**PSYCHOSOCIAL MODELING OF CANADIAN GAMING
BEHAVIOR: A COMPARATIVE ANALYSIS OF CANADIAN
COMMUNITY MENTAL HEALTH**

A thesis submitted to
the Faculty of Graduate Studies and Research
in Partial Fulfillment of the requirements for the degree

Doctor of Philosophy

by

Neda Faregh

Department of Psychology
Carleton University

January 2009

Copyright © 2009 Neda Faregh

Library and
Archives Canada

Published Heritage
Branch

395 Wellington Street
Ottawa ON K1A 0N4
Canada

Bibliothèque et
Archives Canada

Direction du
Patrimoine de l'édition

395, rue Wellington
Ottawa ON K1A 0N4
Canada

Your file Votre référence
ISBN: 978-0-494-52054-3
Our file Notre référence
ISBN: 978-0-494-52054-3

NOTICE:

The author has granted a non-exclusive license allowing Library and Archives Canada to reproduce, publish, archive, preserve, conserve, communicate to the public by telecommunication or on the Internet, loan, distribute and sell theses worldwide, for commercial or non-commercial purposes, in microform, paper, electronic and/or any other formats.

The author retains copyright ownership and moral rights in this thesis. Neither the thesis nor substantial extracts from it may be printed or otherwise reproduced without the author's permission.

AVIS:

L'auteur a accordé une licence non exclusive permettant à la Bibliothèque et Archives Canada de reproduire, publier, archiver, sauvegarder, conserver, transmettre au public par télécommunication ou par l'Internet, prêter, distribuer et vendre des thèses partout dans le monde, à des fins commerciales ou autres, sur support microforme, papier, électronique et/ou autres formats.

L'auteur conserve la propriété du droit d'auteur et des droits moraux qui protègent cette thèse. Ni la thèse ni des extraits substantiels de celle-ci ne doivent être imprimés ou autrement reproduits sans son autorisation.

In compliance with the Canadian Privacy Act some supporting forms may have been removed from this thesis.

Conformément à la loi canadienne sur la protection de la vie privée, quelques formulaires secondaires ont été enlevés de cette thèse.

While these forms may be included in the document page count, their removal does not represent any loss of content from the thesis.

Bien que ces formulaires aient inclus dans la pagination, il n'y aura aucun contenu manquant.

Canada

ABSTRACT

The objective of this research on Canadian community health survey archival data was to model Canadian gambling outcomes derived from risk factors that were developed by previous research in the literature. The literature on the psychological theories of gambling was reviewed, as well as the literature on characteristics of gamblers and the role that each characteristic played as a risk or protective factor. Data from 36,900 gamblers and non-gamblers in the community were examined. Latent Class Analysis was conducted to examine the class structure of the data. Eight Classes were identified based on individuals' gambling activities. The relationship between risk factors, latent Classes, and gambling outcomes were investigated using log-likelihood chi-square tests and multinomial logistic regression tests to determine the distribution and role of risk factors in each latent Class, and at each level of the Canadian Problem Gambling Index. Models were developed for each latent Class separately and for the full set of data. Results showed that risk factors contributed idiosyncratically to gambling outcomes depending on the type of gambling Class individuals belonged to, which in turn was determined by individuals' proclivity toward distinct gaming activities, and further characterized by divergent demographics. Similarities and differences among latent Classes are discussed along with their relationship to Canadian Problem Gambling Index.

Acknowledgement

I am obliged to my committee members, Dr. Nigel Turner and Dr. Steve Prus for their assistance as the Examiners and reviewers of this research. I would like to thank my committee members Dr. Hymie Anisman and Dr. Frank Elgar for their help and support and their contributions to this dissertation. I am grateful and indebted to my advisor, Dr. Craig Leth-Steensen, for his supervision, contributions, guidance, support, and all the long hours of statistical mentoring.

I am especially grateful to my partner Jacek for his understanding, encouragement, and support throughout these long years, and to my daughter Simone for her patience and indulgence.

This research was supported by a Doctoral Fellowship awarded to me by the Ontario Problem Gambling Research Centre.

Table of Content

ABSTRACT.....	ii
Acknowledgement.....	iii
INTRODUCTION	9
Definition of Problem Gambling and Recreational Gambling	13
Historical Background	14
Modern Gambling	18
Gambling Prevalence.....	19
LITERATURE REVIEW: WHY DO PEOPLE GAMBLE	20
Psychodynamic Framework	22
Personality Framework	25
Behavioural Framework	27
Cognitive-Behavioural Framework	39
Summary.....	49
LITERATURE REVIEW: WHO GAMBLES	50
Traits	51
Gambler Types.....	59
Summary.....	66
PURPOSE.....	68
METHOD.....	69
Data Source	69
Sample Size and Allocation	70
Survey administration	71
Sample Weights.....	72
Ethical Approval.....	73
Variables of Interest.....	73
Instruments and the Dependent Variable.....	78
Validity and Reliability of the Problem Gambling Questionnaires	83
Screening and Preparing the Data Prior to Analysis.....	84
ANALYSIS	85
Study 1: Latent Class Analysis	85
Study 2: Associations Between the Latent Classes and Gambling Outcomes	86
Study 3: Associations Between the Latent Classes and Risk Factors.....	87
Study 4: Association between Problem-Gambling Outcomes and Risk Factors..	96
Study 5: Modeling Risk Factors for Gambling Outcomes.....	96
Study 6: Modeling Risk Factors within Each Latent Class.....	98
RESULTS	100
Descriptives	100
Study 1 Results	101
Study 2 Results	107

Study 3 Results	112
Study 4 and 5 Results.....	132
Study 6 Results	148
DISCUSSION	159
Descriptives	159
Latent Class Analysis	159
Risk Factors	163
Physical Health Risk Factors.....	168
Psychological Health Risk Factors.....	169
Substance Use Risk Factors	176

List of Tables

Table 1 Distribution of Survey Sample Numbers Across the Provinces	71
Table 2 List of Questionnaire Modules in CCHS Cycle 1.2 and Descriptions	74
Table 3 Problem Gambling Severity Index Dimensions Variables and Scored Items	80
Table 4 Problem Gambling Severity Index Gambler Subtypes.....	81
Table 5 Physical Health Variable Description and Scores.....	88
Table 6 Psychological Health Variable Description and Scores.....	89
Table 7 Substance-Use Variable Description and Scores	93
Table 8 Social Variable Description and Scores.....	95
Table 9 Distribution of Types of Gamblers.....	100
Table 10 Distribution of Type of Gamblers by Province	100
Table 11 Distribution of Type of Gamblers by Gender.....	101
Table 12 Fit Indices for the Latent Class Analysis.....	103
Table 13 Average Game Playing Frequencies Per Year for Each Latent Class.....	105
Table 14 Crosstabulations for Gambling Types and Latent Classes.....	109
Table 15 Crosstabulation of Demographic Variables Against Latent Classes	112
Table 16 Multinomial Logistic Regression of Demographic Variables on the Modal Class	115
Table 17 Crosstabulations of Physical Health Variables By the Modal Class.....	116
Table 18 Multinomial Logistic Regression of Physical Health Variables on Latent Classes, With Demographic Variables Accounted For	118
Table 19 Crosstabulation of Psychological Health Variables and the Latent Classes	118
Table 20 Multinomial Logistic Regression of Psychological Health Variables on the Latent Classes	124
Table 21 Crosstabulations of Substance-use Variables by Latent Classes, with Demographic Variables Accounted For.	127
Table 22 Multinomial Logistic Regression of Substance-use Variables on the Latent Classes	128
Table 23 Crosstabulations of Social Variables and the Latent Classes.....	130
Table 24 Multinomial Logistic Regression of Social Variables on the Latent Classes	131
Table 25 Risk Factor Modeling with Retained Variables in Individual and the Final Models	133
Table 26 Crosstabulations of Demographic Variables with the Problem Gambling DV.....	137
Table 27 Multinomial Logistic Regression of Demographic Variables on the Problem Gambling DV	139
Table 28 Crosstabulations of Physical Health Variables with the DV.....	140
Table 29 Crosstabulations of Psychological Health Variables with the DV.....	141
Table 30 Crosstabulations of Substance-use Variables with the DV.....	144
Table 31 Crosstabulations of Social Variables with the DV	145
Table 32 Multinomial Logistic Regression of Variables for the Final Model for All Classes (in order of entry into the model)	146
Table 33 Results of Final Models for Each Latent Class	152

Table 34 Class-by-class Crosstabulations of Last 12-months Depression with the Problem Gambling DV	155
Table 35 Class-by-class Crosstabulations of Last 12-month Suicide Thought with the Problem Gambling DV	156
Table 36 Class-by-class Crosstabulations of Lifetime Mania with the Problem Gambling DV	156
Table 37 Class-by-class Crosstabulations of Lifetime Any Drug Use with the Problem Gambling DV	157
Table 38 Class-by-class Crosstabulations of Lifetime Hospitalization for Mental Health or Alcohol/Drug Use with the Problem Gambling DV	157

List of Figures

Figure 1 Plan of Analysis for the Thesis.....	99
Figure 2 Latent Class Membership and Distribution of Average Frequencies of All Games Per Year	104
Figure 3 Percentage of Gambler Types in Each Latent Class.....	111

INTRODUCTION

Legalized gambling in Canada has led to a proliferation of regulated gambling establishments in most regions of the country. Technological (e.g., Internet) gambling has led to an increase in both regulated and un-regulated gambling opportunities which encourages the asocial gambling practice, and attracts increased and new segments of the population, yet leaving little or no reliably traceable data. Canadians have wagered an estimated \$11.3 in 2002, and \$13.6 billion in 2006, compared to \$2.7 billion in 1992 (Statistics Canada, 2003b; Statistics Canada, 2007a). In terms of income proportions spent on gambling, there is a strong positive relationship between income levels and gambling dollars, where this proportion is especially high for senior households and among adolescents (MacDonald, McMullan, & Perrier, 2004). In 2001 the Canadian Centre on Substance Abuse and the Responsible Gambling Council of Ontario undertook a study that determined 86% of Ontario residents engage in some form of gambling and most do so at the frequency of once per month with over 92% stating gregarious motives as their intent (Wiebe, Single, & Falkowski-Ham, 2001). The study found that over 13% of gamblers report some form of gambling problem with a moderate or severe gambling pathology prevalence of 3.8% among Ontario residents 18 years or older.

The majority of gamblers consider gambling a leisure pursuit, however, a minority find themselves compelled to gamble excessively, often to the detriment of their mental, psychological, and financial well-being. For problem-gamblers, the health, psychological, and social costs of gambling exceed any benefits their gambling behaviour might confer as an indulgence or recreational diversion. The

adverse effects of excessive gambling are profound and its social and psychological impact are not directed solely at problem-gamblers, but also at their families and communities in addition to potentially other unrelated sectors of the population (Grinols, 2004). Hence, the nature and the impact of gambling, as well as the unintended consequences of gaming policies, are no longer insignificant and have become a major concern with public health implications.

In 1993, the Canadian Public Health Association identified gambling as a public health issue by adopting a formal resolution seeking funds to coordinate a national health impact assessment of regulated gambling in Canada (Korn & Shaffer, 1999). In Ontario, research in the last decade has provided demographics and psychographics of gambling characteristics and suggest there may be fundamental differences between individuals who choose to pursue gambling as a leisure activity and potentially draw benefits from their involvement in gambling as a recreational pursuit, and those who engage in gambling activities compulsively or problematically to the detriment of their own well-being. Research reports have been pointing towards a complex matrix of inter-related biopsychosocial and socio-economic factors that collectively influence problem gambling behaviour.

Research results have exposed the various characteristics of both problem gambling and gamblers and have helped to increase understanding of problem gambling impact. Problem gambling has been identified as a major cause of social, health, and family problems (Griffiths & Jonathan, 2002; Productivity Commission, 1999; Raylu & Oei, 2002; Walker & Barnett, 1999), financial difficulties (Ladouceur, Boisvert, Pepin, & Dumont, 1994), marital breakdown (Darbyshire, Oster, & Carrig, 2001), depression and other health consequences (Suck Won, Grant, Eckert, Faris,

& Hartman, 2006), and possible criminal acts (Gazel, Rickman, & Thompson, 2001). Some characteristics that may place individuals at increased risk of developing a gambling-related problem include male gender (Petry, 2003), youth (Messerlian, Derevensky, & Gupta, 2005a), concurrent substance abuse (Petry, 2001), and mental illness (Adamson, Todd, Sellman, Huriwai, & Porter, 2006; Rupcich, Frisch, & Govoni, 1997). Problem gambling therefore needs to be addressed comprehensively through a range of responses in order to prevent escalating individual and social problems.

Nonetheless, a comprehensive framework for an integrated approach to considering the interactions between biological, behavioural, social, and economic determinants of both recreational and problem gambling is still not present (Korn et al., 1999; Korn & Gibbins, 2003). Despite the proliferation of research dedicated to the gambling theme, the field remains young and relatively undeveloped. Most research results are explanatory in nature offering descriptive and correlational information. To date, no model of gambling behaviour has attempted to empirically discriminate between individual contributing factors and the joint contribution of seemingly distinct or seemingly dependent factors.

Among the available paradigms for understanding gambling behavior (e.g., medical model, economic model, freedom of individual model), a public health paradigm has the advantage of encouraging the application of various theoretical frameworks to the span of risk levels and protective factors that influence gambling. Public health deals with determinants of health through an inclusive approach that is conducive to understanding interrelated factors including physical and mental health, education, employment and income, social status, levels of

physical activity, stress, and other associated dynamics. A public health framework also has the advantage of considering individuals and their communities, and therefore emphasizing “quality of life”, as opposed to gambling pathology alone.

In addition, examining gambling within a public health framework encourages the understanding of gambling activities from a community perspective. Unlike other forms of addiction, where for example drinking behaviour might be rather uniform in its manifestation, gambling is highly influenced by contextual factors of local gaming industry, community size, norms, and other related issues (Bernhard & Preston, 2004). A gambler might engage in betting through various forms of casino gambling or slot machines, play in bingo halls, buy lottery tickets or any one of a large assortment of instant pull-tab or scratch tickets, bet at horse races, deal with a “bookie”, be over-engaged in trading in the stock market, or gamble at home through the internet. Therefore, a community-level analysis of gambling behavior is central to understanding the behavior of gamblers and how they might differ from non-gamblers (Bernhard et al., 2004). In addition, an appreciation of the factors that differentiate between those who do and those who do not experience detrimental consequences from their gambling behaviour would enhance our understanding of gambling and its impacts.

The aim of this research was to examine gambling behaviour in Canada within a public health framework by examining it from several perspectives, including demographics, physical and psychological health, and social risk factors. To this end, secondary data analyses were carried using the ¹Canadian Community

¹ Since the year 2000, Statistics Canada has been periodically conducting a comprehensive interview-based survey entitled “the Canadian Community Health Survey (CCHS)”. The survey

Health Survey (CCHS) Cycle 1.2 in order to **a)** Develop psychographic and mental-health profile models of the non-gambling, recreational, and problem gambling segments of the Canadian population; and **b)** Draw on an integrative public health framework to model and collectively determine the problem gambling risk levels associated with the full spectrum of known risk factors.

Definition of Problem Gambling and Recreational Gambling

Gambling is defined as a bet placed on the uncertain outcome of an event. The process of gambling usually consists of a winning phase followed by a losing phase. The former involves excitement and a victory as financial gain. This phase reinforces and encourages persistence in gambling and its related risks as the gambler pursues the “euphoric” experience of winning. The latter phase is where the gambler invariably loses, persists in gambling, and loses more. The process can lead the gambler into an “addiction”, and the negative consequences associated with attempts to recover previous losses. In pathological gambling (PG), the consequences can affect familial, social, and work-related activities.

For many years, gambling has been considered a moral issue and a human vice. Early theoretical research approached most addictive behaviour including gambling from a moral standpoint (Shaffer, Stein, Gambino, & Cummings, 1998). The publication of DSM-III in 1980 essentially elevated the act of excessive gambling from vice to disease. Currently, gambling is considered an addiction the

Cycles include information on a wide range of topics such as health conditions, general psychological and mental health states, various forms of addiction, gambling attitudes and behaviour, and use of various health services including psychological and mental health resources. After its introduction in 2002, the survey portion pertaining to information on gambling attitudes and behaviour was collected as an optional sub-survey and only some of the Canadian health regions decided to participate in subsequent years. Full documentation and information regarding these surveys are detailed elsewhere (Statistics Canada, 2003a).

same way that alcohol and drug dependence are considered addictions. The Health Canada agency considers excessive gambling a “process” addiction, in the same way that eating might become an addictive disorder and due to a loss of control or impulse problem (Health Canada, 1997).

PG is considered a disorder of impulse control. According to the American Psychiatric Association’s diagnostic Manual (DSM) III and IV, it is in the same category as kleptomania , pyromania, and trichotillomania, all of which are impulse control disorders and consist of “failure to resist” the urge to behave in ways or do that which is harmful to self or others. The diagnostic criteria for PG were modelled similarly to those for substance abuse (Korn et al., 1999).

In International Classification of Disease, (ICD)-10 (World Health Organization, 1992), impulse control disorders are termed “habit and impulse disorders” and are considered urges “that cannot be controlled”. ICD-10 sites PG as persistent repeated urge to gamble in spite of unfavourable consequences. Both DSM-IV and ICD-10 make a distinction between PG and gambling that is related to or follows mania, or gambling performed by individuals with antisocial personality disorders.

Historical Background

Gambling seems to have always been an ingredient of most human cultures, with a few exceptions recorded in parts of South America and Africa (Binde, 2005). The earliest reference to gambling can be traced back to 5000 years ago on the ancient Egyptian murals and tomb paintings depicting board games such as draughts and pictures of noblemen playing games of hounds and jackals (Belanger, 2006). A Sumerian board game has been found in a royal cemetery

dating back to circa 2600 BCE. The Greeks and Romans are known to have wagered on dice games and chariot wheels and the Romans are known to have used lotteries to settle property division and inheritance disputes among relatives (Belanger, 2006).

The earliest recorded study of gambling dates back to the 16th century, where Gerolamo Cardano (A.D. 1501–1576), an Italian physician, is known to have studied probability and written extensively about games of chance. Himself a pathological gambler, Cardano claimed to have gambled every day, lost great sums of money and wealth and frequently attempted to “chase” his losses (Ore, 1953). Cardano has written extensively on various scholarly topics including mathematics, game strategies, and the rules of probability. His writings also include manuscripts that describe supernatural forces of luck, fate, astrology, and divinatory practices which were supposed accessible to certain individuals and that could predetermine the outcomes of wagers and defy logic. Nevertheless, Cardano’s manuscripts are considered the first scholarly treatment of probability theory, an assumptions that has earned him the title of the father of gambling studies (Aasved, 2003).

Cardano essentially proposed a multi-causal approach to gambling. The modern equivalent of his approach would be that of the medical model of gambling (i.e., all human ailments can be traced back to biological underpinnings and therefore could have a medical solution) combined with considerations for psychosocial underpinnings of gambling. He believed the psychological effects of gambling allowed for a reduction in melancholy, grief, tension, and anxiety, and served significant social benefits. Cardano prescribed gambling to many of his

patients for relief of the above despite the activity being forbidden by the Renaissance laws of his time. However, because these laws did not apply to prisoners, those condemned to death, and the “sick”, Cardano resolved that gambling was justified for those stricken by grief or anxiety and continued to prescribe it to his patients. He also noted that he himself had felt the need to gamble for solace and improved expectations for the future after a long illness where he found death had been close at hand (Ore, 1953). Cardano was ultimately found guilty of heresy and hanged in Milan by the Inquisition (Ore, 1953).

In North America, games and sports were deeply rooted among the aboriginal cultures and were played long before the European settlements. A joint project between two American anthropologists, Stewart Culin and Frank Cushing, sponsored by the Smithsonian Institute, led to the investigation and the meticulous recording of the details of over 500 games of chance played on this continent, as well as cataloguing and collecting of specimens of gaming implements for an exhibition by the United States National Museum at the International and Cotton States Exposition at Atlanta, Ga. (Culin, 1992). Such projects were undertaken in late 19th century due to the prevalent belief of the time that the Aboriginal races were on the verge of extinction and efforts were made to salvage as much data as possible to “chronicle Indian final days” (Belanger, 2006). The most comprehensive of such works is that of the Culin-Cushing project which started in 1891 and continued for 14 years. Their work was first published in 1907. The work describes games of chance, strategy, and skill involving guessing and throwing of different forms of dice, using an assortment of materials such as wood, cane, bone, animal teeth, fruit stones, nut shells, and more. The games shared many similarities

even amid widely separated tribes and existed among 130 tribes incorporating more than 30 unrelated linguistic groups spanning the Algonquian tribes to the Shinookan, Eskimauan, Iroquoian, Mayan, Muskogean, Wakashan, and Zunian tribes and others geographically situated in between. The games of “sport” included long distance running, racquet, and lacrosse, now popular in North America and parts of Europe, and games involving shooting at a moving object. The majority of the games were played by both men and women and were often played either as pastimes or ceremonially, either during special celebration and festivals or religious rites, or during certain months of the year, and most included some form of betting. Many of the ceremonial games were dramatization of war, hunting, agriculture, reproduction of animals, or prayers for rain and health (Culin, 1992).

The authors noted that games of the American aboriginals belonged to the category of either games of chance or games of dexterity but that games of pure skill and calculation were entirely absent; a statement now disputed by modern Aboriginal scholars (Belanger, 2006). The games were shunned by the colonists and the missionaries and forbidden where possible by the state and the church, due to the involvement of wagering practices, the involvement of what was perceived as magic, and the presence of intoxicating beverages or inhalants (Belanger, 2006; Culin, 1992). The prohibitions were ineffective for the most part and led to underground or illegal gambling among these communities (Belanger, 2006). In more recent years, legal tribal gambling such as Indian Casinos, have been adopted by both the US and Canada in 1980’s and 90’s.

Modern Gambling

Local and national governments increasingly recognize modern forms of gambling as a flourishing scheme for generating income and therefore have embarked on profiteering from their population's proclivity toward gambling. However, gambling is a contentious issue of public policy that seems to linger as a social controversy for all governments that have legalized its practice. In Canada, gambling revenues made up 1.9% of total government revenues in 1992 with an increase to 5.1% in 2001 (Marshall & Wynne, 2003). Canadian gambling is a provincial matter with each province having its own gaming control commission. In Ontario, the Alcohol and Gaming Regulation and Public Protection Act of 1996 led to the establishment of the Alcohol and Gaming Commission of Ontario, established in 1998. Beside regulation of alcohol sales, they have a mandate to ensure Ontario casinos and charitable gamings operate in socially responsible manner in the public interest. In 2005, the Ontario commissioner released a report outlining the lowering of revenues from bingo (\$1.2 and \$1.0 billion for 1996 and 2003, respectively) and some forms of instant win such as Break Open Tickets (\$1.2 billion and \$360 million in 1997 and 2003 respectively). Hence, the commission announced its intent "to modernize the regulation of charitable gaming in Ontario to reflect the needs of the 21st century:" (Alcohol and Gaming Commission of Ontario, 2005), and invited all associations involved in, or impacted by, charitable gaming in Ontario to provide their input. In February of 2007, the commission released a report with suggestions regarding liquor licensing at bingo halls in Ontario. It also launched a successful pilot project in 2007 which led to the full implementation of policies that allow Ontario bingo halls to acquire

liquor licenses and to serve alcohol. The additional bingo revenues are shared between bingo hall operators and charities (Alcohol and Gaming Commission of Ontario, 2007).

Gambling revenues and profits have shown a steady increase over the years, with highest net revenues from government-run gambling stemming from casinos, followed by lotteries, and more recently by Video Lottery Terminals (VLTs), a coin operated, free-standing, electronic game of chance. The per capita (18+) revenue was estimated at \$513 in Canada in 2007, compared to \$128 in 1992. The most recent report (2007)) shows the lowest per capita revenue comes from Yukon, Northwest territories and Nunavut (\$111), and the highest from the Province of Alberta (\$750). Overall, gambling industry growth has outpaced all other industries in Canada (Statistics Canada, 2007b).

Gambling Prevalence

PG prevalence reports vary with geography and measurement instrument used. Overall, the reported rate of the prevalence of PG is currently estimated at between 0.6 to 2.0% (Dickerson & O'Connor, 2006b) but the implicit concern of scholars in the field is that increased gambling opportunities will likely lead to increased associated problems and pathologies. Furthermore, prevalence studies do not take into account the pervasive social impact of gambling on members of the pathological gamblers' family, work place, social network, and community. In essence, the ensuing harmful outcomes and the enormous pressures, break down of family and work relationships, criminal outcomes, and domestic violence, just to name a few, affect a much larger proportion of the population than the prevalence studies can estimate. A study conducted at the University of Manitoba estimated

the cost of problem gambling in terms of lost wages, missed work, bankruptcy, and the like, at \$56,000 for each problem gambler per year.

LITERATURE REVIEW: WHY DO PEOPLE GAMBLE

Many areas of scholarly work are attempting to understand gambling behaviours, both to prevent the potential problems they entail and to treat the resulting pathologies. There are diverse views as to the reasons for gambling behaviour. This has led to different approaches to the study of gambling and pathological gambling. From a population health perspective, two sets of broad questions deserve careful study, the answer to which can bridge the public health factors discussed above. These questions can be simplified into 1) why people gamble, and 2) who gambles. All studies point to a heterogeneous group of people who gamble or gamble impulsively. The question of why people gamble is addressed next, followed by the ultimate questions concerning who gambles and who is more likely to develop gambling problems.

Given that gambling activities have been a part of human life for a very long time, there have been many attempts at explaining the related behaviours. Theories of gambling proposed thus far attempt to understand the nature of the behaviour, especially when it becomes pathological, and to understand the reasons for the compulsion many feel toward excessive gambling. For the most part, theories have been proposed by those who consider gambling a problem of morals, health, or society. Recent approaches consider gambling, particularly gambling problems, as a combination of some of the above with less concern about morals but more with other aspects.

There are a number of psychological theories purporting to explain gambling behaviour. The field of gambling studies is wide and varied and a great deal of remarkable research is currently underway. Most researchers follow one or more of the theoretical frameworks thus far proposed for gambling behaviours, the intentions and motives behind them, and their related pathologies. Given the considerable range and extent of gambling-related work it would be unfeasible to review all relevant research. Oftentimes, experimental schemes are based on a blend of psychological frameworks of gambling together with added conjectures from areas such as the decision sciences, medical, social, neurobiological, and other fields. However, the majority of research can be characterized under the rubric of one or more explicit genre of research framework.

The dissertation begins with an overview of the major theoretical frameworks put forward in the field of psychology as to the motivational grounds that support gambling behaviour, upon which the majority of psychological gambling research rests. These are reviewed, more or less chronologically, in this chapter. Where possible, specific examples of research work that support them are included. The purpose of reviewing the psychological theories is to build the ground work for the next section, which examines the more empirical aspects of gambling, gamblers, and gambling problems along with their associated co-occurring characteristics and disorder. An attempt has been made to cite historical references or the primary theorists of major hypotheses. However, various theorists have reiterated many of these gambling-related hypotheses in one form or another, over time. The overview that follows is less than exhaustive yet covers all relevant major theoretical constructs.

Psychodynamic Framework

Theories of gambling that fall into the framework proposed by psychodynamic approaches place great emphasis on the role of early childhood experiences in the development of gambling problems. They include the early and later views from the psychoanalytic theories, as well as personality theory. Both these approaches have been criticized for what Jung has put aptly as “over-emphasizing the pathological aspect of life and for interpreting man too exclusively in the light of his defects” (Jung, 1933). These are reviewed in turn, but only a minimal amount of empirical research supporting them is included, as little is available.

Psychodynamic Theory: Gambling as an Unfulfilled Oedipal Desire

Many consider Pierre Janet (1859-1947), the French physician and psychologist who pioneered the concept of the correlation between early life experiences and present day mental illness as well as the “unconscious” (Janet, 1901), the true founder of psychoanalysis. However, it is Sigmund Freud and his students and followers who are often credited with advancing the topic. However psychoanalytic theory may have been introduced, Freud and his students advanced a version of these theories that included a number of fundamental and untestable assumptions about the human psyche.

For early psychoanalysts, the power imbalance between parent and child and its potential for maladaptive consequences lies at the root of most neuroticism. The particular stage at which the development of the person may have been fixated is therefore demonstrated through language and behaviour problems in adult life. Such problems include repetitive behaviours such as compulsive hand

washing, drinking, or gambling (Aasved, 2003). Ineffective denial of the oedipal and parricidal wishes in the male child, resulting from the unconscious collective racial memory of the id, were presumed responsible for identifying with the mother and confusion in sexual identify which could lead to masochistic needs for punishment in adulthood, an example of which is compulsive gambling that invariably occurs in spite of severe losses (Aasved, 2003). Overall, Freud and his colleagues viewed gambling as an addiction similar to alcoholism or drug dependence. The psychoanalytic theorists were also the first to note and study the co-occurrence of pathological gambling and other addictive disorders.

Most early psychoanalytic views of gambling were various combinations and merging of these earlier assumptions and included the notions of sadism, escape, excitement, latent homosexuality, sublimation of parental figure into father fate and lady luck, sublimation of infantile omnipotence, or psychic masochism. The disagreements as to the ultimate motive for gambling were about the specific stage during which a personality fixation occurred. Some theorists believed that gambling might satisfy one, two, or all pregenital libidinal drives including the main stages described above as well as masturbatory, aggressive, masochistic, and homosexual tendencies (Stekel, 1929). These theories have been based on clinical observations of few or single case studies and for the most part are male-centred. No empirical research has substantiated or negated these conjectures as, for the most part, they are untestable (Aasved, 2003).

Later Psychoanalytic Views of Gambling

Later psychoanalytic theorists viewed the act of gambling as a substitute for the act of sex and concluded that gamblers do not gamble for monetary gain but

for excitement and to dare fate. Unlike their predecessors, later psychoanalytic theories distinguished among gambler types and recognized that some gamblers play for entertainment only but that compulsive gamblers have greater unconscious infantile libidinal drives and more reliance on “omnipotent hope” (Bolen & Boyd, 1968).

More recent psychoanalytic views continue to uphold earlier stances regarding the relationship between gambling and sexuality and cite the co-occurrence of gambling and sexual addictions as well as the relationship to life trauma and stress as supporting evidence for this position (Bolen et al., 1968). In fact, recent research has shown that many problem gamblers report major life stressors such as the loss of a loved one, often a parent, preceding the development of gambling problems (Kausch, Rugle, & Rowland, 2006; Raviv, 1993; Taber, McCormick, & Ramirez, 1987).

Many theorists maintain that gambling is an escape mechanism that involves power-seeking and appealing to fate (Aasved, 2003). As will be discussed later, psychoanalysts were not the only theorists to see gambling as a means to escape. The escape concept is a recurring topic in other theories and hypotheses.

Psychoanalytic approach has been severely criticized and rejected as for the most part the theories rely on clinical observations of relatively few psychiatric patients. It is also seen as a set of theories that deny the effects of extra-psychic and environmental cues on the person. Many criticize the major assumption of psychoanalytic theories that gambling originates from a wish to lose, as it fails to explain the elation felt and demonstrated by those who win their bets (Morasco, Weinstock, Ledgerwood, & Petry, 2007). Comparisons of gambling guilt to

masturbatory, eliminatory, or masochistic guilt are also criticized as it cannot be shown that people of all cultures experience feelings of guilt associated with the above (Galdston, 1960). Overall, psychoanalytic theory denies the impact of contextual factors and has had unsound theoretical foundations and empirically untestable assumptions. However, it is also generally agreed that these theories, flawed though they may have been, managed to dissipate the common pre-Freudian deviance model of gambling and the moralistic disdain for the gambling act which were prevalent at the time, and invoke a shift toward a more secularist view of the subject.

Personality Framework

Personality theories are highly influenced by psychoanalytic theories but constitute a more recent approach to motivation for gambling. The general theory claims that behavioural patterns are formed by each individual's personality and that maladaptive behaviour is a product of negative childhood experiences. Although most personality theorists believe that early learning and socialization experiences shape personalities, some uphold the medical model, which suggests that individuals are born with particular temperaments that are genetically predetermined. All are in agreement that once established, personality types are responsible for behavioural patterns (Aasved, 2003). In general, addictive behaviours are explained by the presence of an intrinsic personality disorder (Landis, 1945).

Two main personality approaches to gambling, and addiction in general, are the power theory and the dependency conflict theory (Whiting & Child, 1953). Both suppose that addictions are developed because of low self-esteem in the

individual (most specifically an inferiority complex) and arrested personality development. Therefore, the tangible benefits of gambling (for example, elation upon winning or elimination of boredom) are viewed as less important than the psychological rewards of self-importance and the sense of power and control. Behavioral theorists maintain that it is the gratification of these emotional needs that beget the continuation of gambling behaviours despite the losses incurred through gambling. Thus, the anticipation of winning brings enhanced self-worth. Behaviours such as “chasing” (explained in detail later) are propelled by the need to regain control and reclaim a positive self-image. The prevailing view of personality theory is that all or most problem behaviours stem from a common origin, given the fact that they tend to co-occur (Hoyle, 2000), although modern personality theories suggest different problem behaviours likely stem from different underlying processes (Hoyle, Fejfar, & Miller, 2000). Overall, personality theorists tend to view behavioural problems as driven by unresolved and unconscious needs for parental support that persist into adulthood and are dealt with in maladaptive ways where gambling is used as an escape (Cooper, Agocha, & Sheldon, 2000).

One of the main criticisms of personality approach is that theories are based on the study of deviant behaviours in clinical settings and not based on observation or the study of “ordinary” behaviour such as non-pathological gambling or drinking (Aasved, 2003; Hoyle et al., 2000). An assortment of personality traits, sometimes contradictory, has been suggested as correlates of pathological gambling. Such traits include immaturity, narcissism, or absence of narcissism, denial and fantasy, impulsivity, or absence of impulsivity, and more,

with some suggesting the discrepancies are due to differences in the type of gambling (Aasved, 2003).

Behavioural Framework

The behavioural psychology view of gambling is made up of several sub-categories of theories and approaches, all of which have been empirically examined. Most are recent theories and differ from the psychoanalytic ones to a great extent. In fact, the only similarity between them is that both approaches consider gambling to be the result of psychological rather than physiological systems. In all other instances, behavioural theory contradicts psychoanalytic theories. An advantage of the behavioural theories is their applicability to both males and females, unlike the psychoanalytic theories which are mostly masculine theories of behaviour.

There are two major classes of theories that fall under the behavioural framework. They are learning theory and drive-reduction theory.

Learning Theories

In general, learning theory is concerned with the ways in which an individual learns to react to direct social and physical situations they come across at any age. These theories are thought to apply to men and women as well as animal species, and are concerned with understanding the motives behind non-pathological behaviour. In this way, the theories do not pathologize gambling but look at the behaviour as a continuum of activities along which the individual may encounter difficulties with self-control and compulsion. As such, the potential for gambling resides in all humans through processes that are common to most

animals. Thus, the study of gambling need be concerned with similarities between excessive gamblers and non-gamblers rather than their differences in order to identify areas of divergence (Cohen, 1975).

Classical conditioning.

The basic premise of Pavlovian classical conditioning concerns animals' associative learning. When a particular stimulus that causes a reflexive response in an animal is paired repeatedly with a second stimulus, the second stimulus alone can unintentionally elicit a reflexive response because the reflexes have been "conditioned" (Malaka, 1998). This is what Pavlov called conditioned stimulus-unconditioned stimulus contiguity, suggesting that conditioning is based on the likelihood of the unconditioned stimulus being present with the conditioned stimulus so that one stimulus can produce the "expectation" of another, followed by the response it elicits (Bitterman, 2006). In more modern terms, this is referred to as "behaviour completion mechanisms" where established or learned behaviours can be activated by situational cues (Aasved, 2003). The classical conditioning concept is often used to explain various addictions including eating compulsions or drug and alcohol use which are thought to be associated with an assortment of situational cues. Reactivity elicited by a stimulus (cue), in general, leads to a positive-incentive state. This holds true for all learned behaviour but especially in the case of addictive behaviour (Havermans & Jansen, 2003). These behaviours can be maintained not only by the stimulus but also through misinterpretation of internal cues (cue-elicited craving), e.g., aroma from a bakery causes an autonomic arousal which is misinterpreted as hunger in the absence of true hunger for a food-addict. Similarly, substance abusers are known to misread

changes in the autonomic arousal as craving or tension (Havermans et al., 2003). The ingestion of food or drug self-administration (conditioned drug response) re-establishes and also reinforces the response.

In this way, pathological gambling behaviour, considered an addiction by learning theorists, can be elicited through an external stimulus such as the croupier's call, the sound of the spinning wheel or game chips, shuffling of cards, and other cues from the gambling environment. These stimuli can create an arousal state of excitement, tension, or anxiety that can trigger the urge to engage in gambling activity (gambling response). In some, even thinking about gambling can generate a conditioned response such as a "rush" consisting of increased heart rate or sweaty palms (Freidenbert, Blanchard, Wulfert, & Malta, 2002).

Operant Conditioning:

The learning theorists base much of their reasoning on Skinnerian operant conditioning (Skinner, 1979) and Pavlovian classical conditioning, both of which are believed to be essential in sustaining repetitive patterns of conduct such as addictions, preferably called "excessive behaviours", which are learned as a result of associations made between events occurring in the environment (Orford, 1985). According to learning theorists, all addictive behaviours, including pathological gambling, are "acquired habit patterns" and represent a compulsion. Although not all agree on the inclusion of every type of addiction, for example there is a disagreement as to whether nicotine addiction can be included in this category, most consider all obsessive compulsive disorders to belong in the acquired habit pattern category (Aasved, 2003).

Skinner is the well-known American behaviourist whose work with laboratory animals helped him to formulate the operant conditioning model. Unlike Pavlov who studied the reflexive response to a stimulus, Skinner was interested in the non-reflexive or the voluntary response of an animal to a stimulus. Skinner observed that “free” behaviour of a rat could be shown to be in line “just as much [with] natural laws as, for example, the rate of his pulse” (Skinner, 1979, p. 59). Skinner’s operant conditioning model proposed that habituated voluntary behaviours are responses to stimuli and are “learned” by the organism. In addition, he suggested that learned behaviours can be unlearned (extinguished) through either punishment or withholding of positive reinforcement (Skinner, 1953).

The reward structure inherent in gambling is, in essence, a schedule of reinforcement, the periodical allocation of a prize interspersed with losses, and is considered the foundation of success in maintaining gamblers’ initial inclination to gamble (Haruvy, Erev, & Sonsino, 2001). This scenario mirrors the behaviour of Skinner’s laboratory rats, which Skinner came upon by accident. Skinner noticed that during his absence from the lab, the lever normally used to drop a food pellet had broken and become immobile, yet the animals who had learned to press the lever to receive a prize had continuously pressed the immobile lever harder and faster than before (Iversen, 2007). After a certain period of pressing the lever without receiving any food pellet, the rats discontinued the lever pressing behaviour. Skinner called the cessation of lever pressing under these circumstances the extinguishing of the behaviour.

The extension of this theory to gambling is that those who gamble successfully or skilfully are reinforced by the rewards of winning whereas unskilful or unsuccessful gamblers are eventually repelled by the experience (Petry, 2005). Unlike psychodynamic theories, behaviourist theories assume that people gamble in order to win just as rats press a lever in order to obtain food. Skinner proposed that a single reinforcement is sufficient for operant conditioning (i.e., a reinforced behaviour can be learned with one reward after a few sets of trials as well as it could be learned with one reward after each trial). Once the expected reward is no longer forthcoming the behaviour extinguishes. Presumably, this is what happens within normal parameters of gambling behaviour. In pathological gambling, the frequent loss should, but fails to, extinguish the desire to gamble further. A number of rationales for this phenomenon have been proposed.

Schedules of Reinforcement: Variable-Ratio. Under normal circumstances, once an expected reward fails to materialize, there should be an extinction of behavioural sequences. This happens when the reward is on a fixed-interval schedule, as in once after a predetermined number of trials. But if the reward occurs irregularly yet the number of rewards remains more or less constant, the extinction of the behaviour does not occur. In fact, the intermittent access to reward results in increased persistence in the behaviour. This is what Skinner and his colleagues called the variable-ratio schedule (Ferster & Skinner, 1957). This pattern of reinforcement of behaviour also holds true for gambling. In fact, the variable-ratio schedule is the basis for “all” gambling systems (Skinner, 1953). The variable-ratio schedule is exploited by the gambling industry and creates a sense of false hope and anticipation. In addition, the experience of “near-miss” or “near-

win” (e.g., almost hitting the jackpot) is used as an extra instrument of operant conditioning that “hooks” the gambler (Gilovich, 1983).

Schedules of Reinforcement: Variable-Magnitude Ratio. The system of scheduling can be exploited further by using the variable-magnitude ratio. Professional gamblers and casinos through the frequent use of non-random variable-magnitude schedule of reinforcements, where the initial payouts are more frequent but wane as the game continues, often exploit this system to their advantage. For example, the professional gamblers allow their opponent to win frequently at the beginning stages of the game but less frequently as the game continues. This creates a reinforcement schedule that delivers a strong operant conditioning stimulus, thereby bringing the opponent’s behaviour, similar to that of a rat or a pigeon, under the control of a variable-ratio schedule (Skinner, 1953).

Skinner notes that by using a variable reinforcement schedule he was able to decrease the rewards given to his laboratory animals until the rewards occurred rarely. In doing so he was able to cause the pigeon or the rat to spend more energy operating the reinforcement device than they received from the food. The animals persisted in their behaviour until their energy expenditure surpassed that received from the food reward. Intriguingly, he was able to protract the reinforcement schedule at variable-magnitude to the point of total exhaustion for the animal where the pigeon would peck itself to death in anticipation of the reward, usually a single pellet of birdseed (Skinner, 1953). This bears great resemblance to the behaviour of the gambler, at play on a casino machine, programmed with a variable-ratio or variable-magnitude ratio of reward schedule,

who loses steadily and yet persists in the behaviour, as would the rat or the pigeon.

Other aspects of gambling also increase the likelihood that a gambler who is losing money would continue to gamble. The uncertainty factor is one of the main features of all gambling, but particularly of the slot machine, often programmed initially to dispense large prizes and then to decrease the reinforcement ratio in order to intensify gamblers' persistence at play. Some argue this constitutes a violation of the laws of consumer-safety protection because the machines are certain to "hook" the player. More recent slot machines, unlike their counterparts of the 1950's, are thought to be so effective that all players develop some form of pathology in response to their games (Dickerson & O'Connor, 2006a).

The critics of learning theories contend that most of the empirical evidence on schedules of reinforcements come from work with laboratory animals and that human cognition prevails over such biologically and learning-based reinforcements because humans are capable of thinking about the implications of their behaviour and the losses that follow excessive gambling (Aasved, 2003; Gilovich, 1983). Many have dismissed such criticism by pointing out the available evidence to the contrary where middle-class, educated, and otherwise healthy individuals persist in gambling in spite of their knowledge of gambling outcomes (Williams & Connolly, 2006). Some also criticize the methodologies used by learning theorists in the study of gambling. Most experiments are conducted within safe laboratory contexts where participants use "fake" money or make no investment of their own. The potential payoffs of laboratory gambling are low and do not mimic real life

gambling: Participants are seldom true gamblers (usually university students) and have few options in terms of gambling activity that are pre-determined by the experimenter (Aasved. 2003). However, laboratory settings lacking the look and feel of real life casinos and using “fake” money, normally should deter rather than enhance experimental findings. Dickerson has been an opponent of learning theories suggesting there is no evidence that persistent gambling is the same as pathological or problem gambling although he conceded that payout schedule would play a role in the development of problem gambling (Dickerson, 1991).

Drive-Reduction Theories

For those who believe gambling is but a recreational activity or amusement and no more than a game, there are many theorists to support them. These theorists suggest that play (an activity distinct from work) is an instinctive drive that is part of the collective unconscious and a hallmark of cultured society. These views are mostly supported by anthropological and sociological theories. The early work of the sociologist Mead (1934) is often cited in support of drive-reduction theories. Mead's symbolic interactionism theories considered games as models of social situations. In all games, players can take on the role of other players and in doing so enhance their social development. He believed the instinctual needs of humans are shaped by the social games that are prevalent in a particular milieu (Mead, 1934). Piaget on the other hand concluded that game playing was the basis of children's moral development and hence a type of “rule following” played out in preparation for responsibilities of adulthood (Szasz, 1974). Whereas in Western cultures play is primarily a childhood activity, game activities of adults are considered leisure or recreation activities and not “play”. However, anthropological

studies reveal that activities such as dance, sport, and religious rituals are also “games” and cannot be distinguished from children’s plays (James, 1998). The German historian and sociologist, Gillis (1999), writes of the concept of both early and modern marriage as a “game” or deeply rooted “social drama” people feel compelled to engage in, where the immediate community is implicated with kith and kin as spectators and eventual beneficiaries of the game. He therefore sees engagement in matrimony equivalent to engaging in games of chance, which could be construed as an instinctual drive to play at a game of chance. He describes love and marriage as “deep play”, an idea that Gillis claims originated with anthropologist Clifford Geertz, describing an activity that involves self-discovery as one moves from the sphere of choice to the realm of chance. Gillis equates married couples to gamblers who engage in an unpredictable yet fascinating affair with many parameters of uncertainty and chance.

“Although most of history is written as if people control their own destinies, for most people fate and luck have offered more acceptable explanations than does choice. One might even go as far as to say that for most of human history, humanity has been more comfortable with chance than with choice. In fact, most people have preferred to be ruled by Fortuna, for seeing life as a lottery provided that glimmer of hope otherwise denied by experience”. (Gillis, 1999, p. 53.)

Modern advocates of play theory regard play as an instinctual drive needing satisfaction or reduction. They contend that as a product of an evolutionary biological process, play is a necessary aspect of animal and human life, just as marriage can be seen as a form of play or a game that is, in essence, a product of

an evolutionary biological process (Gillis, 1999). Many play theorists believe that play acts to soften human primordial instincts and that it can help to utilize excess energy as well as to restore energy (Stagnitti, 2004). The extension of these views to “gambling as play” suggests that gambling acts to reduce the drive or the need to play which exists in all, and that in children it is satisfied with other forms of play that do not involve money (Griffiths, 1989; Aasved, 2003). Current research supports the notion of gambling as amusement showing that up to half of all gamblers give “entertainment” as the reason for their gambling (Aasved, 2003; Langford, 2005; MacDonald et al., 2004). Some have suggested boredom, loneliness, and isolation as the reasons for seeking to gamble as a form of entertainment (Trevorrow & Moore, 1998). However, these particular reasons given for gambling might fit best with theories of tension reduction.

Tension-Reduction and Sensation-Seeking Theories

The tension-reduction hypothesis is closely linked to sensation-seeking hypothesis. The former claims addicts and gamblers engage in their respective activity in order to reduce a certain sensation. The latter, also called reversal theory, posits that these behaviors are employed as means of finding excitement and euphoria. The tension-reduction approaches are based on Skinnerian learning theory and attempt to explain addictions in general. They view the need to use drugs or to gamble as negative reinforcements, which reduce the effects of an aversive stimulus (sensations of craving or tension). In this way, a “bad habit” is acquired as a coping mechanism. This may in part explain the finding that highly stressful life events often precede gambling or other addictive problems (Taber et al., 1987). Addictive behaviors are negatively reinforcing because they relieve

negative states such as depression, anxiety, or tension that may be associated with the addiction. Often, either the behavior, the ingestion of the substance, or the belief that the substance or behavior will relieve the tension, is the underlying reason for engagement in the activity. In this way, the gambling or the drug act as analgesics that provide relief or escape from an otherwise unpleasant world (Aasved, 2003). A study of underlying mechanisms for alcohol use among alcoholics found participants' expectation of tension reduction increased with intensity of their negative moods (Young & Oei, 2000). A US study of 202 university students found that among male students, those who used emotionally focused coping mechanisms in response to high levels of stress were more likely to engage in gambling behavior, compared to those who used task focused coping mechanisms (Lightsey & Husley, 2002). Depression and dysthymia are well known to have a high correlation with gambling problems and it is hypothesized that gambling becomes the principle means of releasing tension that is caused by stress, trauma, loneliness, or anxiety. In fact, many problem and pathological gamblers have claimed to gamble in order to establish a social network and to alleviate loneliness (Orford & McCartney, 1990).

The sensation-seeking approaches are closely related to drive-reduction approaches with subtle differences. They consider gambling to be a stimulant or euphoriant because it activates autonomic sensations and creates exhilaration. Therefore, those who experience hypoarousal such as those with depression or loneliness and feelings of isolation are more likely to find themselves in gambling venues in search of arousal (Zuckerman, Buchsbaum, & Murphy, 1980).

A number of studies have contradicted the notion that pathological gamblers are more likely to possess sensation-seeking traits than non-pathological- or non-gamblers (Hammelstein, 2004). In fact, many have found the opposite where pathological gamblers actually have fewer sensation-seeking traits than controls. An Australian study of off-course bettors (those who bet on horses away from a race course) found that occasional and problem or pathological gamblers had significantly lower values on tests of sensation seeking than a representative Australian control group (Dickerson, Hinchey, & Fabre, 1987). Although gamblers often display excitement during their game and express animation and thrill at the prospect of winning or losing, the need for intense or novel stimulation may not necessarily translate into sensation seeking, at least not as a trait. In other words, there may be other factors involved such as impulsiveness and lack of control (Hammelstein, 2004).

All models of drive reduction or sensation seeking consider the immediate emotional pay-off of gambling to be more important than any potential monetary pay-off. These approaches have been criticized and some have gone as far as suggesting that the concept of psychological tension reduction was essentially derived from the concept of hydraulic pressure release based on the physical model of energy discharge, and used by psychotherapists simply because it offered a good analogy to addiction and gambling (Szasz, 1974). Nevertheless, the tension-reduction hypothesis has had many convinced of its applicability to the study of gambling and other addictions.

Cognitive-Behavioural Framework

The cognitive-behavioural paradigm consists of a combination of theories from cognitive psychologists and behaviourists. There are three general facets to these theories which basically assume that gamblers continue to gamble because (a) they are trying to win money, and/or because (b) they hold false beliefs about the nature of gambling and the probabilities involved, and/or because (c) they overestimate their own abilities in playing games.

As gamblers hold on to these idiosyncratic “cognitive distortions”, their gambling decisions are biased and lead to irrational decision making about the degree of control they, or other fictitious causes, have over the games. In addition, because these beliefs are internalized, gamblers often fail to question their accuracy and worth. When they win, they attribute their success to their own abilities, special insights, and sets of beliefs, or alternatively to luck, fate, or the existence or proximity of a credulous artefact or deed. In contrast, when they lose they blame outside factors, flukes, or the absence of fortune for their failure (Toneatto, 2002).

Attribution theories are subsumed in cognitive-behavioral theories and generally try to explain the reasons behind the gambler’s fallacy, chasing, and other cognitive errors of gamblers, discussed in turn below. They attempt to understand the ways in which people justify their behaviours to themselves. In essence, attribution theory of gambling states that gamblers generally attribute their successes to themselves and their control over events (internal causes) but their failures to luck, divine assistance, and outside contributors (external causes); (Goodie, 2005).

False Beliefs: Gambler's Fallacy

The gambler's fallacy, also called the Monte Carlo fallacy, is the tendency to erroneously believe that repeated occurrences of an outcome will make it less likely to re-occur and conversely, that a particular outcome is more likely to occur if it has not occurred in the recent past. For example, in a series of flipping of a fair coin, a head is considered more likely to occur if several tails have preceded it. In this way, a probability of more than half is attributed to the next occurrence of a head and less than half to the next occurrence of a tail. When wagering, people bet higher after each loss because they think they are "overdue" for a win as they assume random events have an inter-dependent pattern and will balance out (Roney & Trick, 2003). It has been observed that many people operate on gambler's fallacy in almost all games of chance, including electronic slot machines, race-track betting, roulette, craps, or most other casino games, as well as coin tossing (Aasved, 2003).

False Beliefs: Chasing

Chasing loss and persisting to gamble after considerable loss are closely linked behaviours of gamblers which essentially stem from loss of control and an inability to cope emotionally with the incurred loss (Dickerson et al., 1987). Chasing occurs both within and between gambling sessions. Chasers often return to another gambling session at a later time for a chance to get even. This "urge" is often reinforced by any previous "big win" after losses or the experience of "winning streaks" (O'Connor & Dickerson, 2003).

Lesieur's influential work, *The Chase* (1984), defines a compulsive gambler by the continued act of gambling after many losses which the gambler imagines to be the only logical stratagem: There is no likelihood of winning back the losses if the gambler were to quit (Lesieur, 1984). Persistence in gambling in the face of "urgent debts" is the distinguishing factor between problem- and non-problem gamblers according to the DSM-IV diagnostic criteria of gambling pathologies and chasing is one of the criteria for the diagnosis of pathological gambling in DSM-IV (American Psychiatric Association, 1994). This concept closely resembles that of entrapment, an explanation offered by attribution theorists. The attribution theorists' view about excessive gambling is that entrapment occurs when the gambler has gambled "beyond the point of return" and cannot afford to quit.

Chasing occurs among both male and female gamblers and in almost all games of chance. Gamblers who increase the size of bets until a losing streak is broken, and those who persist on one particular bet (e.g., the same number of the roulette) are also considered chasers (Dickerson, 1991). Seasoned gamblers are known to take advantage of the "urge to chase" in their opponents as they detect their opponents' inability to cope, and subsequently induce chasing by prolonging the game. Similarly, casino operators take advantage of chasing and persistence urges in gamblers by attempting to increase the length of stay and playing time of their patrons as much as possible through investing in casino hall decors, colour schemes, wider isles, free drinks, subsidised food, and even the release of pleasant aromas in the air circulation systems of their buildings (Aasved, 2003).

False Beliefs: Illusion of Control

Illusion of control is closely linked to the concept of locus of control. In general, an individual's locus of control orientation would affect their gambling attitude and betting behaviour. Those with strong internal locus of control tend to attribute event outcomes to their own abilities whereas those with strong external locus of control tend to look outwards for sources of event outcomes. Gamblers have been found to have external loci of control as a broad outlook on life. This internal or external focus is likely to determine the type of games preferred by gamblers whereby "internals" would favor games of skills and "externals" would gravitate toward games of chance (Chantal & Vallerand, 1996). In both scenarios, the attribution style leads to "illusion of control" and overconfidence in playing games. A related explanation of gambling offered by attribution theorists include the early win hypothesis which relies on Skinnerian learning concepts and suggest that gamblers' early game experiences of winning or a single large win play the role of reinforcement for future gambling behaviours, establish an internal locus of control, and emphasize attribution to personal causation (Frank & Smith, 1989).

Illusion of control is a term coined by the psychologist Ellen Langer (1975) who developed elaborate experiments to test the attribution theory in gambling contexts. Her work showed that gamblers can be "made" to believe they can predict the future outcome of game events. When a game includes the mere perception of competition (e.g., playing against a less or more competent opponent) the appearance of control over aspects of the game (e.g., choosing numbers on a lottery ticket) or even passive involvement in a chance situation, gamblers are more likely to believe in their ability to predict the outcome. In other

words, the appearances were able to shift the locus of control of gamblers internally (Langer, 1975).

Familiarity was another aspect of illusory control used by Langer in her experiments. When gamblers had a choice of betting on either printed letter alphabets or unfamiliar symbols, gamblers were more likely to bet higher on tickets with letter alphabets than unfamiliar symbols. Further analysis showed that gamblers who recognized or afforded meaning to the letters (e.g., the letters contained their initials) were more likely to bet higher (Langer, 1975). In another experiment, Langer investigated the effect of “involvement” on betting behaviour in two groups of participants. She offered tickets to one group of participants with information about winning numbers (high involvement) and tickets to a second group with no information about winning numbers, three days prior to a lottery draw. Before the draw, she gave all participants the opportunity to exchange their tickets for a more advantageous lottery with higher chances of winning. She found that participants in the high involvement group were far more likely to hang on to their less-advantageous lottery tickets than those in the low involvement group. In addition, those in the high involvement group scored higher on a “confidence” survey regarding their perception of their ability to win the lottery (Langer, 1975). As it happens, it was Langer who suggested to state lottery corporations to allow buyers the ability to “exert illusory control” over the fate of their tickets by choosing their own lottery numbers (Aasved, 2003).

Similar to other false beliefs, the illusion of control is the result of irrational thinking and a cognitive error that results in exaggerated conviction in one's capacity to determine the outcome of a random or uncertain event and results in

higher risk taking behaviour (Goodie, 2005; Delfabbro, 2004). Generally, only a few successes are required to inflate the illusion of control in gamblers (Ladouceur, Gaboury, Dumont, & Rochette, 1988).

Ladouceur (1988) attempted but was unable to replicate all of Langer's findings, though he agreed with most of the premises her work had established. Along with his colleagues, Ladouceur showed that as gamblers became more familiar with a particular game, they were more likely to place higher bets on their chances of winning. For example, as the duration of a game or a session continues, gamblers place successively larger bets. Specifically, these researchers found that even among less experienced gamblers, 30 spins of the roulette were sufficient for gamblers to escalate their bets and match what their more experienced counterparts wagered, and that the risks taken increased regardless of the gambler's loss and win history (Ladouceur et al., 1988). This is also called the "risky shift", a phenomena often seen among blackjack players and is thought to be a product of familiarity with games which results from exposure, rather than a particular locus of control or social influence (Ladouceur et al., 1988).

False Beliefs: Wishful Thinking

Another explanation for gambling behaviour is termed "wishful thinking" which suggests that the hope for a win could bias the gambler's appreciation of the outcome. Wishful thinking is common among sports bettors who have sentiments of loyalty to a particular sport team. When surveyed, sports spectators and sports bettors exhibited the same type of wishful thinking based on their desire for a particular team to win the game and less on objective criteria. In

essence, “fanhood” biased both sports spectators and sports bettors in a similar manner (Babad, 2007).

False Beliefs: Flukes

When all else fails, gamblers rationalize their losses as flukes caused by random and uncontrollable external factors rather than their own failure at predicting the outcome. The same random event, such as rain during a sports game, is considered a fluke by losers and irrelevant by winners. Also called the hindsight bias, this is a protective mechanism employed when the gambler can no longer entertain their illusion of control and a means for coping with the loss (Gilovich, 1983). The hindsight bias occurs in both games of skill and games of chance and is especially prevalent if the loss is a near-miss or a near-win supported by explanations such as “had A not occurred, the win would have been certain” (Aasved, 2003).

False Beliefs: Providence

Studies of gamblers cognitive processes have looked at the ways gambler consider luck and fortune as actual phenomenon that exist alongside skill and can “cause” certain outcomes. Many gamblers formulate strategies for manipulating luck and many believe that luck occurs in waveform, which cannot be foreseen but could be sensed somehow. Many share the belief “you ought to make at least one bet every day, otherwise you might be walking around lucky and not even know it” (Aasved, 2003, p. 132).

Interestingly, the belief in luck or some form of providence has also been observed in employees of gambling halls and among casino management and owners. When the gamblers win, or win more often than expected, then it is the

casino's or the croupier's luck that has had a bad run. Occasionally, casinos change, replace or even fire croupiers in order to "turn the luck". They might change dice manufacturer, gaming tables, or burn old furniture and replace them with new ones to change the "luck" pattern of the casino (Aasved, 2003; Popkin, 1994).

False Beliefs: Magical Thinking

Many forms of magical thinking and superstitious rituals are common among gamblers. Many gamblers are known to throw salt over their shoulder, avoid black cats, go out of their way to offer a beggar money on their way to the game hall, carry a lucky coin, believe there may be magic in certain numbers, have a special system for picking lottery numbers, or wear an old item of clothing for good luck (Wood & Clapham, 2005). They may kiss their lottery tickets, rub items on breasts or buttocks, or believe that a particular ticket machine or sales kiosk is lucky or otherwise blessed. For example, when there is a large lottery win announced, the particular lottery kiosk that released the winning numbers to the winner becomes exceptionally busy (Delfabbro, 2004; Williams et al., 2006; Aasved, 2003).

Ritualistic behaviours seem to have happened even for Skinner's pigeons where any coincidental behaviour a pigeon might have been engaged in when a food pellet dropped became a reinforced response that the pigeon seemed to link to causality for the appearance of the food and therefore repeated. Often, the "superstitious" behaviours repeated over 10,000 times before they were "extinguished". Skinner (1948) documented and published this peculiar observation under the title 'Superstition'.

Misunderstanding Probability Concepts

It has been suggested that many people gamble because they do not understand the concept of odds and probability. In situations where the probability of winning is low most people tend to overestimate their chances. It is argued that people have cognitive illusions when they make inferences about relative probabilities (Johnson-Laird, Legrenzi, Girotto, Legrenzi, & Caverni, 1999) and develop biased perception of their chances simply based on the absolute number of winning or losing occasions. For example, when given the option people tend to favor a hand where the winning probability is 10 out of 100 versus 1 out of 10. Part of cognitive-behavioural treatment therapy often includes teaching gamblers about probability concepts in hopes of eliminating such misunderstandings, along with training that emphasizes “debiasing” the gamblers’ thinking. However, some studies have shown that understanding probabilities does not necessarily affect gambling behaviour. In a study of 470 Canadian university students enrolled in statistics and mathematics (intervention) and unrelated (control) classes, Williams and Connolly (2006) determined that although the students who enrolled in math and statistics classes improved their understanding of odds and probability, that ability had no effect on students’ gambling behaviour. Those in the statistics classes who learned the topics specifically from a games of chance perspective did better at understanding the odds of winning games, and the concept of gambling fallacies, than did students in the control group or in the mathematic class, presumably because mathematic class students were taught the generic probability theory with no references to games of chance. However, no level of instruction resulted in a difference in

gambling behaviour in any of groups, regardless of course grade achieved, suggesting that learning about probability and odds may not be an effective method of treating gambling problems (Williams et al., 2006).

Criticism of cognitive behaviour theories is mainly concerned with some of the divergent results of empirical research into gambling behaviours. These include the tests of irrational beliefs and locus of control, which have shown somewhat diverse results and occasionally have not been supportive of those notions. For example, the false beliefs held by gamblers are not entirely universal. However, those with more severe gambling problems are also more likely to hold such beliefs (Langer & Roth, 1975).

Also, some of the results from influential and original works pioneered by Langer and colleagues have not been replicated. It has been suggested that Langer's findings on illusion of control might be better explained as a two-process model of personal control over gambling. In this case, the primary illusory control would be what constitutes some gamblers' beliefs in their ability to directly "influence" event outcomes. The second would be gamblers' belief in their ability to "predict" event outcomes. Ladouceur et al. (1988) suggested that either one of these false convictions might inculcate the illusion of control in gamblers. Others have criticized the value of the locus of control concept in gamblers suggesting it fails to explain the different stages of gambling from initiation to persistence and eventual pathology given that some research results have shown no significant correlations (Frank et al., 1989).

The concept of gambler's fallacy has also been contradicted by some, suggesting different cognitive mechanism might be at work. Boynton's study

(2003) found that the prediction of binary outcomes was associated with the gamblers' fallacy effect only in cases of failure, which subsequently decreased the gambler's confidence in their ability of future predictions. On the other hand, when successful in their prediction, gamblers were more likely to associate the outcome to a positive bias effect (a form of superstitious responding), less likely to accept the randomness of outcomes in binary events, and became more confident in their ability to predict the next outcome (Boynton, 2003).

Other criticisms involve the research methodology, especially those that require participants to "think aloud" (Hurlburt & Heavey, 2001). In cases of irrational thinking, which in experimental conditions are verbalized through thinking aloud, people do not necessarily accept them as true. For example, those who converse with slot machines, whisper to their dice, bargain with the chips, or curse the roulette, do not think these objects are animate or believe that they possess consciousness. Rather, people are behaving in figurative ways and their "chatter" is simply allegorical. Overall, though an understanding of cognitive constructs has improved understanding of human behaviour and has enhanced what the behaviourists had offered to the field. Fundamentally, cognitive-behavioural psychology has had a tremendous impact in both the study and the treatment of various psychological problems including problem gambling (David, 2004).

Summary

In this section the major theories of causes of gambling intent were reviewed. Each has contributed to the understanding of gambling causes and motives. Each has rested upon insights gained from a previous generation of

theorists. All have met with criticism of assumption or theory, some more than others. There is an enormous amount of research findings available that contribute to general understanding of the complex phenomena of gambling behaviour and gambling pathology. Social and biological sciences and the general medical model have made many strides in shedding light on the issues involved. The next section addresses questions concerning who gambles.

LITERATURE REVIEW: WHO GAMBLES

A recent study from Harvard University suggests that research on gambling epidemiology has reached a point where it must move beyond population-prevalence research and toward examination of risk and protective factors that affect the onset of gambling disorders (Shaffer, Labrie, Laplante, Nelson, & Stanton, 2004). The study of specific trait variables such as gender, age, ethnicity, socioeconomic status, and mental health has been suggested as the next phase of gambling research.

Admittedly, not all individuals within a given population choose to engage in gambling, and not all who gamble develop gambling problems. Therefore, there must be differences between individuals and across groups that can account for different gambling outcomes. Numerous research studies have endeavoured to examine psychosocial antecedents and shared manifestations of gambling disorders. Research studies attempting to answer the “who” question can be divided roughly into two categories: those that evaluate individual characteristics or traits correlating with gambling outcomes, and those that evaluate specific aspects of gaming. These studies are reviewed in turn.

Traits

In Canada, slightly over 70% of the population aged 15 and over gambles. The prevalence of problem gambling in Canada is 2-5% of the adult population. Demographic studies suggest that overall, compared to the general population and non-problem gamblers, problem and pathological gamblers are more likely to be younger, male, have lower educational achievements, lower socio-economic status (SES), higher likelihood of criminality, and higher rates of psychiatric or psychological comorbid disorders (Marshall & Wynne, 2004; Westphal, 2007; Laplante, Nelson, Labrie, & Shaffer, 2006; Shaffer, Hall, Vander Bilt, & J.V., 1999; Raylu et al., 2002; Getty, Watson, & Frisch, 2000).

SES, defined here as the combination of education, employment, social rank, and income that contribute to one's social standing, behaviour, and outlook has consistently been shown to correlate with gambling behaviour, but the nature of this correlation is not always evident. A Canadian study found that gamblers are more likely to have been unemployed for at least six months or have had assorted employment status in the five previous years, compared to non-gamblers (Bland et al., 1993). A Spanish study, on the other hand, found problem gamblers were more likely than non-gamblers to be employed. The authors suggested that those who are employed were more likely to gamble because they had the necessary financial means (Legarda, Babio and Abrey, 1992). A more recent US study confirms the Spanish results, showing that problem and pathological gamblers are more likely to be employed full-time, though they tend to have lower incomes compared to controls (Petry & Mallya, 2004).

Practically all the studies that have looked at the educational levels of gamblers report lower educational achievements among gamblers compared to

controls. A 10-year follow-up US national study that followed a cohort of 10,300 male veterans born between 1939 and 1955, reported high-school or higher educational attainment were significantly correlated with lower likelihood of problem or pathological gambling (Scherrer, Slutske, Xian, Waterman, & Shah, 2007).

Fundamentally, SES is a vital determinant of the health of individuals and communities, including mental health. The factors that make up the SES measure determine the extent of individuals' physical, social, and personal resources necessary to achieve goals, fulfil needs, and cope with the environment. In addition, "health outcomes" , including mental health, depend not only on individual characteristics, but also on the backdrop, the "ecology", and the milieu in which individuals live and work (Jones & Duncan, 1995). Interaction between individual and place occurs at the level of the physical environment, the cultural milieu, differential access to infrastructure and services, and differential mobility of groups such as migrants and minorities (Caughy, Hayslett-McCall, & O'Campo, 2007).

A study of the Canadian national population health survey that compared health and SES across Canadian provinces reported income-related health inequalities. Although the healthiest in Canada (15-24 yr) are also the poorest, income-based health inequalities persist, especially among males, and most notably in Manitoba, Newfoundland, and British Columbia (Safaei, 2007). These results are especially important in light of the fact that both males and those in lower income brackets are also more likely to gamble and develop gambling-related problems. Income-based health inequality places Ontario in the "middle of

the pack” at the level of the national average (Safaei, 2007). A study by the Conference Board of Canada (2006) on the health of the Canadian population has similarly ranked Manitoba at the tenth (last) place. The study attributed this poor ranking for Manitoba to lower health status, difficulty in accessing health care, and lower rates of access to information (Hamilton, 2006). In general, there is evidence that the ease of access to gambling is correlated with gambling-related problems in the population (Marshall et al., 2004). A community impact study in Niagara Falls, after the opening of a new casino, showed an increase in gambling and gambling problems among area residents (Room, Turner, & Ialomiteanu, 1999). Although it remains difficult to establish causation, there is ample evidence that availability of and accessibility to gambling increases PG prevalence rates (Productivity Commission, 1999; Raylu et al., 2002). Additionally, there is evidence that the type of game played, along with its accessibility, likely contribute differently to problem gambling development (Welte, Barnes, Wieczorek, Tidwell, & Hoffman, 2007).

Ethnic origin is correlated with gambling. Welte and colleagues (2004) found increased risk of developing gambling problems in all minorities when compared to Caucasians, especially among Aboriginal (10.5.9%), African-American (7.7%), and Hispanic (7.9%) populations, with the lowest rate being that of Asian Americans (6.5%) compared to 1.8% among Caucasians (Welte, Barnes, Wieczorek, & Tidwell, 2004; Welte, Barnes, Wieczorek, Tidwell, & Parker, 2004). Other general population surveys in several other countries have reported similar associations, where in every study the proportion of ethnic minorities with problem or PG was higher than among non-minority groups (Petry, 2005). In Canada, a survey of Aboriginals has shown rates of gambling among this

population that were between 2.2 to 15.69 times higher than among non-Aboriginals (Wardman, el-Guebaly, & Hodgins, 2001). These data indicate that members of ethnic minorities have an increased risk of developing problem and PG.

Several studies have substantiated the co-existence of gambling pathologies and other addictive disorders. Co-addiction to drugs and alcohol, but also other behavioural addictions such as shopping and sex are frequently reported. Studies of members of Gamblers Anonymous have found high rates of alcohol and substance co-addictions. Multi-addictions are generally common. In a study of 765 male and female gambling treatment seekers in the state of Minnesota, Stinchfield and colleagues found that gambling severity was significantly correlated with higher degree of alcohol addictions compared to occasional or non-drinkers (Stinchfield, Kushner, & Winters, 2005). In addition, these authors found that those with a history of substance abuse treatment had more severe psychosocial as well as gambling-related problems, compared to those without substance abuse treatment histories.

A Canadian study reported that the rates of alcohol abuse among pathological gamblers in Ontario were twice that found among non-gamblers (Smart & Ferris, 1996). A cognitive psychology study has shown that there is a strong association between wagering and alcohol consumption, not only in the act of gambling but even within a memory association concept where intoxicated gamblers later recall more wins and fewer losses. This suggests that such association might be the reason for drinking among gamblers which then leads to

poor decision making and the comorbidity often found between gambling and alcohol disorders (Zack, Stewart, Klein, Loba, & Fragopoulos, 2005).

A considerable body of evidence has established the relationship between PG and abuse of various substances. Although most studies have focused on alcohol and opiate users, other psychoactive substances have also been implicated (Toneatto & Brennan, 2002). In a sample of 580 residents in an addiction treatment centre, Toneatto and Brennan (2002) found significantly higher rates of PG. Among the pathological gamblers, 4% reported concurrent alcohol abuse, 4.8% reported concurrent opiate abuse, 11.5% reported concurrent cocaine abuse, and 24% reported concurrent cannabis abuse.

Overall, PG and substance misuse are similar in several respects. Both addicts experience preoccupation with seeking out the object of addiction. These “obsessions” involve both thrills and tensions they find difficult to resist. Both experience arousal, exhilaration, and euphoria upon achieving their goal of ingesting the substance or playing the games. Both invest more time and monetary resources in such pursuits than they can afford (Spunt, 2002). Similarly, gamblers develop tolerance to their games. The dynamics of tolerance are well established through studies of alcohol and substance abuse. Essentially, tolerance to drugs of abuse occurs when the effect of a substance decreases after repeated exposure so that the addict requires higher doses in order to receive the same “high” as previously achieved with a lower dose (Shepard, 2005). Likewise, gamblers develop tolerance as they feel compelled to increase their bets or “the odds against them” in order to achieve the sense of exhilaration previously attained with

smaller bets. In fact, gamblers frequently report wagering increasing sums as their gambling and pathology progresses (Madden, Ewan, & Lagoria, 2007).

Associations between PG and poor physical health have been reported. In general, problem gambling is associated with poorer general health (Messerlian, Derevensky, & Gupta, 2005b). Those with gambling problems report lower health-related quality of life compared to non-problem gamblers. Scherrer and colleagues (1995) conducted a twin study and reported that although genetic and family environmental effects account for the difference in health-related quality of life, differences between health-related quality of life for problem and pathological gamblers and non-problem gamblers persist after controlling for these variables. They also reported that after adjusting for SES, substance use, and psychiatric disorders, pathological and problem gamblers continued to show significantly lower health-related quality of life compared to non-problem gamblers (Scherrer et al., 2005).

PG has also been associated with depression (Black & Moyer, 1998). In a study of depression and distress among problem and pathological gamblers, Wohl and colleagues (2008) recorded high saliva cortisol (stress-sensitive hormone) levels upon waking among both problem (subclinical) and pathological gamblers, but not among recreational gamblers. Comparing depression symptoms, they found depression did not differ significantly between problem (subclinical) and recreational gamblers, but that it was significantly higher among pathological gamblers (Wohl, Matheson, Young, & Anisman, 2008). Depression has especially been reported among females with gambling problems (Lesieur & Blume, 1991; Lesieur, 1993; Lesieur, 2001; Trevorrow et al., 1998; Wohl et al., 2008). Associations

between depression and gambling problems have also been recorded in several other studies (Black et al., 1998; Castellani, 2000; Getty et al., 2000; Lesieur & Rosenthal, 1999; Messerlian et al., 2005b; Petry, 2005; Raylu et al., 2002; Scherrer et al., 2005). A study of depression among pathological gamblers in a community sample found that depression was fully mediated by impulsivity (Clarke, 2006). In addition, Clarke (2006) suggested that pathological gamblers who were depressed and impulsive were likely to relieve their depression through gambling, as well as substance abuse. Clark's integrated model of gambling showed that the path of depression to the severity of problem gambling was mediated by an impulsive trait, suggesting that depression precedes gambling problems. Similarly, Gupta and Derevensky used path analysis to show that for adolescents, depression was a predictor and not a consequence of problem gambling (Gupta & Derevensky, 1998).

Other significant correlations between problem gambling and characteristics, traits, or disorders have also been found. A large national US study on co-morbidity of PG found the majority of community sampled pathological gamblers had co-occurring psychiatric disorders (Petry, Stinson, & Grant, 2005). Namely, suicidal ideation and attempt (Ledgerwood, Steinberg, Wu, & Potenza, 2005; Blaszczynski & Farrell, 1998), criminality (Lesieur, 1993; Welte et al., 2004), alcohol and substance use and abuse (Lesieur, Blume, & Zoppa, 1986; Ramirez, McCormick, & Russo, 1983), anxiety (Coman, Burrows, & Barry, 1997), personality disorder (Slutske et al., 2001; Blaszczynski & Steel, 1998)}, attention-deficit/hyperactivity disorder (Rodriquez-Jimenez et al., 2006), impulsivity (Petry, 2001; Vitaro, Arseneault, & Tremblay, 1999), sensation-seeking (Nordin &

Nylander, 2007), relationship problems and higher divorce rates (Korman, Collins, Dutton, & Dhayananthan, 2008; Korn et al., 1999), conduct disorder (Slutske et al., 2001), suicidality, dissociation or dissociative-like states (Petry, 2005; Petry et al., 2005), traumatic life experiences and PTSD (Biddle, Hawthorne, Forbes, & Coman, 2005), phobia and agoraphobia (Cunningham-Williams, Cottler, Compton, & Spitznagel, 1998; Zimmerman, Chelminski, & Young, 2006), and certain life-styles such as those lacking structured activity (O'Brien Cousins & Witcher, 2007).

However, a comprehensive review of problem gambling by Australian researchers found the variability in the demographic factors involved with problem gambling suggest a lack of evidence for specific motivation or profile of problem gamblers. These authors suggested that a general personality profile for all problem gamblers would be “impossible” to chart (Raylu et al., 2002). A group of Spanish clinical researchers found also that they were unable to document any specific profile of the pathological gambler after over a decade of treatment research suggesting that no such profile existed (Echeburua & Fernandez-Montalvo, 2005).

In general, the research results published thus far highlight the heterogeneity of the problem gambling population and many concur that this population is far more heterogeneous than previously believed (Lesieur et al., 1999). Despite the existence of specific traits typically observed in pathological gamblers, it is believed that these variables and their contexts each exert divergent functions and have unique implications in the aetiology of the disorder. In an attempt to differentiate among pathological gamblers, many theorists have undertaken typological research proposing PG typologies with each suggesting a

set of characteristics that those within a “type” are likely to have in common. Typology research not only helps to distinguish between gamblers where the differences are not easily discernible, but also has the potential to unravel differing underlying pathology and help with treatment and prognosis. Many have suggested that the next step in the study and treatment of PG is to shift the research focus and concentrate on subtypes of problem gamblers and the factors that could classify them (Westphal, 2007).

Gambler Types

The debate regarding types of gamblers is not new. The longstanding debate centres around the question of problem gambling being either a single disorder and entity or a scale of pathology lying along a continuum (Blaszczynski & Nower, 2002; Shaffer et al., 1998; Toce-Gerstein, Gerstein, & Volberg, 2002). Many believe that the debate could be resolved if the differences in research findings were viewed as simply serving different purposes within the same framework. This view is especially apt because the measurement models used to answer this question are conceptually compatible. There are suggestions that “gambling problems [may] comprise a hierarchy of logically related but qualitatively different disorders” (Toce-Gerstein et al., 2002). In essence, it is likely that the severity of gambling problems can be measured on a continuum but that there are different types of gamblers and the degree, or the range, of their gambling severity depends on the type of gambling, or the preferred game. The typology research is based on the argument that it would be unfeasible and invalid to apply a single theoretical model to all problem gamblers, given the lack of homogeneity in this population (Blaszczynski et al., 2002).

The earliest typology of problem gambling was proposed by Moran in 1970. Moran outlined a qualitative taxonomy of problem gambling subtypes based on his clinical interviews with 50 male problem gamblers. He defined five types of gamblers a) the subcultural type who gambles due to social pressures by family and peers, b) the neurotic type who gambles to relieve stress, c) the impulsive type who gambles due to lack of impulse control, d) the psychopathic type who gambles due to systemic patterns of psychopathy, and e) the symptomatic type whose gambling is symptomatic of a mental disorder such as depression (Moran, 1970). Later studies have supported and sometimes merged some of the subtypes suggested by Moran, finding much evidence for the “impulsive” type (Blaszczynski, Steel, & McConaughy, 1997) and the “neurotic” type (McCormick, 1987).

A two-type taxonomy of problem gambling was suggested by McCormick (1987) based on clinical research with a) recurrently depressed gamblers and b) chronically understimulated gamblers. McCormick found the depressed gamblers exhibited a “depressogenic cognitive style”, had a strong and enduring “need state”, and were more likely to have experienced life trauma. Therefore, McCormick concluded, gambling served as an escape mechanism from a depressed state for this subtype of problem gambling. Those falling within the second subtype were searching for relief from boredom, were hyperactive, gregarious, and narcissistic. They were also novelty seekers and had low tolerance for frustration (McCormick, 1987). This latter group resembled Moran’s (1970) impulsive and psychopathic types combined. The former group resembled Moran’s (1970) neurotic and symptomatic types combined.

Custer (1985), whose work resulted in the addition of PG to the DSM-III, also formulated categories of gamblers consisting of the professional, casual, serious social, relief and escape, and the pathological gambler. Custer believed that the “pathological gambler” types were distinct from the “relief and escape gamblers” and that “escape seekers” wanted relief from pressures of anxiety, tension, and depression. Therefore, they were not at risk of losing control and developing gambling problems (Custer & Milt, 1985).

Custer also noted that problem gamblers go through three stages of gambling, namely, the winning phase, the losing phase, and the desperation phase. However, Leisure and Blume (1991) reported that many female gamblers did not have a “winning phase” and were not motivated by novelty, sensation seeking, or the need to escape from boredom. Rather, these gamblers were motivated by a need to find relief from stress, to escape difficulties, and to numb painful feelings. They were also more likely to play repetitive games of chance, (e.g., lotteries and bingo) rather than competitive or games of skill and preferred to play alone. On the other hand, a different group of gamblers were more likely to be male, competitive, with a need to “impress” other. They were also more likely to have begun gambling earlier, and more likely to be impulsive. They preferred games of skill, to play cards, or to bet at horse-race-tracks. These gamblers were more likely to have what Gamblers Anonymous have come to call “big shot” mentality (Lesieur, 2001). Based on their findings, these authors proposed two subtypes of gamblers, specifically, the “action seekers” and the “escape seekers” corresponding to the above two groups (Lesieur et al., 1991; Lesieur et al., 1999). Lesieur’s findings were in line with Raylu and Oie’s findings

(2002) that gamblers with different game type preferences presented with different personality profiles as well as different demographic factors and different types of cognitive distortions. Raylu and Oie (2002) suggested differentiating among gamblers by the type of gambling preferred.

Blaszczynski and Nower (2002) have proposed a pathway model of PG suggesting that three subgroups of gamblers experience impaired control over their gambling behaviour. The proposed subcategories were a) behaviourally conditioned problem gamblers who display no psychological difficulty and play to obtain the behavioural contingencies offered by the gambling activity and do not seek treatment; b) emotionally vulnerable problem gamblers who have underlying anxiety, depression, poor coping skills, and play in order to escape from negative affective states; and c) antisocial, impulsive gamblers who are thrill-seekers and prone to suicidality, driven by their disinhibition, impulsivity, boredom, and sensation-seeking traits (Blaszczynski et al., 2002). The antisocial-impulsive type is the only type thus far proposed to include suicide attempts. These authors have not yet proposed specific variables that could measure specific proposed traits or conditions.

In a psychometric evaluation of the Gambling Experience Measure (GEM), Ledgerwood and Petry (2005) performed factor analyses on the different traits of 146 treatment-seeking pathological gamblers and produced a three-factor grouping of a) escape gamblers, b) dissociating gamblers, and c) egotistic gamblers. The escape gamblers were significantly more likely to be female and lonely but did not have severe psychiatric morbidity. This factor had a moderate correlation with the dissociation factor. These authors concluded that both escape and dissociation

were coping mechanisms used by gamblers. Blaszczynski and Nower (2002) have also suggested that gambling may be used by some as a means to induce dissociation and escape from chronic depression. The relationship between escape-oriented coping mechanism, depression, and dissociation among pathological gamblers has also been reported elsewhere (Getty et al., 2000; Ledgerwood & Petry, 2006).

Adjacent to suggestions that there may exist distinct subgroups of gamblers with different etiological factors, there have been calls for careful analyses that distinguish among the forms of gambling being investigated (Dickerson, 1991). The theme of differentiating among gamblers based on gambling habits and play preferences has recently elicited some interest. A few studies have examined the effects of partiality towards certain games on problem gambling development. These are reviewed next.

Game Preferences

Early studies with pathological gamblers have shown that the majority have a particular game that is most problematic to them (Petry, 2003). Those who prefer horse- or dog- race betting, sports, or card games, seem to have more problems with their gambling activities compared to those playing other games (Marks & Lesieur, 1992; Petry, 2003). A study comparing “machine gambling” to more traditional forms of gambling has shown that machine gambling has a significantly shorter latency of PG onset than other forms of “traditional gambling” (Breen & Zimmerman, 2002b). A French study compared gamblers playing in Paris cafes (playing slot machines) with gamblers identified in race-track venues, and found the two groups significantly differed in terms of sensation seeking characteristics.

In cafes, no differences were found between pathological gamblers and recreational gamblers in terms of sensation-seeking scores, but race-track pathological gamblers scored significantly higher on sensation-seeking scale, compared to recreational race-track gamblers (Bonnaire, Bungener, & Varescon, 2006). A German study compared exclusively casino roulette players with exclusively restaurant slot machine players and found differences in their temperament and psychological profiles. The restaurant slot machine players considered casinos too large-scale and uninspiring especially because they found casino games could not be influenced, whereas the casino roulette players found restaurant slot machines inadequate and inferior to casino games. In addition, slot machine players were more likely than roulette players to have had difficult childhood experiences and unstable homes. Also, roulette players were more interested in material gains, more likely to “chase” their losses, and to experience the loss as an event directly related to their person, but slot machine players were more concerned with engagement in gambling and the frequency of such engagements (Kroeber, 1992). The relationship between gambling type and frequency has been demonstrated by Welte and colleagues (2004) who showed that gambling pathology was significantly related to the number of game types played. Sudden increases in pathological symptoms were observed after five types of games were played in the year preceding the study. In their study, Welte and colleagues (2004) showed that engaging in any type of gambling could be associated with PG, but some game types carried higher risks. Games that were significantly correlated with PG included casino gambling, lottery, pulltabs, card games played outside a casino, bingo, and sports betting, with two of the games,

pulltabs and casino gambling, carrying the highest risk for PG and with lotteries and sports betting carrying the least risk. Their results also showed that each additional type of game played produced a 34% increase in pathological symptoms regardless of gambling frequency or the size of win or loss. In terms of frequency, they found that although very few of their participants engaged in internet gambling, the volume of the play frequency for those who did was a strong predictor of PG, the same way that gambling versatility predicted the extent of PG for poly-players (Welte et al., 2004). Welte and colleagues published a later study (2007) in which they report having refined their analytical procedures and finding that games with more availability, such as lotteries, could a high impact per instance of play on the development of gambling problems (Welte et al., 2007).

Others have examined interactions between game types, gender, and demographic variables, finding that women have game preferences that differ from men (Laplane et al., 2006). The variability and quantity of games played (Spunt, Lesieur, Liberty, & Hunt, 1996), as well as preferences for specific games tend to be influenced by gender and potentially other demographic factors (Ladd & Petry, 2002). It has been suggested that different games might elicit different responses in players in a manner analogous to different substances of abuse eliciting different responses in users (Fisher & Griffith, 1995). For example, alcohol's sedating nature and cocaine's stimulating effects elicit different responses through the same activation of the reward circuitry (Shaffer et al., 2004). In the same manner, different types of gambling as well as the degree of exposure (frequency) to each game might affect gamblers in distinct ways (Shaffer et al., 2004). For example, it has been suggested that slot machines and VLTs accelerate the development of

problem gambling more than other games (Fisher et al., 1995; Breen & Zimmerman, 2002a), and as reviewed above, games that are readily available, such as lotteries, seem to have a stronger impact per instance of play than less readily available games (Welte et al., 2007). There have also been reports about other risk factors increasing the likelihood of problem development within games (Laplante et al., 2006). Raylu (2002) suggests the gambling patterns of specific subgroups are likely related to gambling pathology, that those who pursue different forms of gambling likely differ with respect to demographics and risk factors. These studies suggest the importance of examining the effect of game types and players' preferences for various games, along with the degree of exposure, and unique risk factors, as to whether there are distinct corollaries to these preferences.

Summary

Overall, the results of trait and typological research indicate persuasive evidence for divergent subgroups of pathological gamblers with differing triggers of pathology and incentives for gambling. The theoretical underpinning can be traced back to Jacob's Theory of Addiction (Jacobs, 1986) which proposes that the ultimate motivation fundamental to all addictions is the need to escape reality and an attempt to relieve some form of stress condition with both a biological and a psychological component such as depression or anxiety and a sense of inadequacy, inferiority, or low self-esteem. Most major psychological theories of gambling allude to the same concept in different ways. Namely, that gambling represents a form of escape and could be considered a form of coping mechanism. The literature on individual traits and characteristics, types of gambling, and game preferences adds complexity to this picture. These studies

collectively point to different subgroups of gamblers and pathological gamblers who resort to gambling possibly in order to alleviate their symptoms and to cope.

The majority of typological studies have relied on treatment-seeking or otherwise self-identified pathological gamblers. However, many gamblers, including those with gambling-related problems, do not consider their behaviour “problematic” or in need of remedy. Many view their behaviour to be consistent with their convictions (ego syntonic) and have little desire to discontinue in spite of unfavourable outcomes (Blaszczynski et al., 2002). Seldom are these gamblers represented in gambling research results. Although community-based and population survey research could confer such information, they generally provide descriptive, demographic, or psychographic data for the purpose of prevalence estimation and profiling. Psychographics and profiling are important and valuable information and fall in the “trait” category of research. However, to date, no community-based study has attempted to model and typify gamblers within a community.

Current research implicates specific the relation of traits and factors such as mood disorders (e.g., depression and anxiety), and environmentally based aspects (e.g., SES) to gambling-related behaviour. However, contextual factors affecting access to gambling venues, and geographical divisions subject to differing gambling-related governmental policy, must also influence variations in individual behaviour. To date, the effects of geographical and inter-provincial variations on gambling behaviour outcomes have not been studied in Canada from a population health perspective.

No one typological system based on any set of individual traits will be completely inclusive, or offer faultless sensitivity or specificity. Most likely, the best any research methodology can hope for is to offer as inclusive a picture as possible with varying contextual factors which interact at multiple levels where individuals are influenced by their unique contexts within a relevant set of risk factors.

PURPOSE

The aim of this proposed research was to examine gambling behaviour in Canada within a public health framework by examining it from several perspectives, including physical, psychosocial, and social perspectives To this end, I conducted a secondary data analysis of the CCHS Cycle 1.2 in order to a) explore sets of variables shown to be related to gambling pathology as possible distinguishing factors among gamblers with varying profiles and degree of problem gambling severity; b) isolate subsets of cases that correspond to distinctions along dimensions associated with their gambling activity (i.e., game) preferences; and c) model gambling predictors that define those gambling activity types.

METHOD

Data Source

Since the year 2000, Statistics Canada has been periodically conducting a comprehensive interview-based survey entitled the “Canadian Community Health Survey (CCHS)”. In 2001, the CCHS Cycle 1.2 was conducted specifically to measure the mental health of Canadians. The survey questionnaire modules include information on a wide range of topics such as health conditions, general psychological and mental health states, various forms of addiction, gambling attitudes and behaviour, and use of various health services including psychological and mental health resources. They also cover issues of health status, health determinants, health-care utilization, SES, and more. For detailed information regarding methodology and data collection of the CCHS, see Beland (Beland, 2002). A illustrative summary is provided below. The content of the survey is based partly on the mental disorders from the “World Mental Health – Composite International Diagnostic Interview Instrument”, (WMH-CIDI). The WMH-CIDI is a lay-administered psychiatric interview intended to generate a disorder profile, if applicable, of interviewees, according to the definitions of the DSM-IV. Other sources used for survey content include the National Population Health Survey, the CCHS Cycle 1.1, the Health Promotion Survey, and other surveys previously used in Canada.

The CCHS Cycle 1.2 database was obtained from Carleton University Data Centre and through an application to the Canadian Research Data Centre. The CCHS data cover 133 health regions and include information on 36,984 individuals (16,773 males representing 12,286,111 males in the population and 20,211 females representing 12,710,482 females in the population) over the age of 15, using a

multi-stage stratified cluster design. The target population was all of Canada with a few exceptions. The sampling frame excluded individuals living on Indian Reserves, on Crown Lands, Health Care institutions residents, full-time members of the Canadian Armed Forces, prison inmates, and those in certain remote regions of Ontario and Quebec.

Sample Size and Allocation

The sampling plan was designed to target a sample that would represent 98% of the Canadian population. The allocated sample size among 10 provinces was proportional to the square root of the estimated population in each province (with, however, both Ontario and Nova Scotia buying in for an additional 7,702 and 790 cases, respectively). For adequate representation the sample was proportionally allocated to two strata (urban and rural) according to the number of dwellings in each stratum. Each province was stratified on geographical basis first (whether urban or rural, size of city or town), and then according to socio-economic characteristics (so that groups from all socio-economic characteristics were selected). This stratified sampling ensured adequate sample size for sub-groups in the population, where each stratum became an independent population. More or less equal numbers of participants were chosen from each stratum. Area frames used for the Canadian Labour Force Survey were re-used in this study. An area frame is a list of geographic areas that provide indirect access to individuals (e.g., neighbourhoods in a city). A list of geographic areas was first selected and then access to individuals within each selected area was worked out. For CCHS Cycle 1.2, homogeneous strata were formed and independent samples of clusters were drawn from each stratum. Then households were selected from a list of

dwelling in each cluster. Overall, the Cycle 1.2 required 54,000 dwellings distributed in the urban and rural stratum of all provinces to achieve the actual sample size of the survey. Selection of individuals within dwellings was designed to over-represent persons aged 15 to 24, and seniors (65 or older) and the selection strategy was based on household composition (i.e., number and age of persons). See Table 1 for information on sample numbers from each province.

Table 1 Distribution of Survey Sample Numbers Across the Provinces

Province	Sample	Population at time of survey
Newfoundland/Labrador	1,562	438,805
Prince Edward Island	1,002	112,041
Nova Scotia	2,785	756,387
New Brunswick	1,706	608,013
Quebec	5,332	6,040,976
Ontario	13,184	9,655,881
Manitoba	2,230	864,873
Saskatchewan	2,045	758,799
Alberta	3,236	2,428,827
British Columbia	3,902	3,331,991
Total	36,984	24,996,593

Survey administration

Before administration, the CCHS Cycle 1.2 was field tested in Alberta and Quebec, using 600 respondents. The CCHS Cycle 1.2 used three collection periods covering seven months between May to December 2002, each lasting between two

to three months. The survey was administered by interviewers using laptop computers and using computer-assisted interviewing method through which questions were customized according to factors such as age and sex of the respondent, and answers to previous questions. Additionally, the system performed automatic checks and tips (e.g., inconsistent or out of range answers). The computer-assisted interviewing method also allowed for automatic skip patterns of the survey where appropriate.

Selected interviewees received introductory letters and brochures through their home mailing address. The brochures explained the purpose of the survey and provided examples of how the results would be used. The impact of language barriers were reduced by recruited interviewers with several language abilities, in addition to English and French. The interviews were also conducted in Chinese and Punjabi when necessary. Interviews were conducted in person (face to face) unless travel was prohibitive or the respondent refused to conduct the interview in person but authorized telephone contact (overall 14% of interviews were conducted by telephone). In all selected dwellings, a knowledgeable household member was first asked to provide demographic information on all residents of the dwelling. Depending on the composition of the household, a person aged 15 or older was then selected for in-depth interview. A national response rate of 77% was achieved. A total of 36,984 individual surveys were collected.

Sample Weights

The CCHS Cycle 1.2 is a probability sample. A probability sample is one in which each person in the sample represent him/herself in addition to several other persons not selected to be in the sample. The CCHS Cycle 1.2 has pre-calculated

sample weights for each individual in the survey and it is suggested that these weights be used to derive meaningful estimates from the survey. The weights applied are related to the area-frame sample and are calculated accordingly with probability of selection proportional to population sizes (based on 1991 Census counts). Weights were used for all analyses below but were modified. The modification involved multiplication of the weight provided by Statistics Canada by a constant which was the ratio of the total sample size to the total population size. The adjustment was made so that the probability of selection for each case was taken into consideration but the total sample was not inflated to represent the total population in Canada (but instead accurately represented the survey sample size).

Ethical Approval

Ethics approval was obtained from Carleton University Research Ethics Committee, Department of Psychology. The “Public Use” microdata ensure anonymity of CCHS Cycle 1.2 survey participants and confidentiality of their data. Steps have been taken by Statistics Canada to suppress individual values through variable grouping and variable capping, thus ensuring that no identifying information remains.

Variables of Interest

There are 1,607 variables within the CCHS Cycle 1.2. They range from a sequential record number for each respondent and identifiers of geography or health region, to demographic information and answers to health-related questions. The questions asked during the interview were grouped into modules which were composed of health and mental health topics of interest to Statistics Canada. Almost all questions are from standardized scales or a derivation of them.

Questionnaire modules used in the CCHS Cycle 1.2 and their descriptions are outlined in Table 2. Note that not all the variables described below were available for analysis. Variables used in the analysis section of this Thesis are based on both scored and derived variables originating from the questionnaire modules in CCHS Cycle 1.2 as described in Table 2.

Table 2 List of Questionnaire Modules in CCHS Cycle 1.2 and Descriptions

<u>Questionnaire module</u>	<u>Summary Description</u>
Administration	Demographic information: birth date, gender, marital status, inter-relationship of household dwellers, education, language of interview.
Agoraphobia	Episodes of persistent and impairing fears of leaving the house, its severity and specific symptoms.
Alcohol Dependence	Lifetime and past 12-months' alcohol dependence. Questions measure Kessler and Mroczek CIDI short form for DSM-III-R alcohol dependence (7 symptoms).
Alcohol Use	Consumptions of number of drinks in past 7 days, past 12 months, and lifetime. Reasons for drinking, reducing, or stopping.
Chronic Conditions	Questions in this category include questions regarding allergies, asthma, fibromyalgia, arthritis or rheumatism, back-problems, high blood pressure, migraine headaches, chronic bronchitis, emphysema, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, effects if stroke, bowel disorder, Crohn's or Colitis, Alzheimer disease or other dementia, cataracts, glaucoma, thyroid condition, chronic fatigue syndrome, multiple chemical sensitivities, schizophrenia, other psychosis, obsessive compulsive disorder, dysthymia, post-traumatic stress disorder (PTSD), autism, other developmental disorders such as Asperger's syndrome or Rett syndrome, learning disabilities, type of learning disability (attention deficit/hyperactivity disorder with or without hyperactivity), dyslexia or other, eating disorders such as anorexia or bulimia, other long terms physical or mental problems.
Distress	Kessler's scale called the K10 measuring the frequency of feeling any of the following: sad, nervous, restless,

	hopeless, worthless, everything was an effort; also tired for no good reason, so nervous that nothing could calm down, or fidgety.
General Health	Respondents' general health status: current and compared to one year ago, sleep patterns, general levels of stress in life, sense of belonging to one's community.
Demographics	Information collected on all household members, including the respondent: date of birth, sex, marital status, education, personal and household income, immigration status, and other variables not used in this study.
Illicit Drug Use and Dependence	<p>Questions partially assessing DSM-IV substance dependence: lifetime and past 12 months', experience of symptoms or situations associated with drug dependence, interference with life and activities.</p> <p>Questions concern lifetime use (or tried) and past 12 months frequency use of: marijuana, cannabis or hashish, cocaine or crack, amphetamines (speed), ecstasy (MDA), hallucinogens, PCP or LSD, sniffing glue, gasoline or other solvents, steroids such as testosterone, dianabol or growth hormones.</p>
Labour Force	Current employment status, occupation, work pattern during the past 12 months. Due to the high number of missing values, these variables were not used in the study.
Major Depressive Episode	Questionnaire based on a modified version of the WMH-CIDI instrument. Questions were about episodes of being sad, empty, depressed, losing interest in most things, feeling discouraged about how things are going in life. Duration of episodes, their frequencies and severity. Specific questions were asked about symptoms such as change in weight or appetite, energy level, and ability to concentrate.
Manic Episode (Mania)	Episodes of being "so happy or excited that it leads to trouble", duration, and severity, in addition to other more specific symptoms.
Mental Health Services	Number of hospitalisations for problems related to emotional or mental health or the use of alcohol or drugs. Contacts with professionals about mental health or use of alcohol or drugs. Mental health professional encountered (psychiatrist, psychologist, social worker, nurse, priest, etc.). Also age at first/last consultation, number of times met, level of satisfaction with treatment, perceived level of help

	<p>received, whether referred to another professional within mental health services. Also, use of an internet support group or chat rooms in search of help with emotional/substance problems; or use of help lines and age of use.</p> <p>Also, type of help needed but not received during the past 12 months. Also, questions regarding mental illness and its treatments, information on availability of services. Also, questions regarding medication. Also, information on use of therapy or counselling: help with financial problems, housing problems, personal relationships, employment status or work situation. Reasons for not receiving help. Total amount spent on services and products used to help with problems with emotions, mental health or use of alcohol or drugs during the past 12 months.</p>
Panic Disorder	<p>Episodes of attacks of fear or panic, and experiencing associated symptoms with respect to the duration, number, and specific symptoms.</p>
Pathological Gambling	<p>Modified questions from Canadian Problem Gambling Index (CPGI)*: Participation in different kinds of gambling (frequency in past 12 months).</p> <p>Amount of money spent on gambling in past 12 months, attitudes and experiences of gambling which indicate severity of problem gambling, family history of gambling, past 12-month alcohol and drug use while gambling. Past 12-month interference with life and activities such as attending work, school, ability to form and maintain close relationships and social life.</p> <p>*Modifications from CPGI: To reduce interview time and response burden, some of the CPGI questions were combined. Modifications did not affect CPGI scoring. Changes were approved by the authors of the scale. Similar types of gambling activity questions: lottery tickets or raffle or fundraiser (reduced from 2 questions to 1), casino games other than slots/VLT (reduced from 5 questions to 1, poker, blackjack, roulette, keno and craps were combined), sports lotteries, pools, sporting events (2 questions reduced to 1), "other" not included. Some names were changed to reflect regional variability (e.g., addition of Mise-au-jeu for Quebec). CPGI questions on amount of time (in minutes or hours) spent on gambling activities were not included. Combined amount of money spent to encompass all types of gambling activity instead of one variable per activity and for the total in 12 months instead of per month/per day and added response categories instead of open-ended.</p> <p>Questions on correlates such as depression and suicidal</p>

	<p>thoughts were not included because they were measured elsewhere. Severity questions not essential to CPGI algorithm were not included.</p> <p>Skip pattern: During the testing of the CCHS Cycle 1.2 gambling module, respondents felt that it was burdensome and led to respondent fatigue and lower response rate. Therefore a skip pattern was adopted: If respondents either gambled 1-5 times per month or less or said don't know or refused to answer for each type of gambling activity, or if they refused to answer the first gambling severity, as well if respondents volunteered, without being asked by interviewer, the information "I do not gamble", the module was skipped.</p>
Physical Activities	Questions regarding participation in physical activity in the past 3 months, frequency of participation, questions regarding purpose of exercise (e.g., for reducing stress).
Psychological Well-being Manifestation Scale	Frequency of having feelings related to things like self-esteem balance, social involvement, sociability, self-control, happiness, etc. based on a questionnaire by Raymond Massé.
Restriction of Activities	Questions asking respondents if they have a physical or mental condition or health problems that reduces the amount or the kind of activity that they can do at home, work, school, other activities such as transportation or leisure). Difficulty with hearing, seeing, communicating, walking, climbing stairs, bending, learning, or doing similar activities. Causes of the condition were also asked about.
Screening Section	Screening questions for mental disorders, used to identify and filter respondents. Respondents were asked if they experience symptoms generally associated with different affective and anxiety disorders. Positive answers were tagged for further questioning.
Socio-demographic Characteristics	Questions regarding country of birth, ethnic or cultural origin, current languages, mother tongue, cultural or racial background. These were suppressed in the Public-use microdata and could not be examined
Social Phobia	Episodes of persistent and impairing fears of social and performance situations, their severity and specific symptoms.
Social Support	Questions regarding type of social support received such as

	help when sick, listening when need to talk or confide, receiving advice, transportation to the doctor, show of love and affection, physical affection, having a good time/relax with, offering information, understanding, love you and make you feel wanted.
Spiritual Values	Questions on the role of spirituality in respondents' life, extent to which it gives meaning to life, strength to face difficulties and help to understand difficulties in life. Also religious affiliation, self-perception of religious identity, and attendance at religious services. The large number of missing values for these questions made them unsuitable for analysis in this study.
Stress	Stress questions rating the ability of responders to handle unexpected and difficult problems, day-to-day demands of life, sources of stress, time pressure, emotional or mental health problems or conditions, financial situation, work hours and demands, employment status, caring for children or others, personal or family responsibilities, relationships, discrimination, personal and family safety. The stress module also asked questions regarding coping mechanisms such as problem solving, confiding in others, avoiding social situations, more or less sleep, more or less eating, more frequent smoking, drinking, drug use, or medication use.
Two-week Disability	Health during the past 14 days, if stayed in bed or if activities were cut down because of illness or injury, mental health, use of alcohol or drugs. Number of days for each of the above were requested.
Work Stress	Derived scale which measures different aspects related to work stress, including: decision latitude, psychological and physical job demands, job security, social support at work, job satisfaction. The large number of missing values for these questions made them unsuitable for analysis in this study.

Instruments and the Dependent Variable

Problem gambling type and problem gambling severity were the main dependent variables (DVs) of interest. However, given the nature of the skip pattern used, problem gambling severity had missing values for about half of the cases (the only skipped cases that had a severity score were those who reported a

gambling frequency of 1 to 5 times a year for at least one gambling activity and such cases were given a severity score of 0). This variable was used in the preliminary analyses (not shown) but not used in the main analyses presented in this work. The main instrument measuring the problem gambling DV was the Canadian Problem Gambling Index (CPGI) and the Problem Gambling Severity Index (PGSI), with minor modifications. The CPGI was developed over a three-year period by the Canadian Centre on Substance Abuse with assistance from an expert panel of Canadian and international gambling researchers. Its goal was to develop a new and more meaningful measure of problem gambling for use in general population surveys. The CPGI is particularly suited for use with general population surveys because it takes little time to administer, especially for those who only participate in few gambling activities which constitute the majority of respondents in a general population survey.

The CPGI is a 36-item instrument which evaluates two domains of problem gambling, namely problem gambling behaviour and consequences of that behaviour for the individual. The gambling behaviour questions asked participants to indicate the frequency with which they engaged in various types of gambling activities (e.g., lottery, scratch tickets, casino games, sport betting, etc.) over the last 12 months. Possible responses to these questions were 1=daily, 2=2 to 6 times a week, 3=once a week, 4=2 to 3 times a month, 5=once a month, 6=6 to 11 times a year, 7=1 to 5 times a year, and 8=never.

The possible responses to each of the consequence questions (used to determine severity) consist of 1=never, 2=sometimes, 3=most of the time, and 4=almost always. These were subsequently recoded as 0-3. The CPGI

questionnaire items used in PGSI are shown in Table 3. Depending on the score achieved from these nine items, the respondent may be classified into one of four gambler subtypes: a) non-problem gambler, b) low risk gambler, c) moderate risk gambler, and 4) problem gambler. The description of each of the gambler subtypes is included in Table 4. Note that two more subtypes have been added to include two more categories of cases skipped over the severity questions. These six subtypes will represent the problem gambling DV used in the following analyses.

Table 3 Problem Gambling Severity Index Dimensions Variables and Scored Items

<u>Dimension</u>	<u>Variable</u>		<u>PGSI Scored Items</u>
Problem Gambling Behaviour	Loss of control	Bet more than could afford	1- How often have you bet more than you could really afford to lose?
	Motivation	Increase wagers	2- How often have you needed to gamble with larger amounts of money to get the same feeling of excitement?
	Chasing	Return to win back losses	3- How often have you gone back another day to try to win back the money you lost?
	Borrowing	Borrow money or sold anything	4- How often have you borrowed money or sold anything to get money to gamble?
Adverse Consequences	Problem recognition	Felt problem	5- How often have you felt that you might have a problem with gambling?
	Personal consequences	Criticism	6- How often have people criticized your betting or told you that you had a gambling problem, regardless of whether or not you thought it was true?
		Feelings of	7- How often have you felt

	guilt	guilty about the way you gamble or what happens when you gamble?
	Negative health effects	8- How often has your gambling caused you any health problems, including stress or anxiety?
Social consequences	Financial problems	9- How often has your gambling caused any financial problems for you or your household?

Table 4 Problem Gambling Severity Index Gambler Subtypes

PGSI Score	Gambler Subtype	Description
NA	Non-gambler	Respondents in this group have not gambled at all in the past 12 months (i.e., responded “never” to all gambling activity questions) and will have been skipped through the severity part of the questionnaire.
0	Non-problem gambler	Some of the respondents in this group will have responded “never” to all of the indicators of behavioral gambling problems, although there may well be a frequent gambler with heavy involvement in terms of time and money. The “professional” gambler would fit into this category. This group probably will not have experienced any adverse consequences of gambling. Other respondents in this group will have engaged 1 to 5 times for at least one gambling activity but never more than that for any game (they will also have been skipped through the severity part of the questionnaire).

1-2	Low risk gambler	Respondents in this group will have responded “never” to most of the indicators of behavioral problems, but will have one or more “sometimes” or more often responses. Gamblers may be at risk if they are heavily involved in gambling and if they respond positively to at least two of the correlates of problem gambling. This group likely will not have experienced any adverse consequences from gambling.
3-7	Moderate risk gambler	Respondents in this group will have responded “never” to most of the indicators of behavioral problems, but will have one or more “most of the time” or “always” responses. Gamblers may be at risk if they are heavily involved in gambling and if they respond positively to three or four of the correlates of problem gambling. This group may or may not have experienced adverse consequences from gambling.
> 8	Problem gambler	Respondents in this group are those who have experienced adverse consequences from their gambling, and may have lost control of their behavior. Involvement in gambling can be at any level, but is likely to be heavy.
95 (a dummy indicator variable)	Not gambler	Respondents in this group have engaged in at least one gambling activity 6 to 11 times a year or more but were not actually given any of the gambling severity questions because they insisted that they were “not a gambler”. Hence, they could be regarded as people who did gamble but did not consider themselves as gamblers.

Validity and Reliability of the Problem Gambling Questionnaires

Further to the development of the CPGI, this questionnaire was tested for validity and reliability through both small sample (N=143 respondents) and general population (N=3,120 respondents) surveys of Canadian adults from 10 provinces, re-tested with cases from the general population survey (N=417 respondents), and fine-tuned through clinical interviews (N=148 respondents). Statistics Canada reports that comparisons were made with both the South Oak Gambling Severity Index (SOGS), and the DSM-IV measures for problem gambling.

Reliability and validity of PGSI – The Cronbach alpha reliability coefficient provided an indication of the internal consistency (consistent results on repeated trials) of the PGSI measure (alpha coefficient = 0.84) and proved stronger than that for either the SOGS (0.81) or the DSM-IV (0.76; Wynne, 2003). The test-retest reliability results indicated that the Pearson product-moment correlation coefficient was highest for the DSM-IV (0.91), followed by the PGSI (0.78), and the SOGS (0.75; Wynne, 2003). Therefore, Statistics Canada deemed the nine-item PGSI to be a reliable measure of problem gambling. The validity of the PGSI was addressed in terms of content validity, criterion-referenced validity, and construct validity. The PGSI was subjected to several rounds of expert feedback until the most appropriate “content” was decided upon. The expert panel agreed that the PGSI measured both the construct of problem gambling and the operational definition of problem gambling. The experts’ views were confirmed by a subsequent factor analysis of the PGSI. Also, given the correlation of the PGSI with the SOGS (0.83) and the DSM-IV (0.83); (Wynn, 2003), the concurrent validity of the PGSI is also assumed. In terms of predictive validity, the PGSI had a moderate correlation (0.48); (Wynn, 2003) with the clinical assessment interview results which were

higher than that for either the SOGS or the DSM-IV. In trend analyses conducted on the data, gambler subtypes were shown to clearly differ from one another, in that the problem-gambling group did spend more money on gambling, gambled more frequently, and was more likely to endorse the problem-gambling correlates, compared to non-problem groups (Wynn, 2003). The construct validity of “problem gambling” in PGSI is therefore assumed.

Sensitivity and Specificity - For tests of sensitivity, the cut-off point for discriminating the problem-gambling subtype was set at a PGSI score greater than or equal to 8, which yielded relatively high sensitivity such that the PGSI correctly identified seven out of nine (78%) of individuals who were problem gamblers as categorized by clinical interviews, and 83% of individuals who scored on the DSM-IV diagnostic measure as pathological gamblers (Wynn, 2003). Specificity of the PGSI was found to be 100% (Wynn, 2003), that is, those identified by the DSM-IV and SOGS as having no problem gambling were also categorized as having no problems by the PGSI.

Screening and Preparing the Data Prior to Analysis

Inclusion criterion for variables was having no more than 1000 missing values (but income levels were included as an exception because of the importance of the variable). Almost all variables included missing (don't know, not applicable, non-response, or refusal to answer) values but given the categorical nature of the variables (i.e., dichotomous or polytomous), imputations for missing values were not attempted. In order to keep the interpretations of the following analyses manageable, all variables with more than five ordinal or nominal categories were recoded to a smaller number of levels and many of the variables with four and

five levels were recoded to have only three levels. In addition, all variables were recoded to ensure that any “not applicable”, “don’t know”, “refusal”, or “not stated” indicator values (e.g., typically 96-99) were set to be system-missing values.

ANALYSIS

Six studies were performed. Data analyses were carried out with SPSS 16.0 statistical software (SPSS Inc.) and MPLUS 5.1 (Muthen & Muthen).

Study 1: Latent Class Analysis

Study 1 used latent class analysis (LCA) to cluster cases into distinct groups based on respondents’ game preferences and frequency of play. LCA was developed in the 1950’s and 60’s to identify latent variables from dichotomous survey items (Lazarsfeld & Henry, 1968). The technique was later adapted to cluster analysis in order to classify a sample into mutually exclusive groups, or classes, based on similarity. The LCA allows for concurrent classification of discrete homogeneous latent classes where members of the same class share a set of common traits. LCA method of classification is superior to the K-means clustering techniques of conventional cluster and discriminate function analyses (Magidson & Vermunt, 2001), mostly due to LCA’s ability to classify cases into clusters based on membership probabilities obtained from observed variables that can be of any form (e.g., nominal, ordinal, or continuous). It also does not rely on assumptions of linearity and normality (Magidson et al., 2001). The technique is therefore the most suitable analytical method to develop latent classes or clusters for the CCHS Cycle 1.2 data.

LCA is based on the assumption of conditional independence and its two main parameters are the prevalence of each cluster (or class) and the probability that a case within a cluster (or class) endorses specific options for each item or, in this case, a particular frequency of play for each gambling activity. The assumption of independence states that the probabilities of endorsing any particular option by the cases within a class are independent (Agrawal, Lynskey, Madden, Bucholz, & Health, 2006). As previously mentioned, it was proposed that there would exist a number of clusters with differential game preferences and frequency of game play. Therefore all of the categories of games examined in the behavioural part of the CPGI were subjected to LCA using MPlus version 5.1 (Muthen & Muthen, 2007), after excluding cases with all missing values on the gambling activity questions.

As recommended by Vermunt and Magidson (2000), model selection was based on the smallest Bayesian Information Criteria (BIC) value in order to arrive at the most parsimonious model. Other indices considered for the selection of the model with the best fit include the Akaike Information Criterion (AIC), the Sample Size Adjusted BIC (SSABIC), and the entropy measures where, with the exception of entropy, lower observed values indicate better fit (Murphy, Shevlin, & Adamson, 2007).

Study 2: Associations Between the Latent Classes and Gambling Outcomes

Study 2 used crosstabulations and log likelihood chi-square tests to examine the relationship between the latent classes derived in Study 1, and the different levels of the problem gambling DV. In this study, associations between the latent classes and the gambling outcomes were examined.

Study 3: Associations Between the Latent Classes and Risk Factors

Study 3 examined the associations between the latent classes derived in Study 1 and a set of variables deemed to be potential problem-gambling risk factors. This study used crosstabulations and multinomial logistic regression to examine these relationships. Multinomial (or polytomous) logistic regression is an extension of the binary logistic regression and is used when the DV (i.e., here, the latent classes) has a nominal scale. The multinomial logistic regression procedure aggregates the data and uses the counts at the different combinations of the DV in order to construct odds ratios, essentially running as many simultaneous logistic regressions as the number of levels of the DV – 1 (all using the same DV level as the “reference” or “no” category in logistic regression terms). The Wald test is used to determine significance of the OR for each level of the predictor variable compared to a reference level (Norusis, 2008).

The CCHS Cycle 1.2 contains many variables that are potentially of interest based on previous gambling research. These variables were divided into subcategories of demographic, physical health, psychological health, substance-use, and social. The distribution of these subcategories within the latent classes were then examined.

Demographic Variables

The demographic variables consisted of gender, age, marital status, education, income, and immigration status. Gender was coded as male and female. Age was divided into five categories consisting of adolescents between 15 to 19 years of age, young adults between 20 to 34 years old, adults between 35 to 59 years old, seniors between 60 and 75 years old, and elderly as 75 and older. Marital status is the relationship standing of respondents and was categorized into

the three categories of single, married/common-law, and divorced/separated/widowed. Income represents the total household income from all sources and was divided into the five categories of less than \$15,000 (including no income), between \$15,000 and \$29,999, between \$30,000 and \$49,000, between \$50,000 and \$79,000, and \$ 80,000 or more. Education represents the highest level of education achieved by the respondent and was categorized into four levels: less than secondary school graduation, secondary school graduation, some post-secondary including college, and post-secondary graduation. Immigration status was coded as yes and no.

Physical Health Variables

Physical health variables consisted of seven variables pertaining to respondents' physical health. The descriptions and coding used for each variable are illustrated in Table 5.

Table 5 Physical Health Variable Description and Scores

Variable	Description	Scores
Health description index	Respondents' health status based on their own judgment.	1=yes 2= no
Perceived Health	Self-perceived physical health.	1=poor 2= fair or good 3= very good, or excellent.
Trouble sleeping	Frequency of sleep problems.	1= most of the time or always 2= some of the time 3= none of the time
Chronic condition	Whether the respondent had any chronic health conditions diagnosed by a health professional.	1= at least one chronic condition 2= no chronic condition
Frequency of	Frequency of all physical activity.	1=regularly

physical activity		2=occasionally or infrequently
Daily physical activity	Participated in daily physical activity greater than 15 minutes.	1=yes 2=no
Leisure activity	Whether the respondent participated in any leisure activities in the three months prior to the interview.	1= yes, did participate 2= no, did not

Psychological Health Variables

Psychological health variables consisted of 23 variables pertaining to respondents' psychological health. The descriptions and coding used for each variable are illustrated in Table 6.

Table 6 Psychological Health Variable Description and Scores

Variable	Description	Scores
Self-rated mental health	Respondents' self-rated mental health.	1=poor 2= fair or good 3= very good, or excellent.
Self-perceived stress	Respondents' self-perceived stress level.	1= low 2= medium 3= high
Psychological well being.	Respondents' psychological well-being in past month.	1= low 2= medium 3= high
Distress Index	Respondent's level of distress in past month.	1=low 2=medium 3=high
Chronicity of distress	Respondents' relative level of current distress compared to in the past.	1= more 2= same 3= less

Major depressive ² episode- past 12 months, and life	Whether respondents meet or fail to meet the CCHS CYCLE 1.2/WMH-CIDI criteria for major depressive episode in the 12 months prior to the interview or during their life time. Respondents who meet the criteria reported a) meeting the criteria for lifetime major depressive episode; b) having a major depressive episode in the 12 months prior to the interview; and c) clinically significant distress or impairment in social, occupational or other important areas of functioning.	1= meets criteria 2= does not meet criteria
Suicidal thoughts- past 12 months, and life	Classifies the respondent based on whether he/she ever thought about committing suicide or taking his/her own life in the 12 months prior to the interview or during their life time.	1= seriously thought about committing suicide 2= did not
Suicide attempt – past 12 month and life	Classifies the respondent based on whether he/she ever attempted suicide in the 12 months prior to the interview or during their life time.	1= attempted suicide 2= respondent did not
Mania – past 12 months and life	Whether respondents meet or fail to meet the CCHS CYCLE 1.2/WMH-CIDI criteria for manic episode in the 12 months prior to the interview, (or during their life time). Respondents who meet the criteria report a) meeting the criteria for lifetime manic	1= met the criteria 2= respondent did not

² Major depressive episode is operationalized as a period of 2 weeks or more with persistent depressed mood and loss of interest or pleasure in normal activities, accompanied by symptoms such as decreased energy, changes in sleep and appetite, impaired concentration, and feelings of guilt, hopelessness, or suicidal thoughts. The questions on major depressive episode in CCHS1.2 are based on a recognized World Mental Health version of the Composite International Diagnostic Interview (WMH-CIDI) modified for the needs of CCHS CYCLE 1.2. The WMH-CIDI instrument, as part of the WMH2000 Project (World Mental Health 2000) is a World Health Organization worldwide initiative to assess the prevalence rates of various mental disorders in multiple countries. The WMH-CIDI is a standardized instrument for assessment of mental disorders and conditions according to an operationalization of the definitions and criteria of DSM-IV and ICD-10. DSM refers to the Diagnostic and Statistical Manual of Mental Disorders used by the American Psychiatric Association. It is an internationally recognized classification of mental disorders with several versions. Mental conditions or problems found in the CCHS CYCLE 1.2 are partially coded either to DSM-IV or DSM-III-R.

	episode; b) having a manic episode in the 12 months prior to the interview; and c) clinically significant distress or impairment in social, occupational or other important areas of functioning.	
Panic attack – past 12 months and life	Identifies respondents who reported having a panic attack in the 12 months prior to the interview or during their life time.	1= reported having a panic attack 2= did not
Panic disorder ³ – past 12 months and life	Identifies whether respondents meet or fail to meet the CCHS CYCLE 1.2/WMH-CIDI criteria for Panic Disorder in the 12 months prior to interview or during their life time. Respondents who meet the criteria reported a) meeting the criteria for lifetime Panic Disorder; b) having a panic attack in the 12 months prior to interview; and c) significant emotional distress during a panic attack in the 12 months prior to interview.	1= meets the CCHS CYCLE 1.2/WMH-CIDI criteria 2= did not
Social phobia ⁴ – past 12	Identifies whether respondents meet or fail to meet the CCHS CYCLE 1.2/WMH-	1= meets the CCHS CYCLE 1.2/WMH-CIDI

³ Panic disorder

For the purpose of CCHS CYCLE 1.2 – Mental Health and Well-being, Panic Disorder is characterised by repeated and unexpected attacks of intense fear and anxiety, in the absence of real danger, accompanied by physiological manifestations such as palpitations, chest pain, choking, dizziness, sweating, nausea or abdominal distress, trembling or hot flushes or chills. The questions on Panic are based on a recognized World Mental Health version of the Composite International Diagnostic Interview (WMH-CIDI) modified for the needs of CCHS CYCLE 1.2. The WMH-CIDI instrument, as part of the WMH2000 Project (World Mental Health 2000) is a World Health Organization worldwide initiative to assess the prevalence rates of various mental disorders in multiple countries.

The WMH-CIDI is a standardized instrument for assessment of mental disorders and conditions according to an operationalization of the definitions and criteria of DSM-IV and ICD-10. DSM refers to the Diagnostic and Statistical Manual of Mental Disorders used by the American Psychiatric Association. It is an internationally recognized classification of mental disorders with several versions. Mental conditions or problems found in the CCHS CYCLE 1.2 are partially coded either to DSM-IV or DSM-III-R.

⁴ Social phobia

For the purpose of CCHS CYCLE 1.2 – Mental Health and Well-being, Social Phobia is characterised by a persistent, irrational fear of situations in which the person may be closely watched and judged by others, as in public speaking, eating, or using public facilities. Symptoms include avoidance or anxiety related to the situations and physical symptoms such as rapid heart rate, nausea, dry mouth, sweating, chest pain, faintness, dizziness, and panic attacks. The

months and life	CIDI criteria for social phobia in the 12 months prior to the interview or during their life time. Respondents who meet the criteria reported a) meeting the criteria for lifetime social phobia; b) fearing or avoiding social or performance situation(s) in the 12 months prior to the interview; and c) clinically significant distress or impairment in social, occupational or other important areas of functioning.	2= did not
Agoraphobia ⁵ – past 12 months and life	This variable identifies whether respondents meet the CCHS CYCLE 1.2/WMH-CIDI criteria for agoraphobia. The criteria are met if respondent: a) reported anxiety about being in places or situations from which escape might be difficult or embarrassing and feared having a panic attack; and b) avoided situations associated with agoraphobia; or endured situations with marked distress or anxiety; or required the presence of a companion in the situations.	1= meets all CCHS 1.2/WMH-CIDI criteria 2= did not
Psychosis	Whether or not the respondent had schizophrenia or other psychosis which	1=yes 2=no

questions on Social Phobia are based on a recognized World Mental Health version of the Composite International Diagnostic Interview (WMH-CIDI) modified for the needs of CCHS CYCLE 1.2. The WMH-CIDI instrument, as part of the WMH2000 Project (World Mental Health 2000) is a World Health Organization worldwide initiative to assess the prevalence rates of various mental disorders in multiple countries. The WMH-CIDI is a standardized instrument for assessment of mental disorders and conditions according to an operationalization of the definitions and criteria of DSM-IV and ICD-10. DSM refers to the Diagnostic and Statistical Manual of Mental Disorders used by the American Psychiatric Association. It is an internationally recognized classification of mental disorders with several versions. Mental conditions or problems found in the CCHS CYCLE 1.2 are partially coded either to DSM-IV or DSM-III-R.

⁵ Agoraphobia

For the purposes of this survey, respondents who experienced the following CCHS CYCLE 1.2/WMH-CIDI lifetime criteria associated with Agoraphobia reported: a) anxiety about being places or situations from which escape might be difficult / embarrassing or in which help may not be available in the event a panic attack; and b) situations are avoided, endured with marked distress, or require the presence of a companion.

For the purposes of this survey, respondents who experienced the following CCHS CYCLE 1.2/WMH-CIDI 12-month criteria associated with Agoraphobia: 1. meet the CCHS CYCLE 1.2/WMH-CIDI criteria for lifetime diagnosis of Agoraphobia; and 2. report a 12-month episode.

	were diagnosed by a health professional.
Learning disability	Whether or not the respondent had a learning disability which was diagnosed by a health professional (includes both attention deficit disorder and dyslexia).

Substance Use Variables

Substance use variables consisted of 12 variables pertaining to respondents' use of alcohol, illegal substances, or drug dependence. The descriptions and coding used for each variable are illustrated in Table 7.

Table 7 Substance-Use Variable Description and Scores

Variable	Description	Score
Alcohol Dependence Scale ⁶ (Short Form Score) – 12 months	Assesses alcohol dependence in the 12 months prior to the interview. Alcohol Dependence is defined as tolerance, withdrawal, or loss of control or social or physical problems related to alcohol use.	0= did not drink enough in the past 12 months to answer the alcohol dependence questions for that period 1-2= low 3-7= high
Cannabis drug use- past 12 months (excluding "one time only" use)	Whether respondents have used marijuana, cannabis, or hashish in the past year, excluding one time use in lifetime.	1= used marijuana in the past 12 months and has used marijuana more than once in his/her lifetime 2= not used
Cocaine or crack Drug use – lifetime	Whether respondents have ever used cocaine or crack.	1= used cocaine or crack 2= not used
Amphetamine (Speed) drug use – lifetime	Whether respondents have ever used amphetamines (speed).	1= used amphetamines 2= respondent did not
Ecstasy (MDMA) drug use – lifetime	Whether respondents have ever used ecstasy (MDMA) or similar drugs.	1= used ecstasy (MDMA) 2= not used

⁶ The Alcohol Dependence Index

The index is based on a subset of items from the Composite International Diagnostic Interview (CIDI) developed by Kessler and Mroczek (University of Michigan). The CIDI is a structured diagnostic instrument that provides diagnostic estimates according to the operationalization of some of the criteria of the DSM-III-R classification for psychoactive substance user disorder.

Source: "The World Health Organisation Composite Diagnostic Interview Short-Form" (Statistics Canada, 2003a).

Hallucinogens, PCP or LSD drug use – lifetime	Whether respondents have ever used hallucinogens, PCP, or LSD (acid).	1= used hallucinogens, PCP, or LSD (acid) 2= not used
Glue, gasoline, or other solvent use – lifetime	Whether respondents have ever sniffed glue, gasoline, or other solvents.	1= sniffed glue, gasoline or other solvents 2= not used
Steroid Use – lifetime	Whether respondents have ever used steroids.	1= used steroids 2= not used
Any illicit drug use – lifetime (excluding “one time only” use of cannabis)	Whether respondents have ever used any of the drugs listed (excludes one time use of cannabis).	1= Respondent has used at least one listed drug, excluding “one time only” use of cannabis 2= not used
Any illicit drug use – 12 months (excluding “one time only” use of cannabis)	Whether respondents used any of the drugs listed in the past 12 months (excludes one time use of cannabis).	1= used at least one drug in the past 12 months, excluding “one time only” lifetime use of cannabis 2= not used
Illicit drug Dependence ⁷ – 12 months	Whether the respondent meets the criteria for illicit drug dependence in the previous 12 months.	1= meets the CCHS CYCLE 1.2/WMH-CIDI criteria for drug dependence in the past 12 months. Respondent reported a maladaptive pattern of drug use, as manifested by 3 or more symptoms 2= does not meet the CCHS CYCLE 1.2/WMH-CIDI criteria

⁷ Illicit drug dependence

The criteria, modified from the CIDI, are partially operationalized to meet the DSM-IV definitions/classification. Respondents who meet the CCHS CYCLE 1.2 criteria reported a maladaptive pattern of drug use, leading to clinically significant impairment or distress, as manifested by three or more of the following six symptoms, all exhibited within the same 12-month period a) tolerance, as defined by a need for markedly increased amounts of the drug to achieve intoxication or desired effect or by markedly diminished effect with continued use of the same amount of drug; b) withdrawal, as manifested by withdrawal syndrome or by taking the same (or a closely related) substance to relieve or avoid withdrawal symptoms; c) the drug is often taken in larger amounts or over a longer period than was intended or drugs are used even though respondents promised not to; d) a great deal of time is spent in activities necessary to obtain the drug (e.g. visiting multiple doctors or driving long distances), using the drug, or recovering from its effects; e) important social, occupational, or recreational activities are given up because of drug use; and f) the drug use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by the drug.

for drug dependence in the past 12 months. Respondent did not report at least 4 symptoms or respondent didn't take drugs frequently enough in the past 12 months to answer the drug dependence questions

Social Variables

Social variables consisted of eight variables pertaining to respondents' social circumstances and their use of mental-health resources. Questions pertaining to health that were deemed important to and moderating of social life were also included. The descriptions and coding used for each variable are illustrated in Table 8.

Table 8 Social Variable Description and Scores

Variable	Description	Scores
Number of days with disability	The number of days in the past two weeks when the respondent stayed in bed or cut down in activities because of illness or injury.	1= 0 days 2= 1 to 14 days
Hospital stay due to mental health or alcohol/drug issues	Whether the respondent was ever hospitalized overnight or longer in any type of health care facility for problems with emotions, mental health or use of alcohol or drugs.	1= yes 2=no
Consultation with professional regarding mental health	Whether the respondent had any lifetime consultations with any professionals for problems concerning emotions, mental health or use of alcohol or drugs.	1= yes 2=no
Use of resources - lifetime	Whether the respondent ever used resources for problems concerning emotions, mental health or use of alcohol or drugs. Questions involve consultation with a professional, use of internet support group or chat room, use of a self-help group or use of telephone help lines during his lifetime.	1= yes 2=no
Mental Health Services Accessibility Barriers	Whether a respondent reported a perceived unmet mental health care need due to accessibility. The reasons include the cost, lack of transportation or issues such as childcare or scheduling.	1= yes 2=no
Tangible Support	Whether the respondent had someone to help if confined to bed, someone to take him/her to the doctor, someone to prepare meals or someone to do daily chores are included.	1= low support 2=medium support 3= high support
Affection	Whether the respondent received any affection. Questions	1= low affection

	about whether or not the respondent had someone to show him/her love, someone to hug or someone to love and someone to make him/her feel wanted are included.	2=medium affection 3= high affection
Social Interaction	Whether the respondent was involved in positive social interactions. Questions about whether the respondent has someone to have a good time with, get together with for relaxation, do things with to get his/her mind off things, or someone to do something enjoyable with are included.	1= low interaction 2=medium interaction 3= high interaction
Emotional/informational support.	Whether the respondent received emotional or informational support. Questions about whether the respondent has someone who can listen and offer advice in a crisis, someone who can give information and can be confided in and talked to, or someone who can understand their problems.	1= low support 2=medium support 3= high support

Study 4: Association between Problem-Gambling Outcomes and Risk Factors

In this study, multinomial logistic regressions were carried out with risk factors as predictor variables and the problem-gambling subtypes as the DV. Five separate regressions were carried out, one for each subset of risk factors involving the demographic, physical health, psychological health, substance-use, and social variables. The demographic variables were always included as covariants in the physical health, psychological health, substance-use, and social variable regression analyses.

Study 5: Modeling Risk Factors for Gambling Outcomes

Variable-selection algorithms were used to arrive at the final model. Namely, the forward selection method was used with a stepwise procedure whereby all variables already in the model were re-evaluated for entry at each step. This method starts with no variables in the model (intercept only) and adds each term sequentially. The addition of terms continues until further addition of new items does not improve the model fit. At each step, the term that gives the greatest model fit improvement is selected. A p-value of 0.05 was used to test the

improvement in the model fit. This improvement is associated with the change in the chi-square fit value for a current model plus the new term. If the addition of the new term improves the fit (i.e., the chi-square change is significant), the term is added. The forward selection algorithm was used for each set of risk factors separately. Variables that remained in the model for each set were then added together and a forward stepwise procedure was used to arrive at the final model.

Demographic Variables: The demographic variables were evaluated by including the demographic variables alone (forward entry).

Physical health variables: The physical health variables were evaluated by holding the demographic variables constant (forced entry) and then including all physical variables (forward entry).

Psychological health variables: The psychological health variables were evaluated by holding the demographic variables constant (forced entry) and including all psychological variables (forward entry).

Substance-use variables: The substance-use variables were evaluated by holding the demographic variables constant (forced entry) and then including all substance-use variables (forward entry).

Social variables: The social variables were evaluated by holding the demographic variables constant (forced entry) and then including all social variables (forward entry).

Final model: The final model was arrived at by adding together all of the retained variables from all sets and allowing the forward stepwise variable-selection algorithm to reduce the full model as necessary.

Study 6: Modeling Risk Factors within Each Latent Class

In this study, subsamples were obtained from the full sample. Each subsample was composed of all members of a latent class. In this way Subsample 1 had all the individuals who were members of Class 1, Subsample 2 had all the individuals who were members of Class 2, and so forth. A separate model of risk factors was then obtained for each of the subsamples. Similar to Study 5, separate models were derived for each set of variables and then the variable-selection algorithms were used to arrive at the final model (based on the set of all retained variables from the previous analyses) for each subsample (i.e., latent class).

A map of the analytical plan is shown in Figure 1.

Figure 1 Plan of Analysis for the Thesis

RESULTS

Descriptives

Each case in the full sample (N=36,984) had one of the five possible valid values of the variable "Type of Gambler". These were non-gamblers, not gamblers, non-problem gamblers, low risk gamblers, moderate risk gamblers, and problem gamblers.

Table 9 shows the frequency for each type. There were 99 missing values corresponding to 0.3%.

Table 9 Distribution of Types of Gamblers

		Type of gambler			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	NON-GAMBLER	9104	24.6	24.7	24.7
	NON-PROBLEM GAMB	17154	46.4	46.5	71.2
	LOW RISK GAMBLER	1017	2.7	2.8	73.9
	MOD RISK GAMBLER	542	1.5	1.5	75.4
	PROBLEM GAMBLER	200	.5	.5	76.0
	NOT GAMBLER	8868	24.0	24.0	100.0
	Total	36885	99.7	100.0	
Missing	NOT STATED	99	.3		
Total		36984	100.0		

Table 10 illustrates the distribution of gambler types by province. The distribution of gambler types varied in each province and was dependent on the sample selection given that more populated provinces were sampled at a higher rate. Gender distributions at each level of the problem gambling DV are shown in Table 11.

Table 10 Distribution of Type of Gamblers by Province

		Type of gambler					Total
Province	Non-gambler	Non-problem gambler	Low risk gambler	Moderate risk gambler	Problem gambler	Not gambler	

NL	403	604	36	24	10	482	1559
PEI	262	356	17	15	4	346	1000
NS	620	1220	62	36	20	822	2780
NB	407	789	35	17	8	444	1700
QC	1070	2436	85	61	21	1640	5313
ON	3315	6247	388	185	59	2966	13160
MB	601	1102	80	50	17	377	2227
SK	504	1064	83	39	22	326	2038
AB	937	1444	104	57	24	657	3223
BC	985	1892	127	58	15	808	3885
Total	9104	17154	1017	542	200	8868	36885

Table 11 Distribution of Type of Gamblers by Gender

Sex	Type of gambler - (D)						Total
	Non-gambler	Non-problem gambler	Low risk gambler	Moderate risk gambler	Problem gambler	Not gambler	
MALE	Count	3738	7862	573	312	110	16723
	% sex	22.4	47.0	3.4	1.9	0.7	100.0%
FEMALE	Count	5366	9292	444	230	90	20162
	% sex	26.6	46.1	2.2	1.1	0.4	100.0%
Total	Count	9104	17154	1017	542	200	36885
	% sex	24.7%	46.5%	2.8%	1.5%	.5%	100.0%

Study 1 Results

LCA was conducted on the CCHS Cycle 1.2 based on the 13 questions of the CPGI scale which asked respondents about the frequency of spending money on various games for the purpose of gambling. The games were a) instant win/scratch tickets such as Keno, Pick 3, Encore, Banco, etc.; b) lottery tickets such as 6/49 and Super 7, raffles, or fund-raising tickets; c) bingo; d) cards/boards games; e) VLTs outside of casinos; f) coin slots or VLTs at casinos; g) casino games such as poker, roulette, blackjack, and Keno; h) internet or arcade; i) live horse racing at the track or off track; j) sports lotteries such as Sport Select, Pro-Line, Mise-au-jeu,

and Total; k) speculative investments such as stocks, options or commodities; l) games of skill such as pool, golf, bowling, or darts; and m) other forms of gambling such as dog races, gambling at casino nights/country fairs, bet on sports with a bookie or gambling pools at work. Of the 36,984 cases, 42 had missing values for all 13 gambling activity questions and were not included in the LCA.

The selection of the number of latent classes that described the CCHS Cycle 1.2 data was conducted using the BIC criterion. These results indicated that the best fit occurred with eight classes. As indicated in Table 12, the eight-class solution can be considered as the best model, whereby the BIC measures are lowest and entropy is highest, suggesting that it is the most parsimonious model. Once the eight classes were determined, each individual case had associated with it a set of probabilities which indicated likelihood of class membership. Class assignments were then made for each individual case by assigning it to the class for which it had the highest membership probability. Note that after the LCA, a further 39 cases could not be assigned because their class probabilities were missing (i.e., could not be determined because they still had too many missing values on the 13 CPGI game questions), leaving N=36,903 remaining cases in the sample.

The actual frequencies associated with each of the response categories for all 13 games were then determined such that daily was considered as 365 times, 2 to 6 times a week was considered as $([2+6]/2)*52=208$ times, once a week was considered as 52 times, 2 to 3 times a month was considered $([2+3]/2)*12=30$ times, once a month was considered as 12 times, 6 to 11 times a year was considered as $([6+11]/2)=8.5$ times, 1 to 5 times a year was considered as

$([1+5]/2)=3$ times, and never was considered as 0 times. For each game, the probability of endorsing each frequency level within each class was also provided as output from the LCA. Cross multiplying those probabilities with the corresponding frequency values, and then summing them yielded an average frequency value for each game within each class.

In Figure 2 and Table 13, average frequencies for each game are shown for each class. This figure indicates the average number of times each type of game was played per year by the members of each class. These average frequencies were then categorized for the purpose of describing the classes by considering average frequencies of 1.0 to 3.4 as low, of 3.5 to 8.0 as moderate, of 8.1 to 18.5 as moderately high, of 18.6 to 28.5 as high, of 28.6 to 48.5 as very high, and of 48.6 and higher as extremely high.

Table 12 Fit Indices for the Latent Class Analysis

Number of classes	BIC	AIC	SSABIC	Entropy
4	458396.926	455271.148	457230.148	0.664
5	457530.912	453621.561	456072.210	0.675
6	456984.184	452291.260	455233.106	0.688
7	456600.450	453621.561	453621.561	0.675
8	456509.796	450249.724	454173.966	0.712
9	456695.946	449652.300	454067.740	0.710

Figure 2 Latent Class Membership and Distribution of Average Frequencies of All Games Per Year

Table 13 Average Game Playing Frequencies Per Year for Each Latent Class

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Game								
Scratch	0.82	4.51	17.79	1.96	14.62	26.95	58.45	72.25
Lottery	16.27	13.54	37.77	12.03	42.73	47.55	99.63	86.80
Bingo	0.50	1.32	3.49	0.81	3.80	2.60	8.68	15.10
Cards	0.66	1.08	2.46	8.39	3.54	7.34	3.36	20.10
VTL(Out)	0.01	0.51	1.19	0.34	1.55	4.26	2.30	23.12
VTL(In)	0.22	1.45	1.81	0.21	4.31	4.31	2.59	26.01
Casino	0.02	0.07	0.05	0.47	1.34	4.15	0.08	21.08
Internet	0.00	0.05	0.05	0.88	0.12	0.78	0.45	5.74
Horses	0.02	0.12	0.59	0.44	1.45	1.09	0.48	7.44
Sports	0.28	0.18	0.46	2.75	0.58	13.65	3.24	21.77
Invest	0.77	1.39	0.31	2.07	1.37	2.41	0.81	6.97
Skill	0.07	0.35	0.45	8.13	2.93	11.81	1.47	15.96
Other	0.17	0.15	0.69	1.45	0.43	5.65	0.72	13.54

Gaming Characteristics of the Latent Classes

Class 1: There were 18,909 cases in Class 1, making it the largest class with the highest probability of latent class membership at 51.2%. Members of this group played lotteries at a moderately high level but had an average frequency of close to zero for all other games. Given the size of Class 1, the nature and frequencies of their endorsed games, this class was chosen as the reference latent class for further analyses.

Class 2: The gambling behaviour of members of Class 2 was similar to those in Class 1 except that all these members also played scratch tickets at a moderate level. They also engaged in playing bingo, card games, VLT inside casinos, and

speculative investment at a low level. Their latent class probability membership was 14.9% (i.e., 5,514 cases).

Class 3: For Class 3 members, their lottery play was at a very high level, their purchase of scratch tickets was at a moderately high level, and they also played bingo, card games and VLT's in and outside of casinos at a low level (but more so than for Class 2). Their latent class probability membership was 10.2% (i.e., 3,779 cases).

Class 4: Class 4 members purchased scratch tickets, played sports lotteries, and engaged in speculative investment at low levels, they played the lottery, card games, and other games of skill at moderately high levels. Their latent class probability membership was 3.6% (i.e., 1,339 cases).

Class 5: Class 5 members played VLT outside casinos, casino games, bet on horse races, played games of skill, and engaged in speculative investment at a low level. They played bingo, card games, and VLT inside casinos at moderate levels. They purchased scratch tickets at a moderately high level, and played lotteries at a very high level. Their latent class probability membership was 10.2% (i.e., 3,772 cases).

Class 6: Class 6 members played bingo, bet on horses, and engaged in speculative investment at low levels. They played card games, VLTs in and outside casinos, casino games, and gambled through other forms of gambling (dog races, gambling at casino nights/country fairs, bet on sports with a bookie) at moderate levels. They played sports lotteries and games of skill at moderately high levels, they purchased scratch tickets at a high level. They played the lottery at a very high level. Their latent class probability membership was 6.5% (i.e., 2,413 cases).

Class 7: Class 7 members played card games, VLTs in and outside casinos, sports lotteries, and games of skill at low levels. They played bingo at a moderately high level, and purchased scratch tickets and played the lottery at an extremely high level (with an average frequency at 99.5 times per year for the latter activity). Their latent class probability membership was 1.7% (i.e., 624 cases).

Class 8: Class 8 members engaged in internet gambling, bet on horse races, and engaged in speculative investment at moderate levels. They played bingo, games of skill, and did other forms of gambling (dog races, gambling at casino nights/country fairs, bet on sports with a bookie) at moderately high levels. They also played card games, VLTs in and outside casinos, casino games, and sports lotteries at high levels. They purchased scratch tickets and played the lottery at an extremely high level. Their latent class probability membership was 1.5% (i.e., 553 cases).

Study 2 Results

The relationship between the problem gambling DV and the eight latent classes was examined using crosstabulations and log-likelihood chi-square tests. The percent distribution of cases in each class for each level of problem gambling outcome is shown in Table 14 and Figure 3. Note that after excluding the $42 + 39 = 81$ cases that could not be classified, 45 missing cases of the problem gambling DV remained and were removed, leaving $N=36,858$ cases in the sample. Moreover, it is important to note that from this point on in this Thesis, all frequency and regression analyses were performed (and reported) using the survey sampling weights. This resulted in a slight adjustment of the effective size of the remaining sample to $N=36,803$.

Results indicated that all of the non-gamblers were in Class 1. Although some low risk, moderate risk, and problem gamblers were also found in Class 1, their proportions were very small. The highest proportion of non-problem gamblers was found in Class 2 with the smallest proportion in Class 8. The highest proportions of low risk, moderate risk, and problem gamblers were in Class 8. In fact, the proportions of these three gambler types tended to increase across Classes 1 to 8. The only exceptions to this trend were for the proportion of problem gamblers in Class 4 versus Class 3 and Class 6 versus Class 5, where this trend was slightly reversed. More specifically:

Class 1 was the most prevalent group (51.9% with the sampling weights) and was characterized by inclusion of all (100%) non-gamblers. Those with any form of gambling problems made up 0.4% of Class 1, corresponding to 0.2% of the total remaining sample (there were 49 low risk, 26 moderate risk and 5 problem gamblers).

Class 2 was the second most prevalent group (14.8% with the sampling weights) and mainly composed of non-problem gamblers. In fact, this class was characterized by having a majority (73%) of non-problem gamblers. Those with any form of gambling problems made up 1.5% of Class 2, corresponding to 0.2% of the total remaining sample (there were 55 low risk, 19 moderate risk, and 5 problem gamblers).

Class 3 had a weighted prevalence of 9.3%. Close to half (48.7%) of Class 3 members were non-problem gamblers. Those with any form of gambling problems made up 6.8% of Class 3, corresponding to 0.6% of the total remaining sample (there were 161 low risk, 53 moderate risk, and 20 problem gamblers).

Class 4 had a weighted prevalence of 3.9%. More than half (64.5%) of Class 4 members were non-problem gamblers. Those with any form of gambling problems made up 9.6% of Class 4, corresponding to 0.4% of the total remaining sample (there were 87 low risk, 46 moderate risk, and 6 problem gamblers).

Class 5 had a weighted prevalence of 9.8%. Exactly half of Class 5 members were non-problem gamblers. Those with any form of gambling problems made up 10.7% of Class 5, corresponding to 1.0% of the total remaining sample (there were 224 low risk, 121 moderate risk, and 40 problem gamblers).

Class 6 had a weighted prevalence of 7.0%. More than half (66.1%) of Class 6 members were non-problem gamblers. Those with any form of gambling problems made up 11.7% of Class 6, corresponding to 0.8% of the total sample (there were 186 low risk, 92 moderate risk, and 23 problem gamblers).

Class 7 had a prevalence of 1.9%. Close to half (48.10%) of Class 7 members were non-problem gamblers. Those with any form of gambling problem made 35.7% of Class 7, corresponding to 0.7% of the total remaining sample (there were 144 low risk, 81 moderate risk, and 23 problem gamblers).

Class 8 had a weighted prevalence of 1.5%. Only about a third (35.7%) of Class 8 members were non-problem gamblers. This class was characterized by the highest proportion of problem gamblers. Those with any form of gambling problems made up 53.6% of Class 8, corresponding to 0.8% of the total remaining sample (there were 124 low risk, 113 moderate risk, and 50 problem gamblers).

Table 14 Crosstabulations for Gambling Types and Latent Classes

		Classes									
Non-gambler	Types	1	2	3	4	5	6	7	8	Total	
		100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0 %

	classes	46.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2 %
Non-problem gambler	Types	38.3	23.1	9.7	5.4	10.5	9.9	1.9	1.1	100.0 %
	classes	34.5	73.0	48.7	64.5	50.0	66.1	48.1	35.7	46.7 %
Low risk gambler	Types	4.8	5.3	15.6	8.4	21.7	18.1	14.0	12.0	100.0 %
	classes	0.3	1.0	4.7	6.0	6.2	7.2	20.7	23.2	2.8%
Moderate risk gambler	Types	4.7	3.4	9.6	8.3	22.0	16.7	14.7	20.5	100.0 %
	classes	0.1	0.3	1.5	3.2	3.4	3.6	11.7	21.1	1.5%
Problem gambler	Types	2.9	2.9	11.6	3.5	23.3	13.4	13.4	29.1	100.0 %
	classes	0.03	0.1	0.6	0.4	1.1	0.9	3.3	9.3	0.5%
Not a Gambler	Types	39.1	15.5	17.0	4.2	15.8	6.4	1.3	0.6	100.0 %
	classes	18.3	25.6	44.4	25.8	39.3	22.2	16.3	10.7	24.3 %
Total	Types	51.9	14.8	9.3	3.9	9.8	7.0	1.9	1.5	100.0 %
	class es	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

* sig. $p < 0.001$ for the log likelihood chi-square test

Figure 3 Percentage of Gambler Types in Each Latent Class

Study 3 Results

In this study, the relationships between the risk factors and the latent classes were examined and tested. First, crosstabulations were carried out with log likelihood chi-square tests for each set of risk factors, followed by multinomial logistic regressions. Variables that were not significant at $\alpha < 0.05$ for the chi-square tests were not followed up with a multinomial logistic regression. Crosstabulations results for the demographic variables are shown in Table 15.

Table 15 Crosstabulation of Demographic Variables Against Latent Classes

		Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Characteristics	Within:								
Male ***	Gender	50.3	12.3	8.1	6.3	10.2	7.5	3.2	2.1
	class	47.6	40.8	42.7	79.8	51.3	52.4	84.5	69.1
Age ***									
15-19	Age	67.2	8.5	3.6	12.4	2.0	3.0	1.6	1.6
	class	11.5	5.1	3.5	28.4	1.8	3.9	7.5	10.0
20-34	Age	45.4	18.5	10.5	5.3	5.2	9.8	3.7	1.5
	class	20.9	30.0	27.0	32.7	12.8	33.3	47.1	25.3
35-59	Age	49.5	15.6	10.1	2.7	11.9	7.0	1.7	1.5
	class	44.5	49.3	50.6	32.5	56.8	46.9	41.3	48.7
60-74	Age	54.3	11.7	9.4	1.4	15.1	6.2	0.5	1.4
	class	15.0	11.3	14.6	5.0	22.2	12.8	3.6	13.6
75 or older	Age	68.1	10.0	6.5	0.9	10.2	3.6	0.2	0.6
	class	8.0	4.2	4.3	1.4	6.4	3.1	0.6	2.4
Marital Status ***									
Single	Marital	54.1	13.6	7.0	8.1	5.3	7.1	2.9	1.9
	class	26.5	23.4	19.2	52.7	13.9	25.9	38.6	33.0
Divorce/separate/widow	Marital	54.7	13.3	10.2	1.5	12.1	5.6	1.2	1.4
	class	13.5	11.6	14.0	5.0	15.9	10.2	8.5	11.9
Married or common-law	Marital	50.4	15.5	10.1	2.7	11.1	7.3	1.6	1.3
	class	60.0	65.0	66.8	42.3	70.2	64.0	52.9	55.1
Income ***									
Less than \$15,000	Income	62.7	12.0	8.7	2.0	8.8	3.1	1.4	1.2
	class	9.7	6.2	7.1	4.0	6.9	3.3	5.6	6.2
\$15,000 to \$29,999	Income	54.5	14.6	10.9	2.0	11.4	4.5	0.6	1.5
	class	16.2	14.4	17.0	7.8	17.1	9.3	4.6	15.1
\$30,000 to \$49,000	Income	52.0	14.9	9.8	3.2	11.3	6.0	1.5	1.3
	class	23.1	22.1	22.9	18.5	25.3	18.6	17.7	18.9
\$50,000 to \$79,000	Income	48.3	16.2	9.9	4.1	10.1	7.9	2.1	1.5
	class	26.4	29.4	28.4	29.6	28.0	30.0	28.9	27.9
\$ 80,000 or more	Income	46.1	15.7	8.7	5.7	8.4	10.5	3.2	1.8
	class	24.6	27.9	24.6	40.1	22.7	38.9	43.2	31.9

Education ***									
Less than secondary	Education	57.3	10.4	9.1	4.0	12.4	3.9	1.1	1.8
	class	28.1	17.9	25.1	25.9	32.3	14.3	14.2	30.5
Secondary grad.	Education	48.5	14.5	9.9	3.7	11.0	7.8	2.8	1.9
	class	17.7	18.7	20.1	18.0	21.1	21.1	27.9	24.1
Other post-secondary	Education	45.8	17.3	9.2	5.1	6.8	10.2	3.2	2.3
	class	7.4	9.8	8.4	11.0	5.8	12.2	14.2	13.5
Post-secondary grad.	Education	51.3	16.8	9.1	3.7	8.5	7.8	1.8	1.0
	class	46.7	53.6	46.4	45.1	40.8	52.5	43.6	32.0
Immigration Status ***									
Yes	Status	64.1	11.3	7.3	2.4	7.8	5.0	1.1	1.0
	class	27.4	17.0	17.3	13.7	17.5	15.8	13.0	15.5

*** $p < .001$

The demographic results further characterized each of the latent classes. In particular, Class 1 was characterized by having the largest proportion of those 75 years or older, those with low income (earning less than \$15,000), and immigrants. Class 2 was characterized by highest proportion of female members' post-secondary graduates. Class 3 was characterized by the second highest proportion of female members. Class 4 was characterized by highest proportion of both adolescents and single people, the second highest proportion of males and those with the highest income, and the second lowest proportion of immigrants. Class 5 was characterized by the highest proportion of 35 to 59 year olds, married people, those with less than secondary education. Class 6 was characterized by the lowest proportion of those with the lowest income and the second highest proportion of post-secondary graduates. Class 7 was characterized by the highest proportion of males, those between 20 to 34 years old, the highest income earners, the second highest proportion of single people, and also the lowest proportion of immigrants. Class 8 was characterised by the third highest proportion of males, and the lowest proportion of post-secondary graduates.

The results of the multinomial logistic regression of the demographic variables on the latent classes are shown in Table 16. The values given represent partial odds ratios. The odds for any specific level of a row variable represent the ratio of the proportion at that level over the proportion at the reference level (e.g., females for males). The odds ratio for any specific class represents the ratio of the odds for that class over the odds for the reference class (i.e., always Class 1). Odds ratios greater than 1 indicate that the likelihood of a case being at the level of any row variable in Table 16 compared to the reference level for that row variable, is greater for the latent class in question compared to the reference Class 1 (and lesser for odds ratios that are less than 1). Partial odds ratios reflect the inclusion of all of the other variables in the regression, and hence, are not guaranteed to be completely consistent with the values given in the corresponding crosstabulations.

The results in Table 16 were in line with those obtained from crosstabulations and chi-square tests. Results for gender showed that compared to Class 1, males were significantly less likely than females in Classes 2 or 3, but significantly more likely in Classes 4, 5, 6, 7, and 8. In particular, males were more than five times as likely in Class 7 and more than four times as likely in Class 4 compared to Class 1. For the age categories, the multinomial regression results showed, most notably, that compared to Class 1, adolescents were more than two and a half times as likely than those 35-39 years old in Class 4, and one-tenth less likely in Class 5, those between 20-34 were more than twice as likely in Class 7 and those 75 years or older were significantly less likely in all of Classes 2 to 8, in comparison to Class 1.

For marital status, these results showed, most notably, that compared to Class 1, singles were significantly more likely than those who were married or common-law in Class 4. For the income categories, these results showed that compared to Class 1, those earning less than \$15,000 were significantly less likely than those earning \$30,000 to 49,000 in Classes 2 to 6; those earning between \$15,000 and 29,999 were significantly less likely in Classes 4, 6, and 7; and those earning between \$50,000 and 79,999 and those earning \$80,000 and more were more likely in Classes 4, 6, 7, and 8.

With respect to education, these results showed that compared to Class 1, those with less than secondary were significantly more likely than those with other post-secondary education in Class 5 and less likely in Classes 2, 6, and 7; and those with post-secondary graduation were significantly about one-third less likely in Class 8 (note that although Classes 2 and 6 had more post-secondary graduates, they also had more in the other post-secondary reference category making the corresponding odds lower than that in Class 1). In terms of immigration status, immigrants were significantly less likely in all of Classes 2 to 8 than in Class 1.

Table 16 Multinomial Logistic Regression of Demographic Variables on the Modal Class

Classes – compared to C1	C2	C3	C4	C5	C6	C7	C8
	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)
Gender – compared to Females							
Males	0.72 ^{***}	0.81 ^{***}	4.01 ^{***}	1.13 [*]	1.11 [*]	5.26 ^{***}	2.27 ^{***}
Age- compared to 35-59 years old							
15-19 years	0.43 ^{***}	0.29 ^{***}	2.60 ^{***}	0.09 ^{***}	0.30 ^{***}	0.63 [*]	0.40 ^{***}
20-34 years	1.25 ^{***}	1.20 ^{***}	1.81 ^{***}	0.53 ^{***}	1.43 ^{***}	2.31 ^{***}	0.92
60-74 years	0.75 ^{***}	0.85 [*]	0.54 ^{***}	1.05	1.07	0.36 ^{***}	0.81
75 years or older	0.58 ^{***}	0.42 ^{***}	0.34 ^{***}	0.55 ^{***}	0.55 ^{***}	0.16 ^{***}	0.30 ^{***}
Marital Status - compared to Married or common law							
Single	0.98	0.87 [*]	1.72 ^{***}	0.94	1.27 ^{***}	1.40 ^{**}	1.54 ^{**}
divorce/separate/widow	0.99	1.13	1.29	1.13 [*]	1.19 [*]	1.91 ^{***}	1.43 [*]
Income- compared to \$30,000 - \$49,999							
less than \$15,000	0.70 ^{***}	0.73 ^{***}	0.56 ^{***}	0.61 ^{***}	0.44 ^{***}	0.89	0.73

\$15,000 - \$29,999	1.01	1.09	0.74 [*]	0.89	0.76 ^{**}	0.46 ^{***}	1.18
\$50,000 - \$79,999	1.09	1.08	1.21 [*]	1.02	1.39 ^{***}	1.33 [*]	1.34 [*]
\$80,000 or more	1.01	1.01	1.68 ^{***}	0.92	1.90 ^{***}	2.10 ^{***}	1.70 ^{***}
Education - compared to Other post-secondary graduation							
Less than secondary	0.64 ^{***}	1.01	0.83	1.45 ^{***}	0.50 ^{***}	0.49 ^{***}	0.85
Secondary graduation	0.78 ^{***}	0.93	1.10	1.21 [*]	0.78 ^{**}	0.95	0.78
Post-secondary graduation	0.79 ^{***}	0.76 ^{***}	1.12	0.81 ^{**}	0.60 ^{***}	0.46 ^{***}	0.36 ^{***}
Immigration Status							
Yes	0.53 ^{***}	0.54 ^{***}	0.51 ^{***}	0.55 ^{***}	0.54 ^{***}	0.45 ^{***}	0.52 ^{***}

^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$

Table 17 Crosstabulations of Physical Health Variables By the Modal Class

	Within:	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Health description index ***									
Poor	Index	59.2	13.3	8.4	1.9	11.9	3.9	0.3	1.0
	Class	2.9	2.3	2.3	1.3	3.1	1.4	0.4	1.7
Fair to good	Index	52.0	13.4	10.0	2.9	12.0	6.3	1.6	1.8
	Class	36.7	33.4	39.4	27.3	44.8	32.7	30.6	45.2
Very good	Index	51.5	15.6	8.9	4.6	8.4	7.6	2.1	1.3
	Class	60.5	64.4	58.3	71.4	52.2	65.9	69.0	53.2
Participant in leisure physical activity ***									
Yes	Yes	51.1	15.0	9.3	4.1	9.7	7.3	2.0	1.5
	Class	91.2	94.4	92.6	98.2	91.5	96.8	99.0	96.8
Self-perceived physical health ***									
Poor	Health	56.1	14.1	10.9	1.9	11.0	4.0	0.7	1.2
	Class	3.4	3.0	3.6	1.5	3.5	1.8	1.1	2.6
Fair to good	Health	50.7	14.5	10.0	3.2	11.0	7.1	1.8	1.7
	Class	42.6	43.0	47.0	35.6	49.2	44.2	41.8	51.7
Very good	Health	52.7	15.0	8.6	4.6	8.7	7.1	2.0	1.3
	Class	54.0	54.1	49.4	62.9	47.3	54.0	57.0	45.7
Has a chronic condition ***									
Yes	Yes	51.6	15.0	9.4	3.3	10.6	7.0	1.7	1.5
	Class	68.8	70.5	70.0	58.0	74.9	69.0	63.3	70.8
Frequency all physical activity ***									
Regular	Frequency	51.2	15.0	8.9	4.7	9.2	7.3	2.2	1.5
	Class	65.8	68.2	64.0	81.0	62.5	69.3	76.3	68.2
Participate in physical activity >15 min a day ***									
Yes	Yes	51.5	14.4	9.0	5.0	8.9	7.3	2.2	1.6
	Class	35.3	34.8	34.6	45.8	32.5	37.3	40.5	38.3
Frequency trouble sleeping ***									
Most/Always	Sleep	51.1	14.4	10.6	3.4	11.0	6.3	1.4	1.8
	Class	13.2	13.1	15.3	11.5	15.0	12.1	9.6	16.8
Sometimes	Sleep	50.4	15.9	9.3	4.2	9.4	7.3	2.0	1.5
	Class	42.6	47.4	44.1	47.2	42.1	45.6	47.1	45.3
None	Sleep	53.8	13.6	8.8	3.8	9.8	6.9	1.9	1.3
	Class	44.2	39.5	40.6	41.3	42.9	42.3	43.3	37.9

Crosstabulation results and log likelihood chi-square tests for the physical health variables are shown in Table 17. An examination of the relationship between the physical health risk factors and the eight the latent classes also helped to further characterize them. In particular, Class 1 was further characterized by the second highest proportion of those in poor health, and the lowest proportion of those who participated in leisure physical activity, but the most likely to report not having trouble sleeping. Class 2 did not particularly stand out in terms of most of these physical health variables, however, they had the highest proportion of cases reporting sometimes having trouble sleeping. Class 3 also did not really stand out in terms of any of the physical health variables. Class 4 was further characterized as the healthiest of all the classes having the highest proportions of those with both very good health and self-perceived health, the lowest proportion of chronic conditions, and the highest proportions of being physically active. Class 5 was further characterized by the highest proportion of cases with poor health, the second highest proportion reporting poor self-perceived physical health, the highest proportion of chronic conditions, and the lowest proportions of being physically active. Class 6 did not stand out in terms of any of the physical health variables. Class 7 was further characterized by the highest proportion of cases involved in leisure physically activity, the lowest proportions of those with poor health and self-perceived health, the second highest proportions of being physically active, and the lowest proportion of cases reporting serious trouble sleeping. Class 8 was further characterized by the highest proportion of those with only fair-to-good health and self-perceived health, and the highest proportion of cases reporting serious trouble sleeping.

The results of multinomial logistic regression of the physical health variables on the latent classes are shown in Table 18. Recall that the demographic variables were also included in the analysis as covariates. As expected, these results were generally in line with those obtained from the crosstabulations and chi-square tests. For example, these results showed the odds of participating in leisure activity were higher for all other classes compared to Class 1. Although, the odds ratios for the chronic condition variable are, for the most part, consistent with the crosstabulation results, none were significant (which likely was a consequence of partialling out the demographic variables such as age and income first).

Table 18 Multinomial Logistic Regression of Physical Health Variables on Latent Classes, With Demographic Variables Accounted For

	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Classes – compared to Class 1	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)
Health index – compared to Very good							
Poor	0.78	0.57 [*]	0.96	0.98	0.68	0.23 [*]	0.70
Fair to good	0.89 [*]	1.03	0.81 [*]	1.22 ^{***}	0.85 [*]	0.82	1.30 [*]
Participate in leisure activity							
Yes	1.39 ^{***}	1.26 [*]	2.06 [*]	1.27 [*]	2.32 ^{***}	5.20 ^{***}	3.52 ^{***}
Self-perceived health – compared to Very good							
Poor	1.37 [*]	1.69 [*]	1.22	1.06	1.18	1.67	1.32
Fair to good	1.16 [*]	1.23 ^{***}	1.08	1.14 [*]	1.35 ^{***}	1.47 ^{***}	1.27
Has a chronic condition							
Yes	1.07	0.98	0.91	1.07	1.03	1.13	1.09
Frequency of all physical activity							
Regularly	1.00	0.84 [*]	1.68 ^{***}	0.87 [*]	0.91	1.29 [*]	0.93
Participation in physical activity >15 min a day							
Yes	0.96	1.10 [*]	1.06	0.98	1.07	1.00	1.19
Trouble sleeping – compared to None							
Most/Always	1.06	1.17 [*]	1.37 [*]	0.96	1.06	0.91	1.51 ^{**}
Sometimes	1.19 ^{***}	1.11 [*]	1.26 ^{***}	1.01	1.11 [*]	1.15	1.31 ^{**}

^{*} $p < .05$, ^{**} $p < .01$, ^{***} $p < .001$

Table 19 Crosstabulation of Psychological Health Variables and the Latent Classes

	Within:	Class	Class	Class	Class	Class	Class	Class	Class
		1	2	3	4	5	6	7	8
Self-perceived stress ***									
High	Stress	50.9	15.6	9.7	3.3	10.0	7.0	1.8	1.7
	class	22.6	24.5	24.1	19.3	23.6	23.0	22.3	27.3
Medium	Stress	50.0	15.7	9.3	4.2	9.5	7.8	2.2	1.3
	class	39.0	43.1	40.5	44.0	39.4	45.1	47.1	37.2
Low	Stress	54.8	13.1	9.1	3.9	10.0	6.1	1.6	1.4
	class	38.4	32.5	35.4	36.7	37.0	31.9	30.6	35.5
Self-perceived mental health ***									
Poor	health	66.2	7.7	8.9	1.9	7.0	4.7	0.9	2.6
	class	1.5	0.6	1.1	0.6	0.8	0.8	0.6	2.0
Fair to good	health	50.8	14.7	9.7	3.5	11.1	6.5	1.8	1.8
	class	31.1	31.7	33.3	28.8	36.0	29.3	30.7	38.8
Very good	health	52.2	14.9	9.1	4.1	9.2	7.3	1.9	1.3
	class	67.4	67.7	65.6	70.7	63.1	69.9	68.7	59.2
Psychological well-being scale ***									
Poor	Index	64.1	9.5	8.2	0.9	9.5	3.0	0.9	3.9
	class	0.8	0.4	0.6	0.1	0.6	0.3	0.3	1.7
Fair to good	Index	51.0	15.6	9.3	4.3	9.5	6.3	2.1	1.9
	class	17.5	18.7	17.6	19.2	17.1	15.8	19.8	22.6
Very good	Index	51.7	14.6	9.4	3.9	9.9	7.2	1.9	1.4
	class	81.7	80.9	81.8	80.6	82.3	83.9	79.9	75.7
Distress scale ***									
High	Index	60.9	9.9	9.4	3.5	10.9	2.0	1.0	2.5
	class	0.6	0.4	0.6	0.5	0.6	0.2	0.3	0.9
Medium	Index	52.9	13.5	9.9	3.6	11.9	4.7	1.3	2.3
	class	8.1	7.3	8.4	7.4	9.6	5.3	5.6	12.3
Low	Index	51.7	14.9	9.3	3.9	9.6	7.2	1.9	1.4
	class	91.2	92.3	91.0	92.1	89.8	94.5	94.1	86.8
Chronicity of distress/impairment scale ***									
More	Index	47.6	17.6	9.3	4.3	9.0	8.0	2.5	1.7
	class	13.0	16.9	14.2	15.5	13.0	16.3	18.4	16.7
Same as before	Index	52.8	14.4	9.1	4.0	9.7	6.9	1.8	1.4
	class	69.5	66.6	66.7	69.1	67.8	67.0	65.7	67.5
Less	Index	52.0	13.9	10.2	3.4	10.8	6.7	1.7	1.3
	class	17.5	16.5	19.1	15.4	19.2	16.7	15.9	15.8
Depression- life ***									
Yes	Yes	52.5	17.0	8.8	2.7	9.5	6.4	1.8	1.3
	class	12.4	14.1	11.5	8.5	11.9	11.1	11.7	11.0
Depression- 12 month **									
Yes	Yes	54.8	15.0	8.3	3.2	10.0	5.2	1.6	2.0
	class	5.1	4.9	4.3	3.9	4.9	3.5	4.0	6.7
Suicidal thoughts – life ***									
Yes	Yes	49.4	16.1	10.1	3.4	10.8	6.6	1.6	1.9
	class	12.8	14.6	14.6	11.7	14.8	12.6	11.4	17.7
Suicidal thoughts – 12 months **									
Yes	Yes	52.3	14.5	10.5	4.3	9.4	5.9	0.9	2.2
	class	3.7	3.6	4.2	4.0	3.5	3.1	1.7	5.6
Suicidal attempt – life **									

	Yes	50.7	15.6	9.4	2.6	10.9	8.1	1.1	1.6
	class	3.1	3.3	3.2	2.1	3.5	3.6	1.9	3.4
Suicidal attempt – 12 months	Yes	48.7	11.9	11.9	5.7	13.5	5.2	2.6	0.5
	class	0.5	0.4	0.7	0.8	0.7	0.4	0.7	0.2
Mania – life ***	Yes	42.2	16.6	9.6	5.7	11.1	8.0	2.8	4.2
	class	1.9	2.7	2.4	3.4	2.7	2.7	3.4	6.7
Mania- 12 months **	Yes	45.6	16.8	10.0	4.0	10.5	6.8	1.7	4.6
	class	0.8	1.1	1.0	1.0	1.0	0.9	0.9	3.0
Panic attack – life ***	Yes	46.6	16.3	11.0	3.7	10.5	7.2	2.8	2.0
	class	18.5	22.8	24.4	19.1	22.0	21.2	30.3	27.5
Panic attack – 12 months ***	Yes	47.5	16.7	11.3	3.9	9.3	6.2	3.2	1.8
	class	7.3	9.0	9.7	8.0	7.6	7.1	13.4	9.5
Panic disorder – life ***	Yes	44.4	14.8	12.6	2.7	13.5	6.7	2.9	2.2
	class	3.2	3.7	5.1	2.5	5.1	3.6	5.7	5.6
Panic disorder- 12 months **	Yes	48.3	15.7	12.4	2.3	9.7	5.9	3.4	2.2
	class	1.4	1.6	2.1	0.9	1.5	1.3	2.8	2.3
Social Phobia – life ***	Yes	47.5	16.9	9.3	4.5	10.6	6.5	2.4	2.2
	class	7.4	9.3	8.1	9.4	8.8	7.5	10.4	12.2
Social Phobia – 12 months	Yes	50.4	16.0	10.0	4.1	8.9	5.9	2.5	2.3
	class	2.9	3.3	3.2	3.2	2.7	2.5	3.9	4.7
Agoraphobia- life **	Yes	48.3	12.4	12.0	2.5	11.9	8.3	1.8	2.8
	class	1.4	1.3	2.0	1.0	1.9	1.8	1.4	3.0
Agoraphobia- 12 months *	Yes	55.6	9.3	8.1	2.2	13.7	7.0	1.9	2.2
	class	0.8	0.5	0.6	0.4	1.0	0.7	0.7	1.1
Psychosis – diagnosed by a health practitioner *	Yes	58.5	15.4	6.9	1.3	10.4	5.0	1.3	1.3
	class	1.0	0.9	0.6	0.3	0.9	0.6	0.6	0.7
Learning disability ***	Yes	58.9	12.3	8.0	6.0	6.0	5.3	1.1	2.5
	class	2.5	1.8	1.9	3.3	1.3	1.7	1.3	3.7

* $p < .05$, ** $p < .01$, *** $p < .001$

Crosstabulations results and log likelihood chi-square tests for the psychological health variables are shown in Table 19. The results for the psychological health variables further characterized each of the latent classes. In

particular, Class 1 was characterized by having the highest proportion of cases with lowest self-perceived stress and the lowest proportions of lifetime mania, panic attack, and social phobia. Class 2 was further characterized by having the highest proportion of those with lifetime depression. Class 3 was further characterized by having the second highest proportion of those whose level of distress had recently decreased. Class 4 members were also characterized by having the lowest proportion of cases reporting high stress, the highest proportion reporting very good self-perceived mental health, the lowest proportion of those with lifetime depression, lifetime and last 12 months panic disorder, lifetime agoraphobia and psychosis, the second lowest proportion of lifetime suicidal thoughts, but the second highest proportion of learning disability. Class 5 was further characterized by having the highest proportion of those whose level of distress had recently decreased and one of the lowest proportions with learning disability. Class 6 was further characterized by having the highest proportion of cases reporting very good psychological well-being and the least distress, the second highest proportion of very good self-perceived mental health, the lowest proportion of last 12-month depression, panic attack, and social phobia, but the highest proportion of lifetime suicide attempts. Class 7 was further characterized by having the highest proportion of those reporting moderate levels of stress, the second highest proportion of those with the least distress, but also the highest proportion to report that their level of distress had recently increased. Members of Class 7 also had the lowest proportions of learning disability, lifetime suicide attempts, and lifetime and last 12-month suicide thoughts, but also the highest proportions of lifetime and last 12-month panic attack and panic disorder, and the

second highest levels of lifetime and last 12-month social phobia. Class 8 was further characterized by having the highest proportion of those reporting high self-perceived stress, both poor and fair-to-good self-perceived mental health and psychological well-being, and high and medium distress. Members of Class 8 also had the highest proportions of learning disability, last 12-month depression, lifetime and last 12-month suicidal thoughts, mania, social phobia, and agoraphobia, and the second highest proportions of lifetime panic attacks and panic disorder.

The results of multinomial logistic regression of the psychological health variables on the latent classes are shown in Table 20. As expected, these results were generally in line with those obtained from the crosstabulations and chi-square tests. However, although the crosstabulation results indicated that in many cases Class 8 was more likely than Class 1 to display poorer psychological health, many of these differences were not significant in this analysis. For example, even though Class 8 members were more likely than Class 1 members to have lower self-perceived mental health, that difference was only significant at the medium level. In fact, the only aforementioned differences that were significant were for lifetime mania, panic attack, and agoraphobia (and now also less depression). There was also even a difference in the proper direction of the partial ORs for high self-perceived stress, last 12-month mania, agoraphobia, and learning disability.

As well, for Class 7, of the differences mentioned earlier, only the greater likelihood of reporting less but more recent distress, less learning disability, and

more lifetime panic attacks than Class 1 were significant. For Class 6, only the greater likelihood of reporting medium levels of self-perceived stress and more lifetime suicide attempts than Class 1 and the lower likelihood of reporting medium levels of distress were significant (in addition to now significant greater likelihoods of lifetime mania, panic attack and agoraphobia and lower likelihoods of learning disability).

For Class 5, the greater likelihood of reporting fair-to-good self-perceived mental health than Class 1 and the lower likelihood of learning disability were significant (in addition to now significant greater likelihoods of reporting medium distress, less distress recently, less lifetime depression, more lifetime panic attacks and panic disorder, and more last 12-month suicide attempts). For Class 4, none of the effects observed in the crosstabulation results were significant in the multinomial regression results (and, now, the greater likelihood of reporting enhanced stress was significant). For Class 3, the greater likelihood of reporting that stress recently decreased was significant (as was now also a greater likelihood of lifetime panic attack and agoraphobia and a lower likelihood of lifetime depression and learning disability). For Class 2, the higher likelihood of lifetime depression was not significant (although lower likelihoods of poor self-perceived mental health, last 12-month agoraphobia, and learning disability and higher likelihoods of enhanced distress recently, lifetime panic attack, and social phobia were now significant).

Table 20 Multinomial Logistic Regression of Psychological Health Variables on the Latent Classes

	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Variable	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)
Self-perceived stress – compared to Low								
High -	1.02	0.99	0.86	1.02	1.12	0.99	0.95	
Medium -	1.08	0.97	1.02	1.02	1.22 ^{***}	1.17	0.85	
Self-perceived mental health – compared to Very good								
Poor -	0.49 ^{**}	0.65	0.36	0.43 ^{**}	0.94	0.53	1.48	
Good -	0.99	1.06	1.00	1.15 ^{**}	1.03	1.07	1.39 ^{**}	
Psychological well-being scale – compared to Very good								
Poor	0.90	0.95	0.31	0.91	0.80	0.78	1.64	
Good	1.08	1.01	1.12	0.98	0.93	1.22	1.12	
Distress scale – compared to Low								
High -	0.73	1.11	2.56 [*]	1.41	0.42	0.35	1.25	
Medium -	0.92	1.04	0.98	1.29 ^{**}	0.75 [*]	0.59 ^{**}	1.28	
Chronicity of distress/impairment scale – compared to Same as before								
More -	1.15 ^{**}	1.09	1.22 [*]	1.03	1.19 [*]	1.49 [*]	1.01	
Less -	0.95	1.13 [*]	0.89	1.18 ^{**}	0.98	0.99	0.88	
Depression- life								
Yes -	0.99	0.77 ^{**}	0.87	0.69 ^{***}	0.87	1.04	0.40 ^{***}	
Depression – 12 months								
Yes -	0.89	0.80	1.03	1.36 [*]	0.77	0.91	1.78	
Suicidal thoughts – life								
Yes -	1.04	1.05	0.85	1.13	0.77 ^{**}	0.86	1.27	
Suicidal thoughts – 12 months								
Yes -	1.06	1.28	1.23	1.07	1.48 [*]	0.32 ^{**}	1.02	
Suicidal attempt – life								
Yes -	1.04	0.84	0.95	0.94	1.90 ^{***}	0.43	1.01	
Suicidal attempt – 12 months								
Yes -	1.40	1.61	1.93	2.17 [*]	0.97	20.37 ^{***}	0.18	
Mania- life								
Yes -	1.27	1.01	1.23	1.17	1.46 [*]	1.49	2.74 ^{**}	
Mania- 12 months								
Yes -	1.19	1.02	0.64	0.81	1.15	0.51	0.60	
Panic attack – life								
Yes -	1.12 [*]	1.19 ^{**}	1.12	1.18 [*]	1.26 ^{**}	2.04 ^{***}	1.67 ^{***}	
Panic attack – 12 months								
Yes -	1.10	1.10	1.18	0.86	0.83	1.28	0.66	
Panic disorder – life								
Yes -	0.86	1.28	1.07	1.65 ^{***}	0.92	0.98	1.28	
Panic disorder – 12 months								
Yes -	1.06	0.93	0.60	0.60 [*]	1.15	1.28	0.62	
Social phobia – life								
Yes -	1.23 ^{**}	0.94	1.05	1.17	0.98	1.10	1.22	
Social phobia – 12 months								
Yes -	0.81	1.11	1.03	0.74	0.93	1.25	0.89	
Agoraphobia – life								
Yes -	1.02	1.99 ^{**}	1.39	0.78	1.85 [*]	1.74	2.51 [*]	
Agoraphobia – 12 months								

Yes	-	0.40 ^{**}	0.32 ^{***}	0.68	1.36	0.60	0.39	0.49
Psychosis								
Yes	-	0.96	0.66	0.39	1.10	0.55	0.56	0.37
Learning disability								
Yes	-	0.76 ^{**}	0.67 [*]	0.87	0.60 ^{**}	0.60 [*]	0.39 ^{**}	0.93

* $p < .05$, ** $p < .01$, *** $p < .001$; Class 1 is the reference category

The examination of the relationship between the substance use risk factors and the latent classes also helped to further characterize each of the eight latent classes (see the crosstabulations in

Table 21). In particular, Class 1 was characterized by having the lowest or second proportions for alcohol dependence, and the use of cannabis, amphetamines, ecstasy, hallucinogens, glue or gasoline, steroids, or any drug use over the lifetime. Class 2 was further characterized by having the lowest proportion of both alcohol and drug dependence. Class 3 did not particularly stand out in terms of most of these substance use variables. Class 4 was further characterized by the second highest proportions of ecstasy and cannabis use in addition to lifetime and past 12 month any drug use and the third highest proportions of hallucinogen use and alcohol dependence. Class 5 was characterized by the lowest proportions of cannabis use, ecstasy use, and 12-month any drug use. Class 5 also had the second lowest proportions of cocaine use, amphetamine use, hallucinogens use and lifetime any drug use. Class 6 did not particularly stand out in terms of any of these substance use variables. Class 7 was further characterized by the highest proportions for all substance use variables (except cocaine and glue and gasoline use for which it had the second highest proportions) as well as lifetime and past 12-month any drug use, and both alcohol and drug dependence. Class 8 was further characterized by the highest

proportions for cocaine and glue and gasoline use, and the second highest proportions for amphetamine, hallucinogens, and steroids use. Class 8 also had the second highest proportions for both alcohol and drug dependence in addition to lifetime and past 12-month any drug use.

The results of multinomial logistic regression of the substance use variables on the latent classes are shown in

Table 22. As expected, these results were generally in line with those obtained from crosstabulations and crosstabulations and chi-square tests. However, although the crosstabulations results indicated that in many cases Classes 8 and 7 were more likely than Class 1 to use substances, many of these differences were not significant in this analysis. For example, even though Class 7 and Class 8 members were more likely than Class 1 members to have endorsed substance use, the use of cannabis and hallucinogens for the Class 7 and the use of ecstasy and hallucinogens for Class 8, the multinomial regression analysis indicated that they were now significantly less likely with partial ORs in the opposite direction for use of these substances. For Class 6, the greater likelihood of reporting cannabis, ecstasy, steroids, and any lifetime drug use were significant in the expected directions, but the use of hallucinogens were significantly less likely than Class 1.

For Class 5, only the greater likelihoods of alcohol dependence, glue and gasoline use, and any past 12-months drug use than Class 1 were significant. As well, for Class 4, of the differences mentioned earlier, only the greater likelihoods of reporting more alcohol dependence and any lifetime drug use than Class 1 were significant. For Class 3, only the greater likelihoods of reporting glue and gasoline use, any lifetime drug use, and drug dependence than Class 1 were

significant (and the likelihood of any past 12-month drug use was in the opposite direction and now significantly less likely than Class 1). For Class 2, only the greater likelihoods of reporting ecstasy and any lifetime drug use were significant (and the likelihood of any past 12-month drug use and drug dependence were in the opposite direction and significantly less than Class 1).

Table 21 Crosstabulations of Substance-use Variables by Latent Classes, with Demographic Variables Accounted For.

	Within:	Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Alcohol dependence ^{***}									
High	Scale	36.5	9.2	9.2	11.2	9.0	9.2	9.8	6.0
	class	0.9	0.8	1.3	3.8	1.2	1.7	6.8	5.4
Use of Cannabis ^{***}									
Yes	Yes	42.8	13.6	9.2	9.4	7.2	9.3	5.4	3.0
	class	9.3	10.5	11.2	27.2	8.3	15.1	32.5	23.4
Cocaine use ^{***}									
Yes	Yes	41.8	16.2	10.6	5.8	8.3	9.3	4.5	3.6
	class	6.5	8.8	9.1	11.9	6.8	10.7	19.0	19.5
Amphetamine use ^{***}									
Yes	Yes	41.8	15.0	10.1	6.6	9.0	8.3	5.4	3.9
	class	3.7	4.7	5.0	7.8	4.2	5.4	13.1	12.3
Ecstasy use ^{***}									
Yes	Yes	39.1	16.5	9.8	8.9	5.4	11.5	6.1	2.9
	class	2.2	3.3	3.1	6.7	1.6	4.8	9.5	5.8
Hallucinogens use ^{***}									
Yes	Yes	42.0	15.6	11.0	6.5	8.8	8.9	4.5	2.7
	class	6.8	8.9	10.0	14.1	7.5	10.6	20.1	15.6
Glue or gasoline use ^{***}									
Yes	Yes	37.6	16.3	14.0	4.3	11.5	9.3	3.4	3.6
	class	0.9	1.3	1.8	1.3	1.4	1.6	2.2	3.0
Steroid use ^{***}									
Yes	Yes	32.2	13.9	8.9	4.5	9.4	16.3	9.9	5.0
	class	0.3	0.5	0.5	0.6	0.5	1.3	2.9	1.9
Any drug use - life ^{***}									
Yes	Yes	43.1	16.2	10.3	6.2	8.8	9.3	3.7	2.3
	class	27.9	36.9	37.3	53.5	30.2	44.7	65.1	52.2
Any drug use - 12 months ^{***}									
Yes	Yes	43.2	13.6	9.0	9.3	7.2	9.2	5.6	3.0
	class	9.9	10.9	11.5	28.3	8.7	15.5	34.8	24.0
Drug dependence ^{***}									
Yes	Yes	41.1	7.7	13.2	7.0	4.5	7.0	12.9	6.6
	class	0.6	0.4	1.1	1.4	0.4	0.8	5.3	3.5

*** $p < .001$

Table 22 Multinomial Logistic Regression of Substance-use Variables on the Latent Classes

	C1	C2	C3	C4	C5	C6	C7	C8
Variables	-	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)
Alcohol dependence scale – compared to Low								
High	-	0.75	0.92	1.64**	1.63**	1.27	1.89**	2.22**
Use of cannabis								
Yes	-	1.68	2.23*	1.39	1.71	2.26*	0.86	3.99
Use of cocaine								
Yes	-	1.08	0.93	0.98	0.80*	1.03	0.94	1.50*
Use of amphetamines								
Yes	-	0.92	0.93	1.11	1.03	0.83	1.30	1.65**
Use of ecstasy								
Yes	-	1.31*	1.26	1.08	0.82	1.45**	1.12	0.77
Use of hallucinogens, PCPs, and LSD								
Yes	-	0.92	1.06	0.96	1.02	0.82*	0.83	0.78
Glue and gasoline								
Yes	-	1.33	1.55*	0.91	1.54*	1.42	0.97	1.45
Use of steroids								
Yes	-	1.16	1.27	0.64	1.54	2.30***	2.03*	1.84
Any drug use- lifetime								
Yes	-	1.25***	1.30***	1.56***	1.15*	1.54***	2.00***	1.66***
Any drug use – 12 months								
Yes	-	0.52*	0.41*	1.02	0.67	0.53	1.96*	0.32
Drug dependence-								
Yes	-	0.84*	2.11**	0.62	0.63	1.09	2.54***	2.00*

* $p < .05$, ** $p < .01$, *** $p < .001$; Class 1 is the reference category

The examination of the relationship between the social risk factors and the latent classes also helped to further characterize each of the eight latent classes (see the crosstabulations results in Table 23). In particular, results showed that Class 1 did not particularly stand out in terms of most of these social risk factor variables. Class 2 was further characterized by having the highest proportion of consultation with mental health professionals and the highest proportion of mental health resource use. Class 2 also had the second highest proportion reporting high affection. Class 3 was further characterized by the second highest proportions reporting consultation with mental health professionals. Class 4 was further

characterized by the lowest proportion of disability days (spent between one to 14 days in bed or cut down in activities because of illness or injury), high tangible support, and low social interaction. This Class also had the second lowest proportions of hospitalization due to mental health, lifetime use of mental health resources. Class 5 did not particularly stand out in terms of most of these social risk factor variables. Class 6 was further characterized by the highest proportions of those reporting high affection, and high social interaction. Class 6 also reported the lowest proportions of accessibility barriers to mental health resources, both low and medium affection, and medium social interaction. Class 7 was further characterized by reporting the lowest proportion of consultation with mental health professionals, use of resources for mental health, high tangible support, and high affection. Class 7 also had the highest proportions reporting accessibility barriers to mental health resources, low tangible support, low affection, and low social interactions. Class 8 was further characterized the highest proportions reporting hospitalization due to mental health, alcohol, or drug issues, medium affection, and medium social interaction. They also had the lowest proportion reporting high social interactions.

The results of multinomial logistic regressions of the social risk factors on the latent classes are shown in

Table 24. As expected, these results were generally in line with those obtained from the crosstabulations and chi-square tests. However, although the crosstabulation results indicated that many cases were significantly different from those in Class 1, many of these differences were not significant in this analysis. For example, even though Class 8 members were more likely to have been

hospitalized for mental health, alcohol, or drug issues, and to report medium social interaction than Class 1, these differences were not significant. There was also even a difference in the proper direction of the partial OR for medium affection. As well, for Class 7, of the differences mentioned earlier, only the lower likelihoods of reporting accessibility hospitalization for mental health, alcohol, or drug issues was significant.

For Class 6, the higher likelihood of total number of disability days, and the lower likelihood of both low and medium affection, and low and medium social interaction were significant. For Class 5, the lower likelihood of social interaction was significant. For Class 4, the higher likelihood of total disability days and the lower likelihoods of hospitalization for mental health, alcohol, or drug issues, and low social interaction were significant (and now also less resources used for mental health). For Class 2, the higher likelihoods of disability days were significant (and now, the lower likelihood of consultation with mental health professionals).

Table 23 Crosstabulations of Social Variables and the Latent Classes

Within:		Class 1	Class 2	Class 3	Class 4	Class 5	Class 6	Class 7	Class 8
Total nbr of disab. days ***									
0	Days	51.8	14.8	9.3	3.9	9.8	7.0	1.9	1.5
	class	98.9	99.1	98.9	98.7	99.1	99.3	98.9	98.9
1 to 14	Days	55.0	13.5	9.8	5.0	8.5	4.5	2.1	1.6
	class	1.1	0.9	1.1	1.3	0.9	0.7	1.1	1.1
Hospitalization for mental health, alcohol, or drug issues ***									
Yes	Yes	53.2	13.4	9.8	2.2	12.3	6.1	1.0	2.1
High	class	5.0	4.4	5.1	2.7	6.1	4.2	2.6	6.9
Consult mental health professional *									
Yes	Yes	49.1	16.8	10.3	3.6	9.9	7.0	1.7	1.6
	class	22.2	26.7	25.9	21.3	23.6	23.4	21.1	25.0
Lifetime use of mental health resources ***									
Yes	Yes	49.3	16.6	10.2	3.6	10.0	7.0	1.7	1.5
	class	24.1	28.7	27.9	23.6	25.9	25.2	23.4	26.9
Accessibility barrier to mental health resources *									

	Yes	43.5	21.3	13.0	6.8	7.2	3.4	3.9	1.0
	Class	0.5	0.8	0.8	1.0	0.4	0.3	1.1	0.4
Tangible support **									
Low	Support	55.1	15.1	8.4	2.4	9.7	5.1	2.4	1.8
	class	4.0	3.8	3.4	2.3	3.7	2.7	4.8	4.7
Medium	Support	51.4	15.1	9.6	3.6	10.2	6.6	2.1	1.4
	class	15.7	16.1	16.2	14.5	16.5	14.8	17.4	15.5
High	Support	51.5	14.8	9.4	4.1	9.7	7.2	1.8	1.5
	class	80.2	80.1	80.4	83.2	79.7	82.5	77.8	79.8
Affection ***									
Low	Affection	58.1	12.4	7.9	3.3	10.0	3.8	2.8	1.6
	class	3.5	2.6	2.7	2.7	3.2	1.7	4.6	3.4
Medium	Affection	53.8	12.3	9.3	3.8	11.3	5.4	2.3	1.8
	class	11.7	9.3	11.2	10.9	13.0	8.7	13.3	13.5
High	Affection	51.1	15.2	9.4	4.0	9.6	7.4	1.8	1.4
	class	84.8	88.1	86.2	86.4	83.8	89.7	82.0	83.1
Social interaction *									
Low	Interaction	61.8	12.4	6.5	1.4	11.6	2.8	2.8	0.8
	class	2.9	2.0	1.7	0.8	2.8	0.9	3.5	1.3
Medium	Interaction	52.1	14.2	10.1	3.8	10.6	5.7	1.7	1.8
	class	15.8	15.0	16.9	15.1	17.0	12.7	14.0	19.1
High	Interaction	51.2	15.0	9.3	4.0	9.6	7.4	1.9	1.4
	class	81.3	83.0	81.4	84.1	80.2	86.4	82.5	79.5
Emotional/informational support *									
Low	Interaction	56.8	11.5	6.5	2.7	12.5	5.8	2.6	1.4
	class	3.2	2.3	2.0	2.0	3.8	2.4	4.1	2.8
Medium	Interaction	50.4	13.2	10.3	4.4	11.1	6.2	2.1	2.2
	class	15.7	14.4	17.7	17.9	18.3	14.1	17.8	23.9
High	Interaction	51.7	15.3	9.3	3.9	9.4	7.3	1.8	1.3
	class	81.0	83.4	80.2	80.0	77.9	83.5	78.1	73.3

*sig at p < .05, ** sig at p < .01, *** sig at p < 0.001

Table 24 Multinomial Logistic Regression of Social Variables on the Latent Classes

	C2	C3	C4	C5	C6	C7	C8
	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)	Exp(B)
Total nbr of disab. days in past 14 days due to mental health issues – compared to 0 days							
Yes	1.12*	1.06	1.33**	0.96	1.27***	1.45**	0.79
Hospitalization for mental health							
Yes	0.83*	0.86	0.64*	1.13	1.06	0.45**	1.33
Consult mental health professional							
Yes	0.90	1.03	0.70	0.86	0.87	0.64	1.16
Lifetime use of mental health resources							
Yes	1.16	1.02	1.67*	1.10	1.04	1.62	1.00
Accessibility barrier to mental health resources							
Yes	1.37	1.39	0.89	0.86	0.46	1.62	0.66
Tangible support – compared to high							
Low	1.24*	0.95	0.77	0.80	1.10	1.43	1.14
Medium	1.08	0.96	0.98	0.94	1.02	1.21	0.86
Affection – compared to high							

Low	0.83	0.91	1.00	0.86	0.61*	0.98	0.79
Medium	0.84*	0.91	0.79*	1.13	0.79*	1.07	0.82
Social interaction – compared to high							
Low	1.05	0.69	0.36**	0.94	0.31***	1.08	0.28*
Medium	1.02	0.99	1.02	0.91	0.78**	0.73*	0.99
Emotional/Informational support – compared to high							
Low	0.86	1.03	1.38	1.69***	1.91**	1.47	1.90
Medium	0.98	1.28***	1.31*	1.34***	1.24**	1.23	1.94***

*sig at $p < .05$, ** sig at $p < .01$, *** sig at $p < 0.001$

Study 4 and 5 Results

The results for the give separate risk factor models and the full final model are shown in Table 25. The modeling procedure started with the demographic variables regressed (i.e., multinomial logistic) on the problem gambling DV with the non-problem gamblers as the reference category. A forward entry variable selection algorithm kept all 6 variables. For the physical health model, the physical health variables were regressed on the problem gambling DV with the non-problem gamblers as the reference category and the demographic variables entered first as covariates. Here a forward entry algorithm retained 5 of these variables. For the psychological health model, the psychological health variables were regressed on the problem gambling DV with the non-problem gamblers as the reference category and the demographic variables entered first as covariates. Here, a forward entry algorithm retained 14 of the variables. For the substance use model, the substance use variables were regressed on the problem gambling DV with the non-problem gamblers as the reference category and the demographic variables entered first as covariates. Here, a forward entry algorithm retained 9 of the variables. For the social model, the social variables were regressed on the problem gambling DV with the non-problem gamblers as the reference category and the demographic variables entered first as covariates. Here, a forward entry

algorithm retained 4 of the variables. For the final model, all retained variables from all previous models were regressed on the problem gambling DV with the non-problem gamblers as the reference category. A forward stepwise algorithm retained 33 of the variables.

The AIC values were calculated based on the -2 log likelihood minus number of parameters in the model (Agresti, 2002). The AIC judges a model by how closely the true values match the fitted values, in terms of a certain expected value. In a model selection scenario, the lower AIC values are considered better fits and should be judged along with the rule of parsimony.

Table 25 Risk Factor Modeling with Retained Variables in Individual and the Final Models

	Retained	Model -2 log likelihood	AIC
Demographics	Age Immigration status Income Sex Education Marital status	11025.03	11019.03
Physical health	Self-perceived physical health Trouble sleeping Health description index Leisure physical activity Frequency of physical activity	53155.34	54403.708
Psychological Health	Panic attack- lifetime Distress Index Psychological well being Self-perceived mental health Self-perceived stress Learning disability Chronicity of distress Psychosis Suicide thoughts – 12 months Agoraphobia -12 months Social Phobia -12 Mania- lifetime Depression_12 Panic attack – 12 months	52217.64	54029.44
Substance use	Alcohol dependence	26799.39	28099.25

	Any drug-use - lifetime		
	Amphetamine use		
	Glue-gasoline use		
	Drug dependence		
	Ecstasy use		
	Cocaine use		
	Steroid use		
Social	Emotional/informational support	36985.24	38179.74
	Hospitalization for mental health, alcohol, or drug		
	Affection		
	Total number of disability days		
	Lifetime use of mental health resources		
Final	Gender	68911.58	71912.31
	Age		
	Marital status		
	Income		
	Education		
	Immigration status		
	Health description index		
	Self-perceived health		
	Trouble sleeping		
	Frequency of physical activity		
	Leisure activity - past 3 months		
	Self-rated mental health		
	Self-perceived stress		
	Psychological well-being - past month		
	Distress index - past month		
	Chronicity of distress		
	Major depression - 12 months		
	Suicidal thoughts - 12 months		
	Mania - lifetime		
	Panic attack - lifetime		
	Panic attack - 12 months		
	Social phobia - 12 months		
	Agoraphobia - 12 months		
	Psychosis		
	Learning disability		
	Alcohol dependence - 12 months		
	Cocaine use - lifetime		
	Amphetamine use - lifetime		
	Ecstasy use - lifetime		
	Glue, gasoline, or other solvents use - lifetime		
	Steroid use - lifetime		
	Any illicit drug use - lifetime		
	Drug dependence - 12 months		
	Number of days with disability - 2 weeks		
	Hospital for mental health or		

alcohol/drug issues
Affection
Emotional/informational support

Demographic Variables

The crosstabulation results for demographic risk factors with the different levels of the problem gambling DV are shown in Table 26. The multinomial logistic regression results are shown in

Characteristics	Within:	Non gamblers	Non- problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Gender***							
Male	Gender	21.5	47.5	24.9	3.5	2.0	0.6
	Type	43.5	49.9	50.4	61.2	66.2	60.5
Age ***							
15-19	Age	48.5	36.5	9.9	3.0	1.9	0.2
	Type	17.8	7.0	3.6	9.7	11.3	4.7
20-34	Age	23.5	49.5	21.1	3.5	1.9	0.5
	Type	23.2	25.3	20.8	30.1	29.9	27.3
35-59	Age	19.3	48.1	27.6	2.9	1.5	0.6
	Type	37.3	48.1	53.1	47.9	46.5	59.3
60-74	Age	21.5	47.4	27.8	1.9	1.2	0.2
	Type	12.7	14.5	16.4	9.8	11.3	7.0
75 or older	Age	35.5	38.9	24.1	1.2	.3	0.1
	Type	9.0	5.1	6.1	2.5	1.1	1.7
Marital status ***							
Single	Marital	32.9	44.3	16.3	3.8	2.0	0.7
	Type	34.6	24.2	17.1	34.2	34.8	35.7
Divorced./sep./widow	Marital	25.1	44.0	26.2	2.3	1.6	0.7
	Type	13.3	12.1	13.8	10.7	14.0	19.3
Married/com.-law	Marital	20.5	48.2	27.2	2.5	1.2	0.3
	Type	52.2	63.7	69.1	55.1	51.2	45.0
Income***							

Less than \$15,000	Income	35.4	37.8	21.7	2.4	2.0	0.7
	Type	12.1	6.2	6.9	6.6	9.9	11.0
\$15,001 to \$29,999	Income	26.5	44.1	24.6	2.9	1.4	0.5
	Type	17.4	13.9	15.1	15.1	13.5	16.0
\$30,000 to \$49,000	Income	24.0	44.7	26.2	3.0	1.5	0.5
	Type	23.6	21.1	24.0	23.7	22.2	24.5
\$50,000 to \$79,000	Income	19.6	50.4	25.4	2.7	1.4	0.5
	Type	23.7	29.2	28.7	26.2	24.4	30.1
\$ 80,000 or more	Income	19.7	52.4	22.9	3.0	1.7	0.3
	Type	23.3	29.7	25.3	28.3	30.0	18.4
Education ***							
Less than secondary	Edu.	30.7	40.8	23.2	3.1	1.7	0.5
	Type	32.4	22.1	24.4	28.5	29.2	25.1
Secondary grad.	Edu.	20.4	47.4	26.2	3.6	1.8	0.6
	Type	16.1	19.1	20.4	24.2	22.8	25.7
Post-sec. grad.	Edu.	22.4	48.9	25.0	2.2	1.2	0.4
	Type	43.8	49.2	48.7	36.8	36.6	38.9
Other Post-sec.	Edu.	22.3	52.8	18.8	3.5	2.0	0.6
	Type	7.8	9.5	6.5	10.5	11.4	10.2
Immigration Status***							
Yes	Status	32.6	40.8	22.8	2.2	1.2	0.4
	Type	29.9	19.3	20.8	17.2	18.3	19.3

Table 27. The results from the crosstabulations showed that all demographic variables were significant at $p < 0.001$.

The results of the multinomial logistic regression showed that the odds of being male were significantly higher for all types of the problem gambling DV, compared to the non-gambler type. For age, all age categories were compared to

35-39 year olds among all levels of the DV and these results showed that the odds of being in any of the levels of the problem gambling DV, compared to non gambler level, were significantly lower for adolescents (15-10 years old) than for 35 to 39 year olds. The results for the variable marital status show that the odds of being single, compared to married, were significantly lower for non-problem and not gamblers when compared to non gamblers, but that ratio was significantly higher for low-risk and problem gamblers. The moderate-risk gamblers were more likely (but not significant) to be single, as opposed to married, compared to non-gamblers. The odds of being divorced/separated/widowed, compared to being married, were higher for all levels of the DV than they were for non-gamblers, although the increase in the odds were not significant for the not gamblers. The income category results showed that compared to non-gamblers, non-problem, not gamblers and low risk gamblers were significantly less likely to have incomes less than \$15,000, as opposed to between \$30,000 and \$49,000. Only some of the education odds ratios were significant. Compared to non-gamblers, non-problem gamblers were significantly less likely (25% less) to have less than secondary education, as opposed to other post-secondary education. Compared to non-gamblers, not gamblers had a significant increase in odds (19% more) of having only secondary education as opposed to other post-secondary education. Immigrants were significantly less likely to be in any of the levels of the DV compared to non-gambler level

Table 26 Crosstabulations of Demographic Variables with the Problem Gambling DV

Characteristics	Within:	Non	Non-	Not a	Low	Mod.	Problem
		gamblers	problem	gambler	risk	risk	gambler

Gender***							
Male	Gender	21.5	47.5	24.9	3.5	2.0	0.6
	Type	43.5	49.9	50.4	61.2	66.2	60.5
Age ***							
15-19	Age	48.5	36.5	9.9	3.0	1.9	0.2
	Type	17.8	7.0	3.6	9.7	11.3	4.7
20-34	Age	23.5	49.5	21.1	3.5	1.9	0.5
	Type	23.2	25.3	20.8	30.1	29.9	27.3
35-59	Age	19.3	48.1	27.6	2.9	1.5	0.6
	Type	37.3	48.1	53.1	47.9	46.5	59.3
60-74	Age	21.5	47.4	27.8	1.9	1.2	0.2
	Type	12.7	14.5	16.4	9.8	11.3	7.0
75 or older	Age	35.5	38.9	24.1	1.2	.3	0.1
	Type	9.0	5.1	6.1	2.5	1.1	1.7
Marital status ***							
Single	Marital	32.9	44.3	16.3	3.8	2.0	0.7
	Type	34.6	24.2	17.1	34.2	34.8	35.7
Divorced./sep./widow	Marital	25.1	44.0	26.2	2.3	1.6	0.7
	Type	13.3	12.1	13.8	10.7	14.0	19.3
Married/com.-law	Marital	20.5	48.2	27.2	2.5	1.2	0.3
	Type	52.2	63.7	69.1	55.1	51.2	45.0
Income***							
Less than \$15,000	Income	35.4	37.8	21.7	2.4	2.0	0.7
	Type	12.1	6.2	6.9	6.6	9.9	11.0
\$15,001 to \$29,999	Income	26.5	44.1	24.6	2.9	1.4	0.5
	Type	17.4	13.9	15.1	15.1	13.5	16.0
\$30,000 to \$49,000	Income	24.0	44.7	26.2	3.0	1.5	0.5
	Type	23.6	21.1	24.0	23.7	22.2	24.5
\$50,000 to \$79,000	Income	19.6	50.4	25.4	2.7	1.4	0.5
	Type	23.7	29.2	28.7	26.2	24.4	30.1
\$ 80,000 or more	Income	19.7	52.4	22.9	3.0	1.7	0.3
	Type	23.3	29.7	25.3	28.3	30.0	18.4
Education ***							
Less than secondary	Edu.	30.7	40.8	23.2	3.1	1.7	0.5

	Type	32.4	22.1	24.4	28.5	29.2	25.1
Secondary grad.	Edu.	20.4	47.4	26.2	3.6	1.8	0.6
	Type	16.1	19.1	20.4	24.2	22.8	25.7
Post-sec. grad.	Edu.	22.4	48.9	25.0	2.2	1.2	0.4
	Type	43.8	49.2	48.7	36.8	36.6	38.9
Other Post-sec.	Edu.	22.3	52.8	18.8	3.5	2.0	0.6
	Type	7.8	9.5	6.5	10.5	11.4	10.2
Immigration Status***							
Yes	Status	32.6	40.8	22.8	2.2	1.2	0.4
	Type	29.9	19.3	20.8	17.2	18.3	19.3

Table 27 Multinomial Logistic Regression of Demographic Variables on the Problem Gambling DV

Gambling Types – compared to non-gamblers	Non-problem gamblers	Not a gambler	Low risk gamblers	Moderate risk gamblers	Problem gamblers
	Exp (B)	Exp (B)	Exp (B)	Exp (B)	Exp (B)
Gender – compared to females					
Males	1.13***	1.21***	1.68***	1.76***	1.60**
Age- compared to 35-59 years old					
15-19	0.33***	0.20***	0.33***	0.26***	0.16***
20-34	0.93	0.75***	1.05	0.99	0.78
60-74	0.91*	0.88**	0.65***	0.40***	0.27***
75 and older	0.51***	0.45***	0.23***	0.09***	0.00
Marital status- compared to married					
Single	0.92*	0.71***	1.27*	1.06	1.98**
	1.13**	1.06	1.36**	1.43**	2.19***
Divorced/separated/widowed					
Income- compared to between \$30,000 and \$49,000					
less than \$15,000	0.61***	0.62***	0.68**	0.90	0.82

between \$15,000 and \$29,999	0.88 ^{***}	0.93	0.88	0.98	0.94
between \$50,000 and \$79,000,	1.26 ^{***}	1.11 [*]	1.10	1.13	0.92
\$80,000 or more	1.23 ^{***}	0.87 [*]	1.09	1.18	0.69
Education- compared to other post-secondary					
Less than secondary	0.75 ^{***}	1.02	1.02	1.31	1.45
Secondary graduation	0.95	1.19 [*]	1.30	1.30	1.53
Post-secondary graduation	0.79 ^{***}	0.93	0.66 ^{***}	0.63 [*]	0.88
Immigration Status					
Yes	0.56 ^{***}	0.53 ^{***}	0.56 ^{***}	0.46 ^{***}	0.55 [*]

* p < 0.05; ** p < 0.01; *** p < 0.001

Physical Health Variables

Crosstabulations with the different levels of the problem gambling DV for the physical health variables that were retained in the model are shown in Table 28.

The results from the crosstabulations showed that all physical health variables were significant at p < 0.001.

Table 28 Crosstabulations of Physical Health Variables with the DV

Characteristics	Within:	Non gamblers	Non-problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Self-perceived health ^{***}							
Poor	Health	29.1	41.5	22.7	3.8	1.6	1.3
	Type	3.7	2.7	2.9	4.2	3.3	8.7
Fair to good	Health	22.9	46.6	24.9	3.1	1.9	.5
	Type	41.3	43.6	44.9	48.0	54.9	50.9
Very good	Health	25.0	47.1	23.8	2.5	1.2	0.4
	Type	55.0	53.7	52.3	47.9	41.8	40.5
Trouble sleeping ^{***}							
None	Level	25.0	45.7	25.2	2.3	1.4	0.3
	Type	44.0	41.8	44.4	35.8	39.4	31.4
Sometimes	Level	23.8	48.6	22.6	3.0	1.5	0.5

	Type	43.2	45.7	40.8	47.4	43.6	48.3
Most/always	Level	23.2	43.7	26.9	3.5	1.9	0.7
	Type	12.8	12.5	14.8	16.8	17.1	20.3
Health description index ***							
Poor	Health	29.6	40.1	27.0	1.8	.5	1.0
	Type	3.1	2.1	2.8	1.7	0.9	5.3
Fair to good	Health	24.0	44.6	25.5	3.3	2.0	0.6
	Type	36.3	35.0	38.4	43.2	48.1	48.0
Very good	Health	24.1	48.3	23.5	2.5	1.3	0.4
	Type	60.6	62.9	58.8	55.1	51.0	46.8
Leisure activity***							
Yes	Yes	23.7	47.3	24.2	2.9	1.5	0.5
	Type	90.7	94.0	92.3	94.7	93.1	91.9
Frequency of all physical activity ***							
Regularly	Level	23.7	47.9	23.9	2.6	1.5	0.4
	Type	66.4	68.5	65.7	62.9	65.5	57.6

*sig at p <.05, ** sig at p < .01, *** sig at p < 0.001

Psychological Health Variables

Crosstabulations with the different levels of the DV for the psychological health variables retained in the model are shown in Table 29. The results from the crosstabulations showed that all psychological health variables were significant at p <0.001.

Table 29 Crosstabulations of Psychological Health Variables with the DV

Characteristics	Within:	Non	Non-	Not a	Low	Mod.	Problem
		gamblers	problem	gambler	risk	risk	gambler
Self-perceived stress***							
Low	Stress	26.4	45.2	24.9	2.1	1.2	0.3
	Type	39.6	35.2	37.3	27.6	28.3	21.6

Medium	Stress	23.2	48.0	23.4	3.1	1.9	0.4
	Type	38.8	41.6	39.1	45.1	50.3	36.8
High	Stress	22.7	46.9	24.9	3.3	1.4	0.8
	Type	21.6	23.3	23.7	27.3	21.4	41.5
Psychological well-being ***							
Poor	Level	35.5	36.4	20.8	1.7	2.6	3.0
	Type	0.9	0.5	0.5	0.4	1.1	4.1
Fair to good	Level	25.5	46.1	21.1	4.1	2.0	1.1
	Type	18.8	17.4	15.4	25.6	23.8	43.2
Very good	Level	23.7	47.1	25.0	2.6	1.4	.3
	Type	80.3	82.1	84.0	74.0	75.1	52.7
Distress scale ***							
High	Index	31.2	43.1	15.3	6.4	.5	3.5
	Type	0.7	0.5	0.3	1.3	0.2	4.1
Medium	Index	25.7	39.1	26.2	4.8	3.0	1.2
	Type	8.5	6.7	8.6	13.6	16.0	19.9
Low	Index	24.0	47.4	24.2	2.6	1.4	0.4
	Type	90.8	92.8	91.1	85.1	83.8	76.0
Chronicity of distress/impairment scale ***							
More	Index	21.5	48.5	23.4	4.2	1.7	0.7
	Type	12.6	14.7	13.6	21.0	16.5	22.1
Same	Index	24.6	46.9	24.1	2.5	1.4	0.4
	Type	69.6	68.6	69.7	60.2	63.7	64.5
Less	Index	24.7	44.6	25.7	3.0	1.7	0.4
	Type	17.8	16.7	18.5	18.7	19.8	13.4
Depression- 12 month ***							
Yes	Yes	28.1	42.5	22.8	3.3	2.0	1.4
	Type	5.6	4.4	4.5	5.6	6.4	14.0
Suicidal thoughts – 12 months ***							
Yes	Yes	29.5	37.7	22.7	5.5	2.2	2.4
	Type	4.5	3.0	3.5	7.2	5.5	18.6
Mania – life ***							
Yes	Yes	21.5	43.5	24.4	4.4	3.4	2.9
	Type	2.1	2.2	2.4	3.7	5.3	14.6

Social phobia – 12 months***							
Yes	Yes	24.5	45.4	20.6	5.8	1.7	1.9
	Type	3.1	2.9	2.6	6.3	3.5	12.4
Panic attacks- life***							
Yes	Yes	20.9	48.5	23.4	4.0	2.3	1.0
	Type	17.8	21.4	19.8	29.5	31.8	43.2
Panic attacks – 12 months***							
Yes	Yes	23.6	46.9	21.8	3.4	2.9	1.3
	Type	7.8	8.0	7.2	9.8	15.7	22.6
Agoraphobia – 12 months***							
Yes	Yes	29.9	42.4	20.7	1.1	3.7	2.2
	Type	0.9	0.7	0.6	0.3	1.8	3.5
Psychosis – diagnosed by a health practitioner***							
Yes	Yes	36.1	43.7	14.2	2.2	1.6	2.2
	Type	1.3	0.8	0.5	0.7	0.9	4.1
Learning disability***							
Yes	Yes	33.8	39.7	19.7	2.4	2.6	1.9
	Type	3.1	1.9	1.8	1.8	3.8	8.7
Self-Perceived Mental Health ***							
Poor	Level	37.8	31.9	21.5	3.3	1.9	3.5
	Type	1.8	0.8	1.0	1.4	1.5	8.7
Fair to good	Level	24.4	45.0	24.3	3.6	2.1	0.7
	Type	32.0	30.6	31.7	40.7	44.8	46.5
Very good	Level	23.9	47.8	24.3	2.4	1.2	.3
	Type	66.2	68.6	67.2	57.9	53.7	44.8

*sig at p <.05, ** sig at p < .01, *** sig at p < 0.001

Substance-use Variables

Crosstabulations with the different levels of the DV for the substance-use variables retained in the model are shown in Table 30. The results from the

crosstabulations showed that all substance use variables were significant at $p < 0.001$.

Table 30 Crosstabulations of Substance-use Variables with the DV

Within:		Non gamblers	Non- problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Cocaine use ***							
Yes	Yes	19.2	45.8	24.6	5.5	3.2	1.7
	Type	6.4	7.9	8.1	15.6	17.1	28.5
Amphetamine use ***							
Yes	Yes	21.6	43.5	24.0	6.6	3.4	1.0
	Type	4.1	4.3	4.5	10.8	10.5	9.9
Ecstasy use ***							
Yes	Yes	23.8	48.4	19.0	5.3	2.9	0.6
	Type	2.9	3.1	2.3	5.5	5.6	4.1
Glue or gasoline use							
Yes	Yes	17.9	46.9	18.8	7.5	5.9	2.9
	Type	0.9	1.2	0.9	3.2	4.7	7.6
Steroid use ***							
Yes	Yes	13.2	54.4	16.7	10.8	4.9	.0
	Type	0.3	0.6	0.4	2.1	1.8	0.0
Any drug use - life ***							
Yes	Yes	19.4	49.4	23.7	4.1	2.5	0.9
	Type	26.9	35.5	32.8	48.7	56.5	62.8
Drug dependence ***							
	Yes	25.3	42.1	12.6	7.7	9.5	2.8
	Type	0.8	0.7	0.4	2.1	4.9	4.7
Alcohol dependence ***							
High	Interaction	17.9	46.2	18.8	7.4	7.0	2.8
	Type	1.9	2.5	2.0	6.8	12.0	15.3
Low	Interaction	16.2	52.4	20.4	6.2	3.6	1.1
	Type	4.2	7.0	5.2	13.7	15.0	15.3
None	Interaction	25.0	46.3	24.7	2.4	1.2	0.4

Type	93.9	90.5	92.8	79.5	73.0	69.4
------	------	------	------	------	------	------

*sig at p <.05, ** sig at p < .01, *** sig at p < 0.001

Social Variables

Crosstabulations with the different levels of the DV for the social variables retained in the model are shown in Table 31. The results from the crosstabulations showed that all physical health variables were significant at p <0.001.

Table 31 Crosstabulations of Social Variables with the DV

Within:		Non gamblers	Non- problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Total number of disability days ***							
1 to 14	Days	23.6	47.9	22.7	3.4	1.8	0.6
	Type	13.0	13.6	12.4	16.1	15.6	17.5
Hospitalization for mental health, alcohol, or drug issues ***							
Yes	Yes	28.6	42.1	21.6	2.9	2.4	2.3
	Type	5.7	4.3	4.3	5.0	7.8	23.3
Lifetime use of mental health resources ***							
Yes	Yes	23.2	47.6	23.2	3.3	1.8	0.9
	Type	24.4	25.9	24.3	30.3	31.1	47.7
Emotional/informational support ***							
Low	Support	27.2	41.5	21.4	4.2	4.3	1.5
	Type	3.3	2.6	2.6	4.3	8.3	9.4
Medium	Support	23.5	46.3	22.8	4.2	2.1	1.1
	Type	15.8	15.9	15.2	24.2	22.3	36.8
High	Interaction	24.0	47.3	24.6	2.5	1.3	0.3
	Type	80.9	81.6	82.2	71.5	69.4	53.8
Affection ***							
Low	Support	32.8	37.6	20.6	4.1	3.2	1.7
	Type	4.3	2.5	2.7	4.6	6.6	11.1
Medium	Support	25.3	43.3	23.6	4.6	2.4	0.9

	Type	11.8	10.3	10.9	18.2	17.6	20.5
High	Interaction	23.5	47.7	24.5	2.6	1.3	0.4
	Type	83.9	87.1	86.4	77.2	75.9	68.4

The results of the multinomial logistic regression for the full model are shown in Table 32.

Table 32 Multinomial Logistic Regression of Variables for the Final Model for All Classes (in order of entry into the model)

Risk Factor:	Non-gambler Exp (B)	Low risk Exp (B)	Moderate risk Exp (B)	Problem gambler Exp (B)	Not a gambler Exp (B)
Emotional/informational support- compared to High					
Low	0.74**	1.17	2.24**	1.42	0.89
Medium	0.86**	1.16	1.10*	2.36***	0.88**
Hospital for mental health or alcohol/drug issues – lifetime					
Yes	1.30***	0.68*	1.19	2.46**	0.92
Ecstasy use					
Yes	0.89	0.58**	0.55*	0.46	0.82
Glue-Gasoline use					
Yes	0.77	1.44	1.87*	1.71	0.68**
Amphetamine use					
Yes	1.39***	1.91***	1.20	0.47*	1.18*
Alcohol dependence scale – compared to None					
High	0.79*	1.56**	2.87***	3.15***	0.99
Low	0.71***	1.61***	1.83***	2.07**	0.81**
Mania – life					
Yes	0.97	0.89	1.06	2.66**	1.12
Agoraphobia – 12 months					
Yes	1.45*	0.29	1.74	1.47	0.99
Suicide thought – 12 months					
Yes	1.09	1.65**	0.82	2.17**	1.17
Psychosis – life					

Yes	1.20	0.56	0.52	0.70	0.60*
Self-perceived stress – compared to Low					
High	0.91	1.15	0.82	1.07	1.00
Medium	0.93	1.20*	1.37**	0.93	0.92*
Psychological wellbeing – compared to Very good					
Poor	1.08	0.31	1.07	2.06	0.88
Fair to good	0.99	0.98	0.86	2.09**	0.84***
Panic attacks – life					
Yes	0.79***	1.41***	1.16	1.49	0.91*
Trouble sleeping – compared to None					
Most/Always	0.96	1.18	1.13	0.91	1.05
Sometimes	0.91**	1.09	0.90	1.13	0.88***
Leisure activity					
Yes	0.74***	1.43*	1.05	1.04	0.97
Immigrant status					
Yes	1.79***	1.07	1.30*	1.97**	1.00
Marital status – compared to					
Married/common-law					
Single	1.08	1.23*	1.01	1.40	0.75***
Divorce/separate/widow	0.91	0.95	1.30	1.81*	0.96
Age – compared to 35- 59 years old					
15-19	3.44***	0.93	1.31	0.61	0.61***
20-34	1.23***	1.05	1.08	0.79	0.87***
60-75	0.90*	0.74*	0.88	0.70	0.91*
75 or older	1.57***	0.47**	0.24**	0.00	0.86*
Gender					
Males	0.81***	1.45***	1.64***	1.27	1.06
Income – compared to					
\$30,000 - \$49,000					
Less than \$15,000	1.58***	0.87	1.10	0.70	1.00
\$15,000 to \$29,999	1.07	0.95	0.90	1.08	0.92
\$50,000 to \$79,000	0.76***	0.83	0.83	1.16	0.88**
\$ 80,000 or more	0.77***	0.91	1.06	0.73	0.77***
Education- compared to					
Other post-secondary					
Less than secondary	1.33***	1.56**	1.31	1.25	1.43***
Secondary grad.	1.10	1.37*	1.23	1.74	1.40***
Post-secondary grad.	1.37***	0.80	0.81	1.04	1.30***
Health description index – compared to Very good					
Poor	1.16	0.43*	0.35	1.12	1.62**

Fair to good	1.05	1.19	1.40**	1.51	1.20***
Self-perceived health – compared to Very good					
Poor	0.87	1.89**	1.60	1.43	0.63**
Fair to good	0.83***	0.95	1.10	0.66	0.92*
Frequency all physical activity					
Regular	0.96	0.78**	0.96	0.69	0.93*
Distress Index – compared to Low					
High	1.14	3.13**	0.27	0.89	0.57*
Medium	1.00	1.35*	1.94***	0.79	1.42***
Self-perceived mental health – compared to Very good					
Poor	1.77**	0.78	1.62	2.09	1.27
Fair to good	1.10*	1.12	1.31*	1.09	1.01
Learning disability					
Yes	1.47***	0.51*	0.94	2.61**	0.90
Chronicity of distress – compared to Same as before					
More	0.86**	1.37**	0.90	0.96	0.98
Less	1.03	1.22*	1.37**	0.82	1.11**
Social phobia – 12 months					
Yes	0.95	1.63**	0.57*	1.29	1.00
Depression – 12 months					
Yes	1.09	0.64*	0.65	0.44*	0.98
Panic attacks – 12 months					
Yes	1.12	0.72*	1.35	1.28	1.02
Any drug use – lifetime					
Yes	0.81***	1.12	1.56***	1.80*	0.98
Drug dependence					
Yes	0.87	0.81	2.36**	1.24	0.77
Cocaine use					
Yes	1.09	1.16	1.08	2.16**	1.12
Steroid use					
Yes	0.72	2.04**	1.16	0.16	0.76
Lifetime use of mental health resources					
Yes	0.93	1.13	1.02	0.72	0.88**
Affection support – compared to High					
Low	1.56***	1.45	1.46	0.98	1.06
Medium	1.13*	1.58***	1.38*	0.80	1.17**

Study 6 Results

In this study, multinomial logistic regression modeling was performed in the same manner as in the last two studies, but separately for each latent class. Results include retained variables for each subset of risk factors. They are shown below for each latent class separately. The results for the final models for each latent class are shown in Table 33.

Class 1

Demographic model: Age; Income; Immigration status; Sex; Marital status; Education.

Physical model: Trouble sleeping; Health description index; Frequency of physical activity; Participation in daily physical activity lasting more than 15 min; Self-perceived health.

Psychological model: Distress index; Psychosis; Panic attacks – lifetime; Self-perceived stress; Psychological well-being; Suicidal thought – 12 months; Panic disorder – 12 months; Self-perceived mental health; Depression – 12 months; Learning disability; Agoraphobia – lifetime; Agoraphobia – 12 months.

Substance-use model: Amphetamine use; Any drug use – lifetime.

Social model: Hospitalization for mental health, alcohol, or drug issues; Affection, Tangible support.

Class 2

Demographic model: Marital status; Education; Income; Immigration status.

Physical model: Trouble sleeping.

Psychological model: Self-perceived stress; Agoraphobia – lifetime; Mania- 12 months.

Substance-use model: None.

Social model: Emotional/informational support.

Class 3

Demographic model: Income; Age; Immigration status; Sex; Education.

Physical model: Self-perceived health; Chronic condition, Health description Index; Leisure activity; Frequency of physical activity lasting > 15 minutes.

Psychological model: Suicidal thought - 12 months; Chronicity of distress; Panic attacks - 12 months; Panic attacks - lifetime; Distress index; Psychological well-being; Mania - lifetime

Substance-use model: Glue and gasoline use; Alcohol dependence; Drug dependence; Ecstasy; Any drug use – lifetime; Steroid use.

Social model: Consult mental health professional; Emotional/informational support; Tangible support; Hospitalization for mental health, alcohol, or drug.

Class 4

Demographics: Age; Sex; Income; Marital Status.

Physical health: Trouble sleeping; Participation in physical activity >15 minutes.

Psychological health: Psychological well-being; Social phobia - lifetime; Mania – lifetime.

Substance-use: Alcohol dependence; Ecstasy use; Hallucinogens, PCP, and LSD use; Any drug use lifetime.

Social: Tangible support; Lifetime use of mental health resources; Affection.

Class 5

Demographics: Marital status; Education; Age; Sex; Income.

Physical health: Trouble sleeping; Chronic condition; Self-perceived health.

Psychological health: Suicidal thought - lifetime; Psychological well-being; Panic attacks - 12 months; depression - lifetime; Distress index; Panic attacks - lifetime; Chronicity of distress; Suicidal attempt - 12 months; Mania- lifetime; Social phobia - 12 months; Social phobia - lifetime; Self-perceived stress; Suicidal thought - 12 months.

Substance-use: Cocaine use; Amphetamine use; Hallucinogens, PCP, and LSD; Any drug use - lifetime; Ecstasy use; Steroid use; Cannabis use.

Social: Hospitalization for mental health, alcohol, or drug issues; Emotional/informational support; Lifetime use of mental health resources; Affection.

Class 6

Demographics: Education; Income; Marital status; Age.

Physical health: Frequency of physical activity >15 minutes; Health description index; Trouble sleeping.

Psychological health: Self-perceived mental health; Suicidal thought - 12 months; Agoraphobia - lifetime; Learning disability; Chronicity of distress.

Substance-use: Hallucinogens, PCP, and LSD use; Steroid use; Glue and gasoline use; Ecstasy use; Any drug use – lifetime.

Social model: Social interaction; Hospitalization for mental health, alcohol, or drug issues.

Class 7

Demographics: Immigration status; Marital status; Education; Income.

Physical health: Trouble sleeping.

Psychological health:: Chronicity of distress; Panic disorder - lifetime; Social phobia - 12 months; Mania - 12 months; agoraphobia - lifetime; Suicide attempt - lifetime; Panic disorder - lifetime.

Substance-use: Alcohol dependence; Cocaine use; Hallucinogens, PCP, and LSD use.

Social: Affection; Social interaction; Consultation with mental health professional.

Class 8

Demographics: Education; Immigration status; Age; Income.

Physical health: Chronic condition; Leisure physical activity >15 minutes.

Psychological health: Self-perceived mental health; Mania - lifetime; Learning disability; Self-perceived stress; Panic attacks - 12 months; Suicidal thought - 12 months; Mania - 12 months; Psychological well-being; Panic disorder - 12 months.

Substance: Any drug use – lifetime; Amphetamine use; Alcohol dependence.

Social: Emotional/informational support; Affection; Lifetime use of mental health resources.

Table 33 Results of Final Models for Each Latent Class

Latent Class	Final Model
Class 1	Gender Age Marital status Income Education Immigration status Trouble sleeping Frequency of physical activity Daily physical activity Self-perceived stress Psychological well-being - past month Distress index - past month Major depression - 12 months

	Suicidal thoughts - 12 months Panic attack - lifetime Learning disability Amphetamine use - lifetime Hospital for mental health or alcohol/drug issues - lifetime Tangible support Affection
Class 2	Marital status Income Education Immigration status Trouble sleeping Self-perceived stress Agoraphobia - lifetime Emotional/informational support
Class 3	Gender Age Income Education Immigration status Health description index Self-perceived health Chronic condition Frequency of physical activity Leisure activity - past 3 months Psychological well-being - past month Distress index - past month Chronicity of distress Suicidal thoughts - 12 months Alcohol dependence - 12 months Ecstasy use - lifetime Glue, gasoline, or other solvents use - lifetime Any illicit drug use - lifetime Drug dependence - 12 months Hospital for mental health or alcohol/drug issues - lifetime Tangible support Emotional/informational support
Class 4	Gender Age Income Trouble sleeping Daily physical activity Psychological well-being - past month Mania - lifetime Social phobia - lifetime

	Alcohol dependence - 12 months Ecstasy use - lifetime Hallucinogens, PCP, or LSD use - lifetime Any illicit drug use - lifetime Use of resources for mental health, alcohol/drug issues, or emotional problems - lifetime Tangible support Affection
Class 5	Gender Marital status Education Trouble sleeping Chronic condition Self-perceived stress Psychological well-being - past month Distress index - past month Chronicity of distress Major depression - lifetime Suicidal thoughts - lifetime Suicidal thoughts - 12 months Suicide attempt - 12 months Mania - lifetime Panic attack - lifetime Panic attack - 12 months Alcohol dependence - 12 months Cannabis use - lifetime Cocaine use - lifetime Amphetamine use - lifetime Ecstasy use - lifetime Hallucinogens, PCP, or LSD use - lifetime Steroid use - lifetime Hospital for mental health or alcohol/drug issues - lifetime
Class 6	Education Frequency of physical activity Self-rated mental health Suicidal thoughts - 12 months
Class 7	Marital status Income Education Immigration status Chronicity of distress Suicide attempt - lifetime Panic disorder - lifetime Agoraphobia - lifetime Alcohol dependence - 12 months

	Cocaine use - lifetime
	Hallucinogens, PCP, or LSD use - lifetime
	Affection
	Social interaction
Class 8	Age
	Marital status
	Education
	Immigration status
	Self-rated mental health
	Self-perceived stress
	Psychological well-being - past month
	Suicidal thoughts - 12 months
	Mania - lifetime
	Mania - 12 months
	Panic attack - 12 months
	Panic disorder - 12 months
	Learning disability
	Alcohol dependence - 12 months
	Use of resources for mental health, alcohol/drug issues, or emotional problems - lifetime
	Affection
	Emotional/informational support

Class by class cross tabulation results for some noteworthy variables such as last 12-month depression, last 12-month suicide thought, lifetime mania, lifetime any drug use, and lifetime hospitalization for mental health or alcohol/drug use with the problem gambling DV are shown in

Table 34, Table 35, Table 36, Table 37, and Table 38 respectively.

Table 34 Class-by-class Crosstabulations of Last 12-months Depression with the Problem Gambling DV

	Within:	Non gamblers	Non-problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Class 1							
Yes	Yes	51.4	33.5	14.9	0.1	0.1	0.0
	Types	5.6	4.9	4.1	2.0	3.8	0.0
Class 2							
Yes	Yes	-	71.1	24.7	1.5	0.0	0.0
	Type	-	4.7	5.2	7.1	0.0	0.0
Class 3							
Yes	Yes	-	43.8	43.2	7.5	2.7	2.7
	Type	-	3.8	4.1	6.9	7.5	20.0
Class 4							
Yes	Yes	-	62.5	17.9	5.4	10.7	3.6

	Type	-	3.8	2.7	3.4	13.0	33.3
Class 5							
Yes	Yes	-	38.1	45.5	7.4	5.7	3.4
	Type	-	3.7	5.7	5.8	8.3	15.0
Class 6							
Yes	Yes	-	58.2	23.1	8.8	4.4	5.5
	Type	-	3.1	3.7	4.3	4.3	21.7
Class 7							
Yes	Yes	-	31.0	20.7	31.0	10.3	6.9
	Type	-	2.7	5.3	6.2	3.7	8.7
Class 8							
Yes	Yes	-	27.0	10.8	27.0	21.6	13.5
	Type	-	5.2	7.1	8.1	7.0	10.0

Table 35 Class-by-class Crosstabulations of Last 12-month Suicide Thought with the Problem Gambling DV

	Within:	Non gamblers	Non-problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Class 1							
Yes	Yes	56.4	24.7	18.2	0.3	0.1	0.3
	Types	4.5	2.7	3.7	4.0	3.7	40.0
Class 2							
Yes	Yes	-	69.9	28.6	1.0	0.0	0.5
	Type	-	3.5	4.0	3.6	0.0	20.0
Class 3							
Yes	Yes	-	41.0	31.9	19.4	2.8	4.9
	Type	-	3.5	3.0	17.4	7.5	35.0
Class 4							
Yes	Yes	-	68.4	10.5	8.8	8.8	3.5
	Type	-	4.2	1.6	5.8	10.9	33.3
Class 5							
Yes	Yes	-	38.0	42.6	8.5	8.5	2.3
	Type	-	2.7	3.9	4.9	9.1	7.7
Class 6							
Yes	Yes	-	55.01	16.2	20.0	2.5	6.2
	Type	-	2.6	2.3	8.6	2.2	21.7
Class 7							
Yes	Yes	-	16.7	8.3	41.7	16.7	16.7
	Type	-	0.6	0.9	3.5	2.5	8.7
Class 8							
Yes	Yes	-	17.2	10.3	17.2	20.7	34.5
	Type	-	2.6	5.3	4.0	5.4	20.0

Table 36 Class-by-class Crosstabulations of Lifetime Mania with the Problem Gambling DV

	Within:	Non gamblers	Non-problem	Not a gambler	Low risk	Mod. risk	Problem gambler
--	---------	--------------	-------------	---------------	----------	-----------	-----------------

Class 1							
Yes	Yes	51.2	31.4	17.4	0.0	0.0	0.0
	Types	2.1	1.7	1.8	0.0	0.0	0.0
Class 2							
Yes	Yes	-	72.7	25.2	0.7	0.0	1.4
	Type	-	2.6	2.6	1.8	0.0	40.0
Class 3							
Yes	Yes	-	52.4	32.1	7.1	7.1	1.2
	Type	-	2.6	1.8	3.8	11.5	5.0
Class 4							
Yes	Yes	-	32.7	40.8	10.2	12.2	4.1
	Type	-	1.7	5.4	5.7	13.0	33.3
Class 5							
Yes	Yes	-	37.1	40.2	9.3	7.2	6.2
	Type	-	2.0	2.8	4.0	5.8	15.0
Class 6							
Yes	Yes	-	57.1	28.6	4.3	4.3	5.7
	Type	-	2.3	3.5	1.6	3.3	17.4
Class 7							
	Yes	-	56.5	17.4	17.4	8.7	0.0
	Type	-	3.9	3.5	2.8	2.5	0.0
Class 8							
Yes	Yes	-	21.6	5.4	29.7	16.2	27.0
	Type	-	4.2	3.6	8.9	5.4	20.0

Table 37 Class-by-class Crosstabulations of Lifetime Any Drug Use with the Problem Gambling DV

	Within:	Non gamblers	Non- problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Class 1							
Yes	Yes	45.1	37.3	17.3	0.2	0.1	0.1
	Types	26.9	30.1	26.2	18.4	23.1	60.0
Class 2							
Yes	Yes	-	71.1	26.9	1.2	0.6	0.1
	Type	-	35.9	38.8	44.6	66.7	60.0
Class 3							
Yes	Yes	-	48.6	42.9	6.1	1.6	0.7
	Type	-	37.1	36.0	48.8	39.5	45.0
Class 4							
Yes	Yes	-	65.9	22.6	7.0	4.2	0.3
	Type	-	54.7	46.8	62.8	69.6	33.3
Class 5							
Yes	Yes	-	46.1	36.6	9.2	6.0	2.1
	Type	-	27.9	28.2	44.4	53.3	59.0
Class 6							
Yes	Yes	-	65.5	21.6	6.7	4.8	1.5
	Type	-	44.2	43.5	41.6	59.1	73.9
Class 7							
	Yes	-	45.2	18.5	20.0	13.0	3.3
	Type	-	61.2	73.7	63.2	72.8	65.2

Class 8							
Yes	Yes	-	34.5	6.8	24.2	22.1	12.5
	Type	-	50.8	32.8	54.8	54.9	70.0

Table 38 Class-by-class Crosstabulations of Lifetime Hospitalization for Mental Health or Alcohol/Drug Use with the Problem Gambling DV

	Within:	Non gamblers	Non- problem	Not a gambler	Low risk	Mod. risk	Problem gambler
Class 1							
Yes	Yes	53.9	29.6	15.7	0.4	0.1	0.2
	Types	5.7	4.2	4.2	8.2	3.7	40.0
Class 2							
Yes	Yes	-	69.3	28.2	1.7	0.4	0.4
	Type	-	4.2	4.8	7.3	5.3	20.0
Class 3							
Yes	Yes	-	51.1	35.6	5.2	3.4	4.6
	Type	-	5.3	4.1	5.6	11.3	40.0
Class 4							
Yes	Yes	-	63.2	23.7	7.9	2.6	2.6
	Type	-	2.6	2.4	3.5	2.2	16.7
Class 5							
Yes	Yes	-	45.5	31.8	6.8	10.5	5.5
	Type	-	5.6	5.0	6.7	19.0	30.0
Class 6							
Yes	Yes	-	68.2	18.7	3.7	2.8	6.5
	Type	-	4.3	3.5	2.2	3.3	30.4
Class 7							
	Yes	-	35.3	35.3	17.6	0.0	11.8
	Type	-	1.8	4.3	2.1	0.0	8.7
Class 8							
Yes	Yes	-	33.3	2.8	22.2	22.2	19.4
	Type	-	6.3	1.8	6.5	7.1	14.0

DISCUSSION

The Discussion will center on the relationship of the present findings to the main aims of this study as well as to the literature on both the psychology of gambling and the characteristics of gamblers. It will also discuss the limitations of the present studies, and will raise questions for future research.

Descriptives

The results of the descriptive analyses show that at the time of CCHS Cycle 1.2 data collection, slightly over three quarters of the Canadian population wagered. Among these gamblers, less than five percent had developed some level of PG, with the lower severity more prevalent than the moderate or higher severity. The 0.5% prevalence of problem gamblers is less than that reported by key prevalence studies (e.g., see Korn & Shaffer, 1999). This may be due to the nature of epidemiological study designs and survey data collection, as well as community samples, where it is more difficult to obtain accurate or readily verifiable data. The CCHS Cycle 1.2 data was collected through one-on-one interviews without the benefit of third party corroboration or clinical judgement. These can potentially lead to measurement biases such as recall or observation bias which may in part explain the low prevalence observed in the present study.

Latent Class Analysis

Although past typology research has been focused on personality traits, more recently it has been recognized that it might be important to determine how people differ with respect to their gambling behaviour and how these differences might be related to problem gambling severity. The LCA analysis performed here was exploratory in nature. There was no a priori hypothesis about the number of

classes or the nature of their compositions. An eight-class solution was obtained based on gambling behaviour and the endorsed frequency of playing each of 13 types of games by the full sample. Importantly, the eight-class solution showed a reliable ordering across the classes whereby the increase in class “number” corresponded to increases in the prevalence of problem gambling. This general directionality was also inherent for almost all of the psychological health incidence and substance use variables, although effects involving the physical health (except, perhaps, increasing amounts of physical activity) and social (except, perhaps, lower levels of social support) variables were not consistently associated with increasing class numbers. This inherent ordering of the latent classes is especially noteworthy given that the latent class structure was determined independently of both the levels of the problem gambling DV and any of the risk factors.

The ordering of classes and its correspondence to problem gambling severity supports the notion of a problem gambling continuum, as suggested by the learning theorists who suggest there is a continuum of gambling behaviour along which an individual may encounter progressively more difficulties arising from that behaviour. This notion is also supported by the work of Strong and Kahlner, among others, who have reported a continuum of gambling problems using the DSM-IV criteria using a community sample (Strong & Kahlner, 2007).

Class 1 in the eight-class solution was the most prevalent group and included all non-gamblers and had the fewest incidents of gambling problems. Gambling members of this class predominantly played the lottery. This class was chosen as the reference category and used as the comparison level for other classes. It is interesting to note that although members of this class constituted those least likely

to gamble, or to play multiple games, the class nevertheless included some cases with gambling problems. This suggests that although purchasing of lottery tickets is considered an innocuous form of wagering, exclusive lottery ticket players are not necessarily protected from harmful consequences of gambling. Hence, this finding supports the work of Welte and colleagues, who reported that the more readily available games, such as lotteries, can contribute heavily per instance of play to the development of problem gambling (Welte et al., 2007). Lotteries were the one form of gambling that was ubiquitous in all eight latent classes.

Members of Classes 2 to 8 showed consistent increases in both the frequency and number of games played. Games played by members of Class 2 consisted of what Ledgerwood and Petry (2006) have called non-strategic forms of games, and what Lesieur and Blume (1991) have called games of chance. These included buying lottery and scratch tickets (about 10 and 5 times a year on average) with some playing of bingo, card games, VLTs in casinos, and engaging in speculative investment to a small extent. Class 3 was similar to Class 2 but with a few more games and a more exaggerated frequency of play (which increased the proportion of cases with some problem gambling by about five fold). This increasing pattern of number and frequency of games played and problem gambling severity continued across Classes 4 to 8.

Class 4 members tended to be younger, single, mostly males, with high incomes, and mostly liked to bet on cards and games of skill. Class 5 members tended to be middle aged, married, with lower education, whose gambling behaviour was similar to Classes 2 and 3 but even more exaggerated and with a few more games. Class 6 members tended to have higher incomes and be more

educated. Their gambling behaviour was similar to Class 5 with respect to buying lottery and scratch tickets, similar to Class 4 with respect to playing cards and games of skill, but with a bit more VLTs and casino games and much more sports betting than all other classes except Class 8.

Although Class 7 members (majority young single male adults with high incomes) played most of the games, the frequency and game types were different in that most non-strategic games of chance (i.e., lotto, scratch tickets, and bingo) were played at frequencies ranging from moderately high to extremely high levels, but most games of skill were played at low levels (with almost no casino, horse-race betting, or investments). Class 8 was unique in its lowest probability of class membership but the highest gambling engagement of its members, ranging from moderate to extremely high for every type of game. Class 8 members played the most numbers and types of games, including horse race betting and card games. It is noteworthy that more than half of Class 8 members had some level of gambling problems, but also that many of the individuals in this class were not problem gamblers even though they gambled at such high frequencies and shared many of the characteristics of problem gamblers. This finding partially supports Marks and Lesieur (1992) and Petry's (2003) earlier findings that those who prefer horse- or dog-race betting, sports, or card games were more likely to develop problems with their gambling activities, compared to those who prefer other games. Although, note that members of Class 6 also had high frequency of sports betting and that both Classes 4 and 6 had moderately high levels of playing cards. This suggests that a preference for horse- or dog-race betting, sports, or card games may be problematic for certain classes more than others. The high proportion of gambling

pathology coincides also with relatively high frequency of play, along with a greater number of game types played by Class 8 members. Moreover, even though the highest casino, horse-race, and VLT playing are in Class 8, members of this class are those who play these games in addition to a number of other games. This finding supports Welte and colleagues' (2004) work which suggested gambling pathology was significantly related to the number of game types played and that sudden increases in pathological symptoms were observed after concomitant playing of five types of games.

The gambling literature conveys a variable set of game types as most problematic or with highest potential for problem development. Some have suggested that VLTs are the most problematic game type, others have suggested casino games, lotteries, or card games present the potential for the most problems. The results of this study suggest that gamblers are not a homogeneous population and that population subsets can be identified based on game choices and different game frequencies. Hence, the variation in the literature regarding the suggested game types most problematic to gamblers is likely due to the variation in sample characteristics of these studies.

Risk Factors

The relationships between the risk factors and the latent classes were examined in several stages consisting of the examination of demographics, followed by physical health, psychological health, substance use and dependence, and sociological factors. Demographic analyses highlighted the elevated prevalence of males in Classes 4, 7, and 8, and their declining membership in Classes 2 and 3. The age categories showed a disparate distribution across the

latent classes. The largest group of those older than 75 was in Class 1. Given that this age category is generally risk-averse, more conservative, and less impulsive (Deakin, Aitken, Robbins, & Sahakian, 2004), their greater membership in Class 1 would be expected where they were either non-gamblers or played lottery games with a low likelihood of developing gambling problem. Although the conservatism found among the elderly in their gambling behaviour may be a generational effect, it has been suggested that risk aversion in gambling task studies is most likely due to the effect of brain aging, inferred in part from longer deliberation in decision making and a lower tendency to adjust risk taking decisions (lower risk tolerance), thereby having a preference for wagering similar amounts more consistently (Deakin et al., 2004).

A lifespan comparison of delayed rewards in the early 1990's showed that rewards of equal amounts are judged to be of higher value if immediate. The value judgements had a decreasing trend as a function of delay. However, the immediate value was judged higher by younger individuals than older individuals, suggesting a life-span developmental trend toward increased self-control (Green, Fry, & Myerson, 1992). This finding further substantiates Skinner's operant conditioning model (1979) and that the reward structure inherent in games is a schedule of reinforcement. However, the work of Green and colleagues (1992) also suggests that the elderly do not require as immediate a reinforcement as their younger counterparts for the same judgement of the reward's value. Hence, the mostly exclusive preference for lotteries, which also constitute wagering similar amounts and proffering lower risk, help to explain the higher membership probability for the elderly in Class 1.

Furthermore, non-gamblers were more likely to be adolescents (i.e., 15-19 years), followed by moderate and low risk gamblers. With respect to latent classes, an examination of some within-class crosstabulations results revealed there were no adolescent problem gamblers in Classes 1, 2, 3, and 6, but that the highest percentage of low and moderate risk gamblers in the youngest age category was in Class 4. This suggests that although the majority of adolescents do not gamble, those who do gamble and develop problems have a specific set of characteristics that can be grouped in Class 4. Members of Class 4 had moderately high frequency levels of playing the lottery, cards, games of skill, and other games. This is best understood in terms of access, considering that gambling is illegal for the under-age and therefore Canadian adolescents likely do not have access to mainstream gambling venues. This, in part, explains the moderately high levels of gaming in the “other” category (including dog races, gambling at charity casino nights/country fairs, betting on sports with a bookie or at gambling pools).

The interpretation of the results for marital status is not very straightforward. Although this study’s findings are in line with other reports in the literature about the higher likelihood of divorce rates for problem gamblers, higher rates of divorce were not present among classes with higher likelihood of gambling problems, such as Classes 7 and 8. The highest divorce rates were shown among members of Class 5 characterized by the highest proportion of 60 to 75 year olds, lowest education, and poor physical health. Compared to Class 1, they were significantly more likely to have attempted suicide in the past 12 months, to have had panic disorder in their lifetime, and to have alcohol dependence. These risk

factors could explain the higher rates for widowed/divorced/separated in this class.

In general, there were relatively fewer single people among non-problem gamblers (and those who self-identified as not gamblers) and they were relatively more likely in the low risk, moderate risk, and problem gambling categories. However, this trend was inconsistent among latent classes. Classes 1 and 3 did not show this trend, that is, singles in Classes 1 and 3 were not more likely to have gambling problems. This trend was exaggerated in Classes 5 and 6, that is, singles in these classes were more likely to have gambling problems. Yet, the trend was reversed in Class 7, even though Class 7 had the second highest proportion of singles. That is, singles of Class 7 were the least likely to be problem gamblers (and, interestingly, 45% of the problem gamblers in this class were widowed/divorced/separated). This finding is in line with the approach of this work that subtypes of gamblers in the population are identifiable based on game choices and frequencies, as well as individual characteristics.

Previous findings in the literature that high income is conducive to higher gambling frequency and problems (Marshall et al., 2004; MacDonald et al., 2004) is at least partially supported by the results of this study. The notion is that higher income allows for more discretionary and leisure expenditure (MacDonald et al., 2004). The results of this study showed that problem gamblers had the highest proportion in the highest household income bracket, but much less in the next lowest income bracket and more in the lowest income bracket than most of the other problem gambler types. However, non-gamblers had the highest proportion in the lower income bracket. This supports McDonald and colleagues' (2004)

report that general leisure and discretionary expenditure was lower among non-gamblers, suggesting lower income was not conducive to gambling. Nevertheless, results of this study also showed that problem gamblers were the second most likely group to be in the lowest income category. This suggests at least two separate behavioural pathways with respect to the relationship between income and problem gambling.

In terms of the relationship between income and latent classes, income levels were shown to be highest for members of Class 7. Given that Class 7 members played more game types and more frequently than other classes, this was expected (within class analyses showed that a the majority of Class 7 problem gamblers were in households which earned incomes in the two top income categories). Those with lowest income had the highest percentage in Class 1, also supporting previous findings that income is correlated with frequency of play. However, the findings do not hold true for Class 8 which had the most members with gambling problems and the highest frequency of play at multiple games.

In line with other reports, the results of this study showed that in general, lower education was associated with higher gambling problems. However, non-gamblers were also highly likely to have low education. Correspondingly, Class 8 members had the smallest proportion of members with post-secondary graduation. Yet, in classes with lower proportion of gamblers, those who did have gambling problems were generally likely to have higher education. It should be noted that education is highly correlated with income; therefore, there is likely to be some confounding of education with income levels.

The highest proportion of immigrants was in Class 1 and the likelihood of immigrants being in the other classes was significantly lower. In general, immigration status seemed to be a protective, rather than a risk factor, for gambling outcomes. However, immigration status was a protective factor in certain classes only. In Classes 7 and 8, immigration status was not a protective factor; on the contrary, as it turns out immigrants were more likely than non-immigrants to have gambling problems in these classes.

Physical Health Risk Factors

The results from examining the physical health variables and gambling outcomes showed those with gambling problems reported poorer actual and self-perceived physical health, and the most trouble sleeping. In terms of latent classes, the physical health variable results did correspond to other demographic variables, particularly age. Members of Classes 1 and 5 generally had poorer health and lower levels of leisure or physical activity and Classes 4 and 7 members had the best general health. Class 7 members in particular were the second most physically active and the least likely to report severe sleep problems. Given the age characteristic of these classes, these physical health tendencies were to be expected. Class 8 members had a greater tendency to report that their health was only fair to good and reported trouble sleeping more than other groups despite their younger age characteristics, which could be due to their gambling behaviours.

Although the overall results for problem gamblers having lower health conform to other studies, the physical health status of Classes 7 and 8 (given the higher membership probability for problem gamblers) do not. This could be due

to the younger ages of the members of these classes. The relationship of physical health to gambling may also be indirect. That is, the highest proportion of individuals who engage in high levels of physical activity are in Class 7, and Class 7 members have a higher proportion of gambling problems. There has been a conjectural suggestion that from an epidemiological stance, some behaviours may compete for a common reward (McIntyre et al., 2007). It may be that Class 7 members' higher levels of physical activity, similarly to their higher levels of substance use and gambling activity, achieve physiological stimulation of the brain's reward pathways.

Scherrer and colleagues' (2008) prospective research on self-reports of health-related quality of life in a community sample showed significantly lower health-related quality of life for those with gambling problems. Their work also showed that most of the variance in health-related quality of life among those with gambling problems could be attributed to genetics and childhood family environmental experiences, as well as co-occurring substance use (Scherrer et al., 2005). The co-occurrence of substance use is also a finding of this study, which will be discussed in a later section.

Psychological Health Risk Factors

The results from examining the psychological health variables and problem gambling outcomes showed that problem gamblers had relatively higher levels of stress, distress, poorer self-rated mental health and psychological well-being, depression, and all other examined psychological disorders in addition to learning disability. This finding is in agreement with gambling literature reports that the majority of community sampled pathological gamblers have co-occurring

psychiatric disorders (Petry et al., 2005). The distributions of psychological health variables among the latent classes generally showed the least amounts of psychological health problems in members of Class 1 and the most in members of Class 8. However, the progression of pathology in latent classes did not always flow in an ordinal manner. For example, self-perceived mental health was highest among Class 4, followed by Class 6, and members of Classes 2 -7 were less likely than Class 1 members to report poor self-perceived mental health (although this was only significant for Classes 2 and 5). These general findings about higher stress and distress levels and lower psychological well being may in fact be the result of gambling problems.

Class 8 members were more likely to report past 12-months depression but significantly less likely to report lifetime depression. The highest proportion of lifetime depression was in Class 1. Overall, depression was highest for problem gamblers (compared to other gambler types). Interestingly, the rates of both depression and suicidality for problem gamblers were somewhat lower in Class 8 than in some of the other classes (e.g., lifetime depression was 18.0% for problem gamblers in Class 8 but 50, 20, 33, 18, 23, and 39% for problem gamblers in Classes 1-7) suggesting that the association between poor mental health and PG is even stronger outside of Class 8. Clarke's proposed integrated model of gambling suggests that among problem gamblers the path of depression to the severity of problem gambling is mediated by an impulsive trait, and that depression is fully mediated by impulsivity (Clarke, 2006). According to Clark's proposed model, gambling behaviours of Class 8 members could construe elements of impulsivity, as suggested by other researchers in terms of associations between impulsivity and

some games of skills, sports and horse-race betting (Blaszczynski et al., 1997; Ledgerwood et al., 2006) which are played at very high frequencies by members of Class 8. In addition, Clarke (2006) suggested that pathological gamblers who were depressed and impulsive were likely to relieve their depression through gambling, as well as substance use, which is also a parallel finding in this study and will be discussed in a later section.

The finding of high suicidality (thoughts and attempts) among problem gamblers is similar to findings by Blaszczynski and Farrell on case records of suicide taking place among pathological gamblers. Blaszczynski and Farrell's suicide cases were majority male with a mean age of 40, and lower SES. They also were highly likely to have been depressed, to have had large financial debts, and to have had relationship difficulties (Blaszczynski et al., 1998; Ledgerwood et al., 2006). Several factors identified by these authors are also present in the current study for problem gamblers.

Lifetime mania had a significantly higher occurrence among problem gamblers. Correspondingly, members of Class 8 had significantly higher odds of lifetime mania compared to Class 1. As noted earlier, both (ICD)-10 and DSM-IV make distinction between PG and gambling that is related to or follows mania. There have been several reports of associations between mania and PG (Petry et al., 2005), as well as bipolar disorder and PG (Tavares et al., 2003). A recent study of gambling behaviours of manic inpatients in a psychiatric setting showed that inpatients with acute mania had less ability to learn from gambling losses and were more likely to make risky gambling decisions (select more cards from the risky decks) than healthy volunteers. The study suggested that the gambling

behaviour of manic patients resulted from lack of insight and impaired decision making ability (Adida et al., 2008). Although the level of mania in a community sample is unlikely to be comparable to the level found among psychiatric inpatients, the reduced ability to learn from risky behaviour, and propensity towards risky behaviours and bias towards decisions associated with immediate reinforcement may be contributing factors to the observed association between PG and mania, and between Class 8 and mania. A recent Canadian study that also used the CCHS Cycle 1.2 data (McIntyre et al., 2007) compared problem gamblers with those with comorbid mood disorders and reported that individuals who screened positive for manic episodes had the highest risk of problem gambling after controlling for SES and economic factors. In addition, the authors reported significant increases in odds of problem gambling for individuals, particularly males, with bipolar disorder (co-occurring major depressive and mania disorders) accompanied by effects of alcohol dependence and illicit drug dependence for these cases. They suggest pathological gambling may be a form of impulse dyscontrol behaviour which affects those with bipolar disorders more frequently than the general population, in part, due to the fact that impulse-control disorders are correlated to each other and to mood disorders, and in part due their correlation with addictive disorder, including PG (McIntyre et al., 2007).

Social phobia was significantly higher for problem gamblers but there were no significant differences between the latent classes with respect to social phobia, except Class 2 which showed significantly higher odds for lifetime social phobia, compared to Class 1. The proportion of cases with lifetime agoraphobia was also higher among problem gamblers. Lifetime agoraphobia was twice as likely to be

among Class 8 members as Class 1 members. The proportions of cases with lifetime and past 12-months episodes of panic attacks were also higher for problem and moderate risk gamblers. Additionally, Classes 7 and 8 had the highest proportion of cases with lifetime and past 12-months panic attack episodes. It was not clear why panic attacks were so much higher in Class 7 but they were elevated for all of the low risk, moderate risk, and problem gamblers in Class 7. These findings concur with other reports in gambling literature regarding the common co-occurrence of pathological gambling with social phobia, agoraphobia, and panic disorders (Zimmerman et al., 2006). Although panic disorder is not identical to episodes of panic attacks, to this author's knowledge no studies have examined the co-occurrence of attack episodes and PG. There have been reports of significant associations between generalized anxiety disorder/panic and PG, describing similar trends (Scherrer et al., 2007).

Rates of psychosis were the highest for the problem gamblers. The proportion of cases with psychosis was highest among members of Class 1, however none of the Class 1 members with psychosis had any gambling problems (similar to Classes 2 and 4). In fact, in Class 1 the majority with psychosis were non-gamblers and the remaining were non-problem or not gamblers. There were a few problem gamblers with psychosis (most notably three of the four cases with psychosis in Class 8 were problem gamblers). No research literature pertaining to co-occurrence of gambling problems and psychosis could be located. A number of studies have used a decision making task involving gambling to study brain functionality of schizophrenic individuals and report that generally schizophrenics display hypersensitivity to rewards and relative insensitivity to losses and future

consequences, suggesting these tendencies are likely contributors to comorbid substance addictions observed in these individuals (Kester et al., 2006).

The highest proportion of individuals with a learning disability was for the problem gamblers. The examination of learning disability as a predictor of gambler types showed that moderate risk gamblers were twice as likely and problem gamblers were almost five times as likely as non-problem gamblers to report a learning disability. In the presence of other variables, these odds were moderated but remained high and significant with Class 8 still having the highest likelihood, followed by Classes 4 and 1. It is interesting, though, that the class with the third highest proportion of individuals with a learning disability was Class 1, none of which were problem gamblers (as in Classes 2, 5, and 7). All other classes except 5 and 8 (although these differences were not significant) were less likely than Class 1 to have members with a learning disability, most notably Classes 6 and 7. In Class 8, 9 of the 20 learning disabled are either low risk, moderate risk, or problem gamblers. In addition, over half of pathological gamblers in Class 4 had a learning disability (i.e., 4 out of the 6 problem gamblers in that class). This is likely due to the fact that Class 4 has a high proportion of adolescents and adolescents are more likely to have received a diagnosis of learning disability compared to older individuals. ADHD was one of the learning disabilities in the CCH Cycle 1.2 questionnaire. ADHD is also comorbid with other learning disabilities (Douglas, 1972), and is comorbid with pathological gambling. The high levels of disinhibition, impulsivity, and lower capacity to delay gratification in individuals with certain types of ADHD are considered the basis for this comorbidity (Rodriquez-Jimenez et al., 2006). This co-occurrence may be the path through

which learning disabilities and pathological gambling correlate. To this author's knowledge, no previous studies have examined the co-occurrence of learning disabilities (other than ADHD) and pathological gambling. The current findings regarding the higher likelihood of a learning disability for those with gambling problems warrant further investigation of this co-occurrence.

It is important to note that the overall trend for most of the psychological risk factors (especially self-rated mental health, stress, psychological wellbeing, distress, depression, and suicidal thoughts and attempts) was one in which although rates were higher for problem gamblers and tended to increase across the latent classes as a whole, they often did not increase across the latent classes for non-problem gamblers. This finding is particularly interesting because it suggests that such variables are related more to problem gambling per se than to the latent classes and that one reason for increased rates for these risk factors in Class 8 in particular is because it contains more problem gamblers. Conversely, not only were the likelihoods of both lifetime and past 12-months' mania increased for problem gamblers but they also increased progressively from Class 1 to Class 8 for the non-problem gamblers as well, indicating that mania is associated with higher gambling activity in general. Taken together, these findings suggest that lifetime and past 12-months' mania precede and could potentially have a causal role in the development of increased gambling activity and gambling problems whereas higher levels of stress, distress, depression, and suicidality could represent consequences of problem gambling.

Substance Use Risk Factors

The results from examining substance use variables and gambling outcomes showed those with gambling problems reported significantly higher rates of almost all substance uses and alcohol and drug dependence. In general, there was also a progression of substance use and dependence from Class 1 to 8. In general, Class 1 reported lower use and dependence, and Classes 7 and 8 showed higher use and dependence. Within most classes the rates of use and dependence were higher for problem gamblers than non-problem gamblers. Interestingly, Class 4 reported relatively high levels of substance use (almost as much or more than Classes 7 and 8) even though it has relatively fewer problem gamblers. This suggests that the strength of the association between substance use and dependence and problem gambling is not as strong for this Class as it is for Classes 7 and 8. This could be due to either the types of games the members of this class play, or due to their comparatively younger age. Also, if there were a relationship between co-occurring substance use and psychological health variables for problem gamblers, the smaller frequency of psychological health problems in Class 4, compared to Classes 7 and 8, could account for these findings. A study of the co-occurrence of psychiatric disorders and substance use disorders and their effects on problem gambling, using the CCHS Cycle 1.2 data, found that psychiatric problems (particularly mood and anxiety disorders) increased the incidents of low risk, moderate risk, and problem gambling, and that substance use and dependence also increased the risk for the above. However, these authors reported that the risks increased almost by three fold when substance use and mood or anxiety disorders co-occurred (el-Guebaly et al., 2006). A more recent study on the same data also reported a strong dose-response

relationship between the combined alcohol and substance use occurrence and problem gambling, and prevalence of low risk and combined moderate risk/problem gambling almost doubled with the presence of at least one lifetime mental disorder, and tripled in the presence of drug dependence, but that co-occurrence of mental disorder with substance use among non-problem gamblers had little or no further effect on gambling disorders (Rush, Bassani, Urbanoski, & Castel, 2008). The discrepancy between these two latter studies could potentially be explained by the differences among class membership of the CCHS Cycle 1.2 sample. For example, the present findings showed that rates of any past 12-month drug use increasingly higher for moderate risk, low risk, and problem gamblers in Classes 5 and 8, and were higher for moderate risk but only slightly higher for low risk and problem gamblers in Classes 4 and 7. In terms of specific drug use, the present findings showed that certain substance uses were not higher for problem gamblers than non-problem gamblers in some classes. Also, with respect to psychological health risk factors, as discussed earlier, there are class-effects which explain the impact of a given psychological health risk factor on problem gambling.

Social Risk Factors

The results from examining social variables and gambling outcomes showed those with gambling problems generally reported higher rates of disability and hospitalization for mental health, alcohol, and drug issues, but this was not true for all classes. Also these rates varied depending on the degree of severity of

gambling problems. For example, the rates of hospitalization were higher for the moderate risk gamblers in Classes 3 and 5, but they were higher for the low risk gamblers only in Classes 1 and 2. In addition, rates of hospitalization for the non-problem gamblers were highest in Class 8, followed by Classes 3 and 5. Overall, members of Class 8 had the least disability days, but the most hospitalization.

In terms of social support, there were rate differences for both affection and emotional or informational support across all three gamblers outcome types (low, moderate, and problem). Rates of low support were much higher for the problem gamblers than for the non-problem gamblers in Classes 5 and 6, and somewhat higher in Classes 3, 7, and 8. Also, rates of low support were somewhat higher for low risk and moderate risk gamblers in Classes 1 to 6. Interestingly, rates of low and medium support were the lowest for Class 8 whereas these rates were about the same in all other classes. Classes 1 and 5 had the lowest emotional or information support. This could be accounted for by the age characteristics of these two classes where in general, older individuals are less likely to report emotional or informational support. In terms of affection, low rates were much higher for the problem gamblers than for the non-problem gamblers in Classes 4, 5, 6, and 8, and were somewhat higher for Classes 3 and 7. This finding is similar to results published elsewhere reporting poor perceived familial and peer support social support were associated with high among those (particularly adolescents) with problem gambling (Hardoon, Gupta, & Derevensky, 2004).

It is noteworthy that rates of low and medium affection were the lowest for Class 8 whereas these rates were about the same in all other classes. These findings suggest that in general, social support is not necessarily a risk factor in

problem gambling and that problem gamblers do not necessarily suffer from a lack of support. It is likely that the gambling behaviour itself is either a substitute for social support or that at least for some classes gambling is accompanied by social support (such as playing in groups).

Studies 5 provided a psycho-social-health model of problem gambling which essentially specified the full set of variables that are significantly associated with the six gambler types derived from the CPGI component of the CCH Cycle 1.2. Moreover, the pertinent multinomial analysis specified the exact nature of the relations between the levels of each of those variables and the six gambler types (that exist above and beyond the effects of all of the other variables in the model - including the demographics). Importantly, the presence of a number of variables in this model that are positively related (i.e., ORs > 1) to one or more of the three problem gambling types (i.e., low risk, moderate risk, or problem) is indeed consistent with many previous research findings (specifically, the higher prevalence of alcohol and drug dependence and drug usage, lifetime mania, and suicidal thoughts). Moreover, the fact that such relations were observed here for a sample of individuals deemed to be representative of the Canadian general population provides particularly strong support for a true association between these variables and problem gambling. Just as importantly, though, is the presence of a number of variables in this model whose relations to one or more of the three problem gambling types could be regarded as representing novel findings (specifically higher levels of stress and distress, lower levels of psychological well-being, poorer self-perceived health, less physical activity, a higher likelihood of having been admitted to a hospital for mental health or

alcohol/drug problems, lower levels of emotional/informational and affection-based support, and a higher prevalence of lifetime panic attack and last 12-month social phobia).

Study 6 attempted to determine if the nature of such a model differs across latent classes. This is actually an extremely important issue because it would indicate that the effects of certain variables are moderated by the type of gambling behaviour profile. For example, the lack of a relation between gender and problem gambling type within Class 8 indicates that once an individual is gambling as much as the typical Class 8 member, they now have an equal likelihood of becoming a problem gambler regardless of their gender. Note, however, that this point does not negate the fact that more males are likely to be Class 8 members and, hence, more likely to be problem gamblers because of that, but it does suggest that there are two levels to the problem of determining what indeed are the risk factors for problem gambling. Namely, on one hand, it is important to determine what variables are associated with higher engagement in gambling activities, and on the other hand, given a certain level of engagement in gambling activities, it becomes important to determine what variables are associated with a higher likelihood of developing gambling problems. Under such a view, although the variable gender does indeed seem to have an influence on the degree to which an individual becomes involved in extensive gambling activities, its influence with respect to rendering that individual more or less susceptible to problem gambling does not extend beyond that. This is key point with respect to developing a theoretical understanding the role of gender in problem gambling. Another key example is the immigrant variable, because the

OR results essentially indicate that the significance of this variable is due to a greater likelihood for immigrants to be non-gamblers (which then implies that immigration status is a “protective” factor). However, within Class 8 itself, immigrant status is positively related to the problem gambling types clearly suggesting that once an individual is gambling at the level of those in Class 8, being an immigrant is associated with a greater risk of developing gambling problems. This is another important result both practically and theoretically.

In conclusion, the results of this study confirm previous findings that gamblers are a heterogeneous population with multiple variations in the contributing factors to problem development. Also, that different gambling activities and venues tend to be patronized by demographically different groups that are generally affected by distinct risk factors. Although problem gambling is associated with significant decrements in quality of life and health problems, several factors affect how the decrements are manifested, which depend on both the game form and the frequency of play. To the extent that different gambling forms are played by different groups, so are the different problem gamblers associated with them. This thesis showed that all of the individuals who responded to the Cycle 1.2 survey could be partitioned into eight latent classes/subtypes that represent eight distinct gambling behavioural profiles. It also demonstrated that those eight classes could be ordered with respect to the extent to which class members suffer from an increased prevalence of gambling problems.

Furthermore, there are some distinct differences between the classes in terms of their demographic makeup. These results are extremely enlightening with

respect to the kinds of gambling activities with which these various demographic subgroups are more or less likely to be engaged in. Such findings also begin to shed some light on some of the relations that exist between these demographic variables and problem gambling.

This thesis attempted to use an integrated approach to examining the behavioural, physical, psychological, and social determinants of both recreational and problem gambling. A contribution of this study is that the findings are representative of the total Canadian population. However, the results are subject to the caveats relevant to general population surveys. Although the stratified sampling strategies used reduce a number of biases, they cannot guarantee perfect representation of the target population, and survey respondents, as in all survey studies, are potentially liable to give inaccurate information either unintentionally or other wise, especially regarding socially undesirable behaviours or traits. The data used for this study were cross-sectional and therefore a hierarchical sequence of risk factors and gambling outcomes cannot be established. Further studies are required to validate and further substantiate these findings.

Reference List

- Aasved, M. (2003). *The Biology of Gambling*. Springfield, Illinois: Charles C Thomas Publisher LTD.
- Adamson, S. J., Todd, F. C., Sellman, J. D., Huriwai, T., & Porter, J. (2006). Coexisting psychiatric disorders in a New Zealand outpatient alcohol and other drug clinical population. *Australian and New Zealand Journal of Psychiatry*, 40, 164-170.
- Adida, M., Clark, L., Pomietto, P., Kaladjian, A., Besnier, N., Azorin, J.-M. et al. (2008). Lack of insight may predict impaired decision making in manic patients. *Bipolar Disorder*, 10, 829-837.
- Agrawal, A., Lynskey, M. T., Madden, P. A. F., Bucholz, K. K., & Heath, A. C. (2006). A latent class analysis of illicit drug abuse/dependence: Results from the National Epidemiological Survey on Alcohol and Related Conditions. *Addiction*, 102, 94-104.
- Agresti, A. (2002). *Categorical data analysis*. (2 ed.) Wiley - Interscience.
- Alcohol and Gaming Commission of Ontario (2005). *A consultation document on the modernization of charitable gaming* Toronto, Ontario: Alcohol and Gaming Commission of Ontario.
- Alcohol and Gaming Commission of Ontario (2007). *Modernization of charitable gaming - Direction and priorities Volume II* North York, Ontario.

- American Psychiatric Association (1994). *Diagnostic and Statistical Manual of Mental Disorders*. (IV ed.) Washington, DC: American Psychiatric Association.
- Babad, E. (2007). Wishful thinking and objectivity among sports fans. *Social Behaviour*, 2, 231-240.
- Beland, Y. (2002). *Canadian Community Health Survey - Methodological overview*. Ottawa: Health Reports.
- Belanger, Y. D. (2006). *Gambling with the future: The evolution of aboriginal gambling in Canada*. Saskatoon: Purich Pub.
- Bernhard, B. J. & Preston, F. W. (2004). On the shoulder of Merton. Potentially sobering consequences of problem gambling policy. *American Behavioral Scientist*, 47, 1395-1405.
- Biddle, D., Hawthorne, G., Forbes, D., & Coman, G. (2005). Probing reward function in posttraumatic stress disorder: Expectancy and satisfaction with monetary gains and losses. *Journal of Traumatic Stress*, 18, 759-767.
- Binde, P. (2005). Gambling across cultures: Mapping worldwide occurrence and learning from ethnographic comparison. *International Gambling Studies*, 5, 1-27.
- Bitterman, M. E. (2006). Classical conditioning since Pavlov. *Review of General Psychology*, 10, 365-376.

- Black, D. & Moyer, T. (1998). Clinical features and psychiatric comorbidity of subjects with pathological gambling behavior. *Psychiatric Services*, 49, 1434-1439.
- Blaszczynski, A. & Farrell, E. (1998). A case series of 44 completed gambling-related suicides. *Journal of Gambling Studies*, 14, 93-109.
- Blaszczynski, A. & Nower, L. (2002). A pathways model of problem and pathological gambling. *Addiction*, 97, 487-499.
- Blaszczynski, A. & Steel, Z. (1998). Personality disorders among pathological gamblers. *Addiction*, 97, 487-499.
- Blaszczynski, A., Steel, Z., & McConaughy, N. (1997). Impulsivity in pathological gambling: the antisocial impulsivist. *Addiction*, 92, 61-73.
- Bolen, E. W. & Boyd, W. H. (1968). Gambling and the gambler: A Review and preliminary findings. *Archives of General Psychiatry*, 18, 617-630.
- Bonnaire, C., Bungener, C., & Varescon, I. (2006). Pathological gambling and sensation seeking- How do gamblers playing games of chance in cafes differ from those who bet on horses at the racetrack? *Addiction Research & Theory*, 14, 619-629.
- Boynton, D. M. (2003). Superstitious responding and frequency matching in the positive bias and gambler's fallacy effects. *Organizational Behavior and Human Decision Processes*, 91, 119-127.

- Breen, R. B. & Zimmerman, M. (2002a). Rapid onset of pathological gambling in machine gamblers. *Journal of Gambling Studies*, 18, 31-43.
- Breen, R. B. & Zimmerman, M. (2002b). Rapid onset of pathological gambling in machine gamblers. *Journal of Gambling Studies*, 18, 31-43.
- Castellani, B. (2000). *Pathological gambling: the making of a medical problem*. Albany: State University of New York Press.
- Caughy, M. O., Hayslett-McCall, K. L., & O'Campo, P. J. (2007). No neighborhood is an island: Incorporating distal neighborhood effects into multilevel studies of child development competence. *Health & Place*, 13, 788-798.
- Chantal, Y. & Vallerand, R. J. (1996). Skill versus Luck: A motivational analysis of gambling involvement. *Journal of Gambling Studies*, 12, 407-418.
- Clarke, D. (2006). Impulsivity as a mediator in the relationship between depression and problem gambling. *Personality and Individual Differences*, 40, 5-15.
- Cohen, J. (1975). The Psychology of gambling. *New Scientist*, 68, 266-268.
- Coman, G. J., Burrows, G. D., & Barry, E. J. (1997). Stress and anxiety as factors in the onset of problem gambling: Implications for treatment. *Stress Medicine*, 13, 235-244.
- Cooper, M. L., Agocha, V. B., & Sheldon, M. S. (2000). A Motivational perspective on risky behaviors: The role of personality and affect regulatory processes. *Journal of Personality*, 6, 1059-1088.

- Culin, S. (1992). *Games of the North American Indians*. (vols. Volume 1: Games of Chance) Lincoln: University of Nebraska Press.
- Cunningham-Williams, R., Cottler, L., Compton, W. M., & Spitznagel, E. L. (1998). Taking chances: Problem gamblers and mental health disorders. Results from the St. Louis epidemiologic catchment area study. *American Journal of Public Health*, 64, 1096.
- Custer, L. F. & Milt, H. (1985). *When luck runs out*. New York: Facts on Files Publications.
- Darbyshire, P., Oster, C., & Carrig, H. (2001). The Experience of pervasive loss: Children and young people living in a family where parental gambling is a problem . *Journal of Gambling Studies*, 17, 23-45.
- David, D. (2004). Special issue on the cognitive revolution in clinical psychology: Beyond the behavioral approach - Conclusions: Toward an evidence-based psychology and psychotherapy. *Journal of Clinical Psychology*, 60, 447-451.
- Deakin, J., Aitken, M., Robbins, T., & Sahakian, B. (2004). Risk taking during decision-making in normal volunteers changes with age. *Journal of the International Neuropsychological Society*, 10, 590-598.
- Delfabbro, P. (2004). The Stubborn logic of regular gamblers: Obstacles and dilemmas in cognitive gambling research. *Journal of Gambling Studies*, 20, 1-21.

- Dickerson, M., Hinchey, J., & Fabre, J. (1987). Chasing, arousal and sensation seeking in off-course gamblers. *British Journal of Addiction*, 82, 673-680.
- Dickerson, M. & O'Connor, J. (2006a). *Gambling as an addictive behaviour: Impaired control, harm minimization, treatment and prevention*. Cambridge: Cambridge university Press.
- Dickerson, M. G. (1991). Internal and external determinants of persistent gambling: Implications for treatment. In N. Heather, W. R. Miller, & J. Greenley (Eds.), *Self-control and the Addictive Behaviors* (pp. 317-328). Maxwell: Australia: Macmillan Publishing.
- Dickerson, M. & O'Connor, J. (2006b). *Gambling as an addictive behaviour*. Cambridge: Cambridge University Press.
- Douglas, V. I. (1972). Stop, look and listen: The problem of sustained attention and impulse control in hyperactive and normal children. *Canadian Journal of Behavioural Science*, 4, 259-282.
- Echeburua, E. & Fernandez-Montalvo, J. (2005). Psychological treatment of slot-machine pathological gambling: New perspectives. *Journal of Gambling Studies*, 21, 21-26.
- el-Guebaly, N., Patten, D., Currie, S., Williams, J. V. A., Beck, C., Maxwell, C. J. et al. (2006). Epidemiological associations between gambling behavior, substance use & mood and anxiety disorders. *Journal of Gambling Studies*, 22, 275-287.

- Ferster, C. B. & Skinner, B. F. (1957). *Schedules of reinforcement*. New York: Appleton-Century-Crofts.
- Fisher, S. & Griffith, M. (1995). Current trends in slot machine gambling: Research and policy issues. *Journal of Gambling Studies*, 11, 239-247.
- Frank, M. L. & Smith, C. (1989). Illusion of control and gambling in children. *Journal of Gambling Behavior*, 5, 127-136.
- Freidenbert, B. M., Blanchard, E. B., Wulfert, E., & Malta, L. S. (2002). Changes in physiological arousal to gambling cues among participants in motivationally enhanced cognitive-behaviour therapy for pathological gambling: A preliminary study. *Applied Psychophysiology and Biofeedback*, 27, 251-261.
- Galdston, I. (1960). The gambler and his love. *American Journal of Psychiatry*, 35, 553-555.
- Gazel, R. C., Rickman, D. S., & Thompson, W. (2001). Casino gambling and crime: A panel study of Wisconsin counties. *Managerial and Decision Economics*, 22, 65-75.
- Getty, H. A., Watson, J., & Frisch, G. R. (2000). A comparison of depression and styles of coping in male and female GA members and controls. *Journal of Gambling Studies*, 16, 377-391.
- Gillis, J. R. (1999). "A Triumph of hope over experience": Chance and choice in the history of marriage. *International Review of Social History*, 44, 54.

- Gilovich, T. (1983). Biased evaluation and persistence in gambling. *Journal of Personality and Social Psychology*, 44, 1110-1126.
- Goodie, A. S. (2005). The role of perceived control and overconfidence in pathological gambling. *Journal of Gambling Studies*, 21, 481-503.
- Green, L., Fry, A. F., & Myerson, J. (1992). Discounting of delayed rewards: A life-span comparison. *Psychological Science*, 5, 33-36.
- Griffiths, M. (1989). Gambling in children and adolescents. *Journal of Gambling Behavior*, 5, 66-83.
- Griffiths, M. D. & Jonathan, P. A. (2002). The social impact of Internet gambling. *Social Science Computer Review*, 20, 312-320.
- Grinols, E. L. (2004). *Gambling in America: Costs and benefits*. Cambridge: Cambridge University Press.
- Gupta, R. & Derevensky, J. (1998). An empirical examination of Jacob's General Theory of Addictions: Do adolescent gamblers fit the theory? *Journal of Gambling Studies*, 14, 17-50.
- Hamilton, C. (2006). *Healthy provinces, healthy Canadians: a provincial benchmarking report* Ottawa: The Conference Board of Canada.
- Hammelstein, P. (2004). Faites vos jeux! Another look at sensation seeking and pathological gambling. *Personality and Individual Differences*, 37, 917-931.

- Hardoon, K. K., Gupta, R., & Derevensky, J. (2004). Psychosocial variables associated with adolescent gambling. *Journal of Gambling Studies*, 18, 170-179.
- Haruvy, E., Erev, I., & Sonsino, D. (2001). The Medium prizes paradox: Evidence from a simulated casino. *Journal of Risk and Uncertainty*, 3, 251-261.
- Havermans, R. C. & Jansen, A. T. (2003). Increasing the efficacy of cue exposure treatment in preventing relapse of addictive behavior. *Addictive Behaviors*, 28, 989-994.
- Health Canada (1997). Exploring the links between substance use and mental health: An annotated bibliography and a detailed analysis. http://www.hc-sc.gc.ca/ahc-asc/pubs/drugs-drogués/mental-mentale/index_e.html [Online]. Available: http://www.hc-sc.gc.ca/ahc-asc/pubs/drugs-drogués/mental-mentale/index_e.html
- Hoyle, R. H. (2000). Personality processes and problem behavior. *Journal of Personality*, 6, 953-966.
- Hoyle, R. H., Fejfar, M. C., & Miller, J. D. (2000). Personality and sexual risk taking: A quantitative review. *Journal of Personality*, 6, 1203-1231.
- Hurlburt, R. T. & Heavey, C. L. (2001). Telling what we now: Describing inner experience. *TRENDS in Cognitive Sciences*, 5, 400-405.
- Iversen, I. H. (2007). Skinner's early research: From reflexology to operant conditioning. *American Psychologist*, 47, 1318-1328.

- Jacobs, D. F. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling Behavior*, 2, 15-31.
- James, A. (1998). Play in Childhood: An anthropological perspective. *Child Psychology & Psychiatry*, 3, 104-109.
- Janet, P. (1901). *Mental state of hystericals: A study of mental stigmata and mental accidents*. New York: G.P. Putnam's Sons.
- Johnson-Laird, P. N., Legrenzi, P., Girotto, V., Legrenzi, M. S., & Caverni, J. P. (1999). Naive probability: A mental model theory of extensional reasoning. *Psychological Review*, 106, 62-88.
- Jones, K. & Duncan, C. (1995). Individuals and their ecologies: analyzing the geography of chronic illness within a multilevel modeling framework. *Health & Place*, 1, 27-40.
- Jung, C. G. (1933). *Modern man in search of a soul*. San Diego: Harcourt Brace & Company.
- Kausch, O., Rugle, L., & Rowland, D. Y. (2006). Lifetime histories of trauma among pathological gamblers. *American Journal on Addictions*, 15, 35-43.
- Kester, H. M., Sevy, S., Yechiam, E., Burdick, K. E., Cervellione, K. L., & Kumra, S. (2006). Decision-making impairment in adolescents with early-onset schizophrenia. *Schizophrenia Research*, 85, 113-123.

- Korman, L. M., Collins, J., Dutton, D., & Dhayananthan, B. (2008). Problem gambling and intimate partner violence. *Journal of Gambling Studies*, 24, 13-23.
- Korn, A. D. & Gibbins, R. (2003). Framing public policy: Towards a public health paradigm for gambling. *Journal of Gambling Studies*, 19.
- Korn, A. D. & Shaffer, H. J. (1999). Gambling and the health of the public: Adopting a public health perspective. *Journal of Gambling Studies*, 15.
- Kroeber, H.-L. (1992). Roulette gamblers and gamblers at electronic game machines: Where are the differences? *Journal of Gambling Studies*, 8, 79-92.
- Ladd, G. T. & Petry, N. M. (2002). Disordered gambling among university-based medical and dental patients: A focus on Internet gambling. *Psychology of Addictive Behaviors*, 16.
- Ladouceur, R., Boisvert, J. M., Pepin, M., & Dumont, M. (1994). Social cost of pathological gambling. *Journal of Gambling Studies*, 10, 399-409.
- Ladouceur, R., Gaboury, A., Dumont, M., & Rochette, P. (1988). Gambling: Relationship between the frequency of wins and irrational thinking. *Journal of Psychology*, 122, 409-414.
- Landis, C. (1945). Theories of the alcoholic personality. *Quarterly Journal of Studies on Alcohol*.
- Langer, E. J. (1975). The illusion of control. *Journal of Personality and Social Psychology*, 32, 311-328.

- Langer, E. J. & Roth, J. (1975). Heads I win, tails it's chance: The illusion of control as a function of the sequence of outcomes in a purely chance task. *Journal of Personality and Social Psychology*, 32, 951-955.
- Langford, B. (2005). Health impact assessment in New Zealand. *NSW Public Health Bull.*, 16, 115.
- Laplante, D. A., Nelson, S. E., Labrie, R. A., & Shaffer, H. J. (2006). Men & women playing games: Gender and the gambling preferences of Iowa gambling treatment program participants. *Journal of Gambling Behavior*, 22, 65-79.
- Lazarsfeld, P. F. & Henry, N. W. (1968). *Latent structure analysis*. Boston: Houghton Mifflin.
- Ledgerwood, D. M. & Petry, N. M. (2006). Psychological experience of gambling and subtypes of pathological gamblers. *Psychiatry Research*, 144, 17-27.
- Ledgerwood, D. M., Steinberg, M. A., Wu, R., & Potenza, M. N. (2005). Self-reported gambling-related suicidality among gambling helpline callers. *Psychology of Addictive Behaviors*, 19, 175-183.
- Lesieur, H. R. (1984). *The chase. career of the compulsive gambler*. Cambridge, MA: Schenkman Publishing Co.
- Lesieur, H. R. (1993). Female pathological gamblers and crime. In W.R.Eadington & J. A. Cornelius (Eds.), *Gambling behavior and problem gambling* (pp. 235-238). Reno, Nevada: Institute for the Study of Gambling and Commercial Gaming, University of Nevada-Reno.

- Lesieur, H. R. (2001). *Cluster analysis of types of Inpatient pathological gamblers*. Massachusetts School of Professional Psychology.
- Lesieur, H. R. & Blume, S. B. (1991). When lady luck loses: The female pathological gambler. In N.van den Bergh (Ed.), *Feminist perspectives on addictions* (pp. 181-197). New York: Springer Publications.
- Lesieur, H. R., Blume, S. G., & Zoppa, R. M. (1986). Alcoholism, drug abuse, and gambling. *Alcoholism: Clinical and Experimental Research*, 10, 33-38.
- Lesieur, H. R. & Rosenthal, R. J. (1999). Pathological gambling: A review of the literature (prepared for the American Psychiatric Association Task Force of DSM-IV Committee on Disorders of Impulse Control Not Elsewhere Classified). *Journal of Gambling Studies*, 7, 5-39.
- Lightsey, O. R. & Husley, D. C. (2002). Impulsivity, coping, stress, and problem gambling among university students. *Journal of Counseling Psychology*, 49, 202-211.
- MacDonald, M., McMullan, J. L., & Perrier, D. C. (2004). Gambling households in Canada. *Journal of Gambling Studies*, 20.
- Madden, G. J., Ewan, E. E., & Lagoria, C. H. (2007). Toward an animal model of gambling: Delay discounting and the allure of unpredictable outcomes. *Journal of Gambling Studies*, 23, 63-83.
- Magidson, J. & Vermunt, J. K. (2001). Latent class factor and cluster models, bi-plots, and related graphical displays. *Sociological Methodology*, 31, 223-264.

- Malaka, R. (1998). Models of classical conditioning. *Bulletin of Mathematical Biology*, 61, 33-83.
- Marks, M. E. & Lesieur, H. R. (1992). A feminist critique of problem gambling research. *British Journal of Addiction*, 87, 549-565.
- Marshall, K. & Wynne, H. (2003). *Fighting the odds* (Rep. No. 75-001-XIE). Ottawa, Canada: Statistics Canada.
- Marshall, K. & Wynne, H. (2004). Against the odds: A profile of at-risk and problem gamblers. Canadian Social Trends 73[11-008]. Ottawa, Statistics Canada.
- Ref Type: Catalog
- McCormick, R. A. (1987). Pathological gambling: a parsimonious need state model. *Journal of Gambling Behavior*, 3, 257-263.
- McIntyre, R. S., McElroy, S. L., Konarski, J. Z., Soczynska, J. K., Wilkins, K., & Kennedy, S. H. (2007). Problem gambling in bipolar disorder: Results from the Canadian Community Health Survey. *Journal of Affective Disorders*, 102, 27-34.
- Mead, G. H. (1934). *Mind, self & society from the standpoint of a social behaviorist*. Chicago, Ill: The University of Chicago Press.
- Messerlian, C., Derevensky, J., & Gupta, R. (2005a). Youth gambling problems: A public health perspective. *Health Promotion International*, 20.

- Messerlian, C., Derevensky, J., & Gupta, R. (2005b). Youth gambling problems: A public health perspective. *Health Promotion International*, 20, 69-79.
- Moran, E. (1970). Varieties of pathological gambling. *British Journal of Psychiatry*, 116, 593-597.
- Morasco, B. J., Weinstock, J., Ledgerwood, D. M., & Petry, N. M. (2007). Psychological factors that promote and inhibit pathological gambling. *Cognitive and Behavioral Practice*, 14, 208-217.
- Murphy, J., Shevlin, M., & Adamson, G. (2007). A latent class analysis of positive psychosis symptoms based on the British Psychiatric Morbidity Survey. *Personality and Individual Differences*, 42, 1491-1502.
- Nordin, C. & Nylander, P.-O. (2007). Temperament and character in pathological gambling. *Journal of Gambling Studies*, 23, 113-120.
- Norusis, M. J. (2008). *Advanced statistical procedures companion*. Chicago, IL.: SPSS Inc.
- O'Brien Cousins, S. & Witcher, C. S. G. (2007). Who plays Bingo in later life? The sedentary lifestyles of 'Little Old Ladies'. *Journal of Gambling Studies*, 23, 95-112.
- O'Connor, J. & Dickerson, M. (2003). Definition and measurement of chasing in off-course betting and gaming machine Play. *Journal of Gambling Studies*, 19, 359-386.

- Ore, O. (1953). *Cardano: The gambling Scholar*. Princeton, NJ : Princeton University Press.
- Orford, J. (1985). *Excessive Appetites: A Psychological View of Addictions*. New York: John Wiley and Sons.
- Orford, J. & McCartney, J. (1990). Is excessive gambling seen as a form of dependence? Evidence from the community and the Clinic. *Journal of Gambling Behavior*, 6, 139-152.
- Petry, N. M. (2001). Substance abuse, pathological Gambling, and impulsiveness. *Drug and Alcohol Dependence*, 63, 29-38.
- Petry, N. M. (2003). A comparison of treatment-seeking pathological gamblers based on preferred gambling activity. *Journal of Gambling Studies*, 20, 155-170.
- Petry, N. M. (2005). *Pathological gambling: etiology, comorbidity, and treatment*. Washington DC: American Psychological Association.
- Petry, N. M. & Mallya, S. (2004). Gambling participation and problems among employees at a university health center. *Journal of Gambling Studies*, 20, 155-171.
- Petry, N. M., Stinson, F. S., & Grant, B. F. (2005). Co-morbidity of DSM-IV pathological gambling and other psychiatric disorders: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Journal of Clinical Psychiatry*, 66, 564-574.

- Popkin, J. (1994). Tricks of the trade: The many modern ways casinos try to part bettors from their cash. *U.S. News and World Report*, 116, 48-52.
- Productivity Commission (1999). *Australia's Gambling Industries: final report*. Canberra: Government Press.
- Ramirez, L. F., McCormick, R. A., & Russo, A. M. (1983). Patterns of substance abuse in pathological gamblers undergoing treatment. *Addictive Behaviors*, 8, 425-428.
- Raviv, M. (1993). Personality characteristics of sexual addicts and pathological gamblers. *Journal of Gambling Studies*, 9, 17-30.
- Raylu, N. & Oei, T. P. S. (2002). Pathological gambling: A comprehensive review. *Clinical Psychology Review*, 22, 1009-1061.
- Rodriguez-Jimenez, R., Avila, C., Jimenez-Arriero, M. A., Ponce, G., Monasor, R., Jimenez, M. et al. (2006). Impulsivity and sustained attention in pathological gamblers: Influence of childhood ADHD history. *Journal of Gambling Studies*, 22, 451-461.
- Roney, C. J. & Trick, L. M. (2003). Grouping and gambling: A Gestalt approach to understanding the gambler's fallacy. *Canadian Journal of Experimental Psychology*, 57, 69-75.
- Room, R., Turner, N., & Ialomiteanu, A. (1999). Community effects of the opening of the Niagara casino. *Addiction*, 94, 1449-1466.

- Rupcich, N., Frisch, G. R., & Govoni, R. (1997). Comorbidity of pathological gambling in addiction treatment facilities. *Journal of Substance Abuse Treatment, 14*, 573-574.
- Rush, B. R., Bassani, D. G., Urbanoski, K. A., & Castel, S. (2008). Influence of co-occurring mental and substance use disorders on the prevalence of problem gambling in Canada. *Addiction, 103*, 1847-1856.
- Safaei, J. (2007). Income and health inequality across Canadian provinces. *Health & Place, 13*, 629-638.
- Scherrer, J. F., Slutske, W. S., Xian, H., Waterman, B., & Shah, K. R. (2007). Factors Associated with Pathological Gambling at 10-Year Follow-up in a National Sample of Middle-aged Men. *Addiction, 102*, 970-978.
- Scherrer, J. F., Xian, H., Kamini, S., Volberg, R. A., Slutske, W. S., & Seth, E. (2005). Effect of genes, environment, and lifetime co-occurring disorders on health-related quality of life in problem and pathological gamblers. *Archives of General Psychiatry, 62*, 677-683.
- Shaffer, H. J., Hall, M. N., Vander Bilt, & J.V. (1999). Estimating the prevalence of disordered gambling behaviour in the United States and Canada: A research synthesis. *American Journal of Public Health, 89*, 1369-1676.
- Shaffer, H. J., Labrie, R. A., Laplante, D. A., Nelson, S. E., & Stanton, M. V. (2004). The road less traveled: Moving from distribution to determinants in the study of gambling epidemiology. *Canadian Journal of Psychiatry, 49*, 504.

- Shaffer, H. J., Laplante, D. A., Labrie, R. A., Kidman, R. C., Donato, A. N., & Stanton, M. V. (2004). Toward a syndrome model of addiction: Multiple expressions, common etiology. *Harvard Review of Psychiatry*, 12, 367-374.
- Shaffer, H. J., Stein, S. A., Gambino, B., & Cummings, T. N. (1998). Compulsive Gambling: Introduction. In H.J. Shaffer, S. A. Stein, B. Gambino, & T. N. Cummings (Eds.), *Compulsive Gambling: Theory, Research, and Practice* (Lexington, MA: Lexington Books.
- Shepard, S. (2005). Drug Tolerance, Drug Addiction, and Drug Anticipation. *Current Directions in Psychological Science*, 14, 296-300.
- Skinner, B. F. (1953). *Science and Human Behaviour*. New York: Macmillan.
- Skinner, B. F. (1979). *The Shaping of a Behaviorist*. New York: Knopf.
- Slutske, W. S., Seth, E., Xian, H., True, W. R., Lyons, M. J., Goldberg, J. et al. (2001). A twin study of the association between pathological gambling and antisocial personality disorder. *Journal of Abnormal Psychology*, 110, 297-308.
- Smart, R. G. & Ferris, J. (1996). Alcohol, Drugs and Gambling in the Ontario Adult Population. *Journal of Psychiatry*, 41, 36-45.
- Spunt, B. (2002). Pathological Gambling and Substance Misuse. *Substance Use and Misuse*, 37, 1299-1304.

- Spunt, B., Lesieur, H. R., Liberty, H. J., & Hunt, D. (1996). Pathological gamblers in methadone treatment: A comparison between men and women. *Journal of Gambling Studies*, 12, 431-449.
- Stagnitti, K. (2004). Understanding Play: The Implications for Play Assessment. *Australian Occupational Therapy Journal*, 51, 3-12.
- Statistics Canada (2003a). Canadian Community Health Survey - Mental health and well-being. Stress Medicine [On-line]. Available: <http://www.statcan.ca/cgi-bin/imdb/p2SV.pl?Function=getSurvey&SDDS=5015&lang=en&db=IMDB&dbg=f&adm=8&dis=2#2>
- Statistics Canada. (2003b). Fighting the Odds: Perspectives on Labour and Income. [75-001-XIE]. Canada, Statistics Canada.
- Statistics Canada (2007a). *Perspectives on labour and income* (Rep. No. 75-001-XIE).
- Statistics Canada (2007b). *Perspectives on labour and income: Gambling* (Rep. No. 75-001-XIE).
- Stekel, W. (1929). The Gambler. In S. Van Teslaar (Ed.), *Peculiarities of Behaviour* (pp. 233-255). New York: Liveright.
- Stinchfield, R., Kushner, M. G., & Winters, K. C. (2005). Alcohol use and prior substance abuse: Treatment in relation to gambling problem severity and gambling treatment outcome. *Journal of Gambling Studies*, 21, 273-297.

- Strong, D. R. & Kahlner, C. W. (2007). Evaluation of the continuum of gambling problems using the DSM-IV. *Addiction*, 102, 713-721.
- Suck Won, K., Grant, J. E., Eckert, E. D., Faris, P. L., & Hartman, B. K. (2006). Pathological gambling and mood disorders: Clinical associations and treatment implications. *Journal of Affective Disorders*, 92, 109-116.
- Szasz, T. S. (1974). *The myth of mental illness: Foundations of a theory of personal conduct*. (Revised ed.) New York: Harper Colophon Books.
- Taber, J. I., McCormick, R. A., & Ramirez, L. F. (1987). The prevalence and impact of major life stressors among pathological gamblers. *The International Journal of the Addictions*, 22, 71-79.
- Tavares, H., Martins, S. S., Lobo, D. S., Silveira, C. M., Gentil, V., & Hodgins, D. C. (2003). Factors at play in faster progression for female pathological gamblers: An exploratory analysis. *Journal of Clinical Psychiatry*, 64, 433-438.
- Toce-Gerstein, M., Gerstein, D. R., & Volberg, R. A. (2002). A hierarchy of gambling disorders in the community. *Addiction*, 98, 1661-1672.
- Toneatto, T. (2002). Cognitive therapy for problem gambling. *Cognitive and Behavioral Practice*, 9, 191-199.
- Toneatto, T. & Brennan, J. (2002). Pathological gambling in treatment-seeking substance abusers. *Addictive Behaviors*, 27, 465-469.

- Trevorrow, K. & Moore, S. (1998). The Association between loneliness, social Isolation and women's electronic gaming machine gambling. *Journal of Gambling Studies*, 14, 263-285.
- Vitaro, F., Arseneault, L., & Tremblay, R. E. (1999). Impulsivity predicts problem gambling in low SES adolescent males. *Addiction*, 94, 575.
- Walker, D. M. & Barnett, A. H. (1999). The social costs of gambling: An economic perspective . *Journal of Gambling Studies*, 15, 181-212.
- Wardman, D., el-Guebaly, N., & Hodgins, D. (2001). Problem and pathological gambling in North America Aboriginal populations: A review of the empirical literature. *Journal of Gambling Studies*, 17, 81-101.
- Welte, J. W., Barnes, G. M., Wieczorek, W. F., & Tidwell, M.-C. O. (2004). Gambling participation and pathology in the United States - A Sociodemographic analysis using classification trees. *Addictive Behaviors*, 29, 983-989.
- Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C. O., & Hoffman, J. H. (2007). Type of gambling and availability as risk factors for problem gambling: A Tobit regression analysis by age and gender. *International Gambling Studies*, 7, 183-198.
- Welte, J. W., Barnes, G. M., Wieczorek, W. F., Tidwell, M.-C. O., & Parker, J. C. (2004). Risk factors for pathological gambling. *Addictive Behaviors*, 29, 323-335.

- Westphal, J. R. (2007). The evidence base supporting the subtyping of gamblers in treatment. *International Journal of Mental Health and Addiction*, 5, 123-140.
- Whiting, J. W. & Child, I. L. (1953). *Child training and personality: A cross-cultural study*. New Haven, CT: Yale University Press.
- Wiebe, J., Single, E., & Falkowski-Ham, A. (2001). *Measuring gambling and problem gambling in Ontario* Canadian Centre on Substance Abuse; Responsible Gambling Council (Ontario).
- Williams, R. J. & Connolly, D. (2006). Does learning about the mathematics of gambling change gambling behavior? *Psychology of Addictive Behaviors*, 20, 62-68.
- Wohl, M. J. A., Matheson, K., Young, M. M., & Anisman, H. (2008). Cortisol rise following awakening among problem gamblers: Dissociation from comorbid symptoms of depression and impulsivity. *Journal of Gambling Studies*, 24, 79-90.
- Wood, S. W. & Clapham, M. M. (2005). Development of the Drake beliefs about Chance Inventory. *Journal of Gambling Studies*, 21, 411-431.
- World Health Organization (1992). *The ICD-10 Classification of mental and behavioural disorders: Clinical descriptions and diagnostic guidelines (10th revision)*. Geneva: World Health Organization.

- Young, M. R. & Oei, T. P. S. (2000). The predictive utility of drinking refusal self-efficacy and alcohol expectancy: A diary-based study of tension reduction. *Addictive Behaviors, 25*, 415-421.
- Zack, M., Stewart, S. H., Klein, R. M., Loba, P., & Fragopoulos, F. (2005). Contingent gambling-drinking patterns and problem drinking severity moderate implicit gambling-alcohol associations in problem gamblers. *Journal of Gambling Studies, 21*, 325-355.
- Zimmerman, M., Chelminski, I., & Young, D. (2006). Prevalence and diagnostic correlates of DSM-IV pathological gambling in psychiatric outpatients. *Journal of Gambling Studies, 22*, 255-262.
- Zuckerman, M., Buchsbaum, M. S., & Murphy, D. L. (1980). Sensation seeking and its biological correlates. *Psychological Bulletin, 88*, 187-214.