

# SYSTEMATIC REVIEW AND META-ANALYSIS OF STUDIES ON EARLY INTERVENTION AND PREVENTION FOR PROBLEM GAMBLERS

NOVEMBER 2007

**GRA**

GAMBLING RESEARCH AUSTRALIA



Commissioned by Gambling Research Australia for the  
Ministerial Council on Gambling



The Ministerial Council on Gambling is comprised of the Ministers responsible for gambling in each State and Territory Government and the Australian Government. The objective of the Council is to minimise the adverse consequences of problem gambling via the exchange of information on responsible gambling measures and by acting as a forum for discussion and facilitation of the development of an effective interventions framework.

The Ministerial Council on Gambling established Gambling Research Australia (GRA), to administer its research program. The Secretariat is provided by the Office of Gaming and Racing, Department of Justice, Victoria. Further information about the national research program may be obtained from: [www.gamblingresearch.org.au](http://www.gamblingresearch.org.au)

Gambling Research Australia commissioned the Monash University to undertake a study into a Systematic review and meta-analysis of studies on early intervention and prevention for problem gambling.

This project has been funded as part of the Research Program of the Ministerial Council on Gambling and was commissioned under objective two of the National Framework on Problem Gambling. This objective involves conducting research into the:

Best approaches to early intervention and prevention.

**Acknowledgement of jurisdictional funding to the Research Program:**

Australian Capital Territory: ACT Government through the ACT Gambling and Racing Commission

Australian Government: The Australian Government Department of Families, Community Services and Indigenous Affairs

New South Wales: NSW Government through the Responsible Gambling Fund

Northern Territory: Northern Territory Government through the Community Benefit Fund

Queensland: Queensland Treasury

South Australia: Government of South Australia

Tasmania: Tasmanian Government through the Community Support Levy

Victoria: Victorian Government through the Community Support Fund

Western Australia: Government of Western Australia through the Gaming Community Trust

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Printing authorised by: Gambling Research Australia

Printer: BIG PRINT - PRINT MINT, 45 BUCKHURST STREET, SOUTH MELBOURNE

# Systematic review and meta-analysis of studies on early intervention and prevention for problem gambling

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Gambling Research Australia

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## ACKNOWLEDGEMENTS

The authors would like to thank the following members of the Australasian Cochrane Centre who provided training and methodological advice during the project:

Veronica Pitt  
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November 2007

ISBN: 978-1-921028-56-4

## CONTENTS

CONTENTS .....	0
SUMMARY .....	1
About this report .....	1
Impacts of problem gambling .....	1
Approaches to problem gambling.....	1
Criteria for considering studies .....	1
Characteristics of included studies .....	1
Interventions .....	2
Outcomes for meta-analysis.....	2
FINDINGS .....	2
Gambling Attitudes/Misconceptions .....	2
Gambling Knowledge .....	2
Gambling Behaviours .....	2
Coping and Problem Resolution Skills .....	3
GUIDING PRINCIPLES FOR THE IMPLEMENTATION OF PRIMARY PREVENTION	
INTERVENTIONS .....	3
INTRODUCTION .....	4
Purpose of the review .....	4
Terminology.....	5
BACKGROUND .....	6
Gambling in Australia .....	6
Gambling behaviour .....	8
Impacts of problem gambling .....	8
Approaches to managing problem gambling .....	11
Primary Prevention .....	11
Secondary Interventions .....	11
Tertiary Interventions .....	13
The Pathways Model .....	13
Current literature on primary preventions .....	14
Most commonly used gambling measures .....	15
Diagnostic and Statistical Manual of Mental Disorders (multiple response) .....	15
Diagnostic Interview for Gambling Schedule .....	16
Other gambling measures .....	17
Scale of Gambling Choices.....	19
Research Question.....	19
Systematic review and meta-analysis .....	20
Systematic review .....	20

Meta-analysis .....	22
Forest plots: a description .....	22
Meta-analysis statistical terminology .....	23
METHODOLOGY .....	24
Criteria for considering studies .....	24
Search strategy for identification of studies .....	25
Electronic Resources .....	25
Hand searching .....	25
Grey literature and other search approaches .....	25
Search terms .....	26
Data Extraction and Quality Assessment .....	28
Characteristics of included studies .....	29
Participants .....	36
Research team leaders .....	36
Interventions .....	37
<i>Videos only</i> .....	37
<i>Lectures and activities</i> .....	37
<i>Video plus lectures and activities</i> .....	37
<i>Educational prevention programs</i> .....	37
<i>Warning messages</i> .....	38
<i>Self-help and motivational interviews</i> .....	38
Study Settings .....	39
Study Personnel .....	39
Study Duration .....	39
Length of study follow-up period .....	40
Losses to follow-up .....	40
Measurement tools .....	41
Quality of included studies .....	41
FINDINGS .....	42
Gambling attitudes and misconceptions .....	43
<i>Video only</i> .....	43
<i>Lectures and activities</i> .....	43
<i>Video plus lectures and activities</i> .....	45
<i>Educational program</i> .....	45
<i>Warning messages</i> .....	45
Gambling knowledge .....	46
<i>Video only</i> .....	46
<i>Lectures and activities</i> .....	46
<i>Video plus Lectures and Activities</i> .....	48
<i>Educational programs</i> .....	48
Gambling behaviour .....	48
<i>Educational programs</i> .....	49
<i>Warning message</i> .....	49
<i>Workbook and motivational interview</i> .....	49
Coping and problem resolution skills .....	50
Possible sources of heterogeneity .....	51

DISCUSSION OF FINDINGS .....	53
Limitations .....	54
GUIDING PRINCIPLES FOR THE IMPLEMENTATION OF PRIMARY PREVENTION	
INTERVENTIONS.....	55
Future research .....	56
CONCLUSION .....	59
REFERENCES .....	60
Appendix 1 - Database search strategy .....	66
Appendix 2 - Data extraction table .....	68
Appendix 3 - Data extraction form.....	73
Appendix 4 - Quality assessment form.....	75
Appendix 5 – Table of excluded studies.....	76

## **SUMMARY**

### **About this report**

We have conducted this systematic review to determine which primary preventions and associated early interventions work best on problem gamblers who are recruited from the general community. It is envisaged that the outcomes from the review will assist in planning strategies to implement appropriate primary prevention interventions to reduce the impacts of problem gambling in Australia.

### **Impacts of problem gambling**

It is estimated that between 1997 and 1998 approximately 293,000 or 2.1% of Australians were affected by moderate or severe problem gambling, with 130,000 or 1% of Australians having severe problems. The adverse impacts of problem gambling extend to spouses, children, friends, employers and the wider community. Some common adverse impacts experienced are financial and legal difficulties, work and study difficulties and a range of personal difficulties.

### **Approaches to problem gambling**

Prevention measures are programs and practices that intervene with individuals, families or communities to stop the occurrence of a problem that could otherwise be expected to progress in some instances. Early interventions are programs and practices that intervene with individuals, families or communities at an early stage in the occurrence of symptoms or maladaptive behaviours in such a way that there is a high probability that the intervention will resolve the symptoms or maladaptive behaviours and stop them from progressing. Primary prevention measures are implemented at the community, family or individual level, to prevent health problems, such as problem gambling, before they occur. Secondary interventions are activities and programs that aim to identify persons, who already are problem gamblers, and stop further progression of the problem. Tertiary interventions assist and help manage the long term effects of problem gambling once they have set in. The authors have focused this review on primary prevention and the associated early intervention measures for problem gambling.

### **Criteria for considering studies**

We conducted a systematic search of the literature to identify randomised and quasi-randomised controlled trials investigating the effectiveness of primary interventions on problem gambling. We included members from the general community of all ages but excluded individuals engaged in any primary, general practice or outpatient care for problem or pathological gambling related issues. Researchers aimed to locate and include the following outcome measures: controlled gambling; the amount of money spent gambling; frequency and time spent gambling; a change in score on the instrument used; and changes in gambling knowledge, misconceptions and coping or problem resolution skills. Not all of these pre-selected outcomes were found to have been used in the identified studies. The four outcomes that were found to have been used and included in the meta-analysis were: gambling behaviour (i.e. the amount of money spent gambling; frequency and time spent gambling); changes in gambling knowledge; misconceptions and attitude errors; and coping or problem resolution skills.

### **Characteristics of included studies**

A total of 13 studies were included in this review. Of the 13, four studies were randomised controlled trials and nine were randomised cluster controlled trials. All nine of the randomised cluster controlled trials used school aged participants, one study used university

participants and three studies used participants from the general community. Eleven studies were based in Canada, one in the United States of America and one in Australia. More detail about the characteristics of the studies can be found in Table 2.

## **Interventions**

The interventions used in the studies came in a number of formats including:

- Video only
- Lectures and activities
- Video plus lectures and activities
- Educational programs
- Warning messages
- Self-help workbook and a motivational interview

## **Outcomes for meta-analysis**

A total of 20 outcome measures were recorded from the included studies.

Only four of the five pre-selected outcomes measures were used in the studies. The four outcomes included for meta-analysis are:

- gambling attitudes and misconceptions
- gambling knowledge
- gambling behaviour
- coping and problem resolution skills

## **FINDINGS**

### **Gambling Attitudes/Misconceptions**

Nine studies assessed the impacts of a variety of interventions on improving gambling attitudes and reducing misconceptions. Seven of the nine studies were found to have positive benefits in favour of the intervention. An overall pooled estimate of the weighted mean difference is not presented as significant heterogeneity was found across all studies.

### **Gambling Knowledge**

Seven studies assessed the impacts of a variety of interventions on improving gambling knowledge. Six of the seven studies were found to have benefits in favour of the intervention. An overall pooled estimate of the weighted mean difference is not presented as significant heterogeneity was found across all studies.

### **Gambling Behaviours**

Six studies assessed the impacts of interventions on improving a range of gambling behaviours. Results were unable to be included in a meta-analysis due to the variability in measurement tools and lack of data reported. Narrative reviews of these studies suggested that educational programs improved gambling behaviours. Warning messages reduced the amount of money lost but not the number of games played. The use of work books and motivational interviews reduced the number of gambling days, lost money and money spent per gambling day.



## **Coping and Problem Resolution Skills**

Two studies report the impacts of interventions that aimed to improve coping and problem resolution skills. The findings of both studies suggest that the interventions had a positive impact on improving coping and problem resolution skills.

## **GUIDING PRINCIPLES FOR THE IMPLEMENTATION OF PRIMARY PREVENTION INTERVENTIONS**

- Interventions should be implemented to students aged 12 to 14 in Years 7 and 8.
  - The literature shows that gambling behaviour begins around the ages of 12 to 13 years and therefore interventions need to be implemented prior to the onset of gambling behaviour, to delay or prevent the behaviour from occurring.
- Interventions should be school-based.
  - Schools would be the best venue to easily access participants aged 12 to 14 years. It would be possible to administer the intervention as part of a health or social science curriculum.
- Interventions should be psycho-educational.
  - Educational based interventions provide individuals with important information regarding gambling, increases their awareness of the risks associated with gambling and helps with the development of coping skills and problem resolutions when faced with high pressure gambling situations.
- The most effective and efficient way to administer the intervention is in the form of a video, activity and lecture combination.
  - This combination of interventions has shown promising results, although only two studies used this combination. One study showed positive benefits and the other showed inconclusive results.
- Appropriately trained personnel are needed to implement the intervention.
  - This review has shown that the majority of studies had appropriately trained professional personnel to implement the intervention.

## **INTRODUCTION**

This review of studies on the early intervention and prevention of problem gambling has been undertaken for Gambling Research Australia, a national research program supported by the Ministerial Council on Gambling. The Council was established in 1999 with the aim of achieving a national approach to the challenges posed by problem gambling by exchanging information on appropriate gambling strategies, providing a forum for discussing common issues and developing suitable regulatory approaches. It is chaired by the Australian Government Minister for Families, Community Services and Indigenous Affairs. The other members of the Council are Ministers in each of the States and Territories whose portfolio responsibilities include gambling.

The Ministerial Council on Gambling has nominated six priority areas for research:

- a national approach to definitions of problem gambling and consistent data collection
- the feasibility and consequences of changes to gaming machine operations such as pre-commitment of loss limits, phasing out note-acceptors, imposition of mandatory breaks in play and the impact of linked jackpots
- best approaches to early intervention and prevention to avoid problem gambling
- major studies of problem gamblers, including their profile, attitudes, gambling behaviour and the impact of proposed policy measures on them
- benchmarks and on-going monitoring studies to measure the impact and effectiveness of strategies introduced to reduce the extent and impact of problem gambling, including studies of services that assist problem gamblers and the effectiveness of these services
- patterns of gambling and consider strategies for harm reduction in specific communities and populations, such as Indigenous, rural, remote or culturally and linguistically diverse communities, young people or older people.

### **Purpose of the review**

The purpose of this study was to determine which primary prevention measures work for certain sub-groups of gamblers across the spectrum of gambling behaviours, and why. It is also to determine which interventions do not work, and why they do not work. In particular this study sought to determine which primary preventions work best on individuals who are recruited from the community, so that appropriate primary prevention interventions can be implemented on a wider scale to reduce the overall impacts of problem gambling in Australia.

The review also considered whether a number of factors were linked with interventions including:

- Setting e.g. home, school and university
- Personnel e.g. specialist or lay person
- Media e.g. video, telephone [telephone, face-to-face and computer]
- Format e.g. tailored, universal and standard
- Duration e.g. timing, frequency and length

It is envisaged that the outcomes from the review will assist jurisdictions to plan local strategies.

## Terminology

To clarify the concepts under discussion, it is helpful to articulate the meaning of certain terms used in the report. Gambling is understood here as “*staking money on uncertain events driven by chance*” (Australian Government Productivity Commission, 1999). Its two key forms are wagering, which covers risking money on racing and other events, and gaming, which is used to cover all other forms of legal gambling such as gaming machines, lotteries, Keno and casino table games (Australian Government Productivity Commission, 1999).

The following definition of problem gambling has been endorsed for the Australian context:

*Problem gambling is characterised by difficulties in limiting money and/or time spent on gambling which leads to adverse consequences for the gambler, others or for the community.*

(Neal et al., 2005)

This report also draws upon the following definitions of the related terms prevention and early intervention as:

*Prevention - programs and practices that intervene with individuals, families or communities to stop the occurrence of a problem or issue that could otherwise be expected; and*

*Early intervention – programs and practices that intervene with individuals, families or communities at an early stage in the occurrence of a problem or issue in such a way that there is a high probability that the intervention will resolve the problem or issue and stop it from becoming worse.*

(Gauntlett, 2001)

## BACKGROUND

### Gambling in Australia

Australia is one of the heaviest gambling nations in the world (Australian Government Productivity Commission, 1999). In 1996-1997 Australia's gambling expenditure was \$10 billion and it has risen to approximately \$15 billion in 2000 – 2001 (Oliveri and Rogers, 2005). In 2005 there were a total of 5,370 businesses in Australia providing gambling as a primary service with the majority (4,178) being pubs, taverns, bars and hospitality clubs (Australian Government Productivity Commission, 1999).

Gambling has been part of Australia's culture since the start of colonisation with settlers and convicts bringing with them many British gambling and betting activities such as cribbage, all-fours, drinking competitions and cock fighting. In an attempt to control the negative impacts of these activities regulations were introduced to enable gambling activities to be undertaken in licensed public houses (O'Hara, 1987).

Beginning in the 1800s turf clubs began to be established in Australia and horse racing became a popular activity (Australian Government Productivity Commission, 1999). At many race meetings, betting was not restricted to horse racing and included betting on cockfights. Despite government prohibition of betting on cock fighting on or near horse racing courses, cock fights were a main event and were held on alternate days to the horse races (O'Hara, 1987).

In 1916 the golden casket lottery commenced. Initially it was conducted to raise revenue for war efforts and soldier repatriation programs. The success of these lotteries prompted State Governments to take over the running of the activities and a number of other lotteries were established for other major charities. Initially lotteries were drawn twice a year and by the 1960s a draw was being conducted almost every day (Australian Government Productivity Commission, 1999).

During the last century State and Territory Governments around Australia legalised many forms of gambling, including non-profit lotteries and other minor games such as raffles and bingo (Australian Government Productivity Commission, 1999, Australian Institute for Gambling Research, 1999). By the 1940s venues legalised to provide gambling services were proving to be successful and extremely popular in multiple regions within Australia. Among Aboriginal Australians, in remote rural areas and urban communities such as many in the Northern Territory, card games have remained the most popular and predominate form of gambling up until recent decades (Australian Institute for Gambling Research, 1999). In 1956 the New South Wales Government introduced the *Gaming and Betting Act 1956* which gave registered clubs the official right to operate gaming machines (Australian Government Productivity Commission, 1999). After 1960 legalised gambling was managed by governments through the government owned gambling bodies such as Totaliser Agency Boards (TAB) and Lotteries and tight regulation of private owned bodies such as clubs and bookmakers. In 1994 Victoria became the first state to privatise the State's TAB, a trend which has spread through other states in Australia. The Australian State and Territory governments have permitted the introduction of other larger private corporations to Australian gambling, as it is leading to the trend of privatisation of Australian gambling and

increased competition between states for shares on the gambling market (Pinto and Wilson, 1990, Australian Institute for Gambling Research, 1999).

Electronic gaming machines are popular forms of gambling for Australians. They have evolved from the poker machines that were re-introduced into licensed clubs in the 1930s (O'Hara, 1987). Clubs were given the exclusive right to operate poker machines. By the mid-1970s casinos began to open in Australia, providing access to not only electronic gaming machines but other forms of gambling such as roulette, blackjack, baccarat and poker (Australian Government Productivity Commission, 1999).

In past decades a number of other forms of gambling have developed, such as scratch cards, sports betting, betting pools, keno, computer and internet gambling. Many of these forms of gambling remain popular today with the most popular being the use of electronic gaming machines (Australian Government Productivity Commission, 1999).

Since the 1970s there has been an increase in the amount of expenditure that Australians have been gambling, as a percentage of household disposable income and in the percentage of dollars gambled per person. Between 1972-73 Australians spent \$2.7 billion or 1.6% of their disposable household income. The average expenditure per person was approximately \$300. In 1997-1998 the general Australian population spent over \$11 billion in gambling expenditure or people were spending 3% of household disposable income (Australian Government Productivity Commission, 1999). Individual expenditure also increased to approximately \$800 per capita. This figure has further increased to \$996 dollars in 2005 (Australian Bureau of Statistics, 2006). Since 2000 there has been a total of 2.9% increase in net takings of gambling venues. The operations with the largest increases in net takings from 2000-01 to 2004-05 are TABs 5.2%, poker machines 3.1%, lotteries and lotto style games and football pools 12.8% and thoroughbred, harness and greyhound betting bookmakers 12.8% (Australian Bureau of Statistics, 2006).

The most common form of gambling in Australia is electronic gaming machines. There are 199,930 poker machines in licensed venues, across the States and Territories in Australia (Australian Bureau of Statistics, 2006). Electronic gaming machines have rapidly expanded since their introduction in the 1990s which has made make electronic gaming machines easily accessible to most Australian adults. Electronic gaming machines are seen as a major contributor to the increasing problem gambling rate within Australia (Australian Institute for Gambling Research, 1999). Recent studies have shown that the consumption of electronic gaming machines in Australia hit a peak around 2001-02 and since then there has been gradual decline in the use of electronic gaming machines in most states within Australia (Department of Justice Victorian Gambling Research Panel, 2006).

Continuing changes with global technological trends and improvements to computing and communications have begun to change the face of gambling. In the past decade gambling has become available through a number of services over the Internet. On-line gambling has become a popular method of gambling for Australians and is rapidly expanding along side the rapidly expanding technology (Jamieson and Hair, 2001). On-line gambling consists of two different types of activities. The first is interactive wagering which allows bets to be placed on actual live events via the Internet such as horse racing or sports events. The other, on-line gambling, includes betting on casino type games which are based on a computer program that produces random number generators to determine the outcome of games. Typical games

include poker, blackjack, roulette and electronic gaming machines (Jamieson and Hair, 2001).

On-line gambling has increased access and availability to individuals wanting to gamble. All that is required to access such services is a credit card and Internet access. It also allows individuals to gamble in casinos and websites overseas. These new forms of gambling raise issues in relation to possible increases in problem gambling. As mentioned on-line gambling increases accessibility to gambling services. It also provides more opportunities for gamblers to gamble with 24 hour access. Opportunities also arise for more frequent underage gambling in unsecured off-shore gambling sites (McMillen and Grabosky, 1998). These are all critical issues in determining whether on-line gambling has increased problem gambling in Australia (Jamieson and Hair, 2001).

It is the respective responsibility of State and Territory Governments to regulate the practices of legal and illegal gambling within Australia (Pinto and Wilson, 1990). Australian State Governments have multiple responsibilities concerning gambling, which include legislation and regulation, licensing of operators, promotion of gambling, revenue raising and research (Department of Health and Aged Care, 1999).

## **Gambling behaviour**

Gambling behaviour can be seen as a continuum where gambling behaviour is absent at one end of the spectrum with pathological gambling behaviour at the other end of the spectrum, and a wide range of severity and risk levels in between. At its most serious level pathological gambling can be defined and diagnosed as:

*“...a progressive disorder in which an individual has a psychologically uncontrollable preoccupation and urge to gamble. This results in excessive gambling, the outcome of which compromises, disrupts or destroys the gambler’s personal life, family relationships or vocational pursuits. The problems in turn lead to intensification of the gambling behaviour. The cardinal features are emotional dependence on gambling, loss of control and interference with normal functioning”*  
(Department of Health and Aged Care, 1999)

It is considered that responses to problem gambling need to be applied across the continuum as all such behaviours cause problems and negative consequences on people’s lives. Often problem behaviour may be helped through primary interventions. In contrast - as identified above - pathological gambling can be classified as a disorder with much more severe problems and symptoms requiring secondary and tertiary interventions.

## **Impacts of problem gambling**

Problem gambling is an issue in many countries throughout the world. Abbott and Volberg have conducted a number of national community epidemiological studies of pathological and problem gambling. These studies used the South Oakes Gambling Screen (Leiseur, 1987) to determine rates of problem and pathological gambling. A New Zealand national study found prevalence rates of 1.2% for current pathological gambling and 2.1% for current problem



gambling (Abbott and Volberg, 1996, Abbott et al., 2004). A national study in Sweden found prevalence rates of 0.6% for pathological gambling and 1.4% for problem gambling (Volberg, 2002). A national study in the United States of America found prevalence rates of 1.2% for pathological gambling and 1.5% problem gambling (Volberg, 2002). They also conducted regional community studies within the United States and found the following prevalence rates for pathological gambling: Massachusetts 2.3%, Maryland 1.5%, New Jersey 1.4%, California 1.2% and Iowa 0.1% (Volberg, 2002).

A report by the Productivity Commission found that in 1997 to 1998 approximately 293,000 or 2.1% of Australians had moderate gambling behaviour with 130,000 or 1% of Australians having severe problems. The Commission identified that the impacts of this problem gambling extended to approximately 1.5 million Australians including spouses, children, friends, employers and the wider community. The report found the impacts to be wide ranging including interpersonal problems such as family and marital difficulties, relationship breakdown, divorce, family neglect and domestic violence (Australian Government Productivity Commission, 1999).

In recent years the issue of adolescent and childhood problem and pathological gambling has become evident and is a source of growing health concern. A number of studies have been conducted in this field. It is estimated that between 80-90% of adolescents gamble in any year (Felsher et al., 2004, Petry, 2005), around 10-15% of adolescents are at risk of developing problem gambling (Felsher et al., 2004, Messerlian et al., 2005, Nower and Blaszczyński, 2004) and between 4-8% meet the diagnostic criteria for pathological gambling (Messerlian et al., 2005, Nower and Blaszczyński, 2004). It has been suggested that the prevalence of adolescent and childhood problem gambling is between 1-5% higher than the rates of problem gambling in the general adult population (Messerlian et al., 2005, Nower and Blaszczyński, 2004). Petry (2005) notes that gambling usually began between the ages of 9 and 11 in adolescent problem gamblers. Several studies have been conducted and show that the most popular form of adolescent gambling is lotteries including lottery tickets and scratch cards (Felsher et al., 2004, Wood and Griffiths, 2004).

A number of risk factors that contribute to the development and maintenance of adolescent and childhood gambling have been identified. One is gender difference. Many studies have shown that males have a higher gambling rate than females (Nower and Blaszczyński, 2004, Petry, 2005, Felsher et al., 2004, Volberg, 2002). However, a report by Volberg also suggests that women are increasingly likely to be affected by gambling (Volberg, 2002). Another risk factor is that adolescents and children are being exposed to gambling within their families from a young age and have lottery tickets bought for them by adults. This may lead to the perception by the adolescents and children that gambling is an acceptable family pastime (Felsher et al., 2004, Nower and Blaszczyński, 2004, Wood and Griffiths, 2004). Some studies have indicated that adolescents and children are easily able to purchase lottery tickets, with many vendors illegally selling lottery tickets to minors (Felsher et al., 2004, Wood and Griffiths, 2004). Additionally, lotteries are also promoted as an enjoyable past time by the media which could increase at-risk gambling behaviour in adolescents and children (Byrne et al., 2005, Felsher et al., 2004, Messerlian et al., 2005).

Many studies have reported a high comorbidity of problem and pathological gamblers and mood disorders such as high anxiety and depression (Blaszczyński and Nower, 2002, Messerlian et al., 2005, Nower and Blaszczyński, 2004, Volberg, 2002).

A high comorbidity has also been found with high usage levels of alcohol, cigarettes and marijuana (Messerlian et al., 2005, Nower and Blaszczynski, 2004, Petry, 2005, Volberg, 2002). Some studies have noted that being part of racial and ethnic minority groups may render individuals more vulnerable to problem gambling (Petry, 2005, Volberg, 2002).

It has been noted that in Australia moderate or severe gamblers also experienced financial difficulties including loss of income and/or assets, debts and other loan problems. Financial difficulties may have legal ramifications and result in imprisonment and bankruptcy. Problem gamblers were also found to experience issues with work and study leading to absenteeism, poor performance and unemployment as well as personal difficulties such as depression, anxiety, poor health and suicide (Australian Government Productivity Commission, 1999).

There are many negative consequences associated with problem gambling that extend to the wider community and place social and economic burdens on the community making problem gambling a major public health issue (Neal et al., 2005). In 1999, it was estimated that social costs of up to \$5.6 billion are being generated annually as a result of problem gambling (Australian Government Productivity Commission, 1999). It is estimated in Australia that problem gamblers on average spend \$12,000 a year on gambling products and services (Jamieson and Hair, 2001).

Some other adverse impacts on the community are reductions in spending on other goods and services; as a result local retail industry may not grow to its potential. The character of local communities can change with community facilities closing, and a decline in volunteers for charity and community projects (Australian Government Productivity Commission, 1999).

## **Approaches to managing problem gambling**

### **Primary Prevention**

As described previously, primary prevention measures are implemented on a community and individual level, to prevent health problems before they occur (Messerlian et al., 2005). Health promotion strategies, public health services and health protection approaches draw on a mix of interventions to reduce and minimise the risk of gambling harm and to prevent gambling problems from developing, as well as seeking to strengthen community and individual capacity (Ministry of Health, 2005).

The main aims of the primary prevention initiatives focus on:

- public education through increasing knowledge and awareness of the risks and consequences of gambling
- public persuasion to question socially acceptable gambling norms
- correct erroneous perception regarding gambling,
- provide training in life skills such as how best to handle money and coping and social skills
- reduction strategies to limit, where appropriate, the availability of gambling (Ministry of Health, 2005).

The term ‘prevention paradox’ was first used by the epidemiologist Geoffrey Rose. He suggested that by using mass environmental control methods, it becomes possible to alter a society’s norms and behaviours. This is done by attempting to shift the whole distribution of incidences within the population by lowering the mean level. It is a preventative measure which brings benefit to a population as a whole (Rose, 1985). The ‘prevention paradox’ can be applied to gambling by applying primary preventions and early interventions to the whole population, which is considered to be ‘at risk’ of problem gambling. The intention is to shift the distribution of gambling behaviours within the population from a medium to high position to a lower position on the gambling continuum and, thereby, reduce the prevalence of problem gambling within the whole society.

### **Secondary Interventions**

Secondary interventions are activities and programs that aim to identify problem gamblers and are implemented to prevent future progression of the behaviours and avoid negative consequences.

There are a number of forms of behavioural interventions including:

#### *Imaginal desensitisation*

- Imaginal desensitisation is based on the theory that the arousal to complete compulsive behaviour is provoked by an initial stimulus. Imaginal desensitisation provides control measures, whereby reducing levels of arousal and tension in

response to a stimulus and therefore reducing the need to undertake gambling behaviour (Toneatto and Ladouceur, 2003).

- Aversion therapy is a technique based on the idea that a compulsive behaviour can be interrupted by administering an undesirable stimulus in a controlled manner (Toneatto and Ladouceur, 2003). Generally the stimulus is unpleasant or painful and will reduce gambling behaviour (Reber and Reber, 2001).
- Imaginal relaxation is a treatment in which participants visualise relaxing scenes to reduce the amount of tension and arousal which would normally be relieved by gambling behaviours (Toneatto and Ladouceur, 2003).

### *Cognitive and Cognitive Behavioural Interventions*

- Cognitive behavioural therapy on an individual basis aims to correct core erroneous cognitions, cognitive distortions and automatic thinking patterns that problem gamblers maintain. Some exercises that are used in cognitive therapy are: taking a life history of gambling behaviour and highlighting some of the following aspects: automatic gambling related thoughts; motivations for gambling; rituals or strategies; how serious financial losses are accumulated; and, how these losses affect others. Another technique is self-monitoring gambling associated cognitions and demonstrating distorted cognitive processes through activities such as dice throwing or coin tossing (Toneatto, 2002).
- Exposure-response prevention is a technique which trains individuals to better manage their money, to identify and avoid gambling situations, to resist gambling when they are in high risk gambling situations and to develop coping strategies to deal with the gambling situations (Toneatto and Ladouceur, 2003). One study by Tolchard, Thomas and Battersby (2006) tested the impacts of a single session of exposure therapy in a single case and found the exposure therapy to substantially reduce gambling behaviour and significantly reduce the gambling urge.
- Group cognitive restructuring treatments use techniques which challenge the illusion of control, randomness perceptions and other cognition errors. These treatments are delivered in a group format and also facilitate communication between participants (Toneatto and Ladouceur, 2003).
- Combined treatments use both the exposure response prevention techniques and the group cognitive restructuring treatments (Toneatto and Ladouceur, 2003).

### *Self-Help Interventions*

- A number of studies have used self-help manuals to aid the participant in controlling or reducing their gambling behaviour. The manuals include self-control strategies such as self-monitoring, functional analysis, goal setting and self-reinforcement (Toneatto and Ladouceur, 2003). This method has shown to enable participants to reduce the number of weekly gambling sessions and the amount of dollars spent (Toneatto and Millar, 2004).

## **Tertiary Interventions**

Tertiary preventions assist and help manage the long term effects of problem gambling once they have set in.

### *Pharmacological Interventions*

- The selective serotonin reuptake inhibitor, Fluvoxamine has been used to control compulsivity in gamblers, however there is no evidence of any lasting effect on gambling problems (Toneatto and Ladouceur, 2003).
- The opioid antagonist, Naltrexone, has been used to control cravings and urges associated with gambling. Naltrexone has shown large improvements in gambling cravings of the trial samples it has been used in (Toneatto and Millar, 2004).
- Paroxetine, lithium and valproate have been used to treat problem gambling symptoms (Toneatto and Millar, 2004).

## **The Pathways Model**

One current perspective in the gambling field is Alex Blaszczynski's Pathways Model of problem and pathological gambling (Blaszczynski and Nower, 2002). The pathways model is a conceptual model that incorporates a mix of biological, developmental, personality, cognitive, learning theory and ecological determinants in the development and maintenance of gambling problems. It is suggested that there are three different sub-groups of gamblers which include behaviourally conditioned problem gamblers, emotionally vulnerable problem gamblers and anti-social impulsivist problem gamblers. Each group of gamblers takes one of three different pathways through the model and each being affected by different vulnerability factors at different stages along the path. The model suggests that behaviourally conditioned problem gamblers gamble initially for entertainment and socialisation. Emotionally vulnerable problem gamblers gamble to escape from and elevate their mood due to negative emotional and physical life factors. Anti-social impulsivist problem gamblers gamble due to a predisposition to addictive behaviour due to psychological and biological dysfunctions (Blaszczynski and Nower, 2002).

Blaszczynski has also suggested that the pathways model could also be applied to gambling in adolescents and suggests appropriate harm minimisation strategies specific to each sub-group of adolescent gamblers (Nower and Blaszczynski, 2004). For behaviourally conditioned problem gamblers it is recommended that educational programs focusing on correcting faulty cognition regarding luck, chance and superstition and to educate to the notions of randomness, odd of winning and probability. For emotionally vulnerable problem gamblers an educational program focusing on correcting faulty gambling-related cognitions provide stress management and problem solving techniques and provides information about addicts. Finally for anti-social impulsivist problem gamblers it is recommended that school peer support-groups are established and one-to-one education with a mentor (Nower and Blaszczynski, 2004).

It is important to note that this is a secondary and tertiary intervention model as it addresses the needs of those who have progressed to problem gambling. Also, it is a theoretical model and is not based on evidence from controlled trials of interventions.

## Current literature on primary preventions

A preliminary literature search did not identify any systematic reviews on the effectiveness of primary preventions for problem gambling. One narrative review by Petry (2005) was identified. A number of the studies and articles in this review are also discussed in Petry's review. In the review by Petry (2005) it is highlighted there was only one evaluated primary prevention intervention targeting youth (Gaboury and Ladouceur, 1993) and there is no information regarding the effectiveness of primary intervention strategies among adults. Petry noted that while there is an increase of public awareness campaigns in areas of the US and Canada, youths are rarely represented in the programs and enhanced screening and early intervention efforts should be targeted at youths and gambling education should be included in the curricula (Petry, 2005).

The authors were aware of one systematic review for secondary and tertiary interventions for pathological gambling (Oakley Browne et al., 2000). A number of individual studies that assessed primary prevention measures have been identified. The results of these studies have not previously been summarised in a systematic or narrative review. Given the paucity of narrative reviews and the absence of systematic reviews of primary preventions for problem gambling, it has not been possible, prior to this systematic review, to come to conclusions from the body of literature about the effectiveness of primary interventions for problem gambling.

Some recent narrative reviews and reports (Byrne et al., 2005, Dickson et al., 2002, Golaszewski, 2004, Kaminer, 2000, Messerlian et al., 2005, Petry, 2005) have been located that make a contribution to our understanding of the possible characteristics and target groups of primary prevention studies. These identify that gambling behaviour starts early in life and advocate that programs and campaigns to prevent or delay the start of such behaviour should be undertaken in schools and be based on empirical research. While targeting youths around 12 to 13 years old would be a key approach, the studies identified a need for educational awareness programs for parents and the general public as well as educational training programs of teachers, social service and other health professionals concerning problem gambling.

Byrne et al (2005) offered some direction on campaign elements and felt that using youth spokespeople to focus on personal stories, including loved ones and family members who are affected by gambling addiction, can have a great deal of impact. The selected studies identified a need to increase awareness of existing outreach programs and telephone hotlines. Messerlian et al (2005) sought to address this by greater promotion of these services to the general public.

One study (Golaszewski, 2004) identified that given the sophisticated and extensive promotion of casinos, lotto and other forms of gambling there is a need for more and stronger public health messages related to gambling prevention. The author proposed that a greater proportion of gambling receipts be allocated to problem gambling intervention programs, particularly primary prevention programs. Kaminer (2000) called for more funding for research, treatment and prevention and highlighted outreach programs, screening procedures and clinical treatment for adolescents with gambling problems as areas of need.

Two studies (Byrne et al., 2005, Dickson et al., 2002) have highlighted that gambling behaviour shares a number of similarities with other addictive behaviours such as cigarette



and alcohol usage, and argue that the findings from campaigns to prevent such substance abuse are applicable to adolescent gambling behaviours.

The need for more research was also a common theme in these articles. The selected studies also identified that factors such as ethnicity and gender may render individuals more vulnerable to problem gambling. As there is a lack of evidence on these issues the authors noted that more research is needed. Dickson, Derevensky and Gupta (2002) recommended that applied research on risk and resiliency needs to be considered in the formulation of prevention programs followed by scientific evaluation research. They noted that there is very little systematic testing of interventions developed and therefore evidence of effectiveness is selectively cited to support certain programs.

## **Most commonly used gambling measures**

While many tools to measure symptoms of problem gambling have been developed, some of the most commonly used measures are discussed below. These tools have been listed and described in the report by Neal, Delfabbro and O'Neil (2005).

### **Diagnostic and Statistical Manual of Mental Disorders**

The Diagnostic and Statistical Manual of Mental Disorders, 4th Edition (DSM-IV) was written by the American Psychiatric Association and contains classification criteria for the diagnosis of pathological gambling (Custer, 1982). It is used as a guide by clinicians to also aid in the prognosis and treatment of psychological disorders. The DSM was designed to be administered in a clinical setting and used following an interview with the individual (Reber and Reber, 2001).

The cut off point for classification of pathological gambling is five or more endorsed criterion items. This manual has shown good reliability with ( $\alpha = 0.94$ ). The DSM-IV contains two different groups within the instrument. One measures pathology of gambling and the other related to consequences of excessive gambling.

### **Diagnostic and Statistical Manual of Mental Disorders (multiple response)**

The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) (multiple response) uses a set of ten diagnostic criteria which was developed by Fisher (2000) from the DSM-IV criteria. Most items are scored using a frequency scale which ranges from one to four with one representing 'never', two denoting 'once or twice', three meaning 'sometimes' and four representing 'often'. This produces a score range from zero to ten with lower scores indicated no or little gambling problems and higher scores indicating more severe gambling problems. Individuals whose overall scores were five or more were classified as severe problem gamblers. This scale has shown to have reliability score of ( $\alpha = 0.79$ ). No validity tests have been conducted on this instrument (Neal et al., 2005).

## **Diagnostic Interview for Gambling Schedule**

The Diagnostic Interview for Gambling Schedule (DIGS) is another instrument which was based on the original DSM-IV criteria (Winters, 1997). The DIGS contains 20 items, of which two questions are asked for each of the 10 DSM-IV criteria. The DIGS is measured over the previous 12 month period or over entire life. The DIGS is administered as part of a structured interview. For each pair of criteria questions, one point is scored if the respondent endorses at least one of the pair. Scores for this instrument range from zero to ten, with zero indicating no or few gambling problems and ten indicating severe gambling problems. Individuals scoring five or more are classified as pathological gamblers. This instrument has a reliability score of ( $\alpha=0.92$ ) and good criterion validity (Neal et al., 2005).

## **Gambling Treatment Outcome Monitoring System**

The Gambling Treatment Outcome Monitoring System (GAMTOMS) was originally developed from the DSM-IV criteria as a tool to assess patients entering treatment facilities. Criteria from the DSM-IV are presented as dichotomous 'yes' or 'no' answers (Stinchfiels, 1996). Patients are classified as either current or life-time pathological gamblers. This instrument has good reliability (0.89). Concurrent validity was shown to be very high when compared to the South Oaks Gambling Screen (SOGS) and criterion validity was shown with moderate correlations to gambling involvement (Neal et al., 2005).

## **National Opinion Research Centre NORC-DSM-IV Screen**

The National Opinion Research Centre NORC-DSM-IV Screen (NODS) is an instrument that was based on the DSM criteria (National Opinion Research Centre, 1999). It contains 17 items which are scored using dichotomous 'yes' or 'no' answers. Some of the DSM-IV criteria are addressed using two questions and others addressed using only one question. Questions are first administered for the entire life time frame. Respondents that endorsed questions on the life-time version were then re-administered the past-year version of the questions. The score scale ranged from zero to ten. Scores of zero indicate a low risk gambler, scores of one to two indicated at-risk gambler, scores of three or four indicated problem gambler and scores of five or more indicated pathological gambler. This instrument has shown high reliability (0.98). There are a number of concerns relating to the validity of the instrument. One issue is whether the meaning of the DSM-IV is altered by introducing time frames. Another issue is that only gamblers who have lost \$100 or more are selected as it would appear there is no support to indicate that this level of spending can differentiate high and low levels of problem gambling. This scale has not been validated against a sample group of both problem and non-problem gamblers (Neal et al., 2005).

## **Lie-Bet scale**

The Lie-Bet scale is made up of two items drawn from the DSM-IV that are answered with a 'yes' or 'no' answer. One point is scored for every 'yes' answer. A score range of zero to two is possible. These two items are able to differentiate between problem and regular gamblers with high accuracy (Neal et al., 2005).

## **Other gambling measures**

### **South Oaks Gambling Screen**

The South Oaks Gambling Screen (SOGS) is an instrument with 20 questions that is used to assess a number of gambling behaviours, with a particular focus on gambling behaviours in the past 12 months (Leiseur, 1987). Among the questions are nine items relate to borrowing money, five to gambling behaviours and six to the consequences of gambling. The responses to the 20 questions are 'never', 'rarely', 'sometimes', 'often' or 'always' for the first three questions of the instrument. The remaining 17 questions require 'yes' or 'no' answers. Lower scores indicate less severe gambling problems, the higher scores the more severe the gambling problems. A score of five is the cut off point for problem gambling diagnosis. There is also an additional section which questions the respondent if they believe they have a gambling problem. This instrument has a good test-retest reliability (0.71) and ( $\alpha=0.97$ ). The SOGS instrument appears to be multi-dimensional testing pathological behaviours and the consequences of gambling. It correlates well with other measures of gambling such as the DSM-IV and CPGI. This instrument has not been sufficiently tested on comparison groups of problem and non problem gamblers (Neal et al., 2005).

### **Canadian Problem Gambling Index**

The Canadian Problem Gambling Index (CPGI) was developed by Ferris and Wynne (2001) as an instrument that could be used in community problem gambling prevalence surveys (Ferris, 2001). It divides a sample into low risk, moderate risk and problem gambling groups. The instrument contains nine items which are scored using a four point scale, in which zero equals 'never', one represents 'sometimes', two equals 'most of the time' and three means 'almost always'. Lower scores indicate less severe gambling problems and higher scores indicate more severe gambling problems. Those with scores of one to two are classified as low risk gamblers, scores of three to seven as moderate risk gamblers and scores of eight or more as problem gamblers. This instrument shows a good test-retest correlation (0.90) and also shows high correlations with other measures of problem gambling including the SOGS (0.83) and DSM-IV (0.83) (Neal et al., 2005).

## **Gamblers' Belief Questionnaire**

The Gamblers' Belief Questionnaire (GBQ) is an assessment tool used for assessing problem gambling in adults with a specific focus of gambling related thoughts. This questionnaire was developed by Steenbergh and colleagues (Steenbergh, 2002). It is self administered and participants rate the extent of their agreement to each of the 21 statements. The statements measure two factors which include Illusion of Control and Luck and Perseverance. Responses are measured on a seven point Likert scale. The GBQ has shown good test-retest reliability (0.77) and internal consistency (0.92) (Steenbergh, 2002).

## **Victorian Gambling Screen**

The Victorian Gambling Screen (VGS) is a 21 item survey that was designed by Ben-Tovim, Esterman, Tolchard and Battersby (2001). This survey is made up of a three factor structure. The 21 items in the survey are divided among the three factors, which are harm to partner (3 items), gambling enjoyment (3 items) and gambling related harm (15 items). Items are scored using the following scoring scale; zero equals 'never', one equals 'rarely', two equals 'sometimes', three equals 'often' and four equals 'always'. The three factors have the following score ranges, harm to partner (0-12), gambling enjoyment (0-12) and harm to self (0-60). Lower scores indicate less severe gambling problems and higher scores indicate more severe gambling problems. The cut off score for classification as a problem gambler is 21 or higher on the harm to self sub-scale. This instrument has good test-retest reliability. This instrument strongly correlates to other measures of gambling harm and problem gambling including the CPGI and the DSM-IV (2005) (Neal et al., 2005).

## **Massachusetts Gambling Screen**

The Massachusetts Gambling Screen (MAGS) is a screening instrument that was designed to assess problem gambling in adolescents. It was designed by Shaffer, LaBrie, Scanlan and Cummings. The screen consists of 26 'yes' or 'no' answer items. The instrument has two sub-scales. Fourteen of the questions are from the Short Michigan Alcoholism Screening Test (SMAST) and 12 questions are from the DSM IV. This instrument classifies adolescents as pathological, in-transit or non-pathological gamblers. This instrument has shown to have good reliability and validity (Rossen, 2001).

## **Gamblers Anonymous – 20**

The Gamblers Anonymous – 20 (GA-20) is a screening instrument to aid people to determine if they require professional treatment for gambling. It is a checklist consisting of 20 yes or no answer questions of which approximately half relate to consequences of gambling and half to behaviours. Each item is scored one point for a yes answer for the behaviour of the person's whole life time. Lower scores indicate less severe gambling problems and higher scores indicate more severe gambling problems. The cut off point for compulsive gambling is a score of seven or more. This screen can be applied to both adults and adolescents. This instrument has shown to have excellent internal consistency and reliability ( $\alpha=0.94$ ) and also has high correlations with SOGS (0.61) and DSM-IV-J (0.68) (Neal et al., 2005).

## **Scale of Gambling Choices**

The Scale of Gambling Choices is an instrument designed to measure impaired control (Baron, 1995). The long version of the scale contains 18 items to which participants respond on a five point scale, one equals 'never', two equals 'rarely', three equals 'sometimes', four equals 'often' and five equals 'always'. The 18 items were split into three categories, ability to control gambling (8 items), setting limits on gambling (6 items) and failure to stop gambling (4 items). This instrument has shown good reliability and internal consistency ( $\alpha=0.98$ ) and has shown to correlate well to the SOGS (0.87) (Neal et al., 2005).

## **Eight-Screen**

The Eight-Screen is a check-list that can be administered to determine if formal problem gambling diagnosis is required. It was developed by Sullivan (1999). The eight items on the check-list are made up from items on the SOGS, DSM-IV and GA-20 and are scored using 'yes' or 'no' answers. One point is scored for 'yes' answers. The cut off point in which formal diagnosis is recommended is four or more points. This instrument has shown to have acceptable internal consistency and test-retest reliability and has shown high correlations with the SOGS (Neal et al., 2005).

## **Other Types of Measurement**

A number of studies have used a gambling questionnaire used to assess gambling knowledge and gambling misconceptions. This questionnaire is specifically altered for each study but is based on the original version used by (Gaboury and Ladouceur, 1993). The questionnaires generally consist of 14 to 18 questions equally divided between the gambling knowledge and gambling misconception scales. In studies, these have been administered pre-test and post-test to determine changes in the scales.

## **Research Question**

Systematic reviews have been shown to be an essential tool for healthcare professionals, administrators, planners, policy makers, funders and consumers. A systematic review allows individuals to keep up to date with accumulating evidence in their field and enable them to make an objective appraisal of the evidence (Egger et al., 2001). From a preliminary review of the literature it is evident that there is scant information on early interventions and primary preventions for problem gambling. Although a number of individual studies were identified, the results have not been summarised so it has not been possible to come to conclusions about the effectiveness of primary interventions on problem gambling from the literature. This information gap provides the justification for conducting this systematic review.

The primary objective of this review is to determine which early prevention interventions for problem gambling, applied to a community level, are effective. This report provides details of:

- the literature search process and findings
- descriptions of all the identified relevant studies that met the pre-determined selection criteria
- results of the estimates of the weighted mean difference of the primary prevention interventions in the identified studies
- descriptions of the studies which could not be included in the meta-analysis
- discussion and analysis of all results
- set of guiding principles for designing early intervention and prevention measures that can be drawn from the findings and analysis
- recommendations for future research.

Systematic reviews have a number of benefits over narrative or traditional literature reviews. The advantages of a systematic review and meta-analysis are discussed in the following sections.

## **Systematic review and meta-analysis**

### **Systematic review**

Traditional literature reviews use narrative approaches to describe and appraise previously conducted work. However the methods used in the reviews are not necessarily specified and biases can result in the subjective selection, analysis and interpretation the earlier studies (Cochrane Health Promotion and Public Health Field, 2007). The methods used in a systematic review provide more reliable results than narrative or traditional literature reviews, which may form the basis of conclusion and decision making (Higgins and Green, 2005). Using systematic searches, eligibility and extraction methods, which reduce error and results that may be due to chance, systematic reviews provide an effective way to manage, integrate and critically appraise large amounts of information on a given topic in an effective manner.

A systematic review begins with a clearly formulated research question that guides the researcher to assess the relevance and eligibility of the studies and in conducting the analysis. The research question must consider components such as the participants used, interventions used, comparisons to be made and outcomes both expected and unexpected (Cochrane Health Promotion and Public Health Field, 2007).

Systematic reviews use explicit methods in searching, collecting and analysing studies. Initially a search strategy is formulated consisting of related search terms to the research topic (Higgins and Green, 2005). This strategy is used in the search of all databases which ensures a comprehensive search, identifying all possible studies in the search process.



Once the search processes are complete a set of strict eligibility criteria are formulated to assess each of the studies identified in the search process (Cochrane Health Promotion and Public Health Field, 2007). Those studies that do not meet the criteria are excluded from the review.

Established standard criteria are used to assess the quality of the included studies. Through this process reviewers systematically examine the study quality, validity and biases within the individual studies, which in turn may affect the overall results of the review (Cochrane Health Promotion and Public Health Field, 2007). Assessing the study quality determines to what extent processes were implemented to reduce the risk of bias within the study. Procedures that reduce the risk of bias include ensuring adequate randomisation methods, concealing allocation and blinding outcome assessors and participants (Cochrane Health Promotion and Public Health Field, 2007). By assessing the internal validity of a study, the reviewer determines to what degree the results actually estimate the true effect size. Assessing the external validity of a study estimates to what degree the study results can be generalised to the general population (Cochrane Health Promotion and Public Health Field, 2007).

Studies are assessed for four main types of biases - selection, performance, attrition and detection biases. A bias can be defined as:

*A deviation of the results or inferences from the truth, or processes leading to such deviation. Any trend in the collection, analysis, interpretation, publication or review of data that can lead to conclusions that are systematically different from the truth*  
(Last, 2001)

**Selection bias** may occur when participants are recruited and allocated between groups in the study in an unsatisfactory manner (Cochrane Health Promotion and Public Health Field, 2007). Firstly, if participants are not randomly selected, the study will not have a truly representative sample of the population. Secondly, if selected participants are not randomly allocated between groups, they may become aware of which group they are in or be able to predict which group they will be allocated to (Cochrane Health Promotion and Public Health Field, 2007).

**Performance bias** may occur when the two groups receive systematic differences other than the intervention e.g. one group may receive additional care or information from outcome assessors which gives that group an unfair advantage.

**Attrition bias** is systematic difference between the groups in losses of participants from the studies e.g. conduction of a trial at a school and all the participants from one group moved to a different area and dropped out of the study. An intention-to-treat analysis examines data from participants that have dropped out from the study in the groups that they were allocated to. Conducting an intention-to-treat analysis ensures the groups are the same at the end of the study as they were in the beginning.

**Detection bias** is the systematic difference between groups in the outcome assessment e.g. when an outcome assessor is aware of the participant's group allocation and gives an exaggerated estimation of an effect (Cochrane Health Promotion and Public Health Field, 2007).

In this review, biases were dealt with by developing a quality standard set of criteria and conducting a quality assessment of each study. Factors which could cause or influence the degree of bias in the studies were assessed. The authors focused on factors such as appropriate randomisation methods for selection and allocation, the blinding of participants and outcome assessors and if intention-to-treat analysis was performed. If any information was not reported authors were contacted to clarify concerns.

Explicit methods of data extraction were used on the included studies. Specific data extraction forms are designed to be unbiased and identify the necessary data that needs to be extracted for the review (Cochrane Health Promotion and Public Health Field, 2007). The data extraction form is generally piloted on a group of studies to ensure the quality of the form and to ensure that it records all necessary information. Where there are multiple reviewers, each reviewer completes the data extraction process and any differences in extraction results should be discussed to ensure the quality of the data set (Cochrane Health Promotion and Public Health Field, 2007).

Conducting a rigorous systematic review should provide an unbiased and agenda free review of primary preventions for problem gambling that are currently being used.

## **Meta-analysis**

Once the data has been extracted a meta-analysis may be performed. This is a process using specialised statistical techniques to summarise and combine two or more studies to produce a single overall effect size. The results of meta-analysis can be presented in forest plots which display the results graphically (Higgins and Green, 2005). These have been used in this report (see pages 45, 48 and 53).

The effect measure used in this meta-analysis was weighted mean difference (WMD). The weighted mean difference is a standard statistic that measures the difference between means of two groups in a randomised controlled trial. The weighted mean difference is appropriate to be used when the outcome measurement scales of studies within a meta-analysis are uniform (Higgins and Green, 2005).

A random effects model has been used in this meta-analysis. A random effects model is used when heterogeneity is present and assumes that the impacts being estimated in the different studies in the meta-analysis are not identical, but follow some distribution (Higgins and Green, 2005).

## **Forest plots: a description**

Forest plots seek to present in a graphical form a complex range of information in an easily understood manner. The label in the top left hand corner of the graph shows the title of the review, the comparison and outcome. The horizontal line at the bottom of the graph includes a scale which measures the treatment effect. The greater the move towards the left or right, the greater the treatment effect for either intervention or control group. There is a vertical line that runs down the middle of the graph, which indicates the point where the intervention and control have the same effect. The column on the left hand side of the graph identifies the

various studies or sub-categories. The next columns contain the data for the intervention and control group. They are divided to show the number of participants, mean and standard deviation for each group in that particular trial. The label above the vertical line indicates what statistic has been used.

Each study is given a marker which is referred to as a blob, which measures the extent of the effect. The size of the blob is in proportion to the percentage of weight given to it. Each blob has lines coming from it which reaches the 95% confidence intervals measures; the wider the lines, the wider the confidence intervals.

It is usual for the pooled analysis to be represented as a diamond shape, in which the middle of the diamond indicates the point estimate and the edges of the diamond indicates the 95% confidence intervals. However, for this review, no pooled analyses are presented for reasons discussed later on. The first column to the right of the vertical line indicates the weighted percentage that the study has given to the overall total. The next column is divided to include the weighted mean difference (point estimate) and in the brackets are the 95% confidence intervals. The final column includes the order in which the studies are to be presented (Alderson, 2002).

### **Meta-analysis statistical terminology**

There are a number of statistical terms used in a meta-analysis. The definitions of the main statistical terms used in this meta-analysis have been included below.

***Estimates*** –are a summary measures calculated from samples. Also termed point estimates. Estimates are used to make inferences about target populations whose parameters are not known.

***Standard error*** –is a statistic which indicates the degree of uncertainty in calculating an estimate from a sample.

***Confidence interval*** – With regards to estimation, the confidence interval is the range of values within which the true parameters of a population are believed to be found.

***Precision*** –refers to the magnitude of the standard error of an estimate. This is reflected in the width of the confidence interval constructed around the same estimate. Wide confidence intervals indicate uncertainty about the true population values.

***Cluster***– a group of individuals that are treated and analysed as a unit. Usually individuals who are closer together or similar are considered to be the same cluster eg. schools or classes. Individuals within a cluster are given the same treatment or intervention.

These definitions have been taken from the work of A-Z of Medical Statistics: a companion for critical appraisal by Pereira-Maxwell (1998).

## METHODOLOGY

### Criteria for considering studies

TABLE 1 – Criteria for considering studies

	Criteria
<i>Types of studies</i>	Randomised or quasi-randomised controlled trials
<i>Types of participants</i>	Members from the general community of all ages, gender and ethnicity took part in the studies. People engaged in any primary, general practice or outpatient care and those who had been diagnosed with pathological gambling were excluded
<i>Types of interventions</i>	The review covered all types of early interventions and primary preventions for problem gambling
<i>Types of outcome measures</i>	<p>Controlled gambling behaviour, either a significant reduction or continued minor gambling in non problem related form</p> <p>A change in score on the measuring instrument used (e.g. South Oaks Gambling Screen (SOGS), Diagnostic and Statistical Manual of Mental Disorders criteria (DSM-IV), the Massachusetts Gambling Screen, Canadian Problem Gambling Index (CPGI)</p> <p>A change in knowledge awareness of the potential negative impact of problem gambling</p> <p>A change in gambling misconceptions and faulty cognitions</p> <p>A change in the score on a commonly used instrument measuring gambling coping and problem resolution skills</p>

A total of 20 outcome measures were recorded from the included studies. Researchers attempted to locate and include all of the outcomes stated in the criteria for selecting studies in the meta-analysis.

Of the five pre-selected outcome measures as outlined above, only four were found to be used in the studies. The four outcome measures were included in the meta-analysis are:

- gambling attitudes and misconceptions
- gambling knowledge
- gambling behaviour
- coping and problem resolution skills

The authors have grouped the results for each outcome, and similarity of interventions.

## **Search strategy for identification of studies**

### **Electronic Resources**

The following electronic bibliographic databases were used to search, identify and retrieve potentially relevant published and unpublished studies, including non-English articles, for inclusion in this review:

- Medline (1966-2006)
- PsycINFO (1985-2006)
- CINAHL (1982-2006)
- Embase (1996- 2006)

Three separate searches of the electronic data bases were conducted on the 8 August 2006, 22 September 2006 and 9 February 2007.

The Cochrane Controlled Trials Register and the Cochrane Collaboration Depression, Anxiety and Neurosis Controlled Trials Register were also searched for any relevant randomised controlled trials. The search was conducted on 22 September 2006.

### **Hand searching**

The following journals were hand searched on 22 September 2006 for any appropriate randomised controlled trials:

- The *Journal of Gambling Studies* (formerly *Journal of Gambling Behavior*) (1985-2005)
- *Addictions* (1999-2005).

Bibliographies of all studies included in the review were searched to further identify any potentially relevant studies.

### **Grey literature and other search approaches**

We attempted to search for grey literature in a number of ways. First, researchers in the gambling field were contacted by letter. They were identified by scanning author lists of relevant studies. Researchers were asked to indicate if they had been, or were presently, involved in any relevant studies. They were also asked whether they were aware of any relevant studies that may be considered for inclusion in this review. Second, the Dissertation Abstracts database (1988-2005) was also searched for potentially relevant theses and dissertations. Finally authors searched conference proceedings for potentially relevant studies.

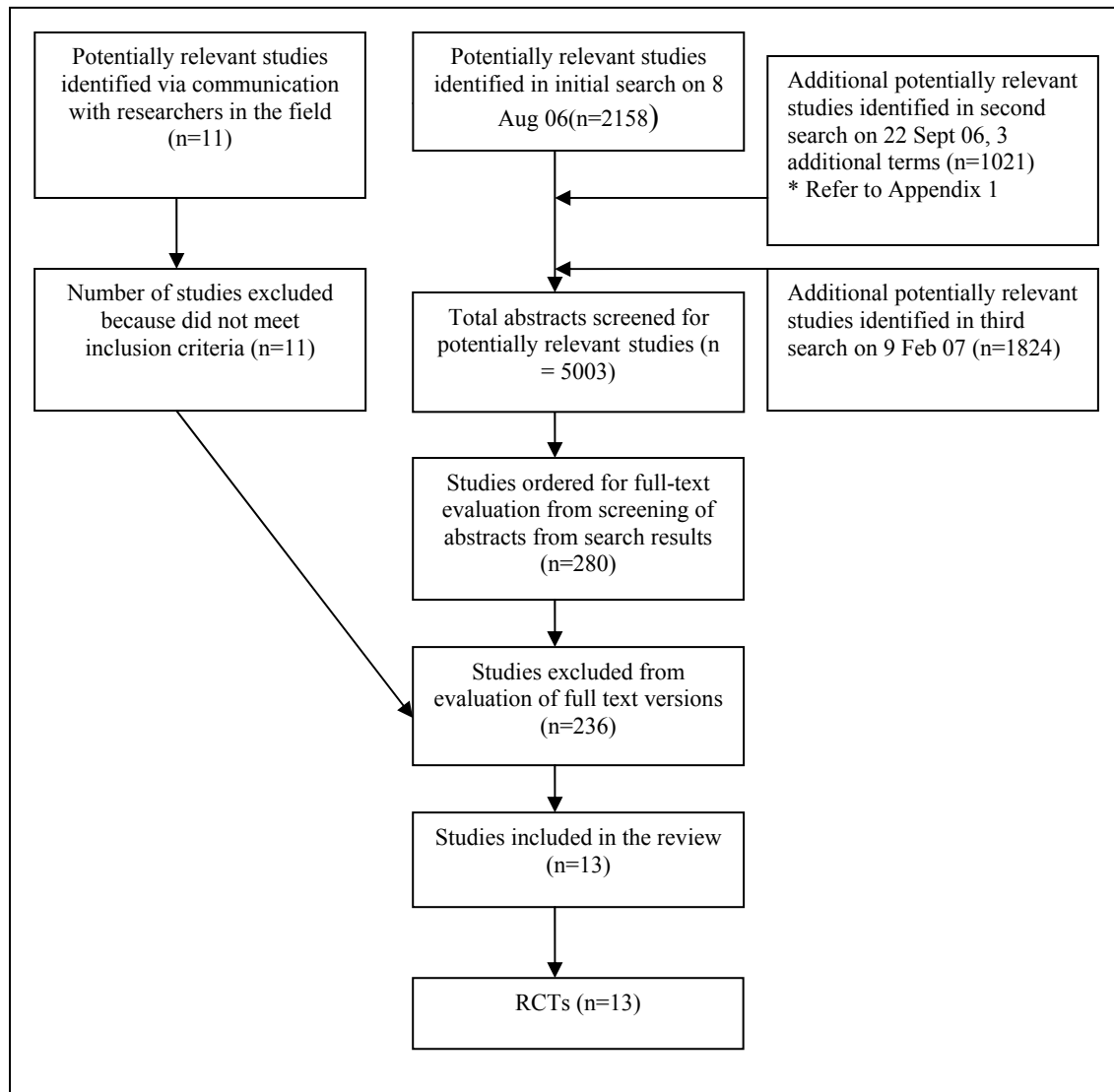
## **Search terms**

Gambling issues relevant to this review are described in the literature in a variety of ways. Accordingly the search used a combination of thesaurus terms (MeSH, Emtree) and other free-text terms for each database to ensure that all possible relevant references were retrieved. A complete list of the search strategies used for each database can be found in Appendix 1.



Throughout the review process there were a number of steps undertaken in the search process, to find relevant studies to be included in the systematic review. The various steps and dates taken in the search process for this review is shown in diagram one.

DIAGRAM 1 - Flow chart of the search process and results



## Data Extraction and Quality Assessment

Three investigators independently selected trials for inclusion in the review and extracted data using a data extraction form specifically designed for this review. Any disagreement between investigators regarding data extracted was resolved through discussion. Where possible, extracted data was analysed using Review Manager 4.2 (Cochrane Collaboration, 2004).

One investigator assessed the methodological quality of the included trials using methods outlined in the Cochrane Handbook for Systematic Reviews of Interventions (Higgins and Green, 2005). The following criteria were used to assess potential selection, performance, detection and attrition bias.

The biases considered in this review are the main sources that produce systematic bias in study trials. This set of four bias sources is used as a logical criteria to assess the overall bias of studies in the review (Higgins and Green, 2005).

The four main forms of bias are:

### Selection bias

- *Was the randomisation method used in the trial adequate?*
- *Was the method of allocation concealment adequate?*

### Performance bias

- *Were treatment providers blind to group allocation?*
- *Were participants blind to group allocation?*

### Measurement bias

- *Were outcome assessors blind to group allocation?*

### Attrition bias

- *Were participants lost to follow up described?*
- *Was intention to treat analysis performed?*

Each criterion was graded with a 'yes', 'no' or 'unclear' mark. Allocation of concealment was graded with a mark of (A) adequate, (B) unclear, (C) inadequate, or (D) not used.

Results have been expressed as mean differences with 95% confidence interval (CI) for continuous outcomes. CIs are measures of uncertainty around a main statistical finding. Within this interval is a range of values in which the theoretical probability of an event or result may be specified (Reber and Reber, 2001). With a 95% CI, if the study was repeated over and over, 95% of the confidence intervals of repeated studies would contain the true value of the unknown value (Higgins and Green, 2005).

Results of separate studies were included if they were deemed to have sufficient methodological and statistical homogeneity. Methodological homogeneity was satisfied when study design, participants, interventions and outcome measures were considered to be sufficiently similar. Statistical inconsistency across studies was assessed using the  $I^2$  test (Higgins and Green, 2005). Pooled results were analysed using a random effects model. Studies not included in the meta-analysis because of issues of heterogeneity or insufficient

data necessary for pooling were presented narratively in the review. Sensitivity analyses were not conducted, as the data reported and methods used across the studies were insufficient to support sensitivity analyses. Subgroup analyses were not performed as there was no data on specific sub-groups repeated consistently across the studies. The review incorporates a thorough description of the varying context and delivery variables of all included studies to facilitate the generalisation of the findings to the Australian setting and inform local programs.

## **Characteristics of included studies**

The following sections describe the included studies and their results under the categories of the four main outcome measures. However, not all study results could be aggregated in the meta-analysis as they differed from the other studies in either type of intervention or they reported insufficient data. This does not discredit the quality of the studies and the impacts of the interventions should be considered and examined for each study individually. Details of the data extracted can be found in Appendix 2.

TABLE 2 – Characteristics of included studies

Study	Methods	Participants	Interventions	Outcomes	Measurement Tool	Allocation concealment*
<b>(Hodgins et al., 2004)</b>	<p>Randomised Controlled Trial</p> <p>Randomisation method- Stratified, ensuring equal numbers of males and females</p> <p>Blinding of outcome assessors - Not present</p> <p>Intention to treat analysis- Used</p>	<p>Total: 52 (Female - 30, Male - 22)</p> <p>Mean age - 46 (SD- 10)</p> <p>Experimental group 1 - 28, Experimental group 2 - 24</p> <p>Inclusion criteria: minimum age of 18 years, self perception of a gambling problem, no present involvement in treatment, a willingness to read a short workbook as a major assessment (to ensure reading ability), willingness to provide follow-up data on gambling activity, willingness to provide name of a collateral to help locate them for follow-up interviews, a willingness to provide a different collateral for data validation.</p> <p>Baseline Equivalence – researchers reported on group equivalence of sex and ethnicity</p>	<p>Self-help workbook</p> <p>Motivational interview 20-40 minutes</p> <p>Method of delivery – Clinical Psychologist</p>	<p>Days gambled</p> <p>Money won and lost</p> <p>Follow-up period: 18 months, 24 months after intervention</p> <p>Losses to follow up – A total of 15 participants were lost to follow up at the 24 month follow up. Participants lost declined follow up or could not be located</p>	<p>Telephone questionnaire adapted from Sanchez-Craig, Davila, &amp; Cooper, (1996)</p>	<b>B</b>
<b>(Hodgins et al., 2001)</b>	<p>Randomised Controlled Trial</p> <p>Randomisation method- Stratified, ensuring equal numbers of males and females</p> <p>Blinding of outcome assessors [insert space]- Not present</p> <p>Intention to treat analysis- Not reported</p>	<p>Total: 102 (Female - 54, Male - 48)</p> <p>Mean age - 46 (SD - 9)</p> <p>Experimental group 1 - 35, Experimental group 2 -32 &amp; Experimental group 3 - 35</p> <p>Inclusion criteria: minimum age of 18 years, self perception of a gambling problem, no present involvement in treatment, a willingness to read a short workbook as a major assessment (to ensure reading ability), willingness to provide follow-up data on gambling, willingness to provide name of a collateral to help locate them for follow-up interviews, a willingness to provide a different collateral for data validation.</p> <p>Baseline Equivalence- researches reported on group equivalence of sex and ethnicity</p>	<p>Self-help workbook</p> <p>Motivational interview 20-40 minutes</p> <p>Method of delivery – Research Assistant</p>	<p>Days gambled</p> <p>Money won and lost</p> <p>Follow-up period: post-test, 1 month, 3 months, 6 months, 12 months after intervention</p> <p>Losses to follow up – researchers reported the following loss at each follow up period: 1 month – 4 6 months – 6 12 months – 12 Reasons not reported.</p>	<p>Telephone questionnaire adapted from Sanchez-Craig, Davila, &amp; Cooper, (1996)</p>	<b>B</b>

Study	Methods	Participants	Interventions	Outcomes	Measurement Tool	Allocation concealment*
<b>(Ladouceur et al., 2004a)</b>	<p>Randomised Cluster Controlled Trial</p> <p>Unit of allocation - Schools Unit of analysis - Individuals</p> <p>Randomisation method - random number table</p> <p>Blinding of outcome assessor - Not reported</p> <p>Intention to treat analysis - Not reported</p>	<p>Two randomly selected schools (grades 7 and 8) from the Quebec city</p> <p>Total - 345 (Female -190, Male - 2155)</p> <p>Mean age - 12.8 (SD - 0.7)</p> <p>Experimental group - 227, Control group - 118</p> <p>Inclusion criteria: parental and participant consent</p> <p>Baseline Equivalence Researchers reported that groups were equivalent in the distribution of gender</p>	<p>Specialist designed Educational Program</p> <p>Duration: 60 minutes</p> <p>Method of delivery - Experimenters</p>	<p>Gambling misconceptions</p> <p>Follow-up period Post-test</p> <p>Losses to follow up - Any losses to [at?] follow up were not indicated</p>	<p>Gambling questionnaire - Adapted from the instrument developed by Gaboury &amp; Ladouceur (1993)</p> <p>14 questions assessing concept of chance</p> <p>Four questions assessing socio-demographic factors.</p>	<b>B</b>
<b>(Ladouceur et al., 2003)</b>	<p>Randomised Cluster Controlled Trial</p> <p>Unit of allocation - Classes Unit of analysis - Individuals</p> <p>Randomisation method - Random draw of numbers from a bag *</p> <p>Blinding of outcome assessor - Not reported</p> <p>Intention to treat analysis - Not reported</p>	<p>Randomly allocated classes (grades 5 and 6) from three primary schools in the Quebec city area</p> <p>Total - 153 (Females - 68, Males - 87)</p> <p>Mean age - Not reported</p> <p>Experimental group -21, Control group -71 C - T Experimental group - 95, C - S Experimental group -122, E - S Experimental group - 139</p> <p>Inclusion Criteria: Not reported</p> <p>Baseline Equivalence Researchers reported that groups were equivalent in the distribution of gender and academic level achieved.</p>	<p>Program: Specialist designed gambling prevention activities</p> <p>Duration: 60 minutes</p> <p>Comparison: presented by teacher versus gambling specialist</p> <p>Method of delivery - Not reported</p>	<p>Knowledge of notion of chance and randomness</p> <p>Follow-up period: post-test immediately after intervention</p> <p>Losses to follow up - Any losses to follow up were not stated.</p>	<p>Gambling questionnaire - Adapted from the instrument developed by Gaboury &amp; Ladouceur (1993)</p> <p>18 questions</p> <p>Ten evaluate notion of chance</p> <p>Eight evaluate gambling habits</p>	<b>B</b>
<b>(Gaboury and Ladouceur, 1993)</b>	<p>Randomised Cluster Controlled Trial</p> <p>Unit of allocation - class</p>	<p>Five randomly selected schools in the Quebec city area 289 junior and senior students selected</p> <p>Male/Female - not reported</p>	<p>Gambling education prevention program</p> <p>Duration: three week period</p>	<p>Knowledge of gambling and pathological gambling</p> <p>Attitude change</p>	<p>Gambling questionnaire – especially developed for this study</p>	<b>B</b>

Study	Methods	Participants	Interventions	Outcomes	Measurement Tool	Allocation concealment*
	Unit of analysis - unclear  Randomisation method - Random draw of numbers from a bag *  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not reported	Mean age - 16 years  Experimental group - 134, Control group - 155  Inclusion criteria - Parental & participant consent  Baseline Equivalence Researchers did not state any baseline equivalences.	Frequency: 3 x 60 minute sessions  Method of delivery - Program leader	Money gambled and gambling frequency  Follow-up periods – post - test and 6 months after intervention  Losses to follow up -Any losses to follow up were not stated	Assessing gambling knowledge, gambling behaviours and gambling attitudes	
<b>(Ferland et al., 2005)</b>	Randomised Cluster Controlled Trial  Unit of allocation - Schools Unit of analysis - Individuals  Randomisation method - Not reported  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not reported	Eight randomly selected secondary schools in the Quebec area  Total -1193 (Female - 594, Male -599)  Mean age (experimental) - 13.3 (SD -1.05) Mean age (Control) -13.8 (SD -1.09)  Experimental group -571 Control group - 622  Inclusion criteria - parental consent  Baseline Equivalence Researchers reported that groups were equivalent in the distribution of gender, age and parental employment status.	Specialist designed educational prevention program  60 minutes x 3 sessions  Method of delivery - Not stated	Gambling knowledge  Gambling attitudes  Presence of pathological gambling  Skills in resolving gambling problems Gambling frequency  Follow-up period - 6 and 9 months after intervention  Losses to follow up - Any losses to follow up were not stated.	Gambling Questionnaire - Adapted from the instrument developed by Gaboury & Ladouceur (1993)  Nine questions assess gambling knowledge  Six questions assess gambling activity	<b>B</b>
<b>(Lemaire et al., 2004)</b>	Randomised Cluster Controlled Trial  Unit of allocation - Classes Unit of analysis - Individuals  Randomisation Method - stratified random sampling method	Randomly allocated classes (grades 7 and 8) from Manitoba public schools  Total - 894 (Female/Male - Not reported)  Mean Age - Not reported  Experimental - 473, Control - 421  Inclusion Criteria - Not reported	Program: "It's your Lucky Day"  Duration - 45 - 60 min  Educational/Awareness Program  Follow-up period -1 month	Gambling knowledge  Losses to follow up - Researchers reported 18 participants were lost to follow up. Reasons were not stated.	Gambling questionnaire developed by the Addictions Foundation of Manitoba (AFM). Some questions were borrowed from Ferland, Ladouceur and Vitaro (2002).	<b>B</b>

Study	Methods	Participants	Interventions	Outcomes	Measurement Tool	Allocation concealment*
	Blinding of outcome assessors- Not reported  Intention to treat analysis- Not reported	Baseline Equivalence Researchers reported that groups were equivalent in the distribution of gender and academic level.	Method of delivery - Not Stated			
<b>(Ferland et al., 2002)</b>	Randomised Cluster Controlled Trial  Unit of allocation – Classes Unit of analysis - Individuals  Randomisation method - Not reported  Blinding of outcome assessor - Not reported  Intention to treat analysis -	Randomly allocated classes (grades 7 and 8) from 2 schools in the Quebec City area  Total -424 (Female -198, Male -226)  Mean age -13.1 years  Experimental group 1 - 118, Experimental group 2 - 106, Experimental group 3 - 105, Control group -95  Inclusion Criteria - parental consent  Baseline Equivalence Researchers reported that groups were equivalent in the distribution of gender or age.	Video: "Lucky" the clown  Duration: 20 minutes  Activities/information session  Follow-up period - 1 week after intervention  Method of delivery - graduate psychology student	Gambling knowledge  Gambling misconception  Losses to follow up - Any losses to follow up were not stated.	Gambling Questionnaire - Adapted from the instrument developed by Gaboury & Ladouceur (1993)  Seven questions assess gambling misconceptions  Nine questions assess gambling knowledge	<b>D</b>
<b>(Ladouceur et al., 2004b)</b>	Randomised Cluster Controlled Trial  Unit of allocation – Classes Unit of analysis - Individuals  Randomisation method - random number table  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not reported	Two classes (years 7 and 8) from two randomly chosen secondary school [make plural] in the Quebec and New Brunswick area  Total - 371 (Female - 178, Male -193)  Mean age - 12.8  Experimental group -204, Control group - 167,  Inclusion criteria- Parental and participant consent  Baseline Equivalence Researchers reported that groups were equivalent in the distribution of gender or age.	An English translation of “Lucky” the clown Video  Duration - 20 minutes  Method of delivery - Not stated	Gambling knowledge  Gambling misconception  Follow-up period: post-test immediately after intervention  Losses to follow up - Any losses to follow up were not stated.	Questionnaire on the games of money and chance – adapted from the instrument developed by Gaboury & Ladouceur (1993)  Seven questions assess gambling misconceptions  Nine questions assess gambling knowledge	<b>B</b>
<b>(Lavoie and</b>	Randomised Cluster Controlled Trial	Randomly allocated classes (grades 5 and 6) from 2 schools in the Quebec city area	Video: "Lucky" the clown	Gambling knowledge	Gambling Questionnaire – adapted from the instrument	

Study	Methods	Participants	Interventions	Outcomes	Measurement Tool	Allocation concealment*
<b>Ladouceur, 2004)</b>	Unit of allocation – Classes Unit of analysis - Individual  Randomisation method - random number table  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not reported	Total - 273 (Females - 136, Males -137)  Mean age -11.53 years  Experimental group 1 - 105, Experimental group 2 - 73, Control group - 95  Inclusion criteria - parental consent  Baseline Equivalence Researchers reported on the equivalence of age, number of attitude errors, knowledge and gender.	Duration: 20 minutes  Activities/information session  Follow-up period: post-test after recess  Method of delivery - psychology students	Gambling attitude misconceptions  Losses to follow up - Any losses to follow up were not stated.	developed by Gaboury & Ladouceur (1993)  Seven questions assessing gambling attitudes  Nine questions assessing gambling knowledge	<b>D</b>
<b>(Ladouceur et al., 2005)</b>	Randomised Cluster Controlled Trial  Unit of allocation – Schools Unit of analysis - Individuals  Randomisation method - Random draw of numbers from a bag *  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not reported	3 Schools (grades 11 and 12), from the Quebec city area randomly allocated between groups  Total - 568 (Females - 301, Males - 267)  Mean age (experimental) - 15.99 years (SD - 0.79), Mean age (control) - 15.81 (SD - 0.85)  Experimental group - 361, Control group - 207  Inclusion criteria: Parental and participant consent  Baseline Equivalence Researchers reported that groups were equivalent in academic level achieved, but not in sex or age.	Video: "Gambling Stories"  Duration 20 minutes  Method of delivery – Research Assistant	Knowledge of gambling  Knowledge of excessive gambling  Stereotypes  Follow-up period: One month after intervention  Losses to follow up - Any losses to follow up were not stated.	Gambling questionnaire-adapted from Ladouceur (2003).  10 questions assessing overall gambling knowledge  10 questions assessing knowledge of excessive gambling  12 questions assessing stereotypes	<b>C</b>
<b>(Floyd et al., 2006)</b>	Randomised Controlled Trial  Randomisation method - Computer generated random number list *  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not reported	122 university students recruited through psychology classes and variety of legal gambling options  Total - 122 (Females - 70, Males - 52)  Mean age - 24.6  Experimental group - not reported, Control group - not reported	Educational video discussing irrational beliefs associated with loss of control while gambling  Periodic warning messages displayed on roulette table screen  40 minutes	Roulette belief questionnaire score  Post-Gamblers beliefs questionnaire score  Risk coefficient  Number of spins	Gambling History questionnaire  Gamblers Belief Questionnaire-  Receipt Questionnaire  Roulette Belief Questionnaire	<b>B</b>



Study	Methods	Participants	Interventions	Outcomes	Measurement Tool	Allocation concealment*
	reported	Inclusion criteria: participant consent, self reported gambling activity, understand English text and completion of all questionnaires  Baseline Equivalence - researchers reported on group equivalence of sex and ethnicity.	Method of delivery – computer simulated	Final dollar amount  Follow-up periods: post-test, immediately after intervention  Losses to follow up - Any losses to follow up were not stated.	Gambling Experience Questionnaire	
<b>(Dickerson et al., 1990)</b>	Randomised Controlled Trial  Randomisation method - Not reported  Blinding of outcome assessor - Not reported  Intention to treat analysis - Not indicated in an intention to treat analysis was conducted within the study	29 adult individuals  Total - 29 (Females - 8, Males - 21)  Mean age - 41  Experimental group- number of participants not reported, Control group- number if participants not reported  Inclusion criteria: 18+ adults, must have a permanent address in the ACT or Queanbeyan area  Baseline Equivalence - Researchers did not state any baseline equivalences.	Self-help manual  Interview  90 - 120 minutes  Method of delivery - Psychologist	Gambling Behaviour: dollars per week, sessions per week and dollars per session.  Follow up period: 3 months and 6 months  Losses to follow up - Any losses to follow up were not stated.	Visual Analogue rating scale.  Personality questionnaire	<b>B</b>

\*\*Note: Allocation Concealment, A= adequate, B= unclear, C= inadequate, D= not used

\* Information that has been confirmed by the researchers

## Participants

The search identified thirteen randomised controlled studies investigating the impact of primary prevention interventions for problem gambling, including nine cluster randomised controlled trials (Ferland et al., 2002, Ferland et al., 2005, Gaboury and Ladouceur, 1993, Ladouceur et al., 2003, Ladouceur et al., 2004a, Ladouceur et al., 2004b, Ladouceur et al., 2005, Lavoie and Ladouceur, 2004, Lemaire et al., 2004) that focussed on schools or classes. Five of the nine studies (Lemaire et al., 2004, Lavoie and Ladouceur, 2004, Ladouceur et al., 2003, Ladouceur et al., 2004a, Ferland et al., 2002) were randomised at the class level and four studies were clustered at the school. Two studies (Lavoie and Ladouceur, 2004, Ladouceur et al., 2003) focused on primary school students in grades 5 and 6, six studies (Lemaire et al., 2004, Ladouceur et al., 2005, Ladouceur et al., 2004a, Ferland et al., 2002, Ferland et al., 2005, Ladouceur et al., 2003) focused on secondary school students in grades 7 and 8 or 11 and 12 and one study (Gaboury and Ladouceur, 1993) focused on both primary and secondary students.

Eleven studies (Ladouceur et al., 2003, Lemaire et al., 2004, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2004b, Ladouceur et al., 2004a, Hodgins et al., 2001, Hodgins et al., 2004, Gaboury and Ladouceur, 1993, Ferland et al., 2002, Ferland et al., 2005) were undertaken in Canada, one study (Floyd et al., 2006) was based in the United States of America and the other (Dickerson et al., 1990) was conducted in Australia. All of the nine cluster trials studies (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Lemaire et al., 2004, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2003) were from Canadian schools. One study (Ladouceur et al., 2004b) involved schools from Quebec City and New-Brunswick areas, one study (Lemaire et al., 2004) involved schools from the Manitoba area and the remainder of the cluster randomised controlled trials studies (Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ferland et al., 2002, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2003) involved schools from the Quebec City area in Canada. Two studies (Hodgins et al., 2004, Hodgins et al., 2001) were based in Alberta, Canada and one study (Floyd et al., 2006) was based in Memphis in Tennessee USA.

Three studies (Hodgins et al., 2004, Hodgins et al., 2001, Dickerson et al., 1990) involved participants from the general community who had a self diagnosed gambling problem while one study (Floyd et al., 2006) involved participants recruited from a psychology class at an urban state university.

## Research team leaders

The majority of the studies (Ladouceur et al., 2003, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005) were conducted by the research team led by Ladouceur. The research team leader for two studies (Hodgins et al., 2004, Hodgins et al., 2001) was Hodgins. The research team of one study (Floyd et al., 2006) was led by Floyd and another study (Lemaire et al., 2004) was led by Lemaire. One study (Dickerson et al., 1990) was conducted by a research team led by Dickerson.

## **Interventions**

The studies varied in the types and combinations of interventions used.

### ***Videos only***

Three studies (Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004) used the *Lucky the clown* video. The 20 minute video features Lucky a sarcastic clown who has lost all his money to gambling. Lucky along with his assistant present a show explaining a variety of aspects of gambling including, chances of winning, randomness, good luck and more. One study (Ladouceur et al., 2005) used the *Gambling stories* video to inform the target audience of teenagers about the possible harmful effects of excessive gambling. The video is set in a bar where three characters discuss their gambling habits and their consequences (Ladouceur et al., 2005).

### ***Lectures and activities***

One study (Ferland et al., 2002) used a series of lectures and activities as the intervention and participants were presented with specific information regarding gambling that included understanding the different characteristics of gambling activities. One of Canada's national lottery games was used to highlight the financial aspects of gambling and address misconceptions students had about gambling. An activity - illusion of control – was undertaken to highlight that it was impossible to control gambling outcomes. These activities were followed by a question and answer period (Ferland et al., 2002).

### ***Video plus lectures and activities***

Two studies (Ferland et al., 2002, Lavoie and Ladouceur, 2004) used the *Lucky the clown* video in combination with the lectures and activities described above and in both cases participants received the information and undertook activities before being presented with the video.

### ***Educational prevention programs***

Five studies (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Lemaire et al., 2004, Ladouceur et al., 2003) used specialist designed educational prevention programs as interventions. All of these studies compared the impacts of the educational program to control groups. The control groups received no active intervention except in one study (Ferland et al., 2005), in which the control group received information about gambling.

In one study (Ladouceur et al., 2004a) the preventative education intervention program was aimed at teenagers, in order to teach the concept of chance. The program consisted of three components. First, participants were required to detect erroneous cognitions connected with the concept of chance. In the second part of the program, a simulated lottery draw was

conducted and finally, a game of “pile-or-face” (similar to heads-or-tails) to illustrate the independence between events (Ladouceur et al., 2004a).

One study (Ladouceur et al., 2003) used a three-part educational program to explain concepts of chance and randomness to primary school children. The start of the program aimed to show the independence of events. The second section sought to highlight that strategies and practices cannot predict or control the result of gambling activity. The final section aimed to demonstrate that no one can control chance. All program elements used a number of activities to communicate the key messages.

The educational program used in one study (Gaboury and Ladouceur, 1993) aimed to provide information and coping skills for problem gambling behaviour. The six units covered an overview of: gambling and legal aspects; the business of gambling; automatic behaviour; pathological gambling; control strategies; and quizzes.

A three-part educational program used in one study (Ferland et al., 2005) sought to improve knowledge of chance and money, to inform participants of strategies to aid in the resolution of gambling related problems and the consequences associated with participation in gambling.

One study (Lemaire et al., 2004) used an interactive multi-media gambling awareness program called “*It’s your lucky day*”. The program was designed to provide factual and reliable information to prevent possible harm from gambling and was complemented by a website [www.luckyday.ca](http://www.luckyday.ca) that included information, community resources and interactive quizzes. The program covered definitions of gambling; myths related to gambling; how gambling works; signs of problem gambling; and gambling services.

### ***Warning messages***

One study (Floyd et al., 2006) used periodical warning messages displayed on the computer roulette table screen as an intervention. The messages were written at fourth grade reading level and targeted different gambling irrational beliefs. The first message appeared after the third spin and then randomly for the rest of the game.

### ***Self-help and motivational interviews***

Three studies (Hodgins et al., 2004, Hodgins et al., 2001, Dickerson et al., 1990) used a self-help workbook on its own and in combination with motivational interviews. Two studies (Hodgins et al., 2004, Hodgins et al., 2001) used the self-help work book entitled “*Becoming a winner: Defeating Problem Gambling*” as an intervention. It included relapse prevention techniques and techniques based on the cognitive behavioural model of problem gambling. The book was divided into five sections including self-assessment, goal setting, strategies, maintenance and other resources. Participants worked through the book in their own time at home. How much of the book they worked through was recorded at follow-ups. A motivational interview was used in combination with the workbook for one group of participants. The motivational interview occurred at the time of the initial information gathering. A research assistant conducted the 20-45 minute interview and used principles of

motivational enhancement therapy to attempt to build a commitment to change (Hodgins et al., 2004, Hodgins et al., 2001).

One study (Dickerson et al., 1990) used a self-help work book called "*Problem Gambling: a self-help manual for controlling or stopping the amount you spend on gambling*" as an intervention. The manual targeted the first 12 weeks of the program specifically. It was divided into eight sections that included: definitions of potential users or problem gamblers; examination of why people gamble; how to self-monitor; functional analysis of gambling behaviour; goal and limit setting; self-reinforcement; alternate incompatible behaviours; and how to maintain gains in the long term. An interview was used in combination with the work book for one group of participants. The interview occurred at the time of the initial gathering of baseline data and lasted between 90 to 120 minutes. The interview followed the following set structure: reasons for seeking help; descriptions of the treatment offered; completion of demographic variables and involvement items; unstructured behaviour analysis of gambling behaviours and interrelationships; completion rating; coffee break for participants to complete personality questionnaires and interviewer to collate assessment; review and feedback including recommendations for action; and a letter summarising review and recommendations sent within 5 days (Dickerson et al., 1990).

## **Study Settings**

Nine of the studies (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Lemaire et al., 2004, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2003) were based in the classrooms of schools. One study (Floyd et al., 2006) was set in a virtual casino in a university's laboratory and three studies (Hodgins et al., 2004, Hodgins et al., 2001, Dickerson et al., 1990) were set in the households of individual participants.

## **Study Personnel**

Nine studies reported the method of delivery of the interventions (Hodgins et al., 2004, Hodgins et al., 2001, Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2002, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Floyd et al., 2006, Dickerson et al., 1990). Of the nine studies, two (Hodgins et al., 2004, Dickerson et al., 1990) were administered by psychologists; two (Hodgins et al., 2001, Ladouceur et al., 2005) were administered by research assistants and two (Ferland et al., 2002, Lavoie and Ladouceur, 2004) were administered by psychology graduate students. One study (Ladouceur et al., 2004a) was administered by an experimenter, another study (Gaboury and Ladouceur, 1993) was administered by a program leader and a final study (Floyd et al., 2006) was computer simulated. Four studies did not state the method of delivery of interventions (Ferland et al., 2005, Lemaire et al., 2004, Ladouceur et al., 2004b, Ladouceur et al., 2003).

[this section does not flow well – please re-word to improve expression]

## **Study Duration**

One study (Dickerson et al., 1990) used an intervention of 120 minutes duration; four studies (Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ladouceur et al., 2003) had a 60 minute intervention; four studies (Hodgins et al., 2004, Hodgins et al., 2001, Lemaire et al., 2004, Floyd et al., 2006) had a 40 minute intervention; and, four studies (Ferland et al., 2005,

Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004) had a 20 minute intervention.

## Length of study follow-up period

Most studies in the review had short follow-up periods. As Table 3 indicates the most common follow-up period was post-test i.e. immediately after the intervention. Only three studies (Hodgins et al., 2004, Hodgins et al., 2001, Gaboury and Ladouceur, 1993) had follow-up periods that extended to six months after the intervention or beyond.

TABLE 3 - Frequency of follow-up periods used in studies

Time	Study												
	1	2	3	4	5	6	7	8	9	10	11	12	13
Post-test			x	x	x				x	x		x	
1 week								x					
1 month		x					x				x		
3 month		x											x
6 month		x			x	x							x
9 month						x							
12 month		x											
18 month	x												
24 month	x												

1= (Hodgins et al., 2004)

2= (Hodgins et al., 2001)

3= (Ladouceur et al., 2004a)

4= (Ladouceur et al., 2003)

5= (Gaboury and Ladouceur, 1993)

6= (Ferland et al., 2005)

7= (Lemaire et al., 2004)

8= (Ferland et al., 2002)

9= (Ladouceur et al., 2004b)

10= (Lavoie and Ladouceur, 2004)

11= (Ladouceur et al., 2005)

12= (Floyd et al., 2006)

13= (Dickerson et al., 1990)

## Losses to follow-up

Three studies reported losses to follow up (Hodgins et al., 2004, Hodgins et al., 2001, Lemaire et al., 2004). Two studies (Hodgins et al., 2004, Hodgins et al., 2001) reported the reasons for the losses as participants declining or not being located.

## Measurement tools

None of the studies included used standardised measurement tools. One study (Lemaire et al., 2004) used a questionnaire specifically designed by the Addictions Foundations of Manitoba for the needs of the study as it was a pilot study. In the two studies that were conducted by telephone interviews (Hodgins et al., 2004, Hodgins et al., 2001), the questionnaires used were adapted from an earlier study by Sanchez-Craig and colleagues (1996). All studies conducted by the research team lead by Ladouceur (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2003), used the same format of measurement tool. The original measurement tool was specifically designed for the Gaboury and Ladouceur (1993). All seven of the other studies used an adapted form of this questionnaire. One study (Floyd et al., 2006) used six measurement tools for various outcomes measured in the study. The measurement tools are as follows:

- Gambling History Questionnaire
- Gambler's Beliefs Questionnaire (GBQ)
- Receipt Questionnaire
- Roulette Belief Questionnaire (RBQ)
- Gambling Experience Questionnaire
- Computerised Roulette Game

One study (Dickerson et al., 1990) used a visual analogue scale in which participants rated the positive and negative impacts that problem gambling had on various aspects of their lives. They also completed a measure of individual differences that was used to compare high and low frequency non-problem gamblers (Dickson et al., 2002).

## Quality of included studies

Of the thirteen studies included in this review, four studies (Hodgins et al., 2004, Hodgins et al., 2001, Floyd et al., 2006, Dickerson et al., 1990) were randomised controlled trials and nine studies (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Lemaire et al., 2004, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2003) were cluster randomised controlled trials.

Six studies (Hodgins et al., 2004, Hodgins et al., 2001, Ladouceur et al., 2004a, Lemaire et al., 2004, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004) reported that the randomisation method used to allocate participants into experimental and control groups. The co-author of four studies (Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ladouceur et al., 2005, Ladouceur et al., 2003) confirmed that this method was employed in the studies utilising a "draw" method of randomisation. Using this method, each school was assigned a number. These numbers were written on a piece of paper, placed in a bag and drawn. Two studies (Ladouceur et al., 2004a, Lavoie and Ladouceur, 2004) used a random number table. One study (Floyd et al., 2006) used a computer generated random number list. Three studies (Hodgins et al., 2004, Hodgins et al., 2001, Lemaire et al., 2004) used a stratified randomisation method. Two of these (Hodgins et al., 2004, Hodgins et al., 2001) used this method to ensure equal numbers of males and females in groups and the other study (Lemaire et al., 2004) used this method to ensure equal numbers of grades 7 and 8 in each group.

One co-author (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ladouceur et al., 2004b, Ladouceur et al., 2005) who was part of the research team led by Ladouceur clarified that randomisation was done at the school level rather than class level to control contamination between the groups. If randomisation had been conducted at the class level with different classes from the same school being allocated to different treatment groups, it is possible that students would talk to each other, which could potentially contaminate the study.

The blinding of participants and outcome assessors was unclear in the majority of the studies. Blinding of the outcome assessor was only reported in two studies (Hodgins et al., 2004, Hodgins et al., 2001). In both of the studies that reported outcome assessor blinding, it was considered inadequate. The outcome assessor was aware of the intervention being received by each participant at follow-up telephone interview. In one study (Floyd et al., 2006) the blinding of the outcome assessor was clarified by the researcher. The assessor was blind to the type of intervention being received by each participant until mid-way through the assessment.

A majority of the studies reported potential confounders between experimental and control groups to help minimise the risk of performance bias. In Table 2 these potential confounders are described for baseline equivalence in each study, when the information is available. Three studies (Gaboury and Ladouceur, 1993, Floyd et al., 2006, Dickerson et al., 1990) were unclear in reporting potential confounders between the groups. Potential confounders reported by studies were age (Ferland et al., 2005, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004), gender (Ferland et al., 2005, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2003), academic level (Ladouceur et al., 2004a, Lemaire et al., 2004, Ladouceur et al., 2005, Ladouceur et al., 2003) and parental employment levels (Ferland et al., 2005).

## **FINDINGS**

The results have been presented showing the effect sizes of interventions. When heterogeneity was absent the studies were pooled. However, the confidence intervals should be considered with caution. As clustering was not taken into account in the analyses of the individual studies, the estimates of the precision of the studies are overly optimistic. That is, the confidence intervals are too narrow as the analyses have not taken into account that the individuals within clusters are more alike than individuals not in clusters. Despite these problems with the calculation of the confidence intervals in the studies, the authors of this review have left the confidence intervals in the forest plots as a visual guide to aid interpretation of the results.



## **Gambling attitudes and misconceptions**

Nine studies (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Floyd et al., 2006, Ladouceur et al., 2003) assessed the impacts of a variety of interventions on improving gambling attitudes and decreasing misconceptions.

A pooled estimate of the weighted mean difference is not presented as significant heterogeneity was found across all studies,  $\chi^2 = 37.81$ ,  $df=9$  ( $p=0.001$ ),  $I^2 = 76.2\%$ .

### ***Video only***

Four studies (Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2004a, Ferland et al., 2002) in the meta-analysis, using a total of 1329 participants, assessed the impact of interventions using videos only to improve gambling attitudes and decreasing misconceptions in comparison with control groups.

Two of the four studies were included in the meta-analysis. One study (Ferland et al., 2002) favours the experimental intervention over the control. One study (Lavoie and Ladouceur, 2004) showed no significant differences between the intervention and the control. As heterogeneity was not detected, an estimate of the pooled weighted mean difference was calculated. The pooled weighted mean difference was calculated as  $PE = -0.65$  with confidence intervals of  $-1.17$  to  $-0.13$ . This is statistically significant ( $p=0.001$ ). This suggests that overall the interventions had a positive impact. However, the confidence intervals should be interpreted with caution, as they have not taken clustering into account and are overly narrow.

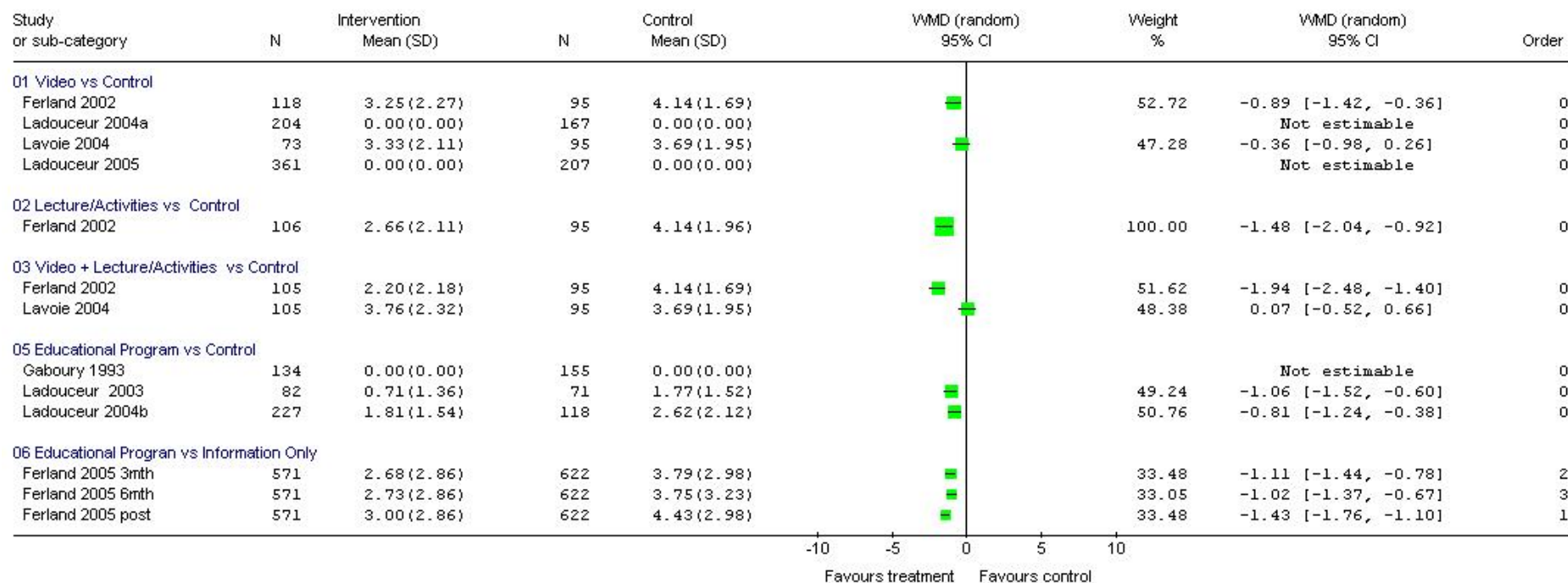
Two of the studies (Ladouceur et al., 2005, Ladouceur et al., 2004a) were unable to be analysed in the meta-analysis and be displayed on the graph, due to a lack of data reported. One study (Ladouceur et al., 2004b) using an ANCOVA revealed significant impacts in favour of the intervention, in decreasing misconceptions, ( $F(1,368)=15.772$ ,  $p=0.001$ ; Eta Squared= 0.041; power= 0.98). Another study (Ladouceur et al., 2005) also using an ANCOVA showed a significant impact in favour of the intervention in decreasing stereotypical views held about excessive gambling ( $F(1,481)=24.36$ ,  $p=0.0001.0001$ ). The findings in both of these studies need to be treated with caution as clustering was not taken into account.

### ***Lectures and activities***

One meta-analysis study (Ferland et al., 2002) assessed lectures and activities as a form of intervention to improve gambling attitudes and decrease misconceptions. The study had 201 participants and the findings were compared with a control group. The study demonstrated positive impacts for this type of intervention. More research would need to be done to replicate this finding.

Figure 1 – Decrease in gambling misconceptions and attitude errors for treatment groups receiving early intervention compared to control groups

Review: Primary Prevention and Early Intervention for Problem Gambling  
 Comparison: 01 Gambling Analysis  
 Outcome: 01 Gambling Misconceptions (lower score is better)



### ***Video plus lectures and activities***

Two studies in the meta-analysis (Ferland et al., 2002, Lavoie and Ladouceur, 2004) using a total of 400 participants, assessed the effect of videos in combination with lectures and activities as an intervention in improving gambling attitudes and decreasing misconceptions in comparison to control groups. While one study (Ferland et al., 2002) shows an effect in favour of the intervention, the other study (Lavoie and Ladouceur, 2004) shows no significant differences between the experimental and control groups.

A pooled estimate of effect is not presented as significant heterogeneity was found across all studies,  $\text{Chi}^2=24.25$ ,  $\text{df}=1$  ( $p=0.001$ ),  $I^2=95.9\%$ .

### ***Educational program***

Four of the five educational program studies (Ferland et al., 2005, Gaboury and Ladouceur, 1993, Ladouceur et al., 2003, Ladouceur et al., 2004b) included in the meta-analysis assessed the impacts of specialist designed educational programs as an intervention in improving gambling attitudes and decreasing misconceptions. Of these three studies (Ladouceur et al., 2004a, Gaboury and Ladouceur, 1993, Ladouceur et al., 2003), with a total of 787 participants, used control groups to compare the interventions. One study (Ladouceur et al., 2004b) shows a positive impact in favour of the intervention. Another study also shows a positive impact in favour of the intervention (Ladouceur et al., 2003). The effect for another study (Gaboury and Ladouceur, 1993) was unable to be estimated as the necessary data was not provided in the report. The ANOVA conducted regarding attitudes towards gambling shows that there was a non-significant difference between groups (Gaboury and Ladouceur, 1993). As heterogeneity was not detected, an estimate of the pooled weighted mean difference was calculated. This was calculated as  $\text{PE}=-0.93$  with confidence intervals of -1.24 to -0.61. This is statistically significant ( $p=0.0001$ ). This suggests that overall the interventions had a positive impact but the confidence intervals should be interpreted with caution, as they have not taken clustering into account.

One study (Ferland et al., 2005) had 1193 participants and compared an educational program as an intervention with a control group that received information only. In this study various follow-up periods were included and analysed on the forest plot. This shows how the estimates of the weighted mean differences changed over time. The study had three follow-up periods - post-test, three months and six months. Positive impacts were found at all follow-up periods.

### ***Warning messages***

One study (Floyd et al., 2006), involving 120 participants, assessed the effect of warning messages as an intervention. The same study assessed two different types of misconceptions. The first GBQ assessed participant gambling related irrational beliefs and the second RBQ assessed attitudes to potential gambling related outcomes. Univariate analysis was conducted on both scales and significant differences were found for both, indicating that participants receiving the warning messages displayed fewer irrational beliefs. For the RBQ scale the

experimental group showed a mean of 2.29 and the control 2.86, standard error of 0.14 and  $p=0.005.005$ . For the GBQ score, the experimental group showed a mean of 44.73 and the control 52.00, standard error of 1.97 and  $p=.01$ .

## **Gambling knowledge**

Seven studies (Gaboury and Ladouceur, 1993, Ferland et al., 2005, Lemaire et al., 2004, Ferland et al., 2002, Ladouceur et al., 2004b, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005) assessed the impact of a variety of interventions on improving gambling knowledge.

A pooled estimate of the weighted mean difference is not presented as significant heterogeneity was found across all studies,  $\text{Chi}^2=61.39$ ,  $\text{df}=7$  ( $p=0.0001$ ),  $I^2=88.6\%$ .

### ***Video only***

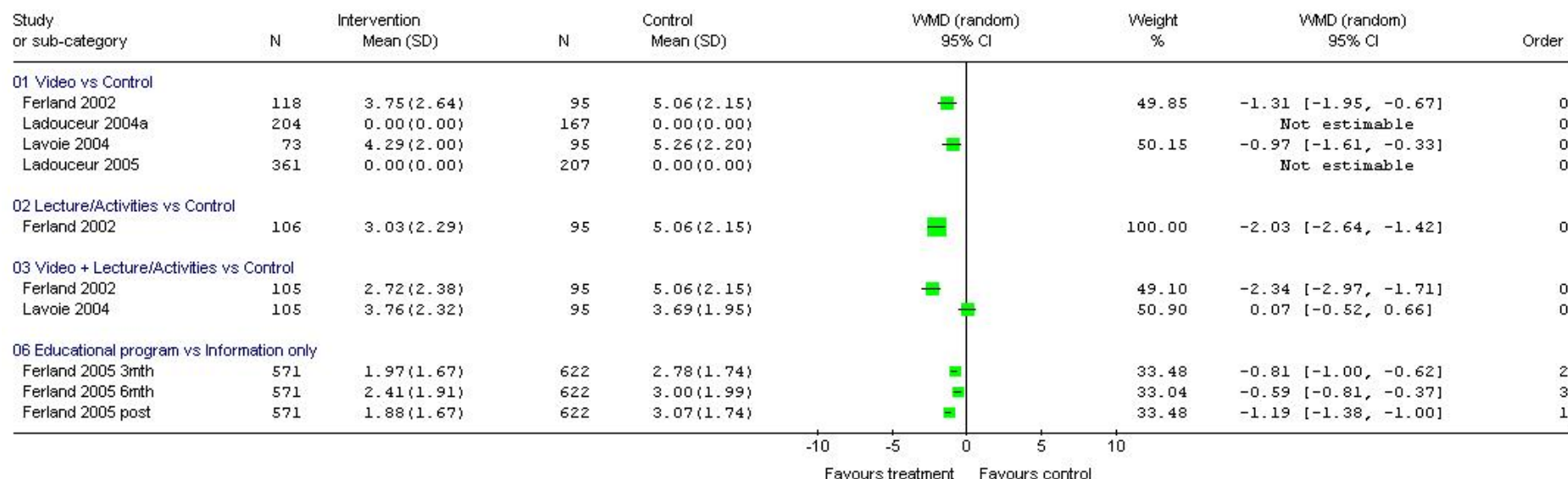
Four studies (Ferland et al., 2002, Lavoie and Ladouceur, 2004, Ladouceur et al., 2005, Ladouceur et al., 2004a), with a total of 1329 participants, assessed the impacts of video only interventions in improving gambling knowledge and compared results with control groups. Two studies (Ferland et al., 2002, Lavoie and Ladouceur, 2004) show estimates of weighted mean difference in favour of the intervention over the control. The estimate of the weighted mean difference of two of the studies (Ladouceur et al., 2005, Ladouceur et al., 2004a) were not included on the forest plot due to a lack of data reported. One study (Ladouceur et al., 2004a), used analysis of covariance (ANCOVA) that revealed significant impacts in favour of the intervention, in improving knowledge, ( $F(1,368)=7.723$ ,  $p=0.001$ ; Eta Squared= 0.021; power= 0.79). In one study (Ladouceur et al., 2005), the ANCOVA showed a significant effect in favour of the intervention in increasing overall knowledge of gambling ( $F(1,491)=17.04$ ,  $p=0.0001$ ). Results also showed significant impacts in increasing knowledge of excessive gambling ( $F(1,493)=18.06$ ,  $p=0.0001$ ). The analyses in both of these studies need to be treated with caution as clustering was not taken into account. As heterogeneity was not detected, an estimate of the pooled weighted mean difference was calculated. This was shown as  $\text{PE}=-1.14$  with confidence intervals of -1.59 to -0.69. This is statistically significant ( $p=0.001$ ). This suggests that overall the interventions had a positive impact but the confidence intervals should be interpreted with caution, as they have not taken clustering into account.

### ***Lectures and activities***

One study in the meta-analysis assessed the impact of lectures and activities intervention in comparison to control groups in improving gambling knowledge. This study (Ferland et al., 2002) using a total of 201 participants, shows an effect in favour of the intervention. This study has shown positive results using lectures and activities as an intervention. More research should be done to replicate this finding.

Figure 2 – Increase in gambling knowledge for treatment groups receiving early intervention compared to control groups

Review: Primary Prevention and Early Intervention for Problem Gambling  
 Comparison: 01 Gambling Analysis  
 Outcome: 02 Gambling Knowledge (lower scores are better)



### ***Video plus Lectures and Activities***

Two studies (Ferland et al., 2002, Lavoie and Ladouceur, 2004) in the meta-analysis assessed the impact of videos in conjunction with lectures and activities as interventions to increase gambling knowledge. The studies had a total of 400 participants and both used control groups for comparison. While one study (Ferland et al., 2002) demonstrates an impact in favour of the intervention, the other study (Lavoie and Ladouceur, 2004) showed no statistically significant differences between the experimental and control groups.

A pooled estimate of the weighted mean difference is not presented as significant heterogeneity was found across all studies,  $\text{Chi}^2 = 29.96$ ,  $\text{df} = 1$  ( $p=0.0001$ ),  $I^2 = 96.7\%$ .

### ***Educational programs***

A number of studies used educational programs to increase knowledge of gambling. One study (Ferland et al., 2005) assessed the impact of specialist designed educational programs as an intervention. The study had 1193 participants and compared those who undertook the educational program with a control group who received information only. The study had a number of follow-up periods. The intervention was found to have a positive impact on improving gambling knowledge of participants immediately after the intervention. The impact of the intervention diminished at both the three and six month follow up periods. The use of specialist designed educational programs as an intervention has shown positive results. However, more research would need to be conducted to replicate these results.

Two educational program studies (Gaboury and Ladouceur, 1993, Lemaire et al., 2004) were unable to be included in the meta-analysis because of a lack of reported data. Both studies assessed the impact of specialist designed educational programs as an intervention in improving gambling knowledge. One study (Gaboury and Ladouceur, 1993) using a total of 289 participants, comparing the intervention to control groups. Using repeated measures, ANOVA showed that the intervention significantly improved gambling knowledge, ( $F(2,5)=67.7$ ,  $p=0.01$ ). Another study (Lemaire et al., 2004) using a total of 894 participants compared the intervention to the control group. ANOVAs were used for the analysis. Pre-test the control group scores were 71.3 and experimental 62.7. Post-test the control group scores were 76.4 and the experimental 83.0. Results showed that the experimental group significantly ( $p=0.05$ ) improved the mean percentage score compared to the control group. The findings in both of these studies need to be treated with caution as clustering was not taken into account in the analyses.

### **Gambling behaviour**

Six studies assessed the impact of interventions on improving a range of gambling behaviours (Hodgins et al., 2004, Hodgins et al., 2001, Gaboury and Ladouceur, 1993, Ferland et al., 2005, Floyd et al., 2006, Dickerson et al., 1990). These results were unable to be included in a meta-analysis due to the variability in measurement tools and lack of data reported.

### ***Educational programs***

Two studies (Gaboury and Ladouceur, 1993, Ferland et al., 2005) assessed the impact of specialist designed educational programs as an intervention to improve gambling behaviour. One study (Gaboury and Ladouceur, 1993) had 289 participants and compared the educational program as the intervention with a control group. An ANOVA was conducted and revealed that the variance in gambling behaviour between the two groups was not significant. One study (Ferland et al., 2005) had 1193 participants and assessed the educational program as the intervention to a control group receiving information only. The measurement instrument used was a questionnaire assessing frequency of involvement in four gambling activities over the past three months. Results showed that the mean post-score for the experimental group was 1.65 (SE=0.11) and 1.93 (SE=0.11) for the control. In the pre-intervention evaluations, 62% of participants reported having never participated in gambling, with 23% participating once a month and 39% participating in gambling activities once a month. It was also reported that overall the frequency of involvement among the participants was so little that it would have been virtually impossible to assess the effectiveness in reducing gambling behaviours as the majority of the participants could not possibly reduce their behaviour. The findings in both of these studies need to be treated with caution as clustering was not taken into account in the analyses.

### ***Warning message***

One study (Floyd et al., 2006) assessed the impact of periodic warning messages on improving gambling behaviour. Warning messages appeared while participants were playing roulette, which involved placing a bet on a number between one and 36 and then spinning the roulette wheel. Using a total of 120 participants and comparing the intervention to a control group, this study measured gambling behaviour on two scales, the number of spins used and the amount of money remaining. Those receiving the warning message finished the session with more dollars remaining supporting the intervention. A significant difference was found between the experimental and control groups in dollars remaining, after the intervention, ( $F(1,177)=13.07$ ,  $p=0.001$ ). No significant differences were found in the number of spins used throughout the games.

### ***Workbook and motivational interview***

Three studies (Hodgins et al., 2004, Hodgins et al., 2001, Dickerson et al., 1990) assessed the effectiveness of using self-help workbooks and motivational interviews to improve gambling behaviour. One study (Hodgins et al., 2001), using a total of 98 participants, compared a workbook and motivational interview to workbook only and waiting list control. The study measured gambling behaviour on three scales – number of days gambled, dollars lost and dollars lost per gambling day. The initial assessment showed significant time effects indicating that all groups improved over time. ANOVAs conducted at the one month follow up show significant differences between the motivational interview group and the waiting list control group. Participants in the motivational interview group gambled less days, ( $F(1,64)=4.6$ ,  $p=0.03$ ,  $f=.27$ ), lost less money ( $F(1,64)=6.7$ ,  $p=0.04$ ,  $f=.33$ ) and spent less per gambling day ( $F(1,64)=5.1$ ,  $p=0.03$ ,  $f=.29$ ). No significant differences were found between workbook only and waiting list control. When comparing the motivational interview group to the

workbook group, a significant group effect was found for days gambled ( $F(1,64)=8.2$ ,  $p=0.006$ ), money lost ( $F(1,64)=4.5$ ,  $p=0.04$ ), but not money spent per gambling day. At three month follow-up, the motivational interview group gambled fewer days, lost less money ( $F(1,63)=4.9$ ,  $p=0.03$ ,  $f=.29$ ) and spent less per gambling day ( $F(1,63)=6.7$ ,  $p=0.05$ ,  $f=.27$ ). At six months follow-up, the motivational interview group gambled fewer days, which was significant in the intention-to-treat analysis, ( $F(1,66)=4.2$ ,  $p=0.05$ ,  $f=.27$ ). No differences were found in money lost or dollars spent per gambling day at this time. No differences were found at the six month follow up.

Another study (Hodgins et al., 2004) reported on three scales of gambling behaviour or classifications - dollars lost, number of gambling days and SOGS total score. A significant main treatment effect was found for dollars lost ( $F(1,51)=7.6$ ,  $p=0.008$ ) with the group receiving the motivational interview reporting smaller losses than the workbook only group. A significant main treatment effect was found for days gambled ( $F(1,60)=3.8$ ,  $p=0.05$ ) with the group receiving the motivational interview reporting gambling fewer days. Analysis on the total SOGS scores showed a significant main treatment effect ( $F(1,48)=4.2$ ,  $p=0.05$ ,  $f=.29$ ). The motivational interview group had a mean SOGS score of 4.3 ( $SD=3.5$ ), in which 60% scored below the cut off for pathological gambling and 29% below the cut off for problem gambling. The workbook only group had a mean SOGS score of 6.6 ( $SD=5.5$ ), in which 50% scored below the cut off for pathological gambling and 30% below the cut off for problem gambling.

One study (Dickerson et al., 1990), using a total of 29 participants, compared a workbook and interview to workbook only. The study measured gambling behaviour on three scales - gambling sessions a week, dollars lost and dollars lost per gambling session. It was reported that there was “a reduction in the frequency of sessions, length of sessions and in the weekly gambling expenditure in the six months following participation in the program, although expenditure remained largely unchanged after six months” (Dickerson et al., 1990). It was also reported that there was “a reduction in the frequency of spending more than planned after the three months and again after six months” (pp. 94). For all three variables, gambling sessions per week, dollars lost and dollars lost per gambling session, it was reported that the workbook and interview group experienced a more rapid improvement than the workbook only group in the first three months following the intervention. However this was not sustained over the six months, where the workbook only group maintained improvement (Dickerson et al., 1990).

## **Coping and problem resolution skills**

Two studies (Gaboury and Ladouceur, 1993, Ferland et al., 2005) report on the impact of the intervention on improving coping and problem resolution skills.

In one study (Gaboury and Ladouceur, 1993) the effect size was not estimable due to the lack of data reported. It was however reported that the experimental group reported significantly more coping skills than the control group, ( $F(2,5)=67.7$ ,  $p=0.01$ ). The findings of this study need to be treated with caution as clustering was not taken into account. In the other study (Ferland et al., 2005), unlike other outcome measures that have been recorded over a number of follow-up periods, problem resolution skills began at the post test with a very small effect size then moved to a medium effect size at three months favouring the control, then back to an even smaller effect size at six months favouring the intervention.

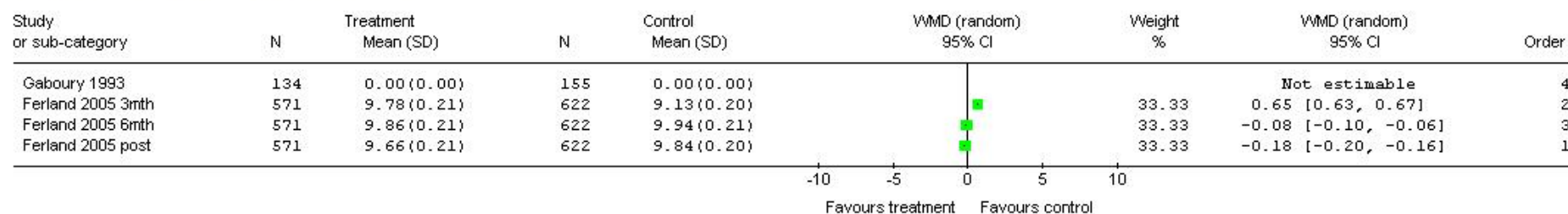


## Possible sources of heterogeneity

One study (Lavoie and Ladouceur, 2004) was an outlier compared to the other studies (as seen in graphs 1 and 2) and marked statistical heterogeneity between the studies was demonstrated. Significant heterogeneity was found between (Lavoie and Ladouceur, 2004) and (Ferland et al., 2002),  $\text{Chi}^2 = 24.25$ ,  $\text{df} = 1$  ( $p=0.0001$ ),  $I^2 = 95.9\%$  for the misconceptions outcome. Significant heterogeneity was also found between the same two studies for gambling knowledge  $\text{Chi}^2 = 29.96$ ,  $\text{df} = 1$  ( $p= 0.0001$ ),  $I^2 = 96.7\%$ . The study results showed that the video condition was successful in improving gambling knowledge and decreasing attitude errors, however the combined video and discussion intervention was not effective. An explanation provided by the researcher was that the video and discussion interventions were too similar. For both outcomes, the experimental intervention of this study had less of an impact than other studies. One possible explanation for this anomalous finding is that at pre-test in this study the two groups showed significant differences in age, number of attitude errors and knowledge, whereas the other studies reported equivalences for such factors.

Figure 3 – Impacts of early intervention on coping and problem resolution skills received by treatment group compared to control groups

Review: Primary Prevention and Early Intervention for Problem Gambling  
 Comparison: 01 Gambling Analysis  
 Outcome: 03 Coping and Problem resolution skills



## DISCUSSION OF FINDINGS

The interventions found to have the largest weighted mean differences focussed on the gambling misconceptions and knowledge outcomes. There were mixed results of the interventions targeting gambling behaviour as some gambling behaviour measures improved, some showed no significant differences after the intervention and in some studies the impact of the intervention was unable to be measured. The estimated weighted mean difference for coping and problem resolution skills was not significant. Interventions seemed to work well in reducing gambling misconceptions and improving gambling knowledge, but not so well in improving gambling behaviours or coping and problem resolution skills.

The interventions that had the largest weighted mean difference in increasing the gambling knowledge of participants were the interventions using video only and lectures combined with activities and educational programs. Interventions combining videos with lectures and activities had an equal impact on increasing gambling knowledge and decreasing misconceptions surrounding gambling. Educational program interventions seemed to decrease gambling misconceptions and were also found to be effective in increasing gambling knowledge. Warning message interventions seemed to decrease gambling misconceptions and improved gambling behaviour. The motivational interview and self-help workbook intervention was an effective intervention for improving gambling behaviour.

The use of video as an intervention tool appeared to be effective in conveying appropriate messages and information. Video content needed to be relevant and appropriate to participants. For the younger participants - those in grades five to eight - the *Lucky the Clown* video was a light hearted approach that used humour to discuss some of the more basic information relating to gambling. The *Gambling Stories* video took a more realistic approach to issues related to gambling and accordingly was more appropriate for the older participants – those in grades 11 and 12.

Interventions that used lectures and activities alone or in conjunction with videos were found to work. Unlike the video only intervention, lectures and activities enabled information and messages to be disseminated through engagement with the participants. Using this form of intervention encourages active involvement and participation in activities. Participants are able to interact with others in the session; it provides opportunities to ask questions and participants may learn more than just watching a video. Repetition of information in different forms may have helped to reinforce the information and concepts for participants.

Due to the problems with the methodology and analyses, which are discussed later in more detail, these results should be considered with caution.

This review was unable to find any other systematic review studies on primary preventions for problem gambling, and as such the authors were unable to determine whether the results are consistent with other reviews.

The systematic review and meta-analysis process is an effective format for this type of study. It provides a good framework to systematically search through numerous references, in the most efficient way, to identify relevant information. This process minimised the risk of bias

in the review. Efforts were also made to identify any grey literature on the subject. Contact was also made with a number of the key authors of the studies in the review. Researchers were very helpful in answering queries or questions.

The results of this review provide some support for Blaszczynski's pathways model, in particular how he suggested the model can be applied to adolescents. Blaszczynski's model suggests educational programs focusing on correcting faulty cognition regarding luck, chance and superstition and to educate regarding the notions of randomness, odds and probability for behaviourally conditioned problem gamblers. For emotionally vulnerable problem gamblers, an educational program focusing on correcting faulty gambling-related cognitions providing stress management and problem solving techniques and providing information about addicts would be appropriate (Nower and Blaszczynski, 2004). Many of the studies in this review used interventions that focused one or more of Blaszczynski's recommendations, but were administered to non-problem gamblers. All of the interventions with a focus on his recommendations had varying impacts on three of the included outcomes in this review: gambling knowledge, gambling misconceptions and problem and coping skills.

## **Limitations**

There were a number of limitations to the individual studies. The main limitation was that none of the randomised controlled cluster trials took clustering into account when conducting their analyses. As a consequence the estimates of the precision of the studies are overly optimistic. Another limitation encountered was the lack of data that individual studies reported with many of the studies only reporting the ANOVA F statistic. As the mean and standard deviation for the studies was required to be included in the meta-analysis, many of the studies were excluded from the meta-analyses and described narratively. Where possible standard deviations were calculated from given standard errors. Again, where randomised cluster trials only reported ANOVA F statistics, the analyses needs to be treated with caution because clustering was not taken into account.

Many of the studies failed to report on method of randomisation, concealment of allocation or blinding of assessors used in the study. This suggests that the methodological quality of the studies was poor and the estimates of the effects obtained are likely to be biased in favour of the experimental intervention compared to the control intervention.

Many of the studies in the review differed by methodology, intervention, population or outcomes. This produced statistical and experimental heterogeneity between the studies. When significant statistical heterogeneity is present the pooled estimate of effects are not presented.

Two of the included articles were in French and were translated into English raising some issues with the meanings of statistical abbreviations used in the original French articles.

Many of the studies looked at different aspects of the four major outcomes. For instance, gambling behaviour, was recorded as dollars lost, days gambled, number of spins or dollars lost per gambling day. A majority of the studies used similar measurement scales, which made it easier to combine the studies when appropriate in the meta-analysis.

The majority of studies had limited follow-up periods and therefore any impacts from the interventions were not measured over the long term. This is a major concern as problem gambling tends to follow a chronic and episodic course over many months and years.

Many of the studies were conducted by the same group of researchers and were the same or very similar interventions, conducted at different age groups. All but one of the studies was carried out in Canada, which made it difficult to determine any differences between countries. Many of these studies were all funded by the same company, Lotto Quebec. Previous reviews have shown that studies funded by pharmaceutical companies are more likely to show large effect sizes and outcomes that favour the sponsor (Lexchin et al., 2003). Having many of the studies in this review funded by the same sponsor may be associated with a bias in the results.

## **GUIDING PRINCIPLES FOR THE IMPLEMENTATION OF PRIMARY PREVENTION INTERVENTIONS**

A number of guiding principles for undertaking a primary intervention for problem gambling have been developed from the studies included in this review. The guiding principles are as follows:

### **Implementing the intervention to students aged 12 to 14 years in years 7 and 8**

The literature shows that gambling has a very early onset age - around the ages of 12 to 14 years (Felsher et al., 2004, Petry, 2005). Therefore, interventions need to be implemented prior to the onset of gambling behaviour in order to delay or prevent the behaviour from occurring. This age group generally does not have any prior gambling misconceptions which need to be corrected.

#### **School based interventions**

Schools would be the best venue to access participants aged 12 or 14 years, as access through schools would provide the best opportunity to efficiently administer the intervention to large number participants at one time. Within schools this intervention could be administered as part of a health or social science curriculum (Nower and Blaszczynski, 2004, Wood and Griffiths, 2007).

#### **Using psycho-educational interventions**

Many of the studies reviewed discussed that education was an important issue in problem gambling. An educational based intervention educates individuals with important information regarding gambling, increases their awareness of the risks associated with gambling and helps in the development of coping skills and problem resolutions when faced with high pressure gambling situations. However, it should not be assumed that changes in knowledge and attitudes will lead to a change in gambling behaviour.

## **Combined interventions**

**The intervention that shows to be the most promising is in the form of video, activity and lecture combination.** The videos are short (20 minutes), easy to administer and present information in a precise and easily understood manner. The information in the video is complemented by using a series of activities in which participants are actively involved in demonstrating the main theories and concepts. Finally, a lecture is also appropriate to use as it reinforced the information given in the video and activities. Lectures should incorporate a question and answer section, to clarify any questions or queries. This is based on only two studies that used this combination, with one study showing good results and one showing inconclusive results.

## **Appropriately trained personnel**

Appropriately trained personnel are needed to implement the intervention. The results of our review show that the majority of studies had appropriately trained professional personnel to implement the intervention. When using lay individuals to implement an intervention, training is required to ensure that they have a full understanding of the intervention and how to appropriately administer it. This will ensure that the intervention is being implemented as intended and is the same between groups.

## **Future research**

An optimum study design would include the following features.

The authors recommend the use of the video, lecture and activity combination as an intervention in future studies. The results of this review suggest that this combination may be the most effective overall, although this conclusion must be tentative as one study showed inconclusive results.

The intervention should be aimed at participants in years seven and eight. From a review of the individual studies, it appears that interventions seemed to work well for participants in this age group. This may be due to children of this age possibly having greater attention spans than those in grades five and six and will therefore be able to absorb more information. In addition, adolescents in years seven and eight generally have not yet developed any gambling attitudes or behaviours.

The study should have adequate methods of randomisation to reduce the chances of selection bias. Selection bias occurs when participants in comparison groups have systematic differences (eg, experimental group is all male and the control group is all females). Selection bias can cause a distortion of the estimates of weighted mean difference of the intervention and usually occurs at the start of the experimental process as a result of inadequate randomisation procedures in allocating participants to either of the comparison groups. Failure to adequately conceal the randomisation process may result in investigators or clinicians being able to influence the allocation of participants. Some adequate randomisation methods are computer generated random sequences, random number table, block

randomisation, stratified randomisation, central computer randomisation, serially numbered, sealed opaque envelopes, externally controlled allocations or coded identical kits.

The blinding of the outcome assessors is needed to reduce the risk of measurement bias within the study. Measurement bias is error due to differences between the measurement of the subjects on study variable and the true value of the variable. A single-blind investigation is recommended in which the outcome assessors are unaware of the intervention received by participants. As noted in some of the studies included in this review, randomisation and allocation occurred at the school level rather than the class level. Having different classes within the one school allocated to different groups could cause contamination within groups. This means participants from the same school, in different classes which have been allocated to different treatment groups, may be able to talk to each other outside of classes and discover information regarding the other's treatment. As a result, participants may be able to gain prior information and know what to expect during the study. These factors could potentially contaminate the results of the study. This can be avoided by allocating at the school level and having different classes within the school in the same group.

An intention-to-treat analysis should also be conducted, to avoid the risk of attrition bias. Attrition bias is systematic differences in the loss of participants to follow-up between groups and participants lost to follow-up will affect the final results. An intention-to-treat analysis, analyses all participants in all groups to which they were originally allocated, regardless of whether they received the intervention, deviated from the protocol or withdrew from the study.

The study should be a cluster design study, which consists of specialised cluster sampling, in which members of a population who are close or similar to each other are arranged into groups (eg, classes or schools). Each cluster in the population has equal chances of being selected. Clusters are then randomly selected for participation and allocated into groups. Special statistical techniques, which take clustering into account, can be used in the analysis. Specialist clustering statistical techniques take into account the similarity of participants within the clusters. If a study accessed participants from a school or classroom, a cluster design would be appropriate.

An optimum study would have a number of long term follow-up periods, to determine the impacts of the intervention over the long term. As problem gambling is episodic and chronic, long term follow-up periods would be required to assess whether participants have relapsed into gambling behaviour or if the impacts of the intervention have been maintained over time.

A sufficient and appropriately trained research team would be needed to plan and conduct an optimum study. The key personnel that should be part of a research team would include trained educationalists, Random Control Trial (RCT) methodologists, statisticians and data entry personnel and trained outcome assessors. Trained RCT trial methodologists and intervention administrators are required to reduce the risk of bias within the study and ensure the methodology of the intervention is correct and appropriate. They would ensure that appropriate randomisation methods for selection and allocation were implemented to reduce the risk of selection bias. Trained intervention administrators are required to ensure that they themselves have a full understanding of the intervention and how to appropriately administer the intervention. This will ensure that the intervention is being implemented correctly and in the way it was designed to. The intervention would then remain constant between groups and will reduce any adverse impacts and in turn reduce the risk of performance bias.

All studies analysed in this project were based in Canada or America and may be subject to influences such as culture or language. Hence it cannot be assumed that the results of those interventions are applicable to the Australian context. Research is needed for this to be determined and it is considered that a pilot study needs to be conducted to implement similar interventions to those studies in Australian schools. These should ideally be random controlled trials.

It is apparent there is a lack of evidence of the impact of gender, location, culture and ethnicity on the effectiveness of primary preventions of problem gambling. These are all important issues where much more work is required.



## **CONCLUSION**

The literature search found studies and narrative reviews of secondary and tertiary prevention and interventions, but none for primary preventions for problem gambling. As has been discussed, systematic reviews have been shown to be an essential tool for healthcare professionals, administrators, planners, policy makers, funders and consumers. Information gaps inhibit the ability to make decisions regarding a number of issues including service development and implementation. A systematic review allows people to keep up to date with accumulating evidence in their field and enable them to make an objective appraisal of the evidence on which to base their decisions (Egger et al., 2001).

The literature search revealed only a small number of studies about primary preventions for problem gambling. The majority of these studies were school based and aimed at teenagers. The studies found that implementing an educational and cognitive based intervention, in the form of video, lectures and activities was effective. These interventions were effective in correcting any erroneous cognition's or attitudes students had about gambling and increased their knowledge of gambling and the associated risks. However, the results should be treated with caution as they are based on a small number of methodologically flawed studies and further replication is required.

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## Appendix 1 - Database search strategy

Note - \* terms only included in the second search

Databases Searched			
Databases	Dates Covered	Dates Searched	Hits
<b>CINAHL</b>	1982 to February 2007 Week 2	09/02/2007	431
<b>Medline</b>	1966 to February 2007 Week 2	09/02/2007	270
<b>PSYCINFO</b>	1985 to February 2007 Week 2	09/02/2007	1816
<b>Embase</b>	1966- 2007	09/02/2007	2486
<b>After Manual Duplicate checking</b>			<b>5003</b>

### CINAHL (OVID)

February 2007

1. Gambling/
2. Videogames/ or gaming.mp.
3. Wagering.mp.
4. Pokie\$.mp.
5. electronic gaming machine\$.mp
6. betting.mp.
7. video lottery terminals.mp. [mp=title, subject heading word, abstract, instrumentation]
8. slot machines.mp. [mp=title, subject heading word, abstract, instrumentation]
9. fruit machines.mp. [mp=title, subject heading word, abstract, instrumentation]
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9

### Medline (OVID)

February 2007

1. Gambling/
2. Videogames/ or gaming.mp.
3. Wagering.mp.
4. Pokie\$.mp.



5. electronic gaming machine\$.mp
6. betting.mp.
- 7.\* video lottery terminals.mp. [mp=title, subject heading word, abstract, instrumentation]
- 8.\*slot machines.mp. [mp=title, subject heading word, abstract, instrumentation]
- 9.\* fruit machines.mp. [mp=title, subject heading word, abstract, instrumentation]
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9

## **PSYCINFO (OVID)**

February 2007

1. Gambling/
2. Videogames/ or gaming.mp.
3. Wagering.mp.
4. Pokie\$.mp.
5. electronic gaming machine\$.mp
6. betting.mp.
7. \*video lottery terminals.mp. [mp=title, subject heading word, abstract, instrumentation]
8. \*slot machines.mp. [mp=title, subject heading word, abstract, instrumentation]
9. \*fruit machines.mp. [mp=title, subject heading word, abstract, instrumentation]
10. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9

## **Embase**

February 2007

**((('gambling'/exp OR 'gambling') OR ('gaming') OR ('betting'/exp OR 'betting') OR ('wagering') OR (pokie\*) OR (electronic AND gaming AND machine\*) OR (('fruit'/exp OR 'fruit') AND machine\*) OR (slot AND machine\*) OR (('video'/exp OR 'video') AND lottery AND terminal\*)) NOT (('pathological gambling'/exp) OR ('gambling'/exp) OR (gaming) OR (wagering) OR (betting) OR (pokie\*) OR ('electronic gaming machine'))**

## Appendix 2 - Data extraction table

STUDY	Gambling Misconceptions/Attitude	Gambling Knowledge	Gambling Behaviours	Coping and Resolution Skills
(Hodgins et al., 2004)			<p><b>Days Gambled</b> Exp 1- N=35 Exp2 – N= 32 Cont – N=35 Sig effect of covariate <math>F(1,51)=11.4</math>, <math>p=.001</math> and treatment group <math>F(1,60)= 3.8</math>, <math>p=.054</math>. Main effect of time was marginally sig <math>F(2, 55)= 2.8</math>, <math>p=.07</math> &amp; time x group interaction not sig <math>F(2,55)= 2.4</math>, <math>p=.10</math>. For the completer sample, variance component structure used &amp; showed sig effect of covariate , <math>F(1,135)=16.9</math>, <math>p=.0001</math> &amp; treatment group <math>F(1, 138)= 5.8</math>, <math>p=.02</math> &amp; no sig effect of time <math>F(1,128)= 1.1</math>, <math>p=.35</math> or time x group interaction <math>F(1,128)= 0.5</math>, <math>p=.60</math></p> <p><b>Dollars Lost</b> Exp 1- N=35 Exp2 – N= 32 Cont – N=35 Sig main effect on treatment group <math>F(1,51)=7.6</math>,<math>p=.008</math>. Main impacts of the covariate <math>F(1,46)=2.7</math>, <math>p=.10</math>, &amp; time <math>F(2,88)= 0.4</math>, <math>p=.64</math>, &amp; time x group interaction <math>F(2,88)=0.3</math>, <math>p=.74</math> not significant. Results from the completer sample show sig main effect of treatment group <math>F(1,52)=5.8</math>, <math>p=.02</math>. Main effect of the covariate <math>F(1,50)=1.7</math>, <math>p=.19</math>, time <math>F(2,95)=0.1</math>, <math>P=.88</math> &amp; time x group interaction <math>F(2,95)=0.7</math>, <math>p=.48</math> not sig.</p>	
(Hodgins et al., 2001)			<p>Means, Sd &amp; SE not reported 1 month follow up 74%of MI improved/quit compared to WO 61% or WL 44%. <math>X^2 (2,N=102)= 6.1</math>,<math>p=.05</math>. Of MI 32% quit compared to W O 21% or WL 18%</p> <p><b>Days Gambled</b> Post test, 1 month, 3 month, 6month &amp; 12 month f/up Exp1 (MI) <math>M=4.3</math> SD=4.9 Exp2 (Wood and Griffiths) <math>M=4.7</math> SD=5.4 Cont(WL) <math>M=6.0</math> SD=7.1 One way ANCOVA using group and post tst scores. Participants receiving the MI gambled significantly fewer day <math>F (1, 64)= 4.6</math>, <math>p=.03</math>,</p>	

STUDY	Gambling Misconceptions/Attitude	Gambling Knowledge	Gambling Behaviours	Coping and Resolution Skills
			<p><math>f=.27</math> 2x3 ANCOVA conducted between MI &amp; WO, found a sig main effect for treatment for days gambled <math>F(1,64)=8.2</math>, <math>p=.006</math>. At 3 mth, MI gambled fewer days. At 6 mth MI gambled fewer days <math>F(1, 62)=2.5</math>, <math>p=.12</math>, <math>f=.20</math> which was sig at intention to treat analysis <math>F(1,66)=4.2</math>, <math>p=.05</math>, <math>f=.27</math>. No sig differences found at 12 mth.</p> <p><b>Dollars Lost</b> Post test, 1 month, 3 month, 6month &amp; 12 month f/up  Exp1 (MI) <math>M=415.9</math> <math>SD=695.1</math>  Exp 2(Wood and Griffiths) <math>M=761.9</math> <math>SD=1036.7</math>  Cont(WL) <math>M=800.9</math> <math>SD=982.4</math>  One way ANCOVA using group &amp; post test scores. Participants receiving the MI lost less money <math>F(1, 64)=6.7</math>, <math>p=.04</math>, <math>f=.33</math>  2x3 ANCOVA conducted between MI &amp; WO and found sig main treatment effect for money lost <math>F(1, 64)=4.5</math>, <math>p=.04</math>. At 3 mth MI lost less money <math>F(1, 63)=4.9</math>, <math>p=.03</math>, <math>f=.29</math>. At 6 mth no sig diff in money lost. No sig differences found at 12 mth</p> <p><b>Dollars per gambling day</b> Post test, 1 month, 3 month, 6month &amp; 12 month f/up Exp1 (MI) <math>M=62.3</math> <math>SD=95.9</math>  Exp 2 (Wood and Griffiths) <math>M=184.7</math> <math>SD=264.5</math>  Cont (WL) <math>M=141.1</math> <math>SD=145.7</math>  One was ANCOVA using group &amp; posttest scores. Participants receiving MI spent less per gambling day <math>F(1,64)=5.1</math>, <math>p=.03</math>, <math>f=.29</math>  2x3 ANCOVA conducted between MI &amp; WO and found no main effect for money gambled per gambling day. At 3 mth MI gambled sig less per gambling day <math>F(1,63)=4.1</math>, <math>p=.05</math>, <math>f=.27</math>. At 6mth no sig difference in amount gambled per gambling day. No sig differences found at 12mth</p>	
(Ladouceur et al., 2004a)	<p>Post test measurement  Total  <math>M=2.32</math> <math>SD=1.68</math>  Cont <math>M=3.98</math> <math>SD=1.67</math>  3+ errors  <math>M=4.48</math> <math>SD=1.53</math>  <math>M=4.06</math> <math>SD=1.35</math></p> <p>ANCOVA showed sig difference between groups <math>F(1,343)=8.84</math>, <math>p=.05</math>. ANOVA on those made 3+ erroneous perceptions show sig time effect</p>			

STUDY	Gambling Misconceptions/Attitude	Gambling Knowledge	Gambling Behaviours	Coping and Resolution Skills
	F(1,174)= 63.23, p=.05, group effect F(1,174)= 7.70, p=.005 and time x group interaction F(1,174)=54.55, p=.005			
(Ladouceur et al., 2003)	<p>Post test measurement All students</p> <p>Exp M=0.71 SD= 1.36 Cont M=1.77 SD=1.52 3+ errors</p> <p>Exp (n=21) M=1.74 SD= 2.23 Cont (n=18) M=3.33 SD=1.48</p> <p>A repeated measures ANOVA conducted &amp; show sig impacts for time F(1,151)= 20.05, p=.05, group F(1,151)=8.24, p=.05 &amp; time x group interaction F(1,151)= 13.90, p=.05. Secondary analysis conducted on participants who made 3+ errors in pretest. As groups not equivalent [<math>X^2(1, n=40)=4.82, p=.05</math>] variable used as covariate. ANCOVA for repeated measures show sig time x group interaction effect F(1, 37)= 6.46, p=.05</p>			
(Gaboury and Ladouceur, 1993)	Means, SD & SE not reported ANOVA revealed non-significant differences	<p>*Accounted for Clusters</p> <p>Means, SD &amp; SE not reported</p> <p>Post test &amp; 6 month measurement 2x3 ANOVA revealed that more participants in the experimental group improved their gambling knowledge compared to control group F(2, 5)= 23.5, p=.05. Improvement maintained at 6 month follow-up</p>	Means, SD & SE not reported ANOVA revealed non-significant differences	*Means, SD & SE not reported Experimental group reported significantly more skills for coping with gambling than the control group F(2,5)=67.7, p=.01). Difference not significant at follow up
(Ferland et al., 2005)	<p>Post test, 3 month &amp; 6 month f/up <u>Post-test</u> Exp</p> <p>M=3.00 SD=0.12</p> <p>Cont M=4.43 SD=0.12 <u>3Months</u></p> <p>Exp M=2.68 SD=0.12 Cont</p> <p>M=3.79 SD=0.12 <u>6Months</u></p> <p>Exp M=2.73 SD=0.12 Cont</p> <p>M=3.75 SD= 0.13 ANCOVA, repeated measures effect of attitude</p> <p>show sig group impacts F(1,1190)=40.79, p=.0001, time impacts F(3, 3570)=31.44, p=.0001 and time x group interaction F(3,3570)=21.79,p=.0001</p>	<p>Post test, 3 month &amp; 6 month f/up <u>Post test</u></p> <p>Exp M=1.88 SD=0.07</p> <p>Cont M=3.07 SD=0.07 <u>3Month</u></p> <p>Exp M=1.97 SD=0.07</p> <p>Cont M=2.78 SD=0.07 <u>6Month</u></p> <p>Exp M=2.41 SD=0.08</p> <p>Cont M=3.00 SD=0.08 ANCOVA conducted and show sig main</p> <p>impacts for knowledge for group Post-test F(1,1190)=34.03, p=.0001, 3Months F(1,1190)=28.73, p=.05 &amp; 6Months F(1,1190)=4.38, P=.041. Knowledge dissipated at 3 months but was stabilised at 6 months</p>	<p>Posttest, 3 month &amp; 6 month Follow up <u>Post test</u></p> <p>Exp M=1.64 SD=0.13</p> <p>Cont M=1.80 SD=0.12 <u>3Month</u></p> <p>Exp M=1.29 SD=0.12</p> <p>Cont M=1.67 SD=0.12 <u>6Month</u></p> <p>Exp M=1.23 SD=0.12</p> <p>Cont M=1.38 SD=0.12. It is reported that because the gambling participation was so l</p> <p>low at pre-experimental, majority of participants cold not decrease behaviour any further and make it impossible to evaluate the effectiveness of the program.</p>	<p>Post test, 3 month &amp; 6 month follow up <u>Post test</u></p> <p>Exp M=9.66 SD= 0.21</p> <p>Cont M=9.84 SD=0.20 <u>3month</u></p> <p>Exp M=9.78 SD= 0.21</p> <p>Cont M=9.13 SD=0.20 <u>6month</u></p> <p>Exp M=9.86 SD= 0.21</p> <p>Cont M=9.94 SD= 0.21</p> <p>ANCOVA conducted on scale of</p> <p>resolution of problems show sig time effect F(3,3570)= 3.02 and time x group interaction F(3,3570)=3.32, p=0.05</p>

STUDY	Gambling Misconceptions/Attitude	Gambling Knowledge	Gambling Behaviours	Coping and Resolution Skills
(Lemaire et al., 2004)		Means, SD & SE not reported 1 month follow up ANOVA, $p=.05$ Exp M= 83.0% (sig) Cont M=76.4%		
(Ferland et al., 2002)	Post test measurement (1 week) Exp 1 M=3.25 SD=2.27 Exp 2 M=2.66 SD=2.11 Exp 3 M=2.20 SD= 2.18 Cont M=4.14 SD=1.69 ANOVA revealed sig impacts for Group $F(3,416)=15.86$ , $p=.0001$ , time $F(1,416)= 19.08$ , $p=.0001$ and interaction $F(3,416)= 8.56$ , $p=.0001$ .	Post test measurement (1 week) Exp 1 M=3.75 SD=2.64 Exp 2 M=3.03 SD=2.29 Exp 3 M=2.72 SD= 2.38 Cont M=5.06 SD=2.15 ANOVA revealed sig impacts for Group, $F(3,416)=12.90$ , $p=.0001$ , time $F(1,416)=$ $194.43$ , $p=.0001$ and interaction $F(3,416)=$ $8.86$ , $p=.0001$		
(Ladouceur et al., 2004b)	Means, Sd & SE not reported Post test measurement (1 week) ANOVA revealed significant differences for misconceptions $F(1,368)=$ $15.772$ , $p=.001$ ; ETA Squared= 0.041; power 0.98)	Means, Sd & SE not reported Post test measurement (1 week). ANOVA revealed significant differences for knowledge $F(1,368)= 7.723$ , $p=.001$ ; ETA Squared= 0.021; power 0.79)		
(Lavoie and Ladouceur, 2004)	Post test measurement Exp 1 M= 3.76 SD=2.32 Exp 2 M= 3.33 SD=2.11 Cont M= 3.69 SD=1.95 ANOVA revealed significant effect for group $F(2,267)= 7.05$ , $p=.005$ .	Post test measurement Exp 1 M= 5.14 SD=2.19 Exp 2 M= 4.29 SD= 2.00 Cont M= 5.2 SD=2.20 Covariance analysis for knowledge for knowledge showed sig group effect $F(2, 266)= 7.25$ , $p=.005$		
(Ladouceur et al., 2005)		Means, SD& SE not reported 1 month follow-up ANCOVA conducted and revealed a sig group effect for knowledge, $F(1, 491)=17.04$ , $p=.0001$ & sig time x group interaction $F(1,491)=33.03$ , $p=.0001$ . ANCOVA carried out on knowledge of excessive gambling showed sig effect of video $F(1, 493)= 18.06$ , $p=.0001$	Means, SD & SE not reported Chi-square test showed sig less participants in the experimental group gambled in the  forthcoming year than the control group $X^2(1,n=534)= 4.21$ ; $p=.04$	
(Floyd et al., 2006)	<b>RBQ Score</b> Post test measurement Exp (adj) M=2.29 Cont (adj) M=2.86 $F(1,177)=8.23$ Std Err= 0.14 $\eta=.055$ , $p=.005$ <b>Post GBQ Score</b> Post test measurement Exp (adj) M=44.7, Cont (adj) M=52.00, $F(1,177)=6.80$ , Std Err=1.97, $\eta=0.66$ , $p=0.01$		<b>Number of Spins</b> Post test measurement Exp (adj) M=28.34 Cont (adj) M=31.50, $F(1,177)=0.82$ , Std Err 2.46, $\eta=.007$ , $p=.37$ <b>Dollars Remaining Post</b> test measurement. Exp (Adj) M=\$89.75 Cont (Adj) M=\$53.34 $F(1,177)=13.07$ , Std Err= 7.11 $\eta=.100$ , $p=.001$	<b>RBQ Score</b> Post test measurement Exp (adj) M=2.29 Cont (adj) M=2.86 $F(1,177)=8.23$ Std Err= 0.14 $\eta=.055$ , $p=.005$ <b>Post GBQ Score</b> Post test measurement Exp (adj) M=44.7, Cont (adj) M=52.00, $F(1,177)=6.80$ , Std Err=1.97, $\eta=0.66$ , $p=0.01$
(Dickerson et al., 1990)			3 & 6 month follow/up.	

STUDY	Gambling Misconceptions/Attitude	Gambling Knowledge	Gambling Behaviours	Coping and Resolution Skills
			<p>A reduction in the frequency of session, length of sessions and weekly gambling expenditure was reported at the 6 month follow/up. Clients also reported a reduction in the frequency of spending more than planned at both the 3 and 6 month follow/up. For both the manual and interview group reported more rapid improvements than the manual only group in first 3 months, but this was not sustained over 6 months. Manual only group continued to improve from 3 to 6 months.</p>	

## Appendix 3 - Data extraction form

Date –  
Review Title –  
Name of Review author completing this form –  
Notes –

Citation: Year.....  
Authors.....  
Title.....  
Journal.....  
Volume.....  
Issue.....  
Pages.....

Methods:  
*Details of Study*

Aim of intervention?  
9  
Aim of study?

Study design? ☐ RCT ☐ Quasi-Randomised Controlled Trials  
☐ Pre and Post intervention study  
☐ Cohort Study ☐ Case control study ☐ Program Evaluations  
☐ Case Series ☐ other .....

Methods of recruitment of participants:.....  
.....

Inclusion/exclusion criteria for participation in study: .....  
.....  
.....

Informed consent obtained? ☐ Yes ☐ No ☐ Unclear

Ethical approval? ☐ Yes ☐ No ☐ Unclear

Funding?

### Participants:

Description: ☐ Living in the general community  
☐ Primary Care/ General Practice  
☐ Outpatient (attending specialist care)

Gender: ☐ Male ☐ Female ☐ Male and Female adults

Age: Range.....  
Mean.....  
Standard deviation .....

Ethnicity:

Geographic location (eg. City/State/Country):.....  
.....  
.....

Number: Eligible.....  
Excluded.....  
Refused to take part.....  
Randomised to intervention.....  
Randomised to control.....  
Excluded post randomisation.....  
Withdrawn.....  
Lost to follow up.....  
Died.....  
Included in analysis.....  
Included for each outcome.....

Principal health problem or diagnosis: ☐ Normal gambling  
☐ Diagnosed as 'at risk' gambler  
☐ Diagnosed as Pathological gambler  
☐ Diagnosed as Problem gambler

Other social/demographic details: .....

### Interventions:

Number of interventions: .....

Details of intervention: ☐ Theoretical basis .....,  
☐ Aim.....,  
☐ Content.....,  
☐ Formats.....,  
☐ Source.....,  
☐ Setting.....

Details of co-interventions in all groups: .....,

Delivery of intervention: ☐ Stages.....,  
☐ Timing.....,  
☐ Frequency.....,  
☐ Duration .....

Details of providers: ☐ Who delivers the intervention.....,  
☐ Number of providers.....,  
☐ Training of providers in delivery of intervention.....  
.....

Fidelity/integrity (Was the intervention delivered as intended?):

.....  
.....  
.....

Were intervention and control groups comparable? .....

### Outcomes:

What was measured at the baseline?.....  
.....

What was measured after the intervention?.....  
.....

Principal and secondary outcome measures:  
.....  
.....

Methods of assessing outcome measures: ☐ phone survey ☐ questionnaire,  
☐ physical measurements ☐ other.....

What was the measurement tool:.....

Validated measurement tools: .....

Methods of follow-up for non-respondents:  
.....  
.....

Timing of outcome assessment:  
.....  
.....

Adverse events:.....  
.....



## Appendix 4 - Quality assessment form

### Assessment of Study Quality

Allocation concealment: ☐ A. Adequate ☐ B. Unclear ☐ C. Inadequate ☐ D. Not used.

Method of generating randomisation schedule ☐ computer ☐ random number table  
☐ other .....

Method of concealment of allocation ☐ sequentially numbered ☐ sealed,  
☐ opaque envelopes ☐ other.....

Blinding?: Participants ☐ Yes ☐ No ☐ Unclear  
Provider/s ☐ Yes ☐ No ☐ Unclear  
Outcome assessor/s ☐ Yes ☐ No ☐ Unclear

Intention to treat analysis ☐ Yes ☐ No ☐ Not stated

Baseline comparability of intervention and control groups ☐ Yes ☐ No ☐ Not stated

Statistical methods used and their appropriateness? Method Used.....  
☐ Appropriate ☐ Not Appropriate

## Appendix 5 – Table of excluded studies

Study	Reason for exclusion
(Aubry et al., 2005)	Not an intervention study
(Byrne et al., 2005)	Not an intervention study
(Breen, 2005)	Does not use community participants
(Bentall et al., 1989)	Not an intervention study
(Howat et al., 2005)	Not an intervention study
(Blaszczynski, 2005)	Not an intervention study
(Gupta et al., 2004)	Not an intervention study
(Makarchuk et al., 2002)	Does not use community participants
(Williams and Connolly, 2006)	Not an intervention study
(Korn et al., 2003)	Not an intervention study
(Delfabbro et al., 2005)	Not an intervention study
(Westphal et al., 2000)	Not an intervention study
(Kaminer, 2000)	Not an intervention study
(Andresen, 2006)	Not an intervention study
(Najavits, 2003)	Not an intervention study
(Brown et al., 2001)	Not an intervention study
(Cooper, 2001)	Not an intervention study
(Wheeler et al., 2006)	Not an intervention study
(Dickson et al., 2002)	Not an intervention study
(Shepard, 2004)	Not an intervention study
(Hayer and Meyer, 2004)	Not an intervention study
(Baiocco et al., 2005)	Not an intervention study
(Golaszewski, 2004)	Not an intervention study
(Blaszczynski et al., 1999)	Not an intervention study
(Marotta, 1999)	Not an intervention study
(Fabiansson, 2006)	Not an intervention study
(Ricketts and Bliss, 2003)	Not an intervention study
(Evans, 2003)	Not an intervention study
(Remmers, 1996)	Does not use community participants
(Hoye, 2005)	Not an intervention study
(Messerlian et al., 2005)	Not an intervention study
(Turchi and Derevensky, 2006)	Not an intervention study
(Diskin, 2006)	Not a primary prevention study – participants recruited already had problem gambling behaviours.