factors can be identified as contributing to excessive gambling behaviour. These results support the suggestion of Brown (1986) that several important groups of variables are

involved in maintaining problem gambling and that a general model of gambling behaviour should seek to incorporate all of these. Before this can be done he proposed that research should identify and focus on specific variables as a basis for investigating the interrelationships between the main variables.

Internal factors were shown to have the most influence on the self-control of problem gamblers both in situations involving decisions to persist at playing and in situations involving decisions to begin or not. Of the internal factors included in the present scale there were no differences in the problem gamblers' assessment of positive and negative factors. That is factors such as excitement and feeling lucky were assessed as being equal to negative factors like feeling depressed and having a belief that gambling is the only way to repay debts, in their influence on the likelihood of gambling. In other words, within the limits of self-appraisal data it would seem that feeling good or feeling optimistic does not differ from feelings of unhappiness or a belief in a chasing strategy in their influence in problem gamblers' decisions to gamble.

However when compared to the non-problem gamblers there are differences between the influence of positive and negative factors. For negative factors the problem gamblers' likelihood to begin gambling was greater than for both non-problem groups. The problem gamblers' likelihood to begin gambling due to positive factors was only greater than the low frequency group. The item analysis showed that in the positive factor items, problem gamblers rated the influence of a positive cognition (belief in luck) higher than low frequency gamblers. However, there were no differences between any of the groups for the positive emotion item. The implication is that negative emotions such as frustration and

depression as well as a belief in chasing as a strategy to recoup debts are relatively more influential for problem gamblers in their likelihood of deciding to begin a gambling session on poker machines than a positive emotion such as excitement or a belief in luckiness or external factors.

The influence of negative factors in decisions to begin gambling supports the findings of Cummings et al. (1980). They investigated the reasons for relapses in various addictive behaviours, including gambling, and they found that at least 72% of all relapses were associated with negative situations such as coping with frustration, anger, depression, etc., coping with unpleasant physical states and coping with interpersonal conflict. In a review of the processes of recovery among alcoholics, Billings and Moos (1983) identified posttreatment stressors and episodic loss of control over drinking as being characteristic of the months subsequent to treatment. Hence they argued that clinicians should pay more attention to anticipating and preventing relapse. Given the similarities in reasons for relapses between compulsive gamblers and alcoholics (Cummings et al., 1980) one emphasis in the clinical treatment of problem gamblers might be to identify high risk situations such as disappointments, loneliness and interpersonal conflict which might increase the likelihood of a relapse. The focus of the intervention should be on ways of coping with these stressors and bolstering the gambler's social resources. Billings and Moos found that the incidence of posttreatment stressors and the degree of coping and social resources available had as much influence on a person's recovery as their treatment experience.

A final point in relation to relapse prevention is that for most of the gambling response items in this study, problem gamblers rated their

likelihood of deciding to gamble as being quite high. This in itself is indicative of diminished self-efficacy (Bandura, 1977), or expectations of self-control. Decreased self-efficacy or a sense of helplessness has been proposed as a significant factor in precipitating relapse (Cummings et al., 1980). Interventions such as skill training and anxiety reduction have been suggested as ways of coping with situations which threaten self-efficacy and together with more global interventions they may stabilize a general sense of self-control.

Of the internal factors relating to decisions to persist at gambling when losing, problem gamblers rated their likelihood of deciding to persist as higher than both non-problem groups for the negative items and the positive cognition item. There were no differences between the groups for the positive emotions (excitement) item. The results support research which emphasizes the involvement of negative emotional states such as depression (Dickerson & Adcock, 1987, McCormick et al., 1984), chasing as a gambling strategy (Dickerson, 1984; Lesieur, 1979; Oldman, 1978) and the illusion of control (Dickerson & Adcock, 1987; Langer, 1975) in maintaining persistence at gambling.

The absence of significant differences between problem and non-problem gamblers on the items measuring the influence of subjectively assessed excitement in gambling behaviour appears to be less to do with its effect on problem gamblers than it is with the strong influence of subjective excitement on non-problem poker machine players. The means of the positive factors (positive emotion and positive cognition) sub-scales for both levels of gambling likelihood for the regular gamblers and for the likelihood to persist at gambling for the low frequency gamblers were the only sub-scales which indicated a "likely to

gamble" response from the non-problem gamblers. That is on the scale of responses from 1 for "very unlikely to gamble" to 5 for "very likely to gamble" the means for these positive factors were above 3 which indicated a likely to gamble response. Of the positive factors items, only the items pertaining to excitement registered no differences between problem and non-problem gamblers. It may be that subjective excitement in lower involvement gambling is one predisposing influence towards the development of impaired control in high involvement gamblers.

While keeping in mind that a general explanatory model of problem gambling behaviour is likely to have multiple determinants, the results of the study allow some speculation as to the role of a number of the more important components in the development of impairment of control as the frequency of poker machine playing increases. The low frequency gamblers indicate that a gambling response is likely only in situations where they are already playing and where they find it exciting or believe that the machine is ready to pay. Of these factors, excitement produced a degree of response which is no different from other higher frequency problem and non-problem gamblers.

Regular non-problem gamblers reported they were likely to begin gambling in response to items which involved positive cognitions and emotions. That is a feeling of wanting to celebrate, which may be associated with excitement, and a belief in the luckiness of the gambler resulted in responses which indicated they were likely to begin a gambling session. In addition, being in a club environment for a non-gambling occasion also resulted in the likelihood of a decision to gamble. Once playing, a belief in the ability to predict when a machine will pay and the experience of loneliness and depression are factors

which contribute to persistence when losing.

Excitement and cognitive aspects which are akin to the illusion of control appear to be involved in the impairment of control at low levels of involvement in gambling. For higher levels of involvement the prospect of winning and having an exciting time and the possible association of this with stimuli in the actual gambling environment such as the sight and sounds of poker machines may be components which engender a strong feeling of wanting to play. The illusion of control element is again involved with persistence in regular players and an additional factor is introduced through the influence of negative emotions on persistence. That is regular non-problem players report that disappointments, frustrations and feelings of depression together with a belief in their ability to predict when the machine will pay are factors which influence their persistence in playing when losing.

Negative emotions have also been shown to be important for the gambling behaviour of problem gamblers. Feelings of depression, frustration and loneliness were reported by them to be influential in their excessive gambling. These types of negative feelings may be both a contributor towards the excessive behaviour as well as a result of the mounting debts and personal problems associated with problem gambling. The gamblers' assessment of the role that negative emotions play suggests that gambling at this level has a high degree of emotional significance. One of the main motives for playing poker machines which was listed by the problem gambling group in this study was "to forget your troubles". It appears that what was once a leisure activity which provided entertainment and the opportunity to socialise may serve the function of an escape from problems or a type of emotional regulator for

problem gamblers.

4.4 Self-control as a Differentiator of Gambling Groups

The concept of subjectively assessed self-control as represented by the scales provided a good discrimination between problem and non-problem gamblers. The mean ratings of self-control for the problem gamblers were greater than the low frequency gamblers' ratings for all scales. They were also greater than the regular gamblers for all scales except those measuring the impulse to begin gambling for external factors and positive internal factors. The canonical variate analysis which maximized differences between the groups derived a weighted combination of items which established a clear differentiation, with the exception of one problem gambler, between problem and non-problem gamblers.

The results of the study support the use of the concept of impaired self-control as a diagnostic criterion. This issue is considered to be separate from the question of whether the concept is dimensional or discontinuous. Robins and Helzer (1986) maintained that in the absence of definitive tests for the presence of a disorder the only available method for making a diagnosis is a dimensional one. That is a method involving the counting of signs and symptoms according to specific criteria. The issue then becomes one of whether a dimension should be translated into a category by setting a cut point for the presence or absence of a disorder such as occurs in DSM-III. The current emphasis of the pathological gambling criteria in DSM-III on impaired control over gambling behaviour appears to be justified. The inclusion of impaired control as diagnostic criteria for DSM-III(R) also is supported by the results of the

study. Three of the proposed criteria have been used to operationally define impaired control in the research literature and the notion is implicitly embodied in other criteria such as continuing to gamble in the face of mounting costs and the intrusion of gambling into important social or occupational activities.

It may be possible that a self-control scale such as the one employed in this study could be used as a diagnostic tool for problem gamblers. In order to develop the current scale, further testing is required among other populations of gamblers including problem gamblers using forms of gambling other than poker machines and greater numbers of high frequency non-problem gamblers. This would allow for a refining of items and selection of cut points to achieve the best ratio of false negatives to false positives.

4.5 Self-control in Gambling as a Continuous or Discontinuous Concept

The question whether particular disorders are regarded as having categorical or dimensional bases is an ongoing debate in the classification of mental disorders. A number of different techniques have been used in attempting to resolve the question and all have been criticized for their limitations in this field (Garside and Roth, 1978; Maxwell, 1971; Strauss, 1973).

It has been argued here that the question of the classification of excessive gambling as a categorical or dimensional disorder can devolve on the issue whether self-control in gambling behaviour is a continuous or discontinuous concept. The argument is based on the emphasis which current diagnostic criteria for pathological gambling places on the notion

of impaired control.

If self-control is a discontinuous concept with a qualitative difference between self-control in problem and non-problem gamblers a necessary condition is that there should be differences in self-control between these groups. These differences do show up on the self-control scale and sub-scales which measure the impulses to persist and begin gambling. These findings are complicated by the results of lower level sub-scales and particular items where there was no evidence of differences in self-control between problem and non-problem gamblers. The descriptive statistics on self-control also support the absence of qualitative differences between problem and non-problem gamblers. These results are similar to previous research which showed that while problem gamblers score highly on impaired control criteria non-problem gamblers also experience impaired control, albeit in lower numbers and less frequently (Dickerson, 1984).

It has been argued (Hope, 1969) that the existence of a significant difference doesn't by itself support a categorical hypothesis. However a significant difference does indicate that the distributions of the groups are beginning to separate. A canonical variate analysis is one method which, by finding a linear combination of variables, maximizes the differences between groups. By its nature this technique maximizes the chance of a categorical hypothesis being supported.

The results of the canonical variate analysis for this study indicate that there is good discrimination between the groups, particularly between the problem gamblers and non-problem gamblers, as there is only a small area of overlap. Maxwell (1971) has suggested that the existence of only a small area of overlap in such an analysis may be

sufficient to conclude that the groups represent separate categories. However it can also be argued that although the analysis maximizes differences between groups the individual gambler's scaled coefficients are continuous along the self-control axis. That is there is no evidence of a gap in the range of self-control variables which might be expected if there was a qualitative difference between problem and non-problem gamblers on perceived self-control. The question of what criteria should be used to determine when a qualitative distinction between groups exists is an important element of the categorical classification versus dimension debate (Garside & Roth, 1978; Hope, 1969).

Another of the limitations of canonical variate analysis relates to its potential circularity. It has been suggested that the analysis merely refines the classification that is already present and therefore is just a description of the diagnostic or selection process used. Garside and Roth (1978) proposed that the main implication of this criticism was that the weights derived from a canonical variate analysis should be applied to fresh data before making firm conclusions.

An alternative method of determining whether the concept of self-control in gambling is dimensional or categorical is to compare it with a related set of variables which is known to be continuous. It has been proposed that the main differences between problem gamblers and other gamblers are quantitative in that problem gamblers use larger stakes and have larger debts (Dickerson, 1984). Corresponding with this analysis, self-control was proposed as an important dimension of gambling which was positively correlated with frequency of play. The results of the analysis of covariance on the self-control scale using indicators of level of involvement as covariates suggests that the

covariates were significantly correlated with self-control. Level of involvement indicators account for a large amount of the variance in the self-control scales. However, a large and significant portion of the variance remains unaccounted for. In other words greater frequency per se is an important contributor towards increasingly experienced impaired control in gamblers. The results also indicate that other significant factors are involved.

Overall these results are inconclusive as to whether there are qualitative differences between problem and non-problem gamblers in regard to self-control. What is required is further testing of this question using different populations of gamblers who differ in levels of involvement as well as types of gambling activities. However, Skinner (1981) has argued that empirical evidence alone is unlikely to resolve the debate about which classification approach is "best". He suggested that with fallible data it is possible to fit alternative diagnostic models with reasonable degrees of success. His conclusion was that current classification methods are predominantly exploratory and there is an urgent need for confirmatory statistical techniques which will allow alternative classification methods to be tested empirically.

4.6 Implications for Theories on Impaired Control in Gambling

This research has not set out to evaluate the various models of excessive gambling behaviour. In all of these models impaired control is an important component. However, the results have identified a number of important factors which are involved in gambler's self-control and these can be related back to certain of the theories which have been proposed to explain impaired control in gambling behaviour.

Cognitive factors were shown to be an important influence on the self-control of poker machine players. A belief in the ability to predict poker machine outcomes was involved in problem gamblers' persistence when losing and may be implicated in the development of increasing impaired control in non-problem gamblers. This provides support for suggestions that beliefs associated with Langer's (1975) illusion of control may serve to maintain persistence in gambling behaviour. The presence of beliefs related to the phenomenon of chasing (Lesieur, 1979; Oldman, 1978) were also shown to be important factors in the persistence of problem gamblers (but not non-problem gamblers) when losing. Whether this constitutes more a description of an aspect of problem gambling behaviour rather than an explanatory process cannot be determined from the study.

The other strand to emerge from the research is the importance of both positive and negative emotional factors in poker machine playing. The influence of negative emotions on the self-control of problem gamblers supports the findings and theories of a number of researchers. Cummings et al. (1980) identified emotional distress as an important precipitant of relapse in compulsive gamblers. Zimmerman et al. (1985) proposed gambling as a release from frustration and worry and McCormick et al. (1984) suggested that gambling may act as an anti-depressant for excessive gamblers. This raises the possibility that gambling may function as an emotional regulator for some problem gamblers. The theme of emotional regulation was a central component of a model developed by Leventhal and Cleary (1980) as an explanation of addictive smoking. Similarities between the emotional aspects involved in excessive gambling and cigarette smoking are a further reminder of

commonalities which exist among a variety of excessive behaviours.

Positive emotion in the form of excitement has also been shown to be another important component in the behaviour of problem gamblers and may be involved in the development of impaired control in non-problem gamblers. This corresponds with a number of theorists who have proposed excitement as an explanatory factor in problem gambling (Anderson & Brown, 1984; Blaszczynski et al., 1986; Dickerson & Adcock, 1987; Leary & Dickerson, 1985). One of the models which incorporates excitement as a determinant of problem gambling also combines two of the other major factors identified in this study. Dickerson and Adcock (1987) suggested both prior disturbed mood and the illusion of control are factors which might retard the arousal or excitement habituation process in gamblers and hence increase their persistence at gambling.

4.7 Conclusions

The study resulted in the development of an instrument to measure subjectively assessed self-control in poker machine players. It has been shown to effectively discriminate between problem and non-problem gamblers. The differentiation between self-control in decisions to begin and to persist at gambling which is incorporated in the measure has been shown to be useful in looking at impaired control in varied situations such as relapses or persistence while losing. The instrument has the potential to form the basis of a measure of degrees of dependence in gambling.

The results of the responses to the self-control questionnaire suggest that for problem gamblers self-control is more difficult to maintain when playing and losing than in situations involving a decision

to begin or not. It has also been demonstrated that cognitive and emotional factors are subjectively appraised as having a bigger influence on impaired control in problem gamblers than external factors. Of these factors negative emotional states such as frustration or depression, a belief in the ability to predict when poker machines were about to pay and the adoption of a chasing philosophy were shown to be most influential on the impairment of self-control. For lower involvement players the main factors involved in impaired control were excitement and a belief in the ability to predict wins. These may be predisposing factors towards the development of increasing impaired control in poker machine players.

Increasing levels of involvement in poker machine play were found to be positively correlated with increasing difficulties in self-control. However, the results indicated that other factors were also involved. Despite the clarity of the discrimination between the gambling groups in the canonical variate analysis, the findings do not resolve the issue of whether self-control is a continuous concept or whether there are qualitative differences between problem and non-problem gamblers. It is suggested that similar analyses should be carried out on other populations of gamblers involving varying levels of involvement and various types of gambling activities. The study highlights the lack of agreement in the literature on classification models and the limitations of current statistical techniques in resolving this issue.

Appendix A

DSM-III Diagnostic Criteria for Pathological Gambling

- A. The individual is chronically and progressively unable to resist impulses to gamble.
- B. Gambling compromises, disrupts or damages family, personal, and vocational pursuits, as indicated by at least three of the following:
 - (1) arrest for forgery, fraud, embezzlement, or income tax evasion due to attempts to obtain money for gambling
 - (2) default on debts or other financial responsibilities
 - (3) disrupted family or spouse relationship due to gambling
 - (4) borrowing of money from illegal sources (loan sharks)
 - (5) inability to account for loss of money or to produce evidence of winning money, if this is claimed
 - (6) loss of work due to absenteeism in order to pursue gambling activity
 - (7) necessity for another person to provide money to relieve a desperate financial situation.
- C. The gambling is not due to Antisocial Personality Disorder.

Appendix B

Questionnaire 1 - Actual Gambling Behaviours and Demographics

Questionnaires on Poker Machine Play

These questionnaires are part of a project aimed at gathering information on various aspects of poker machine play. Some of these aspects include how people choose to stop and start playing, the frequency of play, the regularity of expenditure on poker machines and the various reasons people have for playing poker machines.

On the following double-sided pages are a number of questions on poker machine play. Some of the questions refer to your poker machine play over previous periods such as the last month or the last year. If you have not played in the last month or for some time your answers should refer to times when you were playing, such as the last month when you were playing or the last year when you were playing. You are asked to write your answers in the appropriate spaces or where alternative answers are already given you are asked to *underline* the answer which best fits your reply. There are no right or wrong answers.

Please return the completed questionnaires in the attached reply paid envelope. All information you provide will be treated as confidential. In order that participants cannot be identified, *do not* write your name on these pages. Thank you for your assistance.

Tony Corless
Gambling Project
ANU Psychology Department

Poker Machine Play

1. Sex: Male Female
2. Age: _____ years
3. In the last month, how often have you played the poker machines?
once a month once a week twice a week 3-5 times a week every day
4. How often do you usually play the poker machines?
rarely, once a year or less several times a year but less than once a month
once a week twice a week 3 to 5 times a week every day
5. In the last month were poker machines the main form of gambling (in terms of hours and money spent) you used?
Yes No
6. In any one session how long do you usually play for?
less than 1/2 hr 1/2 to 1 hr 1 to 2 hrs 2 to 3 hrs 3 to 4 hrs more than 4 hrs
7. Does the above level stay regular or does it fluctuate?
very regular fairly regular varies quite a bit
regular but interspersed with not playing at all
8. How long have you been playing at your present level? _____ yrs
9. Before or after a session of playing, do you spend any time thinking or talking about playing? Estimate the time involved.
not at all few infrequent thoughts/conversations
regularly thought about most days frequently thought about most days
frequently and intrudes into other thoughts/work (spoils concentration on other activities)
10. Do you sometimes feel that the way you play can influence your chances of winning?
never, hardly ever occasionally usually always, nearly always
11. Do you think you can predict when machines may be more likely to pay out?
never, hardly ever occasionally usually always, nearly always
12. How often might you change machines in a session?
never, hardly ever occasionally usually always, nearly always

13. How much would you usually spend in one session?
\$ _____
14. Does the amount you usually spend in a session vary much?
very regular fairly regular varies a bit varies a lot
15. Would the amount you spend in a session have changed over the last year?
decreased a lot decreased a little no change increased a little increased a lot
16. How much would you spend per week on poker machines (not including winnings restaked but own cash spent)?
\$ _____
17. Over the past year, in terms of winnings, do you think you are:
up even down
18. What sum of money represents for you a big win?
\$ _____
19. When you play the poker machines do you mainly play:
to win a major payout to win money, not necessarily a major payout
for entertainment to be sociable to forget your troubles
for something to do for excitement for a challenge something to look forward to
other reasons, please specify _____
20. Do you ever plan or budget what you are going to spend on playing?
no sometimes frequently always
21. In the last 5 sessions how often have you spent more than planned?
once twice 3 times 4 times 5 times none
22. Have you ever tried to reduce or stop playing poker machines?
yes no
23. If the answer to Q.22 was yes, was it easy or hard to reduce or stop?
very easy easy neither easy nor hard hard very hard
24. At what age did you start playing poker machines?
_____ years
25. Do you remember any early big wins when you started?
yes no
26. Have you ever sought help to reduce or stop your expenditure on gambling?
yes no

In the last year how often have you spent more than you could afford on poker machines. For example:

27. How often have you taken from other leisure funds?
not at all sometimes frequently always
28. How often have you taken from housekeeping funds?
not at all sometimes frequently always
29. How often have you taken from next week's wages in advance?
not at all sometimes frequently always
30. How often have you taken from savings?
not at all sometimes frequently always
31. How often have you taken a loan from a friend or an institution?
not at all sometimes frequently always

Appendix C

Questionnaire 2 - Likelihood of Occurrence of a Gambling
Response**GAMBLING QUESTIONNAIRE**

One of the most important things about our habits such as smoking, drinking or gambling is how we choose to or choose not to stop and start and how different situations influence our choices.

Sometimes it is easy to say no to another drink or cigarette and, in another situation, it is hard. We are interested how in different situations people choose to stop and start their gambling.

On the following double-sided page a number of different situations are described and you are asked to underline what you would do in these different situations. If you have not been in some of these situations, imagine yourself in the situation and what you would do.

There are no right or wrong answers. All information is given in confidence and will be treated accordingly.

Tony Corless
Gambling Project
ANU Psychology Department

When you are at home or at work (i.e. not at the club), how often in the last month have you had a strong feeling of wanting to play the poker machines?

once a month once a week twice a week 3 to 5 times a week every day
not at all

How likely is it that you would go to your club to play the poker machines if:

1. If you have had a disappointing or frustrating day.
very likely likely neither likely nor unlikely unlikely very unlikely
2. If it's the weekend and you have a large amount of cash on hand.
very unlikely unlikely neither unlikely nor likely likely very likely
3. If you believe it's your lucky day.
very likely likely neither likely nor unlikely unlikely very unlikely
4. If you want to go to your club but a relative (or close friend) argues that you shouldn't go to the club because they don't like you gambling.
very unlikely unlikely neither unlikely nor likely likely very likely
5. If you have had some good luck and you want to celebrate.
very likely likely neither likely nor unlikely unlikely very unlikely

If you are at your club playing poker machines how easy or hard is it for you to stop playing:

1. If you have had a lot of near misses on the machine and you are losing more than you planned to spend.
very easy easy neither easy nor hard hard very hard
2. If you have lost more than you can afford and a number of jackpots have been won on poker machines near you.
very hard hard neither hard nor easy easy very easy
3. If you have urgent debts which must be paid soon and you are losing on the machines.
very easy easy neither easy nor hard hard very hard
4. If you have lost all the cash you brought with you but you know you can cash a cheque or borrow from a friend.
very hard hard neither hard nor easy easy very easy

If you are at your club playing the poker machines and you have run out of coins how likely is it that you would go to the cashier for more coins:

1. If you are losing and you feel lonely and depressed.
very likely likely neither likely nor unlikely unlikely very unlikely
2. If you have lost all of a big win you had early in the session and you are now losing your original stake.
very unlikely unlikely neither unlikely nor likely likely very likely
3. If you have lost more than you planned to spend but you believe the machine you are playing is ready to pay.
very likely likely neither likely nor unlikely unlikely very unlikely
4. If a friend (or relative) wants you to stop playing as you have lost more than you can afford.
very unlikely unlikely neither unlikely nor likely likely very likely
5. If you have lost more money than you had planned to spend but you are finding it exciting.
very likely likely neither likely nor unlikely unlikely very unlikely

How easy or hard is it to resist the temptation to go to your club and play the poker machines if:

1. If you have urgent debts which have to be paid soon.
very hard hard neither hard nor easy easy very easy
2. If you are at home and your friends (or relatives) are talking to you about their recent wins on the poker machines.
very easy easy neither easy nor hard hard very hard
3. If you are feeling lonely and depressed.
very hard hard neither hard nor easy easy very easy

If you go to your club to have a meal or a drink or to meet friends.

1. How easy or hard is it to resist the temptation to play the machines.
very easy easy neither easy nor hard hard very hard

When you are at home or at work (i.e. not at the club), how often in the last month have you had a strong feeling of wanting to play the poker machines?

once a month once a week twice a week 3 to 5 times a week every day
not at all

How likely is it that you would go to your club to play the poker machines if:

1. If you have had a disappointing or frustrating day.

very likely likely neither likely nor unlikely unlikely very unlikely
(Internal factor - negative emotion)

2. If it's the weekend and you have a large amount of cash on hand.

very unlikely unlikely neither unlikely nor likely likely very likely
(External factor - discriminative stimulus)

3. If you believe it's your lucky day.

very likely likely neither likely nor unlikely unlikely very unlikely
(Internal factor - positive cognition)

4. If you want to go to your club but a relative (or close friend) argues that you shouldn't go to the club because they don't like you gambling.

very unlikely unlikely neither unlikely nor likely likely very likely
(External factor - relationship)

5. If you have had some good luck and you want to celebrate.

very likely likely neither likely nor unlikely unlikely very unlikely
(Internal factor - positive emotion)

If you are at your club playing poker machines how easy or hard is it for you to stop playing:

6. If you have had a lot of near misses on the machine and you are losing more than you planned to spend.

very easy easy neither easy nor hard hard very hard
(Internal factor - negative emotion)

7. If you have lost more than you can afford and a number of jackpots have been won on poker machines near you.

very hard hard neither hard nor easy easy very easy
(External factor - discriminative stimulus)

8. If you have urgent debts which must be paid soon and you are losing on the machines.

very easy easy neither easy nor hard hard very hard
(Internal factor - negative cognition)

9. If you have lost all the cash you brought with you but you know you can cash a cheque or borrow from a friend.

very hard hard neither hard nor easy easy very easy
(External factor - discriminative stimulus)

If you are at your club playing the poker machines and you have run out of coins how likely is it that you would go to the cashier for more coins:

10. If you are losing and you feel lonely and depressed.

very likely

likely

neither likely nor unlikely

unlikely

very unlikely

(Internal factor - negative emotion)
11. If you have lost all of a big win you had early in the session and you are now losing your original stake.

very unlikely

unlikely

neither unlikely nor likely

likely

very likely

(External factor - discriminative stimulus)
12. If you have lost more than you planned to spend but you believe the machine you are playing is ready to pay.

very likely

likely

neither likely nor unlikely

unlikely

very unlikely

(Internal factor - positive cognition)
13. If a friend (or relative) wants you to stop playing as you have lost more than you can afford.

very unlikely

unlikely

neither unlikely nor likely

likely

very likely

(External factor - relationship)
14. If you have lost more money than you had planned to spend but you are finding it exciting.

very likely

likely

neither likely nor unlikely

unlikely

very unlikely

(Internal factor - positive emotion)

How easy or hard is it to resist the temptation to go to your club and play the poker machines if:

15. If you have urgent debts which have to be paid soon.

very hard

hard

neither hard nor easy

easy

very easy

(Internal factor - negative cognition)
16. If you are at home and your friends (or relatives) are talking to you about their recent wins on the poker machines.

very easy

easy

neither easy nor hard

hard

very hard

(External factor - discriminative stimulus)
17. If you are feeling lonely and depressed.

very hard

hard

neither hard nor easy

easy

very easy

(Internal factor - negative emotion)

If you go to your club to have a meal or a drink or to meet friends.

18. How easy or hard is it to resist the temptation to play the machines.

very easy

easy

neither easy nor hard

hard

very hard

(External factor - discriminative stimulus)

Appendix E

ANOVA Summary Tables for Sex by Gambling Group
on Self-control Scales

Self-control scale

Source	SS	df	MS	F
Total	20131.8	64		
Group	11842.3	2	5921.2	43.3*
Sex	110.6	1	110.6	0.8
Interaction	101.6	2	50.8	0.4
Within subjects	8077.3	59	136.9	

* $p < .01$

Likelihood to begin sub-scale

Source	SS	df	MS	F
Total	4904.6	64		
Group	2458.5	2	1229.3	30.4*
Sex	39.2	1	39.2	1.0
Interaction	22.1	2	11.1	0.3
Within subjects	2384.7	59	40.4	

* $p < .01$

Likelihood to persist sub-scale

Source	SS	df	MS	F
Total	6111.6	64		
Group	3594.8	2	1797.4	43.0*
Sex	18.1	1	18.1	0.4
Interaction	34.2	2	17.1	0.4
Within subjects	2464.5	59	41.8	

* $p < .01$

Appendix F

**Summary Tables for an Analysis of Covariance of the
Means of Self-control Scales for the Low Frequency, Regular
and Problem Gambling Groups with Age as a Covariate**

Self-control scale

Source	SS	df	MS	F
Total	19466.7	64		
Group	11177.2	2	5588.6	41.2*
Covariate	6.9	1	6.9	0.1
Within subjects	8282.5	61	135.8	

* $p < .01$

Likelihood to begin scale

Source	SS	df	MS	F
Total	4997.6	64		
Group	2551.6	2	1275.8	32.6*
Covariate	61.9	1	61.9	1.6
Within subjects	2384.1	61	39.1	

* $p < .01$

Likelihood to persist scale

Source	SS	df	MS	F
Total	5619.5	64		
Group	3102.8	2	1551.4	39.3*
Covariate	110.0	1	110.0	2.8
Within subjects	2406.7	61	39.5	

* $p < .01$

Appendix G

Item-total Correlations and Alphas for Component Scales

Total Likelihood to Begin

Alpha = .863

Item no.	Item-total correlation	Alpha if item deleted
1	.663	.842
15	.703	.838
17	.611	.847
3	.465	.860
5	.599	.848
2	.516	.857
4	.493	.858
16	.682	.841
18	.627	.846

Total Likelihood to Persist

Alpha = .908

Item no.	Item-total correlation	Alpha if item deleted
6	.772	.891
8	.711	.896
10	.710	.896
12	.665	.900
14	.500	.910
7	.803	.890
9	.723	.895
11	.776	.891
13	.511	.910

Internal Factors - Likelihood to Begin

Alpha = .791

Item no.	Item-total correlation	Alpha if item deleted
1	.638	.728
15	.684	.714
17	.593	.743
3	.432	.792
5	.509	.769

Internal Factors - Likelihood to Persist

Alpha = .838

Item no.	Item-total correlation	Alpha if item deleted
6	.721	.781
8	.721	.781
10	.697	.789
12	.655	.804
14	.424	.858

External Factors - Likelihood to Begin

Alpha = .707

Item no.	Item-total correlation	Alpha if item deleted
2	.452	.674
4	.453	.670
16	.481	.653
18	.605	.579

External Factors - Likelihood to Persist

Alpha = .837

Item no.	Item-total correlation	Alpha if item deleted
7	.799	.736
9	.685	.786
11	.687	.785
13	.516	.856

Negative Internal Factors - Likelihood to Begin

Alpha = .830

Item no.	Item-total correlation	Alpha if item deleted
1	.622	.835
15	.708	.750
17	.745	.708

Negative Internal Factors - Likelihood to Persist

Alpha = .850

Item no.	Item-total correlation	Alpha if item deleted
6	.703	.806
8	.765	.747
10	.691	.818

Positive Internal Factors - Likelihood to Begin

Alpha = .707

Item no.	Item-total correlation	Alpha if item deleted
3	.547	-
5	.547	-

Positive Internal Factors - Likelihood to Persist

Alpha = .587

Item no.	Item-total correlation	Alpha if item deleted
12	.416	-
14	.416	-

Appendix H

Individual Subject Scores for Each Item in the Self-control Scale
(Appendix D)

Subjects	Items																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Low Frequency																		
1	1	4	1	1	2	2	2	2	1	1	1	1	1	2	1	1	1	1
2	1	2	4	2	4	2	2	2	1	4	2	4	2	4	2	2	3	2
3	1	4	4	2	4	2	2	2	2	3	2	4	2	4	1	4	3	3
4	3	1	4	4	3	1	2	1	1	1	1	2	2	4	1	2	3	2
5	1	1	1	1	1	1	3	1	1	1	2	1	1	4	1	1	1	3
6	1	2	2	1	2	1	2	1	1	1	1	2	1	2	1	1	1	2
7	2	3	5	3	5	2	3	4	1	4	2	3	2	4	3	2	3	5
8	2	3	3	2	3	1	2	1	1	2	1	3	1	2	1	3	1	3
9	1	1	3	2	3	3	2	2	2	2	2	4	2	4	2	2	2	3
10	3	2	3	5	3	3	2	3	1	2	2	3	3	4	2	2	1	1
11	1	2	2	1	2	1	1	1	1	1	1	2	2	2	1	1	1	1
12	1	1	2	3	2	1	2	1	1	1	1	1	5	2	1	1	1	4
13	4	3	3	1	4	1	2	3	2	5	2	4	1	5	2	4	3	4
14	2	1	1	1	4	2	4	4	4	5	5	5	1	1	1	1	5	5
15	4	3	1	1	1	4	4	4	2	5	4	5	1	4	4	3	5	1
16	3	3	1	1	4	4	1	1	1	5	4	4	1	4	1	1	3	3
17	3	3	3	3	3	1	1	2	1	2	2	2	1	4	1	1	1	2
18	1	5	1	1	1	2	1	1	1	2	1	1	1	2	1	1	1	3
19	3	3	3	4	3	4	4	2	2	2	3	4	4	4	1	1	2	2
20	1	1	3	1	1	1	1	1	1	1	1	3	1	3	1	1	1	1
21	1	1	2	2	2	1	1	1	1	4	1	4	4	4	1	1	1	2
22	1	1	3	1	4	3	2	1	1	1	4	4	1	4	1	1	3	3
23	1	1	4	1	3	4	4	4	3	4	3	3	3	4	3	4	3	3
24	1	1	1	1	1	2	2	1	2	1	1	5	1	1	1	1	1	1
25	2	1	1	1	1	1	2	2	2	4	1	2	1	1	1	1	1	1
26	1	5	1	1	5	1	5	1	1	5	1	5	5	5	5	5	5	5

cont/...

Subjects	Items																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Regular Frequency																		
1	1	3	4	2	4	2	2	3	2	2	2	3	2	3	2	2	2	3
2	4	5	3	3	3	4	2	2	2	5	5	5	3	5	2	4	4	4
3	2	3	1	3	3	2	2	1	1	2	2	5	2	2	2	2	3	3
4	1	4	3	4	3	4	3	1	3	4	1	3	2	2	2	3	3	4
5	1	1	3	3	4	1	1	1	1	2	2	2	3	2	1	1	1	3
6	4	3	3	1	3	3	2	1	2	4	2	3	5	3	1	1	1	3
7	3	5	1	2	3	1	4	2	1	4	2	4	1	2	1	1	3	3
8	4	1	4	4	2	1	4	2	4	4	4	4	3	4	4	3	4	4
9	3	4	3	3	3	2	1	1	2	1	2	3	3	3	2	3	2	4
10	1	3	5	5	4	3	3	4	3	5	2	1	1	1	3	1	1	5
11	5	2	5	1	5	3	3	3	3	4	2	4	1	1	3	3	3	3
12	4	2	1	5	1	4	4	1	2	3	4	4	3	4	2	2	4	4
13	4	4	3	2	4	4	3	2	3	3	4	4	4	5	2	2	2	3
14	3	3	4	3	3	1	2	1	1	3	4	4	1	2	1	2	2	4

cont/...

Subjects	Items																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Problem Gamblers																		
1	5	5	5	4	5	5	5	3	5	5	5	5	3	5	2	2	1	3
2	3	1	1	1	1	2	2	3	1	4	2	4	1	3	2	2	3	1
3	4	3	3	4	3	4	4	4	4	5	4	4	4	5	4	3	5	3
4	4	4	4	4	4	4	4	2	2	4	4	4	2	2	2	3	2	4
5	4	5	4	3	5	4	5	4	4	5	5	5	4	5	4	3	3	4
6	5	5	3	3	2	3	3	3	4	5	4	4	2	4	3	3	4	4
7	5	5	5	3	5	5	5	5	5	5	4	5	4	3	5	3	5	5
8	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	2	5	5
9	4	4	3	4	3	4	4	3	2	5	5	4	2	4	3	4	5	5
10	5	4	3	2	4	4	3	5	4	5	2	4	1	4	4	3	5	1
11	5	4	4	2	4	5	5	3	5	4	4	4	4	4	2	2	4	4
12	4	5	4	5	5	5	5	5	1	5	5	5	5	5	1	1	1	5
13	3	2	2	3	2	4	4	4	4	4	4	5	3	4	3	3	3	4
14	5	5	2	1	3	5	3	2	2	5	5	2	4	2	2	3	5	4
15	5	4	4	2	5	5	5	5	4	5	4	5	4	4	4	4	4	3
16	5	5	5	5	5	5	5	5	5	5	5	5	3	5	5	5	5	5
17	4	1	4	5	3	5	3	5	3	4	1	4	1	3	3	3	4	5
18	5	3	3	1	3	5	5	4	5	5	5	5	4	5	3	3	4	3
19	4	3	1	4	2	4	5	4	4	5	5	5	3	3	5	3	4	3
20	5	4	5	4	5	4	4	4	4	5	4	4	2	4	4	4	4	4
21	4	2	4	2	2	2	4	2	3	5	4	4	2	1	2	4	5	2
22	2	1	4	1	1	5	1	5	1	5	3	5	1	1	4	1	3	3
23	5	5	3	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
24	4	1	5	4	2	5	5	5	5	5	5	5	5	5	5	5	5	5
25	5	5	1	4	5	4	4	5	2	5	5	5	4	4	4	4	5	4
26	5	5	5	4	5	5	5	4	2	4	4	5	4	4	5	4	4	5

APPENDIX I

ANOVA Summary Tables and Scheffé Tests for Comparison of Low Frequency, Regular and Problem Gambling Groups Means for the Self Control Sub-scales

An analysis of variance was carried out on the scale for the likelihood to begin gambling, for the three groups. The ANOVA yielded a significant treatment effect, $F_{(2,63)} = 32.14$, $p < .01$.

ANOVA Summary Table for Likelihood to Begin Gambling Scale

Source	SS	df	MS	F
Total	4943.17	65		
Between subjects	2496.34	2	1248.17	32.14*
Within subjects	2446.83	63	38.84	

* $p < .01$

A Scheffé test was carried out on the means of the three groups. The mean for the problem gambling group was found to be significantly higher than the regular gamblers' mean score, $F_{(2,63)} = 3.64$, $p < .05$. The mean for regular gamblers was found to be significantly higher than the mean for low frequency gamblers, $F_{(2,63)} = 3.05$, $p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51$, $p < .05$.

An analysis of variance was carried out on the scale assessing the likelihood to persist at gambling. The ANOVA yielded a significant treatment effect, $F_{(2,63)} = 43.34$, $p < .01$.

ANOVA Summary Table for Likelihood to Persist at Gambling Scale

Source	SS	df	MS	F
Total	6114.12	65		
Between subjects	3540.65	2	1770.32	43.34*
Within subjects	2573.47	63	2573.47	

* $p < .01$

A Scheffé test was carried out on the means of the three groups. The problem gamblers' mean score was found to be significantly higher than the regular gamblers' mean score, $F_{(2,63)} = 5.98, p < .05$. The difference between the regular and low frequency gambling group means did not reach significance, $F_{(2,63)} = 1.53, p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51, p < .05$.

An ANOVA on the internal factors scale for the likelihood to begin yielded a significant treatment effect $F_{(2,63)} = 32.85, p < .01$.

ANOVA Summary Table for Internal Factors Likelihood to Begin Scale

Source	SS	df	MS	F
Total	1802.36	65		
Between subjects	920.03	2	460.02	32.85*
Within subjects	882.33	63	14.01	

* $p < .01$

A Scheffé test to compare the means of the groups was carried out. The mean of the problem gambling group was found to be significantly higher than the mean of the regular gambling group, $F = 4.29, p < .05$. There was no difference between the regular and low frequency group, $F_{(2,63)} = 2.45, p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51, p < .05$.

An analysis of variance was carried out on the internal factors scale for the likelihood to persist at gambling. The ANOVA yielded a significant treatment effect, $F_{(2,63)} = 37.98$.

ANOVA Summary Table for Internal Factors Likelihood to Persist at Gambling

Source	SS	df	MS	F
Total		65		
Between subjects	1074.81	2	537.41	37.98*
Within subjects	891.45	63	14.15	

* $p < .01$

A Scheffé test on the means of the three groups indicated that the mean of the problem gambling group was significantly higher than the mean of the regular gamblers, $F_{(2,63)} = 6.096$, $p < .05$. There were no differences between the means of the regular and low frequency gambling groups, $F_{(2,63)} = 0.76$, $p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51$, $p < .05$.

An analysis of variance was carried out on the external factors scale for the likelihood to begin gambling. The ANOVA yielded a significant treatment effect, $F_{(2,63)} = 19.48$, $p < .01$.

ANOVA Summary Table for External Factors Likelihood to Begin Gambling Scale

Source	SS	df	MS	F
Total	1037.53	65		
Between subjects	396.48	2	198.24	19.48*
Within subjects	641.05	63	10.18	

* $p < .01$

A Scheffé test was carried out on the means of the three groups. The difference between the mean score in the problem gambling group and the mean score in the regular gambling group did not reach significance,

$F_{(2,63)} = 2.08, p < .05$. The mean for the regular gambling group was found to be significantly higher than the low frequency group mean score, $F_{(2,63)} = 3.1, p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51, p < .05$.

An analysis of variance was carried out on the external factors scale for the likelihood to persist at gambling. The ANOVA yielded a significant treatment effect, $F_{(2,63)} = 32.64, p < .01$.

ANOVA Summary Table for External Factors Scale for the Likelihood to Persist at Gambling Scale

Source	SS	df	MS	F
Total	1422.98	65		
Between subjects	724.16	2	362.08	32.64*
Within subjects	698.83	63	11.09	

$p < .01$

A Scheffé test was carried out on the means of the three groups. The problem gamblers' mean score was found to be significantly higher than the regular gamblers' mean score, $F_{(2,63)} = 4.64, p < .05$. There was no significant difference between the regular and low frequency mean scores, $F_{(2,63)} = 2.0, p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51, p < .05$.

An ANOVA carried out on the negative internal factors scale of likelihood to begin gambling yielded a significant treatment effect, $F_{(2,63)} = 40.02, p < .01$.

ANOVA Summary Table for Negative Factors Scale for the Likelihood to Begin Gambling Scale

Source	SS	df	MS	F
Total	957.53	65		
Between subjects	535.78	2	267.89	40.02*
Within subjects	421.75	63	6.69	

* $p < .01$

A Scheffé test was carried out on the means of the three groups. The means of the problem gambling group scores was found to be significantly higher than the regular gambling group scores, $F_{(2,63)} = 5.19$, $p < .05$. The differences between the regular and low frequency mean scores did not reach significance, $F_{(2,63)} = 2.16$, $p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51$, $p < .05$.

An ANOVA on the negative internal factor scale for the likelihood to persist at gambling yielded a significant treatment effect, $F_{(2,63)} = 50.08$, $p < .01$.

ANOVA Summary Table for Negative Internal Factors for the Likelihood to Persist at Gambling Scale

Source	SS	df	MS	F
Total	1016.67	65		
Between subjects	624.08	2	312.04	50.08*
Within subjects	392.58	63	6.23	

* $p < .01$

A Scheffé test was carried out on the means of the groups. The problem gamblers' mean score was significantly higher than the mean score for the regular gambling group, $F_{(2,63)} = 6.71$, $p < .05$. The difference between the regular and low frequency mean scores did not reach significance, $F_{(2,63)} = 1.29$, $p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51$, $p < .05$.

An ANOVA on the positive internal factors scale for the likelihood to begin yielded a significant treatment effect, $F_{(2,63)} = 5.53$, $p < .01$.

**ANOVA Summary Table for Positive Internal Factor Scale
for the Likelihood to Begin Gambling Scale**

Source	SS	df	MS	F
Total	363.17	65		
Between subjects	54.27	2	27.14	5.53*
Within subjects	308.90	63	4.90	

* $p < .01$

A Scheffé test was carried out on the means of the three groups. The difference between the means of the problem and regular gambling group did not reach significance, $F_{(2,63)} = 1.17$, $p < .05$. No significant difference was found between the mean of the regular gambling group and the mean of the low frequency group, $F_{(2,63)} = 1.59$, $p < .05$. The mean of the problem gambling group was found to be significantly higher than the mean of the low frequency group, $F_{(2,63)} = 2.77$, $p < .05$. The critical value of F for these comparisons was $F_{(2,63)} = 2.51$, $p < .05$.

An ANOVA on the positive internal factors scale of the likelihood to persist at gambling yielded a significant treatment effect, $F_{(2,63)} = 8.41$, $p < .01$.

**ANOVA Summary Table for Positive Internal Factor Scale for Likelihood
to Persist Scale**

Source	SS	df	MS	F
Total	294.26	65		
Between subjects	61.98	2	30.99	8.41*
Within subjects	232.28	63	3.69	

$p < .01$

A Scheffé test was carried out on the means of the three groups. The problem gamblers' mean score was found to be significantly higher than the regular gamblers' mean score, $F_{(2,63)} = 3.17$, $p < .05$. The difference

between the regular and the low frequency mean scores did not reach significance, $F_{(2,63)} = -0.09$, $p < .05$. The critical value of F for these comparisons $F_{(2,63)} = 2.51$, $p < .05$.

Appendix J

**Summary Tables for ANOVAs on Selected Self-control
Item Means for Low Frequency, Regular and Problem Gambling Groups**

Item 1				
Source	SS	df	MS	F
Total	157.9	65		
Between subjects	89.5	2	44.7	41.1**
Within subjects	68.5	63	1.1	

** $p < .01$

Item 8				
Source	SS	df	MS	F
Total	143.9	65		
Between subjects	72.9	2	36.5	32.4**
Within subjects	71.0	63	1.1	

** $p < .01$

Item 5				
Source	SS	df	MS	F
Total	113.8	65		
Between subjects	10.2	2	5.1	3.1
Within subjects	103.6	63	1.6	

Item 14				
Source	SS	df	MS	F
Total	109.3	65		
Between subjects	10.3	2	5.1	3.3*
Within subjects	99.0	63	1.6	

$p < .05$

Item 2				
Source	SS	df	MS	F
Total	147.0	65		
Between subjects	27.9	2	14.0	7.4**
Within subjects	119.1	63	1.9	

** $p < .01$

Item 3				
Source	SS	df	MS	F
Total	121.0	65		
Between subjects	17.4	2	8.7	5.3**
Within subjects	103.5	63	1.6	

** $p < .01$

Item 10				
Source	SS	df	MS	F
Total	147.5	65		
Between subjects	60.2	2	30.1	21.7**
Within subjects	87.4	63	1.4	

** $p < .01$

Item 12				
Source	SS	df	MS	F
Total	98.6	65		
Between subjects	26.0	2	13.0	11.3**
Within subjects	72.7	63	1.2	

** $p < .01$

Item 18				
Source	SS	df	MS	F
Total	106.6	65		
Between subjects	22.7	2	11.3	8.5**
Within subjects	83.9	63	1.3	

** $p < .01$

Appendix K

**Summary of F Ratios for Scheffé Tests for Comparison of
Gambling Group Means for Selected Self-control Items**

Item No.	Comparisons of Means	F Ratios
1	Problem - regular	4.40*
	Regular - low	3.2*
8	Problem - regular	6.3*
	Regular - low	-0.3
14	Problem - regular	2.5
	Regular - low	-1.1
2	Problem - regular	1.4
	Regular - low	1.8
	Problem - low	3.8*
3	Problem - regular	1.1
	Regular - low	1.6
	Problem - low	3.3*
10	Problem - regular	3.8*
	Regular - low	1.6
12	Problem - regular	2.8*
	Regular - low	1.1
33	Problem - regular	0.6
	Regular - low	2.7*

* $p < .05$

Critical value of $F = 2.51$, $p < .05$

Appendix L

**Analysis of Covariance Summary Tables for Self-control Scales,
Urge to Gamble and Frequency of Overspending Using Average
Time Spent Gambling in a Month and
Average Outlay per Month as Covariates**

1. Self-control scale with time spent gambling as a covariate

Source	SS	df	MS	F
Total	12611.7	65		
Between subjects	4251.1	2	2125.6	17.06**
Covariate	635.5	1	635.5	5.10*
Within subjects	7725.0	62	124.6	

* $p < .05$; ** $p < .01$

2. Likelihood to begin gambling sub-scale with time spent gambling as a covariate

Source	SS	df	MS	F
Total	3417.8	65		
Between subjects	971.0	2	485.5	12.97**
Covariate	125.7	1	125.7	3.36
Within subjects	2321.1	62	37.4	

** $p < .01$

3. Likelihood to persist at gambling sub-scale with time spent gambling as a covariate

Source	SS	df	MS	F
Total	3808.9	65		
Between subjects	1235.4	2	617.7	16.11**
Covariate	196.0	1	196.0	5.11*
Within subjects	2377.5	62	38.4	

* $p < .05$; ** $p < .01$

4. Internal factors sub-scale, likelihood to begin, with time spent gambling as a covariate

Source	SS	df	MS	F
Total	1232.0	65		
Between subjects	349.7	2	174.9	12.89**
Covariate	41.5	1	41.5	3.06
Within subjects	840.8	62	13.6	

** $p < .01$

5. Internal factors sub-scale, likelihood to persist, with time spent gambling as a covariate

Source	SS	df	MS	F
Total	1289.4	65		
Between subjects	398.0	2	199.0	14.6**
Covariate	47.6	1	47.6	3.5
Within subjects	843.8	62	13.6	

** $p < .01$

6. External factors sub-scale, likelihood to begin, using time spent gambling as a covariate

Source	SS	df	MS	F
Total	807.5	65		
Between subjects	166.5	2	83.2	8.35**
Covariate	22.7	1	22.7	2.28
Within subjects	618.3	62	10.0	

** $p < .01$

7. External factors sub-scale, likelihood to persist, using time spent gambling as a covariate

Source	SS	df	MS	F
Total	939.9	65		
Between subjects	241.1	2	120.6	11.53**
Covariate	50.4	1	50.4	4.81*
Within subjects	648.5	62	10.5	

* $p < .05$; ** $p < .01$

8. Frequency of an impulse to begin gambling with time spent gambling as a covariate

Source	SS	df	MS	F
Total	132.2	65		
Between subjects	40.5	2	20.3	14.96**
Covariate	7.8	1	7.8	5.75*
Within subjects	83.9	62	1.4	

* $p < .05$; ** $p < .01$

9. Overspending with time spent gambling as a covariate

Source	SS	df	MS	F
Total	169.5	62		
Between subjects	37.7	2	18.9	9.08**
Covariance	9.2	1	9.2	4.45*
Within subjects	122.6	59	2.1	

* $p < .05$; ** $p < .01$

10. Self-control scale with outlay for month as a covariate

Source	SS	df	MS	F
Total	14420.7	61		
Between subjects	6430.5	2	3215.2	25.83**
Covariance	770.8	1	770.8	6.19*
Within subjects	7219.4	58	124.5	

* $p < .05$; ** $p < .01$

11. Likelihood to begin sub-scale with outlay per month as a covariate

Source	SS	df	MS	F
Total	3738.8	61		
Between subjects	1311.7	2	655.9	17.11**
Covariance	203.4	1	203.4	5.31*
Within subjects	223.7	58	38.3	

* $p < .05$; ** $p < .01$ **12. Likelihood to persist sub-scale with outlay per month as a covariate**

Source	SS	df	MS	F
Total	4336.3	61		
Between subjects	2018.8	2	1009.4	27.42**
Covariate	182.3	1	182.3	4.95*
Within subjects	2135.3	58	36.8	

* $p < .05$; ** $p < .01$ **13. Internal factors sub-scale, likelihood to begin, with outlay per month as a covariate**

Source	SS	df	MS	F
Total	1385.5	61		
Between subjects	515.1	2	257.5	18.26**
Covariate	52.6	1	52.6	3.73
Within subjects	817.8	58	14.1	

** $p < .01$ **14. Internal factors sub-scale, likelihood to persist, with outlay per month as a covariate**

Source	SS	df	MS	F
Total	1454.8	61		
Between subjects	596.5	2	298.2	21.24**
Covariate	43.8	1	43.8	3.12
Within subjects	814.6	58	14.0	

** $p < .01$

15. External factors sub-scale, likelihood to begin, with outlay per month as a covariate

Source	SS	df	MS	F
Total	826.5	61		
Between subjects	197.1	2	98.5	9.85**
Covariate	49.1	1	49.1	4.91*
Within subjects	580.3	58	10.0	

* $p < .05$; ** $p < .01$

16. External factors sub-scale, likelihood to persist, with outlay per month as a covariate

Source	SS	df	MS	F
Total	1010.2	61		
Between subjects	432.1	2	216.1	23.61**
Covariate	47.4	1	47.4	5.18*
Within subjects	530.7	58	9.2	

* $p < .05$; ** $p < .01$

17. Frequency of an impulse to begin gambling with outlay per month as a covariate

Source	SS	df	MS	F
Total	138.9	61		
Between subjects	52.8	2	26.4	20.96**
Covariate	12.9	1	12.9	10.24**
Within subjects	73.1	58	1.3	

* $p < .01$

18. Overspending with outlay per month as a covariate

Source	SS	df	MS	F
Total	207.0	61		
Between subjects	76.2	2	38.1	17.40**
Covariate	3.9	1	3.9	1.77
Within subjects	127.0	58	2.2	

** $p < .01$

Appendix M

Summary Tables for ANOVAs on the Means of Differences Between Sub-scales for the Three Gambling Groups and Summary Table of Scheffé Tests for Comparisons of Means

Likelihood to persist - likelihood to begin

Source	SS	df	MS	F
Total	23.7	65		
Between subjects	3.0	2	1.5	4.5*
Within subjects	20.7	63	0.3	

* $p < .05$

Internal factors (persist) - internal factors (begin)

Source	SS	df	MS	F
Total	25.6	65		
Between subjects	2.0	2	1.0	2.7
Within subjects	23.6	63	0.4	

External factors (persist) - external factors (begin)

Source	SS	df	MS	F
Total	49.4	65		
Between subjects	5.5	2	2.7	3.9*
Within subjects	43.9	63	0.7	

* $p < .05$

Scheffé Comparison of Means	Value of F
Total persist - begin	
Problem - regular	3.0*
Problem - low	1.5
Low - regular	1.8
Internal (persist) - internal (begin)	
Problem - regular	2.2
Problem - low	0.3
Low - regular	2.0
External (persist) - external (begin)	
Problem - regular	2.6*
Problem - low	2.0
Low - regular	0.9

* $p < .05$

Critical F = 2.51, $p < .05$

Appendix N

**Summary of Tests for Means of Differences Between Self-control
Sub-scales for the Three Gambling Groups**

Sub-scale comparisons	Gambling groups		
	Low	Regular	Problem
	2 tail t values		
Total persist - total begin	1.4	-1.2	3.5**
Internal (persist) - internal (begin)	3.7**	0.3	4.1**
External (persist) - external (begin)	-1.2	-2.0	1.6
Neg. internal (pers.) - neg. internal (begin)	2.2*	0.3	2.8**
Pos. internal (pers.) - pos. internal (begin)	2.5*	0.0	2.4*
Internal (persist) - external (persist)	4.9**	1.7	4.0**
Internal (begin) - external (begin)	0.1	-1.1	2.3*
Neg. internal (pers.) - pos. internal (pers.)	-5.4**	-2.4*	1.2
Neg. internal (begin) - pos. internal (begin)	-2.9**	-2.1	1.5

* $p < .05$; ** $p < .01$

REFERENCES

- Alloy, L., Abramson, L., & Viscusi, D. (1981). Induced mood and the illusion of control. *Journal of Personality and Social Psychology*, **41**, 1129-1140.
- Anokhin, P.K. (1955). Characteristics of the afferent apparatus of a conditioned reflex and its importance for psychology. *Problems of Psychology*, **6**, 16-38.
- Arnold, P. (1979). *The book of gambling*. London: Hamlyn.
- Australian Bureau of Statistics. (1986). *Australian Demographic Statistics* (Catalogue 3101.0). Canberra.
- Australian Bureau of Statistics.(1981). *Taxation Revenue Australia* (Catalogue 5506.0). Canberra.
- American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed.). Washington DC: Author.
- Anderson, G., & Brown, R.I.F. (1984). Real and laboratory gambling, sensation-seeking and arousal. *British Journal of Psychology*, **75**, 401-410.
- Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioural change. *Psychological Review*, **84**, 191-215.
- Barker, J.C., & Miller, M. (1966). Aversion therapy for compulsive gambling. *British Medical Journal*, **2**, 115.
- Beck, A.T., Ward, C.H., Mendelson, M., Mock, J., & Erlbaugh, J. (1961). An inventory for measuring depression. *Archives of General Psychiatry*, **4**, 561-571.

- Bergler, E. (1957). *The psychology of gambling*. New York: Hill and Wang Inc.
- Billings, A.G., & Moos, R.H. (1983). Psychosocial processes of recovery among alcoholics and their families: Implications for clinicians and program evaluators. *Addictive Behaviors*, 8, 205-218.
- Blaszczynski, A., Wilson, A.C., & McConaghy, N. (1986). Sensation seeking and pathological gambling. *British Journal of Addiction*, 81, 109-113.
- Blaszczynski, A.P., Winter, S.W., & McConaghy, W. (1985). Plasma endorphin levels in pathological gambling. In W.R. Eadington (Ed.), *The gambling studies proceedings of the sixth national conference on gambling and risk taking. Volume 5. The phenomenon of pathological gambling: Psychological theories and treatment strategies* (pp. 126-151). Reno: Bureau of Business and Economic Research College of Business Administration, University of Nevada.
- Boyd, J.H., Burke, J.D. Jr., Gruenberg, E., Hozer, C.A. III., & Rae, D.S. (1984). Exclusion criteria of DSM III. *Archives of General Psychiatry*, 41, 983-989.
- Brown, R.I.F. (1986). Arousal and sensation-seeking components in the general explanation of gambling and gambling addictions. *The International Journal of the Addictions*, 21, 1001-1016.
- Caldwell, G. (1985). Poker machine playing in NSW and ACT clubs. In G. Caldwell, B. Haig, M. Dickerson, & L. Sylvan (Eds.), *Gambling in Australia* (pp. 261-268). Sydney: Croom Helm.

- Chick, J. (1980a). Alcohol dependence: Methodological issues in its measurement; Reliability of the criteria. *British Journal of Addiction*, **75**, 175-186.
- Chick, J. (1980b). Is there a unidimensional alcohol dependence syndrome? *British Journal of Addiction*, **75**, 265-280.
- Cohen, J. (1972). *Psychological probability or the art of doubt*. London: Allen and Unwin.
- Corney, W.J., & Cummings, W.T. (1985). A locus of control perspective on gambling behaviour. In W.R. Eadington (Ed.), *The gambling studies proceedings of the sixth national conference on gambling and risk taking. Volume 3* (pp. 83-94). Reno: Bureau of Business and Economic Research, College of Business Administration, University of Nevada.
- Cornish, D.B. (1978). *Gambling: A review of the literature and its implications for policy and research*. HMSO: London.
- Culleton, R.P. (1985). *A survey of pathological gambling in the state of Ohio*. Philadelphia: Transition Planning Associates.
- Cummings, C., Gordon, J.R., & Marlatt, G.A. (1980). Relapse: Prevention and prediction. In W.R. Miller (Ed.), *The addictive behaviours: Treatment of alcoholism, drug abuse, smoking and obesity*. Oxford: Pergamon.
- Custer, R.L. (1984). Profile of the pathological gambler. *Journal of Clinical Psychiatry*, **45**, 35-38.
- Dell, L., Ruzicka, M., & Palisi, A. (1981). Personality and other factors associated with gambling addiction. *International Journal of the Addictions*, **16**, 149-156.

- Dickerson, M.G. (1974). *The effect of betting shop experience on gambling behaviour*. Unpublished Ph.D. thesis, University of Birmingham.
- Dickerson, M.G. (1977). The role of the betting shop environment in the training of compulsive gamblers. *Behavioral Psychotherapy*, 1, 24-29.
- Dickerson, M.G. (1979). FI schedules and persistence at gambling in the UK betting office. *Journal of Applied Behaviour Analysis*, 12, 315-23.
- Dickerson, M.G. (1984). *Compulsive gamblers*. New York: Longman.
- Dickerson, M.G. (1985). The importance of a field study approach to gambling research. In J. McMillen (Ed.), *Gambling in the 80's*, Brisbane: Griffith University Reprographics.
- Dickerson, M.G. (in press). The future of gambling research - learning from the lessons of alcoholism. *The Journal of Gambling Behaviour*.
- Dickerson, M.G., & Adcock, S. (1987). *Mood, arousal and cognitions in persistent gambling: Preliminary investigation of a theoretical model*. Manuscript submitted for publication.
- Dickerson, M.G., Fabre, J., & Bayliss, D. (1985). A comparison of TAB customers and poker machine players. In J. McMillen (Ed.), *Gambling in the 80's*. Brisbane: Griffith University Reprographics.
- Dickerson, M.G., & Hinchy, J. (1986). *The prevalence of excessive and pathological gambling in Australia*. Manuscript submitted for publication.

- Dickerson, M.G., Hinchy, J., & Fabre, J. (in press). Chasing, arousal and sensation seeking in off-course gamblers. *British Journal of Addiction*.
- Edwards, G., & Gross, M. (1976). Alcohol dependence: Provisional description of a clinical syndrome. *British Medical Journal*, 1, 1058-1061.
- Everitt, B.S. (1975). Multivariate analysis: The need for data, and other problems. *British Journal of Psychiatry*, 126, 237-240.
- Eysenck, H.J., Wakefield, J.A., Jr., & Friedman, A.F. (1983). Diagnosis and clinical assessment: The DSM-III. *Annual Review of Psychology*, 34, 167-193.
- Feighner, J.P., Robins, E., Guze, S.B., Woodruff, R.A., Winokur, G., & Munoz, R. (1972). Diagnostic criteria for use in psychiatric research. *Archives of General Psychiatry*, 26, 57-63.
- Ferster, C.B., & Skinner, B.F. (1957). *Schedules of reinforcement*. New York: Appleton - Century - Crofts.
- Frosch, J. (1977). The relation between acting out and disorders of impulse control. *Psychiatry*, 40, 295-314.
- Garside, R.F., & Roth, M. (1978). Multivariate statistical methods and problems of classification in psychiatry. *British Journal of Psychiatry*, 133, 53-67.
- Goffman, E. (1969). *Where the action is*. London: Allen Lane.
- Golin, S., Terrell, T., Weitz, J., & Drost, P.L. (1979). The illusion of control among depressed patients. *Journal of Abnormal Psychology*, 9, 363-368.
- Haig, B. (1985). In G. Caldwell, B. Haig, M. Dickerson, & L. Sylvan (Eds.), *Gambling in Australia* (pp.179-195). Sydney: Croom Helm.

- Heather, N., & Robertson, I. (1983). *Controlled drinking*. London: Methuen.
- Hodgson, R.J. (1980). Degrees of dependence and their significance. In M. Sandler (Ed.), *Psychopharmacology of alcohol*, New York: Raven Press.
- Hodgson, R.J. (1984). Craving and priming. In G. Edwards & J. Littleton (Eds.), *Pharmacological treatments for alcoholism*, London: Croom Helm.
- Hoff, E.C. (1961). The etiology of alcoholism. *Quarterly Journal of Studies of Alcohol*, supplement no. I, 177-181.
- Hope, K. (1969). Review of The Classification of Depressive Illnesses, by R.E. Kendell. *British Journal of Psychiatry*, **115**, 731-741.
- Jellinek, E.M. (1960). *The disease concept of alcoholism*. New Haven: Hillhouse Press.
- Kallick, M., Suits, D., Dielman, T., & Hybels, J. (1979). *A survey of American gambling attitudes and behaviour*. Ann Arbor: Survey Research Center, Institute for Social Research.
- Keller, M. (1972). On the loss-of-control phenomenon in alcoholism. *British Journal of Addiction*, **67**, 153-166.
- Koller, K.M. (1972). Treatment of poker machine addicts by aversion therapy. *Medical Journal of Australia*, **1**, 742-745.
- Kuhl, J. (1984). Volitional aspects of achievement motivation and learned helplessness: Toward a comprehensive theory of action control. *Progress in Experimental Personality Research*, Volume 13. B.A. Maher & W.B. Maher (Eds.), Orlando, Florida: Academic Press Inc.

- Ladouceur, R., & Mayrand, M. (1984). Evaluation of the "illusion of control": Type of feedback, outcome sequence, and number of trials among regular and occasional gamblers. *The Journal of Psychology*, **117**, 37-46.
- Langer, E.J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, **32**, 311-28.
- Leary, K., & Dickerson, M.G. (1985). *Behaviour Research Therapy*, **23**, 635-40.
- Leon, G., & Roth, L. (1977). Obesity: Psychological causes, correlations and speculations. *Psychological Bulletin*, **84**, 117-139.
- Lesieur, H.R. (1979). The compulsive gambler's spiral of options and involvement. *Psychiatry*, **42**, 79-87.
- Lesieur, H.R., Custer, R.L., & Blume, S. (1986). *Report on the Survey of Pathological Gambling for DSM III - rev.* Unpublished manuscript, funded by the South Oaks Foundation, Amityville, New York.
- Leventhal, H., & Cleary, P.D. (1980). The smoking problem: A review of the research and theory in behavioural risk modification. *Psychological Bulletin*, **88**, 370-405.
- Levitz, L.S. (1971). The experimental induction of compulsive gambling behaviours. *Dissertation Abstracts International*, **32**, B, 1216-1217.
- Levy, R. (1984). *The new language of psychiatry. Learning and using DSM-III.* Boston: Little, Brown and Company.
- Lorr, M. (1961). Classification of the behaviour disorders. *Annual Review of Psychology*, **12**, 195-216.

- Lyons, J.C. (1985). Differences in sensation seeking and in depression levels between male social gamblers and male compulsive gamblers. In W.R. Eadington (Ed.), *The gambling studies proceedings of the sixth national conference on gambling and risk taking*. Volume 5 (pp. 76-100). Reno: Bureau of Business and Economic Research, College of Business Administration, University of Nevada.
- Malkin, D. (1981). An empirical investigation into some aspects of problem gambling. Unpublished Masters thesis: University of Western Australia. Cited in M. G. Dickerson, *Compulsive gamblers*, London, Longman, 1984.
- Maxwell, A.E. (1971). Multivariate statistical methods and classification problems. *British Journal of Psychiatry*, **119**, 121-127.
- McConaghy, N., Armstrong, M.S., Blaszczynski, A., & Allcock, C. (1983). *British Journal of Psychiatry*, **142**, 366-372.
- McCormick, R.A., Russo, A.M., Ramirez, L., & Taber, J.I. (1984). Affective disorders among pathological gamblers seeking treatment. *American Journal of Psychiatry*, **141**, 215-218.
- Mooney, J. (1984, May 3). Gambling mad. *The Sydney Morning Herald*, Life & Home, pp.1-2.
- Moran, E. (1970). Varieties of pathological gambling. *British Journal of Psychiatry*, **116**, 593-597.
- Nadler, L.B. (1985). The epidemiology of pathological gambling: Critique of existing research and alternative strategies. *Journal of Gambling Behaviour*, **1**, 35-50.
- Oldman, D.J. (1978). Compulsive gamblers. *Sociological Review*, **26**, 349-371.

- Orford, J. (1985). *Excessive appetites: A psychological view of addictions*. Chichester: John Wiley & Sons.
- Polich, J.M., Armor, D.J., & Braiker, H.B. (1980). *The course of alcoholism: Four years after treatment*. Santa Monica: Rand Corporation.
- Politzer, R.M., & Morrow, J.S. (1980). The John Hopkins University Compulsive Gambling Counselling Centre. Paper presented at the American Psychological Association Annual Meeting, Sept. Cited in M.G. Dickerson, *Compulsive gamblers*, London, Longman, 1984.
- Rachman, S., & Hodgson, R. (1980). *Obsessions and compulsions*. Englewood Cliffs, New Jersey: Prentice Hall.
- Robins, L.N., & Helzer, J.E. (1986). Diagnosis and clinical assessment: The current state of psychiatric diagnosis. *Annual Review of Psychology*, **37**, 409-432.
- Rosenhan, D.L., & Seligman, M.E.P. (1984). *Abnormal psychology*. New York: W.W. Norton and Company.
- Rotter, J.B. (1966). Generalized expectancies for internal versus external control of reinforcement. *Psychological Monographs*, **80**, 1, (Whole No. 609).
- Rotter, J.B., & Mulry, R. (1965). Internal versus external control of reinforcement and decision time. *Journal of Personality and Social Psychology*, **2**, 598-604.
- Saunders, W.M., & Kershaw, P.W. (1979). Spontaneous remission from alcoholism - A community study. *British Journal of Addiction*, **74**, 251-256.

- Schacht, T., & Nathan, P.E. (1977). But is it good for the psychologists? Appraisal and status of DSM-III. *American Psychologist*, **32**, 1017-1025.
- Skinner, B.F. (1972). *Beyond Freedom and Dignity?* London: Cape.
- Skinner, H.A. (1981). Toward the integration of classification theory and methods. *Journal of Abnormal Psychology*, **90**, 68-87.
- Solomon, R.L., & Corbit, J.D. (1974). An opponent-process theory of motivation: I. Temporal dynamics of affect. *Journal of Abnormal Psychology*, **81**, 119-145.
- Spielberger, C.D., Gorsuch, R.L., & Lushene, R.E. (1970). *Manual for the State-Trait Anxiety Inventory (Self-Evaluation Questionnaire)*. Palo Alto, California: Consulting Psychologist Press.
- Spitzer, R.L., Endicott, J., & Robins, E. (1975). Clinical criteria for psychiatric diagnosis and the DSM-III. *American Journal of Psychiatry*, **132**, 1187-1192.
- Spitzer, R.L., & Williams, J.B.W. (1980). Classification in psychiatry. In H.I. Kaplan, A.M. Freedman, & B.J. Sadock (Eds.), *Comprehensive textbook of psychiatry III* (pp.1035-1072). Baltimore: Williams and Wilkins.
- Spitzer, R.L., Williams, J.B.W., & Skodal, A.E. (1980). DSM-III: The major achievements and an overview. *American Journal of Psychiatry*, **137**, 151-164.
- Stewart, R.M., & Brown, R.I.F. (in press). An outcome study of gamblers anonymous. *British Journal of Psychiatry*.
- Stockwell, T., Hodgson, R., Edwards, G., & Rankin, H. (1979). The development of a questionnaire to measure severity of alcohol dependence. *British Journal of Addiction*, **74**, 79-87.

- Storm, T., & Cutler, R. (1975). Notes towards the analysis of loss of control in normal and pathological drinkers. *British Journal of Addiction*, **70**, 151-155.
- Strauss, J.S. (1973). Diagnostic models and the nature of psychiatric disorder. *Archives of General Psychiatry*, **29**, 445-449.
- Taber, J.I., Collachi, J.L., & Lynn, E.J. (1986). Pathological gambling: Possibilities for treatment in northern Nevada. *Nevada Public Affairs Review*, **2**, 39-42.
- Tucker, J., Vichinich, R., & Sobell, M. (1979). Differential discriminative stimulus control of non-alcoholic beverage consumption in alcoholics and in normal drinkers. *Journal of Abnormal Psychology*, **88**, 145-152.
- Volberg, R.A., & Steadman, H.J. (1986). *Refining prevalence estimates of pathological gambling*. Manuscript submitted for publication.
- Walker, M.B. (1985). Explanations for gambling. In G. Caldwell, B. Haig, M. Dickerson & L. Sylvan (Eds.), *Gambling in Australia* (pp.146-162). Sydney: Croom Helm.
- Walker, M., & Trimboli, L. (1985). An analysis of heavy gambling as an addiction. In J. McMillen (Ed.), *Gambling in the 80's*. Brisbane: Griffith University Reprographics.
- Wong, G. (1980). The obsessional aspects of compulsive gambling. Paper presented to the Society for the Study of Gambling, London. Cited in M.G. Dickerson, *Compulsive gamblers*, London, Longman, 1984.
- World Health Organization. (1977). *International Classification of Diseases*, rev. 9. Geneva: author.

- Wray, I., & Dickerson, M.G. (1981). Cessation of high-frequency gambling and "withdrawal" symptoms. *British Journal of Addiction*, **76**, 401-405.
- Zimmerman, M.A., Meeland, T., & Krug, S.E. (1985). Measurement and structure of pathological gambling behavior. *Journal of Personality Assessment*, **49**, 76-81.
- Zuckerman, M. (1979). Dimensions of sensation seeking. *Journal of Consulting and Clinical Psychology*, **36**, 45-52.