NATIONAL INSTITUTE FOR HEALTH AND WELFARE

Sari Castrén

# Disordered Gambling in Finland: Epidemiology and a Current Treatment Option

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*Sari Castrén*

# DISORDERED GAMBLING IN FINLAND: EPIDEMIOLOGY AND A CURRENT TREATMENT OPTION

ACADEMIC DISSERTATION

To be publicly discussed with the permission of the Faculty of Behavioural Sciences, University of Helsinki, in room/Auditorium 107, Siltavuorenpenger 3A on August 28th, 2013, at 12 noon.

National Institute for Health and Welfare
Department of Mental Health and Substance Abuse Services
Helsinki, Finland

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*Supervisors*

Adjunct Professor **Tuuli Lahti**, PhD
National Institute for Health and Welfare
Department of Mental Health and Substance Abuse Services
Helsinki, Finland

and

Professor Emeritus **Robert Ladouceur**, PhD
University of Laval, Quebec City
School of Psychology
Quebec, Canada

*Co-supervisor*

Professor **Kimmo Alho**, PhD
University of Helsinki
Institute of Behavioural Sciences
Helsinki, Finland

*Reviewers*

Professor **Nady el-Quebaly**, MD, PhD
Head, Division of Addiction,
Department of Psychiatry at the University of Calgary,
Calgary, Canada

and

Adjunct Professor **Sami Leppämäki**, MD, PhD
Finnish Institute of Occupational Health
Helsinki, Finland

*Opponent*

Professor **Ståle Pallesen**, PhD
Department of Psychosocial Science
University of Bergen
Bergen, Norway

*To my wonderful children*

# Abstract

Sari Castrén. Disordered Gambling in Finland: epidemiology and current treatment option. National Institute for Health and Welfare (THL). Research 111. 126 pages. Helsinki, Finland 2013.
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Disordered gambling is a multifaceted phenomenon, and consequently many factors have a role in its development and maintenance. Adverse consequences of disordered gambling can be mental, social and legal. Only a few epidemiological studies of disordered gambling have previously been conducted in Finland, and none of these studies have been published internationally. Gambling research in Finland has increased during the past years, especially the investigation of treatment options for disordered gambling. In this thesis, disordered gambling is approached from two angles: the epidemiological angle provides an overall picture of the current situation in Finland, and the treatment angle studies the phenomenon from an individual standpoint.

In the epidemiological studies of this thesis, the prevalence, socio-demographic characteristics, comorbid substance use, perceived health and well-being and the type of gambling and its relations to the severity levels of gambling were measured. The data were derived from two samples, The Health Behaviour and Health among the Finnish Adult Population, Spring 2010, postal survey (N = 2826) and The Finnish Gambling 2011 (N = 3451), telephone interview. These studies used South Oaks Gambling Screen (SOGS) and Problem Gambling Severity Index as a measure of gambling severity. In the epidemiological studies the prevalence of disordered gambling was found to be about 3% (Finnish Gambling 2011). Disordered gambling was more common among males and the younger age group. Disordered gambling was generally associated with socio-economic disadvantages like being divorced, unemployed or having a low level of education. Comorbid alcohol use and nicotine dependency as well as low self-perceived mental health status were associated with disordered gambling. Lotto (Finnish lottery) was the most popular type of game gambled, but slot machine and internet gambling were found to be associated with disordered gambling.

The two treatment studies of this thesis describe the socio-demographic characteristics (N = 471), the severity of disordered gambling, gambling urge, gambling-related erroneous thoughts and the level of control of gambling among the treatment-seeking gamblers. In the treatment studies, comorbid alcohol use and depression were also studied. Moreover, changes in the severity of gambling, gambling urge, gambling-related erroneous thoughts and control of gambling, as well as alcohol use and the level of depression at baseline, post-treatment and 6- and 12-month follow-

up were studied. The data were derived from the Peli Poikki program which is an internet-based 8-week cognitive behavioural therapy for gamblers. This study used NORC DSM-IV Screen for Gambling Problems as a measure of gambling severity. Results revealed that 78.8% of the treatment-seeking participants were disordered gamblers. 224 participants completed the treatment and after 8 weeks of treatment a significant decline was seen in gambling-related problems and gambling urge, and an improvement in control of gambling. The mood of participants improved and alcohol use decreased during the treatment period, and participants reported improvements in their social situations after the treatment.

In conclusion, the prevalence of disordered gambling has been more or less unchanged during the past years in Finland. A specific socio-demographic group of individuals seems to be at higher risk of having and developing disordered gambling, especially with the abundant gambling opportunities in Finland. The results of the Peli Poikki program encourages implementing more evidence-based treatment options for disordered gambling in Finland.

Keywords: cognitive behavioural therapy, disordered gambling, epidemiology, prevalence, internet-based treatment, socio-demographic characteristics, type of gambling

# Tiivistelmä

Sari Castrén. Disordered Gambling in Finland: epidemiology and a current treatment option [Rahapelaamishäiriö Suomessa: epidemiologia ja hoito]. Terveyden ja hyvinvoinninlaitos (THL).Tutkimus 111. 126 sivua. Helsinki, Finland 2013.
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Rahapelaamishäiriö on monisyinen ilmiö, jonka syntyyn ja jatkumoon liittyy useita osatekijöitä. Rahapelaamishäiriön seuraukset voivat olla terveydellisiä, sosiaalisia, taloudellisia tai oikeudellisia. Ennen vuotta 2013 vain muutama kansainvälinen julkaisu rahapelaamishäiriön epidemiologiasta Suomessa oli saatavilla. Viime vuosina rahapelaamishäiriön tutkiminen Suomessa on lisääntynyt ja samalla tuntemus rahapelaamishäiriön epidemiologiasta ja hoidosta kasvanut. Tämä väitöskirja käsittelee tuoreimpaan tutkimustietoon pohjautuen rahapelaamishäiriötä kahdesta näkökulmasta: väestötutkimus antaa kokonaiskuvan suomalaisten rahapelaamishäiriöstä ja hoitotutkimus valottaa ilmiötä yksilön näkökulmasta.

Tässä väitöskirjassa on tutkittu väestötutkimusaineistoihin pohjautuen rahapelaamishäiriön esiintyvyyttä suomalaisessa väestössä sekä sosiodemografisten taustatekijöiden, koetun terveyden ja hyvinvoinnin, rahapelaamisen tyypin ja liitännäisongelmien (kuten alkoholin riskikulutus ja tupakointi) yhteyttä rahapelikäyttäytymiseen ja rahapelaamishäiriön vaikeusasteeseen. Väitöskirjaan sisällytetyt väestötutkimuksen alaan kuuluvat osajulkaisut ovat I) postikyselytutkimus ”Suomalaisen aikuisväestön terveyskäyttäytyminen ja terveys, kevät 2010”, (N = 2826) sekä II) puhelinkyselynä toteutettu ”Suomalaisten rahapelaaminen 2011”, (N = 3451). Rahapelaamishäiriön vakavuutta mitattiin väestötutkimuksissa kahdella eri mittarilla: South Oaks Gambling Screen (SOGS) ja Problem Gambling Severity Index (PGSI). Suomalaisten rahapelaaminen 2011 – tutkimuksen mukaan rahapelaamishäiriön esiintyvyys väestötasolla oli noin 3 %. Rahapelaamishäiriö oli yleisempää miehillä ja nuoremmissa ikäluokissa kuin naisilla tai vanhemmissa ikäluokissa. Tutkimustulosten mukaan rahapelaamishäiriön esiintyvyys oli yhteydessä sosiaalisiin taustatekijöihin kuten avioeroon, työttömyyteen ja alempaan koulutustasoon. Samanaikainen alkoholin käyttö, tupakointi sekä mielenterveysongelmat olivat yhteydessä rahapelaamishäiriön vaikeusasteeseen. Lotto oli pelatuin rahapeli väestöotoksessa, rahapeliautomaattien ja internetin välityksellä pelatut rahapelit olivat kuitenkin voimakkaimmin yhteydessä rahapelaamishäiriön vaikeusasteeseen.

Tässä väitöskirjassa on tutkittu hoitotutkimukseen pohjautuen hoitoon hakeutuneiden rahapelaamishäiriöstä kärsivien rahapelaajien (N = 471) sosiodemografisia taustatekijöitä, rahapelaamisen vaikeusastetta, rahapelihimoa, rahapelaamiseen liittyvien virheellisten uskomusten ja pelaamisen kontrollin astetta sekä liitännäisongelmia (masennus ja alkoholin riskikulutus) sekä muutoksia näissä muuttujissa

ennen hoitoa ja hoidon jälkeen sekä 6 ja 12 kuukauden jälkiseurannoilla. Aineistona tutkimuksessa käytettiin Peli poikki hoito-ohjelman (kognitiiviseen käyttäytymisterapiaan pohjautuva virtuaaliterapia) aikana kerättyjä tietoja. Väitöskirjaan on sisällytetyt hoitotutkimuksen alaan kuuluvat osajulkaisut ovat III ja IV. Hoitotutkimuksissa rahapelaamishäiriön vakavuutta mitattiin NORC DSM-IV Screen for Gambling Problems- mittarilla. 78.8% osallistujista täytti rahapelaamishäiriön kriteerit. 244 osallistujaa kävi loppuun 8-viikkoa kestäneen hoito-ohjelman. Hoito-ohjelman läpikäyneiden osallistujien rahapelaamisen vaikeusaste ja rahapelihimo laskivat, kun taas rahapelaamisen kontrolli kasvoi. Lisäksi osallistujien mieliala koheni ja alkoholin kulutus ja negatiiviset rahapelaamisen aiheuttamat seurannaisvakutukset vähenivät.

Väitöskirjan osatöiden perusteella voidaan sanoa, että suomalaisten rahapelaaminen on pysynyt jokseenkin samalla tasolla 2000-luvulla. Tietyt sosiaaliset taustatekijät ovat selkeästi yhteydessä rahapelaamishäiriön vaikeusasteeseen ja kehittymiseen. Peli poikki hoito-ohjelman tulosten perusteella tutkittuun tietoon perustuvan hoito-ohjelman vaikuttavuus on lupaavaa, joten tutkittuun tietoon perustuvia hoito-ohjelmia ja malleja tulisi käyttää rahapelaamishäiriön hoidossa Suomessa laajemminkin.

Avainsanat: esiintyvyys, internet-pohjainen hoito, kognitiivinen käyttäytymisterapia, pelityyppi, rahapelaamishäiriö, sosiaaliset taustatekijät, väestötutkimus

# Sammanfattning

Sari Castrén. Disordered Gambling in Finland: epidemiology and a current treatment option. [Spelberoende i Finland: epidemiologi och behandling]. Institutet för hälsa och välfärd (THL). Forskning 111, 126 sidor.
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Spelberoende är ett komplicerat fenomen, och det finns olika faktorer som bidrar till dess uppkomst och förlopp. Spelberoende kan leda till hälsomässiga, sociala, ekonomiska eller juridiska konsekvenser. Före 2013 fanns det bara några internationella publikationer om epidemiologin för spelberoende i Finland. Under de senaste åren har forskningen om spelberoende i Finland ökat, och samtidigt har kunskaperna om behandlingen av och epidemiologin för spelberoende ökat. Denna doktorsavhandling bygger på senaste forskningsrön och behandlar spelberoende ur två olika synvinklar: befolkningsstudien ger en helhetsbild av finländarnas spelberoende, och behandlingsstudien belyser fenomenet ur individens perspektiv.

Baserad på materialet från befolkningsstudien undersöker denna doktorsavhandling förekomsten av spelberoende i den finländska befolkningen. Dessutom undersöks hur sociodemografiska bakgrundsfaktorer, upplevd hälsa och välfärd, speltyp och problem som förknippas med spelande (till exempel rökning och riskkonsumtion av alkohol) står i samband med spelbeteendet och graden av spelberoende. De delarbeten som ingår i doktorsavhandlingen inom området befolkningsstudier är I) postenkäten ”Den finländska vuxenbefolkningens hälsobeteende och hälsa, våren 2010” (N = 2 826) samt II) ”Finländarnas penningspel 2011”, som genomfördes i form av telefonintervjuer (N = 3 451). Graden av spelberoende mättes i befolkningsstudierna med två olika instrument: South Oaks Gambling Screen (SOGS) och Problem Gambling Severity Index (PGSI). Enligt enkäten ”Finländarnas penningspel 2011” var förekomsten av spelberoende i befolkningen cirka tre procent. Spelberoende var vanligare bland män och i yngre åldersgrupper än bland kvinnor och i äldre åldersgrupper. Enligt forskningsresultaten var förekomsten av spelberoende förknippad med sociala bakgrundsfaktorer, såsom skilsmässa, arbetslöshet och lägre utbildningsnivå. Psykisk hälsa, rökning och samtidig användning av alkohol hade ett samband med graden av spelberoende. Enligt urvalet var Lotto det populäraste spelet om pengar, men spelautomater och spel om pengar via Internet uppvisade starkast samband med graden av spelberoende.

Baserad på behandlingsstudien undersöker denna doktorsavhandling olika faktorer hos spelberoende personer som sökt behandling (N = 471). Dessa variabler är sociodemografiska bakgrundsfaktorer, grad av spelberoende, spelbegär, felaktiga uppfattningar om spelande om pengar, kontroll över spelande samt problem som

förknippas med spelande (depression och riskkonsumtion av alkohol). Dessutom undersöks förändringar i dessa variabler före och efter behandlingen och vid uppföljningarna efter sex och tolv månader. Som material i studien användes data som samlats in under behandlingsprogrammet ”Peli poikki” (virtuell terapi som bygger på kognitiv beteendeterapi). De delarbeten som ingår i doktorsavhandlingen inom området behandlingsstudier är III och IV. I behandlingsstudierna mättes graden av spelberoende med instrumentet NORC DSM-IV Screen for Gambling Problems. Kriterierna för spelberoende uppfylldes av 78,8 procent av deltagarna. 244 deltagare slutförde det åtta veckor långa behandlingsprogrammet. Graden av spelberoende och spelbegäret minskade och kontrollen över spelandet ökade hos deltagarna som slutförde behandlingsprogrammet. Dessutom förbättrades deltagarnas humör, och alkoholkonsumtionen och spelandets negativa effekter minskade.

På grundval av delarbetena kan man konstatera att finländarnas spelande om pengar har legat på ungefär samma nivå under 2000-talet. Vissa sociala bakgrundsfaktorer har ett klart samband med graden och uppkomsten av spelberoende. På grundval av resultaten från behandlingsprogrammet ”Peli poikki” är effekten av behandlingsprogrammet som bygger på evidensbaserad kunskap lovande. Därför borde behandlingsprogram och modeller som bygger på evidensbaserad kunskap användas i större utsträckning vid behandling av spelberoende i Finland.

Nyckelord: förekomst, webbaserad behandling, kognitiv beteendeterapi, speltyp, spelberoende, sociala bakgrundsfaktorer, befolkningsstudie

# Contents

# List of original papers

I Castrén, S., Basnet, S., Pankakoski, M., Ronkainen, J-E., Helakorpi, S., Uutela, A., Alho, H., Lahti, T. An analysis of Problem Gambling among the Finnish working-age population: A Population Survey. BMC Public Health 2013; 13:519 doi: 10.1186/1471-2458-13-519.

II Castrén S., Basnet, S., Pankakoski, M., Salonen, A, Ronkainen, J-E., Alho, H., Lahti, T. Factors associated with disordered gambling in Finland. Substance Abuse Treatment, Prevention, and Policy 2013; 8:24 doi: 10.1186/1747-597X-8-24.

III Castrén, S., Pankakoski, M., Ladouceur, R., Lahti, T. Internet-based 8-week cognitive therapy for gambling problems: socio-demographic characteristics of the participants. Psychiatria Fennica 2012; 43:79-96.

IV Castrén, S., Pankakoski, M., Tamminen, M., Lipsanen, J., Ladouceur, R., Lahti, T. Internet-based CBT intervention for gamblers in Finland: Experiences from the field. Scandinavian Journal of Psychology 2013; 54(3): 230-235 doi: 10.111/sjop.12034.

In the text these articles will be referred to as Studies I-IV.

# Abbreviations

| | |
|---|---|
| ANOVA | Analysis of variance |
| AVTK | Health Behaviour and Health among the Finnish AdultPopulation |
| AUDIT-C | Alcohol Use Disorders Identification Test |
| B | Estimates |
| CBT | Cognitive Behavioural Therapy |
| CI | Confidence Interval |
| DG | Disordered Gambling |
| DSM-III-R | Diagnostic and Statistical Manual of Mental Disorders, Third Edition-Revised |
| DSM-IV | Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition |
| DSM-5 | Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition |
| EBT | Evidence-based treatment |
| EFPPA | European Federation of Professional Psychologists' Associations |
| EGM | Electronic Gaming Machines |
| GD | Gambling Disorder |
| GEE | Generalized Estimating Equations |
| MADRS-S | Montgomery Åsberg Depression Rating Scale, Self-administrated version |
| M | Means |
| MHI-5 | Mental Health Inventory |
| MI | Motivational Interviewing |
| NODS | NORC DSM-IV Screen for Gambling Problems |
| NRC | National Research Council |
| OR | Odds ratios |
| PAF | Åland Slot Machine Association |
| PG | Pathological gambling |
| PGs | Pathological gamblers |
| PGSI | Problem Gambling Severity Index |
| PGRTC | Problem Gambling Research and Treatment Centre |
| PP program | Peli Poikki program |
| SD | Standard Deviation |
| SOGS | South Oaks Gambling Screen |
| SOGS-R | South Oaks Gambling Screen Revised |

# 1 Introduction

Gambling has attracted mankind since the beginning of our civilisation. Notes and quotes of gambling have been traced, for example, from the writings of Homer, Chaucer and Shakespeare. Even more recent writing of Fyodor Dostoyevsky "The Gambler" captures well the spell of gambling:

"I believed in my system... went to the tables, and within a quarter of an hour I won 600 francs. This whetted my appetite. Suddenly I started to lose, could not control myself and lost everything... In Baden I took my last money, and went to play. Starting with 4 napoléons I won 35 napoléons in half an hour. I was carried away by this unusual good fortune and risked all 35 napoléons and lost them all. I had 6 napoléons left to pay landlady and for the journey. In Geneva I pawned my watch." (Dostoevsky, The Gambler).

Ancient and recent quotes and notes of gambling reflect lust, excitement and joy, but on the other hand also loss, despair and misery. In fact, there is a vast truth in those quotes in describing well what gambling is about, problematic gambling in particular: a moment's pleasure, yet rarely a lifetime treasure. Today, the increasing amount of opportunities to gamble and the constant expansion of the gambling markets have the potential to increase disordered gambling (Williams et al., 2012).

Gambling is widely available in Finland (Jaakkola, Murto & Pajula, 2012), and in the future gambling opportunities for the Finns will grow even more with a new casino opening in the eastern part of Finland. As expansion of legal gambling opportunities, especially slot machines and casino gambling, has the tendency to increase disordered gambling in societies (Williams et al., 2012; Cox et al., 2005), disordered gambling has become a public health concern in Finland.

In this thesis, disordered gambling was studied from two angles: epidemiology and treatment. Epidemiological studies investigated phenomena associated with disordered gambling (Shaffer et al., 2004; Petry, 2005; Black et al., 2012). Treatment studies investigated the treatment-seeking population of disordered gamblers and the efficacy of an internet-based cognitive behavioural therapy. The first aim of these studies was to identify the factors related to the development of disordered gambling: by identifying these factors, early detection and prevention of disordered gambling is possible. The second aim of these studies was to evaluate how the only evidence-based treatment (EBT) option available in Finland works in practice.

# 2 Review of the literature

## 2.1 Terminology

As based on individual gambling patterns, varying terms can be used for classification of disordered gambling (DG). Terms "pathological gambling", "problem gambling", "compulsive gambling", "gambling addiction", "at-risk gambling", "low-risk gambling" and "probable pathological gambling" are often used in gambling research. The different terms stem from various instruments that have been used to measure the severity of disordered gambling.

Shaffer and colleagues (1997) defined disordered gambling as a term to describe the full range of gambling problems. The severity of disordered gambling range from at-risk gambling to problem gambling and to pathological gambling (PG) (NRC, 1999). Similar to other addictive behaviours (e.g., psychoactive substance use), disordered gambling may eventually lead to: a) neuro-adaptation with increase of tolerance and experience of withdrawal symptoms and b) negative psychosocial consequences such as debt, shame, guilt and depression (Shaffer et al., 2004). Those disordered gamblers who continue to gamble even with adverse consequences, may lose control over gambling and eventually become pathological gamblers (PGs) (Shaffer & Martin, 2011). Note that at least five of the ten criteria of the DSM-IV must be met for a diagnosis of pathological gambling (Table 1) and three of the ten criteria for problem gambling.

In May 2013, specific changes took place in DSM criteria. Due to the similarities between substance and behavioural addictions in natural history, phenomenology and adverse consequences (Grant et al., 2010; Holden, 2010), diagnosis of pathological gambling has been reclassified in DSM-5 (APA, 2013) as "Substance-Related and Addictive Disorders". The term "pathological gambling" has been renamed Gambling Disorder (GD). Changes in diagnostic criteria are as follows: a) elimination of the criterion "has committed illegal acts such as forgery, fraud, theft, or embezzlement to finance gambling", b) lowering the threshold for diagnosis meaning that four or more of nine points are needed for the diagnosis, c) adding a specific timeline that is needed for a diagnosis, meaning that gambling must occur within a 12-month period in order to meet the criteria of GD, d) three levels of severity: mild (4-5 criteria met), moderate (6-7 criteria met) and severe (8-9 criteria met), e) course of the disorder either episodic or persistent, f) recovery status: either in early remission or in sustained remission (APA, 2013).

This thesis, however, used measures based on the previous DSM-IV criteria.

**Table 1.** Diagnostic Criteria for Pathological Gambling, Reworded From the Diagnostic and Statistical Manual of Mental Disorders IV

| | |
|---|---|
| 1. | Preoccupation. Frequent thoughts about gambling. |
| 2. | Tolerance. Need to gamble with larger amount of money. |
| 3. | Withdrawal. Repeated unsuccessful efforts to cut down or stop gambling. |
| 4. | Restless or irritable when attempting to reduce gambling. |
| 5. | Escape. Gambling to escape problems or relieve negative mood. |
| 6. | Chasing lost money by returning to gambling to get even. |
| 7. | Lying to others to hide extent of gambling. |
| 8. | Illegal acts to support gambling. |
| 9. | Jeopardizing important relationships and job opportunities because of gambling. |
| 10. | Bailing out. Relying on others to relieve financial problems caused by gambling. |

Note: From Diagnostic and Statistical Manual of Mental Disorders (4th ed., p.615), 1994, Washington DC; American Psychiatric Association. Copyright by the American Psychiatric Association. Adapted and printed with permission.

In this thesis several instruments were used to measure the severity of disordered gambling: SOGS (South Oaks Gambling Screen), NODS (NORC DSM-IV Screen for Gambling Problems) and PGSI (Problem Gambling Severity Index). All these above mentioned instruments use their unique cut-off points to define the level of severity of disordered gambling. Despite the differences in their cut-off points and terms used in these instruments, this thesis uses the term disordered gambling systematically throughout the text as defined by Shaffer and colleagues (1997).

## 2.2 Fundamental principles of disordered gambling

### 2.2.1 Impaired control of gambling

Impaired control to restrain oneself from certain behaviour is a common feature of addictions (Alcoholic Anonymous, 1939; Jellinek, 1960; Heather, 1991; Corless & Dickerson, 1989; Dickerson et al., 1991; Dickerson & Baron, 2000). In 1991 Dickerson and colleagues pointed out that regular gamblers have difficulties in maintaining control over gambling (i.e., money and time consumed to gamble) during their gambling sessions. Impaired control to restrain oneself from gambling urges has nowadays been recognized as one of the most important underlying factors behind the development of disordered gambling (Blaszczynski & Nower, 2002; Dickerson, 2003).

According to Cantinotti and colleagues (2009) pathological gamblers (PGs) gamble with the intention to refund their debts and to escape from stress. PGs' erroneous thoughts include the idea of recouping losses by gambling and are fuelled by positive expectations, which further increases gambling behaviour.

### 2.2.2 Cognitive basis of gambling and illusion of control

Disordered gambling includes specific thought patterns that fuels the idea of winning or even predicts the wins. These thought patterns are modified by gambling-related erroneous thoughts and include the following errors in thinking: gamblers' limited knowledge of negative winning expectancy, independence of turns or events, illusion of control, superstitions and the fallacious hope of recouping losses (Ladouceur et al., 2002).

Negative winning expectancy is based on interpretative error, which makes gamblers believe that they have better chances to win by gambling. The fact is that the gambling industry is a profit-seeking business and thus cannot be profitable for the gamblers. In other words, all games with negative winning expectancy are profitable for the industry. The more gamblers bet, and the more their bets increase, the more their chances of losing increases.

The independence of events is often misinterpreted among gamblers. Independence of events refers to an event not influenced by previous or following events. It is independent by itself. Gamblers' misinterpretation of events occurs when two events having nothing to do with each other are erroneously linked together. For example, in slot machine gambling, a gambler's speed or way of touching the buttons of the machine is not actually linked to winning. However, in the gambler's mind the way of operating a machine are linked with wins. This in turn fosters the gambler's illusion of control and leads them to continue gambling. How is such a misinterpretation possible? First, the principle of independence of events occurs in all games of chance. Second, games of chance are based on chance, meaning that one wins or loses by chance. Third, games of chance are structured in such a way that each event is independent and cannot be predicted. With all this in mind, it is impossible to predict, control or influence the outcome of a game of chance.

Another trap for gamblers is the illusion of control, meaning that he or she could somehow influence the outcome of the game. Langer (1975) defined the illusion of control as an expectancy of success higher than the objective probability would warrant. There are specific illusions related to different game types. Table 2 shows some specific game illusions.

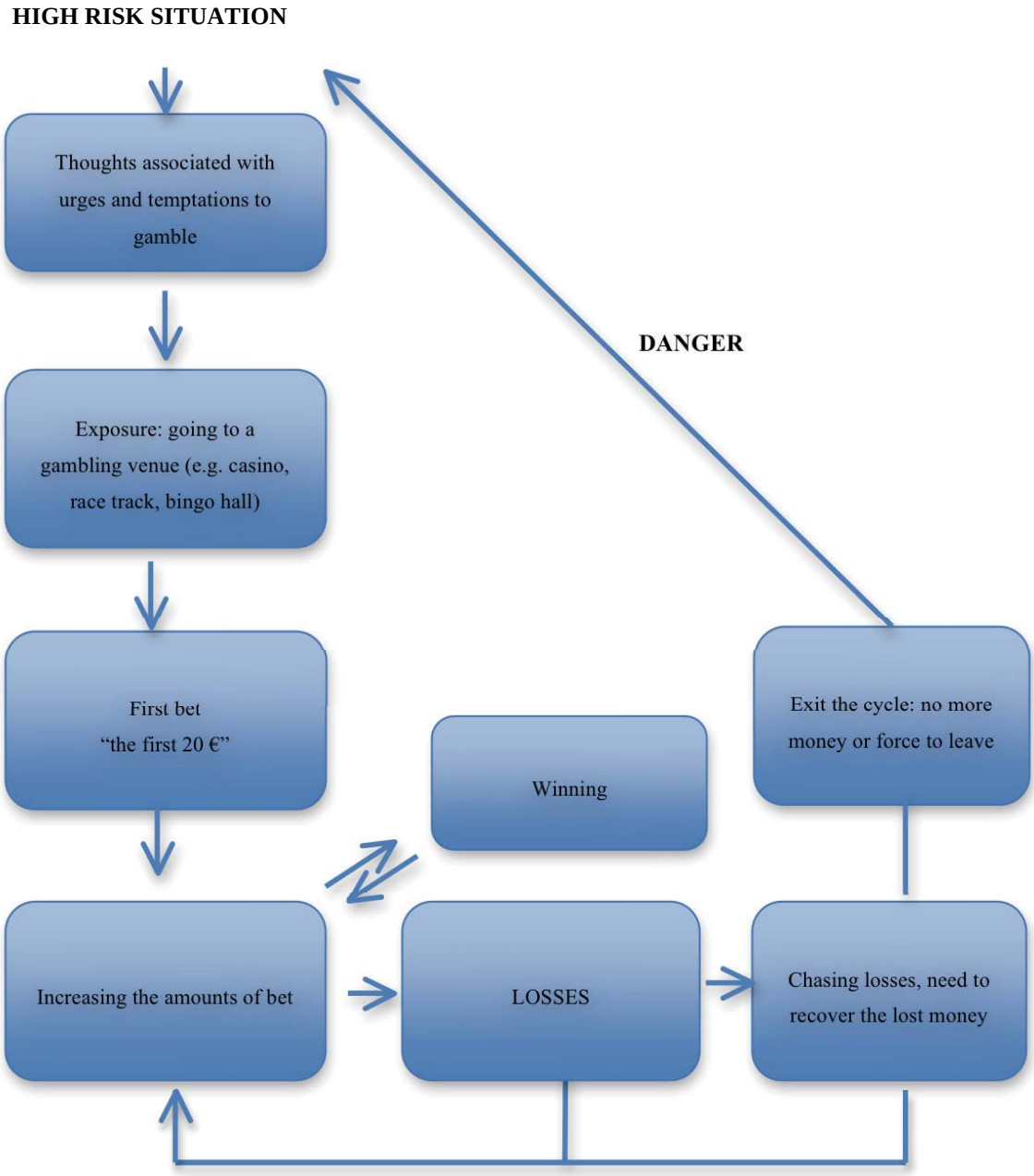
**Table 2.** Illusions of control in different games

| Game | Illusion |
|---|---|
| ***Slot machine*** | Observing the machine's cycles or patterns of winning or losing<br>Pressing the start button in different ways, e.g. changing your level of force, hitting it repeatedly, or changing your speed of betting |
| ***Lottery*** | Keeping track of winning numbers from previous draws<br>Betting on lucky numbers |
| ***Bingo*** | Choosing cards that have favourite numbers in them<br>Choosing a table where several people have won recently |
| ***Blackjack*** | Trying to memorize or count cards<br>Placing very high bets |
| ***Roulette*** | Watching previous rolls and keeping count of outcomes<br>Observing croupier's rolling technique, e.g. rhythm, regularity, continuity |
| ***Horse race*** | Studying statistics from previous races<br>Analysing the physical attributes of the horse, e.g. muscularity, way of standing. |
| ***Superstitions*** | "The 21st is a lucky day because it is made of three sevens"<br>"When I am not trying to win I win" |

Source: Ladouceur & Lachance, (2007). Adapted and printed with permission.

An individual's erroneous thoughts related to gambling fuels the urge to gamble. Thus the gambler becomes trapped into the circle of gambling, where both wins and losses lead to more gambling. Figure 1 shows the problem gambling behavioural chain by Ladouceur and Lachance (2007).

**Figure 1.** Problem Gambling Behavioural Chain




Source: Ladouceur & Lachance, (2007). Used with permission.

Ladouceur and Lachance (2007) have proposed what actually happens in a gambling situation on cognitive and behavioural levels. According to their model, strong urges are activated in specific high-risk situations. On a cognitive level this activation of urges means thoughts that lead to gambling. These gambling-related thoughts fuel the urge to gamble even more and thus maintain gambling. With the urge fuelled with gambling-related thoughts the gambler is vulnerable to be exposed to a gambling venue: in the case the gambler has access to a gambling venue he or

she first starts gambling with a low bet. The gambler either wins or loses and, despite "luck" he or she continues to gamble by either trying to increase the wins or to chase the losses, until the evident fact of having no money left.

## 2.3 Prevalence

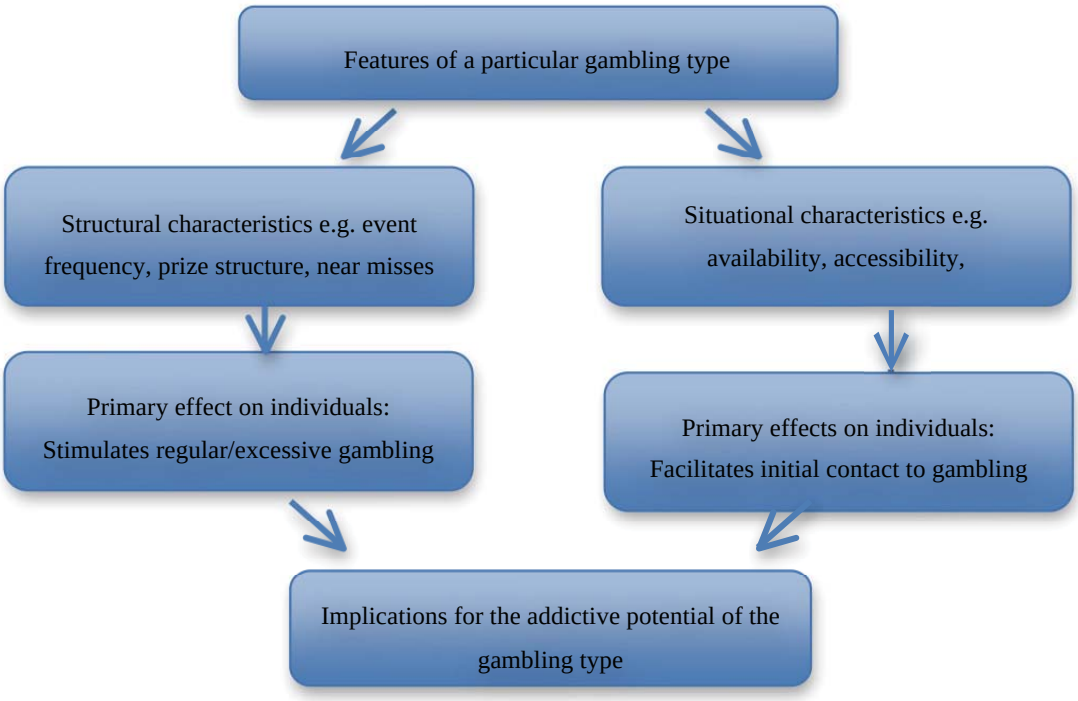
All in all, disordered gambling is an international phenomenon. Recent analysis by Williams, Volberg and Stevens (2012), that included a total of 202 prevalence studies between 1975 and 2012 worldwide, concluded that the standardized past-year problem gambling ranged from 0.5% to 7.6% with the average rate across all countries being 2.3%. According to their comprehensive report, the lowest prevalence rates are in Europe, intermediate rates in North America and Australia and the highest rates in Asia. The estimated current disordered gambling rate in Finland is 2.7%, more specifically 1.0% pathological gamblers and 1.7% problem gamblers (Turja et al., 2012).

## 2.4 Types of gambling and availability

The types of games gambled and especially specific features of them may have influence on the development of disordered gambling (Griffiths, 1999). For example, high frequency games that involve skill or perceived skill by creating a "near miss" illusion of having almost won are strongly associated with disordered gambling. Probability of winning or perceived probability of winning, and possibility of using credit to play are also associated with higher levels of disordered gambling (Parke & Griffiths, 2007). Electronic gaming machines (EGM's) and casino table games usually meet these criteria. In order to determine the addictive potential of a specific game type, both situational and structural characteristics should be taken into account.

Griffths, Hayer and Meyer (2009) illustrate type of gambling with an analysis scheme (Figure 2) by using situational and structural characteristics to explain the complexity of disordered gambling. In this scheme, the situational characteristics are the location of the gambling venues, the number of the gambling venues in a specific area, or advertisements that stimulate people to gamble and thus encompass the dimensions such as availability, acceptability and accessibility of gambling. Whereas structural characteristics are the gambler's motivation and urge to gamble in order to satisfy the need to gamble and, as a result, have the potential to induce regular or even excessive types of gambling.

**Figure 2.** The addictive potential of a particular gambling type – an analysis scheme




Source: Adapted From Problem Gambling in Europe, Challenges, Prevention and Interventions, Meyer, Hayer, & Griffths Eds. (p. xxi), 2009, New York, New York: Springer. Copyright by the Springer. Used with permission.

Globally, the utmost problems caused by disordered gambling are associated with EGM's (Griffths, 1999; Parke & Griffiths, 2006). EGM's account for some 70% of revenue for the gambling industry (Meyer, Hayer & Griffths, 2009). In Finland there are unique opportunities to gamble with about 20,000 EGM's scattered around kiosks, restaurants, shopping malls, grocery stores and fuel stations. Finnish Gambling Clinics' annual reports as well as Finnish Gambling Help Line – Peluuri's annual reports (Pajula et al., 2010; Pajula et al., 2011; Jaakkola et al., 2012) both show slot machines to be the most troubling game type for those who seek help. Notwithstanding the rather high problem of gambling rates in Finland, Finland's Slot Machine Association (RAY) is building a new casino in the eastern part of Finland to be opened in 2015. The opening of the new casino brings business to Finland, but also increases the potential to gamble, and thus may increase the risk of disordered gambling for the population living in close proximity of the gambling venue (Sevigny et al., 2008; Jacques, Ladouceur & Ferland, 2000). New gambling opportunities have the potential to attract people who have an existing gambling problem to relocate to areas that provide gambling opportunities, and may even encourage the gambling industry to build supplementary gambling venues in areas where a high rate of gambling already exists within the population (Shaffer and Korn, 2002).

## 2.5 Assessment

Various instruments have been developed and used for assessing gambling behaviours. Such instruments are, for example, the Problem Gambling Severity Index (PGSI; Ferris & Wynne, 2001), the South Oaks Gambling Screen Revised (SOGS-R; Lesieur & Blume, 1987) and the NORC DSM-IV Screen for Gambling Problems (NODS; Gerstein et al., 1999).

### 2.5.1 Problem Gambling Severity Index (PGSI)

The PGSI is a subset of the larger scale Canadian Problem Gambling Index (CPGI) (Ferris & Wynne, 2001). PGSI is based on DSM-IV criteria. PGSI has good psychometric properties. PGSI is simpler than SOGS/SOGS-R and DSM-IV yet has comparable internal consistency. Based on studies comparing PGSI with other measures like SOGS-R and Victorian Gambling Screen (VGS), CPGI was considered as a better instrument for population studies (McMillen & Wenzel, 2006).

### 2.5.2 South Oaks Gambling Screen (SOGS)

The South Oaks Gambling Screen (SOGS) was developed by Lesieur and Blume (1987) originally to measure lifetime gambling. SOGS is based on DSM-III-R criteria. SOGS also has good consistency, reliability and concurrent validity. Despite its wide use in population studies as well as research studies, SOGS has been reported to produce false positives and therefore overestimate the number of pathological gamblers, especially when used in the general population (Ladouceur et al. 2000; Walker & Dickerson, 1996; Abbott & Volberg, 1992; Volberg & Banks, 1990). SOGS has been modified further to SOGS-R (Abbott & Volberg, 1991; 1992; 1996). Where SOGS measures the lifetime gambling, the SOGS-R measures both current (6 months) and lifetime gambling problem and probable pathological gambling. Abbott and Volberg added the word probable to distinguish that the score on a SOGS-R indicated only probable classification compared to clinical interview by a professional.

### 2.5.3 NORC DSM-IV Screen for Gambling Problems (NODS)

The NODS was developed by Gerstein and colleagues in 1998 as based on DSM-IV modified criteria for pathological gambling. NODS was developed to produce less false positive answers than SOGS (Gerstein et al., 1999). The NODS screen showed good internal consistency and validity (Gerstein et al., 1999). However, NODS has been found to produce false positives, meaning that NODS identifies the gambling problem and pathology to be more severe than it is in reality (Phillips, 2005; Murray, Ladouceur & Jaques, 2007).

## 2.6 Socio-demographics of disordered gamblers

Certain socio-demographic characteristics are associated with the development of disordered gambling. Explicitly, they are young age, male gender and lower socio-economic status. Marital status and ethnic minority status are also associated with disordered gambling (Petry, 2005).

### 2.6.1 Age

Age is evidently associated with disordered gambling. Early onset age is a risk factor for disordered gambling (Bondolfi et al., 2000; Vitaro et al., 2004). Several studies report that the rate of PG is higher among adolescents and college students compared to adults (Stinchfield & Winters, 1998; Shaffer et al., 1999; Ladouceur et al., 1999). Gupta and Dereversky (1998) found that those adolescents who are PGs have more often parent(s) who gamble or are involved with illegal activities when compared to other adolescents. Strong and Kahler (2007) have found that younger gamblers differ from older gamblers by their tendency to chase losses more.

Along with adolescents being at risk for developing disordered gambling the middle age groups (ages 30-64) have the highest risk of becoming PG's (Welte et al., 2002; Petry et al., 2005; Korn & Shaffer, 1999; Wiebe & Kostyk, 2000; McNelly & Burke, 2000). Furthermore, McCready and colleagues (2008) have found that the same socio-demographic characteristics and comorbidities are apparent among elderly gamblers as with other age groups. However, the elderly gamblers may have different reasons to gamble (McNelly and Burke 2000): the elderly individuals may attend gambling venues especially to seek social activities.

### 2.6.2 Gender

Studies worldwide have consistently reported an association between gender and disordered gambling. Male gender has continuously been linked as a risk factor for disordered gambling (Blanco et al., 2006).

Previously in 1999, Shaffer, Hall and VanderBilt reported the prevalence rates of disordered gambling by gender. According to 17 studies, males gambled more than females, particularly at more severe level. The same trend seems to be apparent on all continents. Another significant gender difference among disordered gamblers is that males, unlike females, tend to be young, single and living alone without children (Crisp et al., 2004). Furthermore, males tend to choose games that are strategic such as sport betting or card gambling. In fact, Blaszczynski and colleagues (1997) found that sensation seeking and impulsivity was significantly linked with males who were PGs. Vitaro and colleagues (1999) confirmed the same observation among frequently gambling adolescent males. While males are seeking challenge, females

are identified as "escape" gamblers (Davis, 2002; Blanco et al., 2006). Females seem to gamble mostly because of boredom, loneliness and isolation (Brown & Coventry, 1997; Trevorrow & Moore, 1998). Where males take risks in order to win big, females spend more time in gambling and wager less than males. Where males prefer sport betting and card games with bigger wagering, females prefer EGM's and bingo, which allow perhaps more gambling time as a function to forget daily problems. Males tend to have more significant gambling debts than females (Potenza et al., 2006).

Another distinctive gender difference is that males can gamble longer than females before their gambling develops as disordered (Potenza et al., 2006; Ibanez et al., 2003; Ladd & Petry, 2002; Tavares et al., 2001). In other words, disordered gambling develops among females faster than among males. This same observation has been made with alcohol dependence (Randall et al., 1999; Brady & Randal, 1999; Potenza et al., 2001). Nevertheless, comorbid alcohol dependency is more common among males and anxiety and depression are more common among females (Ibanez et al., 2001; Potenza et al., 2006; Desai & Potenza, 2008).

There is also a gender difference in the tendency to seek treatment for disordered gambling: females are more proactive to seek help for disordered gambling than males (Slutske, Blaszczynski & Martin, 2009).

### 2.6.3 Socio-economic status

Low socio-economic status, which here includes income, education and socio-demographic rankings, is associated with elevated rates of disordered gambling. In 1999, Shaffer and colleagues and the National Research Council (NRC) reported that a low level of education (high school or lower) is associated with disordered gambling, as is also low employment status (Johansson et al., 2009; Kessler et al., 2008; Welte et al., 2008; Blanco et al., 2006; Toneatto & Nguyen, 2007). Moreover, Volberg et al. (2001) found that in Sweden, individuals that received social welfare payments are an at-risk group. On the other hand, Petry (2005) notes that lower socio-economic status and ethnic minorities are often linked with mental health problems. Therefore, it is not quite clear which problem leads to another.

### 2.6.4 Ethnicity

Prevalence rates seem to vary by race and ethnicity. Welte and colleagues (2002) reported higher rates of disordered gambling among African Americans, Latinos and Asians. Further, Welte and colleagues (2004) found that gambling had increased among non-white ethnic minority groups. Petry and colleagues (2005) reported that especially African Americans in America seem to be at greater risk for disordered gambling. Furthermore, Cunningham-Williams and colleagues (2007) found that African Americans differed from Caucasians by endorsing higher proportions of preoccupation,

chasing losses, loss of control, financial bailout, interference with life responsibilities and illegal behaviours. In Sweden, Lund (2007) study found that individuals that were born in a non-western country were at risk of developing disordered gambling.

### 2.6.5 Marital status

Being single, i.e., never married, separated or divorced, is a risk factor for disordered gambling (Ferris et al., 1996; Lyk-Jensen, 2010; Lund, 2007). A recent study by Black and colleagues (2012) concluded that PGs are more likely than others to have an unstable marital life, be divorced or live alone.

## 2.7 Comorbidity of disordered gambling and other psychiatric disorders

Comorbidity is defined in Mosby's Medical Dictionary (2009) as two or more coexisting medical conditions or disease processes that are additional to an initial diagnosis. Each disorder can occur independently and the pattern can be identified as lifetime comorbidity or in a simultaneous pattern known as current comorbidity (Petry, 2005). Persons with disordered gambling often suffer from various comorbid disorders.

Comorbid substance abuse is an important correlate of disordered gambling (Smart & Ferris, 1996; Cunningham-Williams, Cottler, Compton & Spitznagel, 1998; Spunt, Dupont, Lesieur, Liberty & Hunt, 1998; Shaffer, Freed & Helea, 2002; el-Guebaly et al., 2006; Rush, Veldhizen & Adlaf, 2007). Nicotine dependence is also strongly associated with disordered gambling. Petry and colleagues (2005) state that approximately 60% of problem gamblers have nicotine dependence. Previously, Petry and Oncken (2002) reported that smoking is also associated with gambling severity and other psychiatric symptoms. It was also found that smokers craved gambling more and suffered lower self-perceived control of gambling than non-smokers (Petry & Oncken, 2002). Harper (2003) stated that smoking is a strong trance-inducing ritual associated with gambling. Recently, Odlaug and colleagues (2012a) concluded that cigarette smokers presented significantly more severe level of disordered gambling.

Comorbid psychiatric disorders that have been identified with disordered gambling are: major depression, dysthymia, manic disorders, generalized anxiety disorder, panic disorder, social and other phobias which are also identified as gambling comorbidities (Petry, 2005). Also attention deficit hyperactivity disorder, antisocial, narcissistic and borderline personality disorders, depression, cyclothymia and bipolar disorder (Odlaug et al., 2012b; Park et al., 2010), as well as compulsive shopping and compulsive sexual behaviour, are linked to disordered gambling (Kaush, 2003).

A high rate of comorbidities linked to disordered gambling is observed in population studies and the same trend occurs among help-seeking gamblers (Rash et al., 2011; Seguin et al., 2010; Kausch, 2003). It has been noted that disordered gambling and substance abuse are more severe when they co-occur as compared to those with only one of the disorders (Petry, 2000).

The comprehensive review and meta-analysis of population studies by Lorains and colleagues (2011) shows that disordered gamblers appear to have various comorbid disorders. Table 3 shows the prevalence of comorbid psychiatric disorders as presented by Lorains and colleagues (2011).

**Table 3.** Prevalence of comorbid mental health disorders in disordered gambling by Lorains et al. 2011 (Used with permission)

| Study | AUD[1] | MD[2] | BD[3] | SUD[4] | IDAD[5] | ND[6] | AD[7] | GAD[8] | AMD[9] | ASPD[10] |
|---|---|---|---|---|---|---|---|---|---|---|
| ***Afifi et al. 2010*** | | | 4.0% | | 1.6% | | | | | |
| ***Bondolfi et al. 2000*** | 36.0% | | | | | | | | | |
| ***Bondolfi et al. 2000*** | 13.5% | | | | | | | | | |
| ***Cunning-ham et al. 1998*** | 44.5% | 8.8 % | 3.1% | | 39.9% | 76.3% | | 7.7% | | 35.0% |
| ***Fiegelman et al. 1998*** | | | | 26.0% | | | | | | |
| ***Gerstein et al. 1999*** | 9.9% | 29.1% | 32.5% | | | | | | | |
| ***Kessler et al. 2008*** | | 38.6% | 17.0% | 76.3% | | 63.0% | 60.3% | | 55.6% | |
| ***Marshall & Wynne, 2004*** | 15.0% | 24.0% | | | | | | | | |
| ***Park et al. 2010*** | 30.2% | 11.6% | 0.0% | 69.8% | | 34.9% | | | 11.6% | |
| ***Petry et al. 2005*** | 73.2% | 37.0% | 22.8% | | 38.1% | 60.4% | 41.3% | 11.2% | 49.7% | 23.3% |
| ***Welte et al. 2001*** | 18.0% | | | | | | | | | |

Note: 1: Alcohol Use Disorder, 2: Major Depression, 3: Bipolar Disorder-Manic Episodes, 4: Substance Use Disorder, 5: Illicit Drug Abuse/Dependence, 6: Nicotine Dependence, 7: Anxiety Disorders, 8: Generalized Anxiety Disorder, 9: Any Mood Disorder, 10: Antisocial Personality Disorder

Some studies have identified individuals with disordered gambling of having poorer general health as compared to individuals who do not gamble (Morasco, von Eigen & Petry, 2006; Morasco, Pietrzak et al., 2006).

## 2.8 Social consequences of gambling

At an individual level, the consequences of disordered gambling can be personal, financial and legal problems.

High rates of divorce, decreased productivity and absences from work are common among disordered gamblers (Black et al., 2012; Shaw et al., 2007; Volberg & Boles, 1995; Ladouceur & Walker, 1996). One of the consequences of disordered gambling is debt, which can easily lead to financial instability (Unwin, Davis & De Leeuw, 2000). Financial instability can be a stress that leads to further symptoms of anxiety and depression. Stressful events may cause a decline in cognitive functioning by impaired judgement, and, as stated by Blaszczynski, McConaghy and Frankova (1991), may lead to criminal activities as the individual tries to recover the losses caused by gambling. Illegal acts are rather common among disordered gamblers (Brown, Killian & Evans, 2005). In fact, it has been suggested that as many as a third of criminal offenders meet the criteria for disordered gambling (Williams, Royston & Hagen, 2005).

## 2.9 Evidence-based treatment options

Natural recovery or recovery without formal treatment can occur for some gamblers (Hodgins, Wynne & Makarchuk, 1999; Suurvali, Hodgins & Cunningham, 2010). In 2006, Slutske reported that a third of the participants with a diagnosis of PG had recovered without treatment, and in 2009, Slutske and Blaszczynski reported that 80% of PGs recovered without treatment.

Coping methods in natural recovery are 1) practical: engaging oneself with meaningful activities, and 2) behavioural: paying attention to conditioned cues to gamble, for example, by avoiding gambling venues or advertisements or news about betting odds (Hodgins & el-Quebaly, 2000; Cunningham, Hodgins & Toneatto, 2009).

Various treatment options have been applied to disordered gambling over the years. The Problem Gambling Research and Treatment Centre (PGRTC, 2011) in Australia and The Cochrane Review (Cowlishaw et al., 2012) have identical suggestions for treating disordered gambling.

### 2.9.1 Psycho-social treatments

Cognitive therapy models primarily emphasise the modification of gambling-related erroneous thoughts (Ladouceur et al., 2001). In addition, the overestimation of probabilities of winning, independence of events and memory biases are covered in the treatment (Toneatto, 1999; Ladouceur & Lachance, 2007).

Behavioural therapy models approach disordered gambling learned patterns by reinforcement based on a functional framework. This means that the treatment focus is in antecedents, behaviours and consequences. In therapy the focus is in modification of one or more elements of that functional construction. In detail, behavioural therapy uses strategies like reduction of avoidance, exposure to high-risk situations, challenge of gambling-related erroneous thoughts with the help of behavioural experiments and skills training.

Cognitive behavioural therapies use elements from cognitive and behavioural techniques. Cognitive erroneous thoughts are identified, corrected and restructured. Behavioural methods are used to reduce the arousal and excitement of disordered gambling. At present, evidence-based treatment studies confirm that behavioural, cognitive and cognitive behavioural therapy (CBT) are the most effective psychotherapeutic treatments for problem gambling (Ladouceur et al., 2001; Petry et al., 2006; Toneatto & Ladouceur, 2003; Sylvain, Ladouceur & Boisvert, 1997). These treatments are cost-effective and have lasting-term benefits. The CBT model is also flexible and can be modified to meet clients' individual needs. The meta-analysis of treatment efficacy by Pallesen and colleagues (2005) showed that a combination of cognitive and behavioural therapies is the most efficient treatment model for the treatment of disordered gambling.

Motivational interviewing (MI) focuses on exploring and resolving ambivalence, and centres on motivational processes within the individual to facilitate the change (Miller & Rollnick, 2002). MI is a client-centred approach, yet directive where the therapist is promoting client's capacity for change, by intensifying discrepancy between present situation and behaviour with goals of change (Rollnick & Gobat, 2010). Motivational Enhancement Therapy (MET) is a four-session manualised intervention, derived from MI.

Group therapy is recommended by PGRTC to be delivered, but the body of evidence provides only some support for group intervention as based on research (Ladouceur et al., 2003; Echeburua et al., 1996).

### 2.9.2 Internet-based treatment

Internet-based therapies are a relatively new, though little studied, treatment option. Research evidence shows that only a small number (< 10%) of gamblers pursue treatment for their disordered gambling (Productivity Commission, 2010; Slutske, 2006; Cunningham, 2005). Therefore, new treatment options have been sought for

disordered gambling. Internet-based therapy appears to be a progressive alternative to face-to-face treatments. Internet-based treatment offers numerous advantages like availability, convenience, accessibility, cost-effectiveness, anonymity and privacy. These factors are valuable for those who seek help for addictions, but may not have access or the potential of face-to-face treatments (Monaghan & Blaszczynski, 2009 a, b; Gainsbury & Blaszczynski, 2011 a, b). These factors of internet-based treatment have various benefits. Cunningham (2007) stated that internet-based treatment modality works well with individuals that have not been seeking treatment actively or have dropped out from previous treatments. This means an overall increase in treatment uptake as only a very low percentage of gamblers seek treatment. The reasons for low help-seeking rates can be guilt, shame or apprehension of change or even a denial of the problem. Therefore, seeking internet-based treatment is easier (DiClemente & Prochaska, 1982). Moreover, evidence shows that internet-based CBT is effective and works (Carlbring & Smit, 2008; Carlbring et al., 2012).

### 2.9.3 Psychopharmacology

Opioid receptor antagonists (naltrexone and nalmefene) have been found to reduce the intensity of urges to gamble, gambling thoughts and gambling behaviour (Pallesen et al., 2007; Kim, Grant, Adison & Shin, 2001; Grant et al., 2006; Grant et al., 2008; Grant et al., 2010). Other pharmacological agents such as N-acetylcysteine, fluvoxamine, paroxetine, sertraline, bupropion and olanzapine (Pallesen et al., 2007; Black et al., 2007; Fong et al., 2008; McElroy et al., 2008) have also been used in the treatment of disordered gambling (Grant, Kim & Odlaug, 2007). So far, there have been only few studies combining pharmacological and psychological treatment options (Lahti et al., 2012a, 2013).

# 3 Aims of the studies

The basic aims of the four studies described here were to investigate the prevalence and characteristics of disordered gambling in Finland, and to study the efficacy of internet-based cognitive behavioural therapy for gamblers.

## 3.1 Aims of the epidemiological Studies I and II

In Study I, the first aim was to study the prevalence of disordered gambling (problem gambling) in the adult sample in Finland and to describe socio-demographic characteristics such as gender, marital status and employment status among disordered gamblers. The second aim was to investigate how alcohol use and cigarette smoking were associated with disordered gambling. Thirdly, the type and frequency of gambling was explored.

In Study II, the first aim was to compare the socio-demographic characteristics of non-problem gamblers, problem gamblers and PGs. The second aim was to investigate associations between gambling-related factors among the subgroups of gamblers. Third to investigate the association between perceived health and well-being among the subgroups of gamblers. Fourth to analyze simultaneously socio-demographic-characteristics, gambling related factors and perceived health and well-being and the severity of DG.

## 3.2 Aims of the treatment Studies III and IV

In Study III, the first aim was to describe the socio-demographic characteristics and the severity of disordered gambling, gambling urge, gambling-related erroneous thoughts, social consequences and the level of control of gambling among treatment-seeking gamblers at the baseline. The second aim was to measure the level of alcohol consumption and the level of depression at the baseline. The third aim was to use these variables as predictors for disordered gambling.

In Study IV, the aim was to measure changes in the severity of disordered gambling, gambling urge, gambling-related erroneous thoughts , social consequences and control of gambling, as well as alcohol use and the level of depression at baseline, post-treatment and 6- and 12- month follow-up.

# 4 Material and methods

## 4.1 Samples of the epidemiological studies

### 4.1.1 Study I

During April to June 2010, a total of 2826 individuals (1243 males and 1583 females) replied to the survey. An annual postal survey, entitled Health Behaviour and Health among the Finnish Adult Population (AVTK), was sent to a random sample of Finnish adults (N = 5000) aged between 15 and 64. The sample was derived from the Finnish Population Register. The survey was mailed to the participants in April 2010. A total of three reminders were sent until June if the participants did not return the survey. Participants sent their replies by pre-paid mail. The primary purpose of the AVTK survey was to obtain information about current health-related behaviours of working-age Finns, and about long- and short-term changes in health-related behaviours among this population. The survey examined key aspects of health-related behaviours including: smoking, dietary habits, alcohol consumption and physical activity. Two sections of gambling-related questions were included in the survey.

### 4.1.2 Study II

This study is based on a cross-sectional nationwide telephone survey entitled the Finnish Gambling 2011 (Turja et al., 2012). The data were collected between 3rd October 2011 and 14th January 2012. Participants were selected from the Finnish Population Register by using a random sample of 15-74-year-old Finns. The sample size was 16,000, of whom 11,129 had a registered telephone number. Before the telephone interview, the participants received an introductory letter describing the purpose of the study. The participants, whose phone number was not in the Finnish Population Register, were sent a letter requesting their willingness to participate in the survey. Eventually a total of 4,484 participants completed the study. From that sample, participants with any past-year gambling involvement (N = 3,451) were drawn for this study. The sampling weights based on age, gender and residency of the Finnish population (Turja et al., 2012) were applied to all descriptive and inferential analysis.

## 4.2 Sample of the treatment Studies III and IV

471 participants (325 males and 146 females) enrolled in the Peli Poikki (PP) program from May 2007 to September 2011. The Peli Poikki program is offered via internet sites (www.voimapiiri.fi; www.pelihaitat.thl.fi; www.pelipoikki.fi) to individuals that seek help for disordered gambling. All individuals whose anonymous information was used

in this study gave their consent to the purpose of the study. There were no exclusion criteria. Upon registration to the program the participants also filled in the Montgomery Åsberg Depression Rating Scale self-assessment (MADRS-S; Montgomery & Åsberg, 1979). In the case of participants scoring 20 points or higher in MADRS-S, they were advised to consult a mental health professional for appropriate help.

## 4.3 Measures of the epidemiological Studies I and II

### 4.3.1 Study I

Descriptive measures were classified by the gender, age, years of education, employment status and marital status.

Gambling severity was assessed by using the Finnish translation of the Problem Gambling Severity Index (PGSI) (Ferris & Wynne, 1999) where the sum of 9 items was computed, maximum points being 27, using a 4-point Likert scale with 0 = never, to 3 = almost always. Cronbach's alpha was 0.79. The scoring of the PGSI is as follows: a) 0 = non-problem gambling, b) 1 or 2 = low level of problems with few or no identified negative consequences (here considered to be low level gambling), c) 3 to 7 = moderate level of problems leading to some negative consequences (here considered to be moderate level gambling) and d) 8 or more = problem gambling with negative consequences and a possible loss of control (here considered to be problem gambling).

Consumption of alcohol was measured by two questions. Two questions of alcohol use: a) overall alcohol consumption: "During the past 12 months, have you consumed any alcohol?" Yes/No answers, b) risk-level of alcohol consumption: "How often do you drink six or more units of alcohol?" (One unit: 1/3 litre beer or cider, 12 cl wine, 8 cl strong wine, 4 cl strong alcohol), with a 6-point Likert scale where 1 = daily, 2 = 2–3 times per week, 3 = once a week, 4 = 2–3 times per month, 5 = couple of times per year or less, 6 = 0 never. Risk-level of alcohol consumption is defined at least 6 units at least once a week. Only question b) was used in the analyses, being a more accurate variable.

Frequency of smoking was measured by the question: "Do you smoke at the moment (cigarettes, pipe or cigars)? Using a 3-point Likert scale where 1 = yes, daily, 2 = once in a while, 3 = not at all.

The type of gambling was assessed by presenting 10 main types of gambling. The participants were asked to choose on what type of gambling they gambled. Gambling types were: a) Lotto and Viking lotto, b) daily Keno-lotteries, c) slot machines, d) scratch cards, e) sports betting, f) horse race betting and g) internet poker via both PAF (Åland Slot Machine Association) and other international internet gambling sites.

Frequency of gambling was measured using a 5-point Likert scale: not at all, less than once a week, 1–2 days per week, 3–5 days per week, 6–7 days per week. For gender and in general comparisons, responses were classified into two classes with regards to the frequency of gambling: less than once a week, and at least once a week.

### 4.3.2 Study II

Descriptive measures were classified by the gender, age, years of education and marital status.

Severity of disordered gambling was measured by using the South Oaks Gambling Screen (SOGS) (Lesieur & Blume, 1987). It is composed of thirteen items with a total score of 20 points. The scoring of SOGS is as follows: 0-2 = non-problem gamblers, 3-4 = problem gamblers, ≥5 = probable pathological gamblers. The Cronbach alpha for the SOGS was 0.913.

Gambling-related variables (problem gambler close by, gambling frequency, gambling expenditure and the types of games gambled) consisted of the following four questions. Onset age of gambling: "When did you start gambling?" Significant others' involvement in gambling activities: "Do any of the significant others of yours have problems with gambling?" with seven options (father, mother, sibling, grandparent, spouse, child, a close friend), and three answering options (yes, no, do not know).

Wagering on gambling: "How much money did you spend in gambling during the past week?" with three categories (do not know, 1-5 Euros, 5 or more Euros).

Type of gambling: lotto, scratch cards, slot machines, casino gambling and internet gambling during the past 12 months.

Loneliness was measured by using a question: "Do you feel lonely?" with five options which were recoded into two categories (all the time/often and sometimes/rarely/never).

Frequency of smoking was evaluated by using a question: "Have you smoked during the past 12 months?" with a 3-point Likert scale (daily, randomly, not at all). Random smokers and non-smokers were grouped into one for the analysis.

Consumption of alcohol was measured by using the modified version of the Alcohol Use Disorders Identification Test (AUDIT-C). AUDIT-C is a 3-item screen, which is used to identify the persons who are hazardous drinkers or have active alcohol use disorders (including alcohol abuse or dependence). The AUDIT-C has (Bush et al., 1998) a 5-point Likert scale scoring: a = 0 point, b = 1 point, c = 2 points, d = 3 points and e = 4 points. In this study, the total scores of AUDIT-C were counted by summing up the points for each item, and cut-off points recommended by Seppä (2010) were used to define risky drinking among males (score ≥6) and females (score ≥5).

The mental health of the participants was assessed by using the Mental Health Inventory (MHI-5) (Veit & Ware, 1983) comprising the following five items: nervousness, melancholy, jollity, calmness and happiness. MHI-5 was measured by using a 6-point Likert scale scoring: 1 = all of the time, 2 = most of the time, 3 = a good bit of the time, 4 = some of the time, 5 = a little of the time, 6 = none of the time. The total scores of MHI-5 variables were calculated by summing up the score of each item and the sums (range 4-30) were scaled into 1-100. Cut-off score of 52 or less was used: lower scores indicate clinically significant mental health problems (Berwick et al., 1991).

General health was inquired by using a question: "How is your general health at present?" with five options (bad, somewhat bad, average, good or somewhat good) recorded into three categories.

## 4.4 Measures of the treatment Studies III and IV

### 4.4.1 Study III

Descriptive variables were classified by the gender, age, onset age of gambling, level of education and employment status.

The NORC DSM-IV Screen for Gambling Problems (NODS) (Gerstein, Hoffman, Larison et al., 1999) was used to measure the severity of gambling. It is composed of 17 items. The sum of items was computed with maximum points of 10. Severity of gambling is determined as follows: 0 points = no gambling problem, 1-2 points = risky gambling habits, 3-4 points = problem gambling and 5-10 points = pathological gambling. NODS scores of the past two months were used in the analysis, being more representative of the recent past as compared to the past year.

The urge to gamble was measured by using one question: "How strong is your gambling urge, when it is at its strongest?" with a 10-point Likert scale, where 1 = weak urge to gamble to 10 = strong urge to gamble.

In Study III, four questions on control of gambling were used. Questions were: "Have you sometimes felt like that you are in a trance while you gamble?" "Have you sometimes felt that you are like another person when you gamble?" "Have you sometimes lost control of time while you gamble?" "Have you sometimes experienced that you had difficulties to recall what had happened while you gambled? A 5-point Likert scale was used, where 1 = never to 5 = always.

In Study IV only one question on control of gambling was used: "Have you sometimes lost control of your time while you gamble?"

Consumption of alcohol was measured by using a modified version of the Alcohol Use Disorders Identification Test (AUDIT-C) (Bush et al., 1998). It consists of 3 items with a 5-point Likert scale from 0 to 4 points. Sum of scores were used. Cut-off points for risky drinking among males (score ≥6) and females (score ≥5) recommended by Seppä (2010).

Social consequences of gambling were measured by using 14 questions, with a 5-point Likert scale, where 1 = very negative consequences to 5 = very positive consequences.

Gambling-related erroneous thoughts were measured by 14 questions with yes or no answers.

The patient-administered version of MADRS-S (Montgomery & Åsberg, 1979) was used to assess the mood of participants. The MADRS-S includes 9 questions with a 6-point Likert scale. Sum of scores range from 0 to 50 without weights used. Severity of depression is determined as follows: 0 to 6 = symptom absent, 7 to 19 = mild depression, 30 to 34 = moderate level of depression and 35 to 60 = severe level of depression.

Nine different types of gambling were investigated: slot machine gambling by RAY (Finnish Slot Machine Association), betting games both at the counter and via internet gambling site of Veikkaus (Finnish National Betting Agency), horse race betting Fintoto (Finnish National Horse Race Betting Agency), internet poker via PAF (Åland Slot Machine Association) and internet gambling via other international websites, internet poker by RAY, other internet gambling, casino gambling and other internet games not involving money.

Four questions of wagering were asked: "How much money have you wagered gambling in one week over the past month, and past year?" "How much money have you wagered in each gambling session over the past month, and past year?"

### 4.4.2 Study IV

In Study IV, the same variables as in Study III were used to collect the data at the baseline, after 8 weeks of treatment and in 6-and 12-month follow-up.

In Study IV, four trained therapists delivered the treatment.

The applied PP program is an 8-week internet-based CBT program with weekly therapist calls. Participants' progression is based on weekly modules. Participants are encouraged to participate in an online discussion group. The contents of the eight modules are:

1) Psycho-education and enhancement of motivation.
2) Recognition of high-risk situations and triggers for gambling behaviour. Recognition of gambling-related cognitive erroneous thoughts. Exercise: how to manage economy.
3) Identification of gambling-related social consequences.
4-5) Recognition of gambling-related erroneous thoughts and their impact on gambling behaviour. Enhancement to work toward future goals by accepting the present situation and focusing on the future.
6-7) Identification of gambling-related erroneous thoughts in a high-risk situation with practical exercises.
8) Relapse prevention.

## 4.5 Ethics of the studies

All present studies received ethics clearance from the Ethics Committee of the National Institute for Health and Welfare, Helsinki, Finland.

## 4.6 Statistics

### 4.6.1 Statistics of the epidemiological Studies I and II

In Study I, gender differences in socio-demographic variables, frequency of gambling and PGSI were assessed using t-tests for continuous data and Chi- Square tests for categorical data. A multinomial regression model was created to explore the association between socio-demographic variables and the level of gambling severity (PGSI). Different severity levels of gambling were compared to the non-problem gambling group, which served as the reference category. The statistical program SPSS (version 18) was used for the analyses.

In Study II, all continuous variables are presented as means (M) and standard deviations (SD) and all categorical variables are presented as frequencies and percentages. Chi-Square tests were used to assess the associations between categorical variables. The effect size of the best predictors of severity levels of disordered gambling was defined by using a multinomial regression analysis. Results of the multinomial regression model are presented as odds ratios (OR) and their corresponding 95% confidence intervals (CI).

The analyses were carried out in two steps. First, chi-square test was used to assess the statistical significance (p) of the associations of the categorical factors and the subgroups of gamblers. The factors for these bivariate analyses were chosen based on strong evidence gained from the previous studies. All categorical factors are presented using frequencies and percentages.

Then, simultaneously analysed factors associated with the severity of DG were explored using a multivariate-adjusted multinomial regression analysis. Problem gamblers and PGs were compared with non-problem gamblers. Selected factors consisted of socio-demographic characteristics, gambling-related factors and perceived health and well-being were included in the final model simultaneously.

Socio-demographic characteristics (gender, age and education) used in the model carry strong theoretical evidence from past studies. To precisely optimise the model, two game types, which represent the most widespread accessibility and addictive potential, slot machine and internet gambling, were included into the model as gambling-related factors. Finally, loneliness, daily smoking, risky alcohol consumption and overall mental health (MHI-5) represented significant factors related to perceived health and well-being.

The best fitting model was chosen by exploring different combinations of factors and comparing different models using the coefficient of determination (R squared). Results of the multinomial regression model are presented as odds ratios (OR) and their corresponding 95% confidence intervals (CI). Goodness of fit was assessed using Nagelkerke's R2.

### 4.6.2 Statistics of the treatment Studies III and IV

In Study III, all continuous variables are presented as means (M) and standard deviations (SD) and all categorical variables are presented as frequencies and percentages. A linear regression model was used to investigate variables contributing to gambling-related problems (NODS).

In Study IV, gender differences in socio-demographic variables and gambling types were analysed using t-tests and Chi-Square tests. A regression model was used to study the changes in time. Logistic regression was used with dichotomized variables NODS, gambling urge and impaired control of gambling. Results are presented with odds ratios (OR) and their corresponding 95% confidence intervals (CI). Linear regression was used in analysing continuous variables. Results are presented with best estimates (B) and confidence intervals (CI). Generalized estimating equations (GEE) were used in the estimation.

# 5 Results

## 5.1 Findings of the epidemiological Studies I and II

The basic findings of Studies I and II were that young age, male gender, low socio-economic status (including education) and separated or divorced marital status were associated with disordered gambling. Slot machine gambling and internet gambling were strongly associated with disordered gambling. Comorbid disorders, especially depression and low self-perceived mental health status, loneliness, alcohol consumption and cigarette smoking were also associated with disordered gambling.

### 5.1.1 Results of Study I

#### *5.1.1.1 Socio-demographic characteristics*

There were more females (56%) than males in this sample. The age difference between females (M = 42.3, SD = 14.4) and males (M = 43.6, SD = 14.32) was small but statistically significant (t (2824) = 2.40, p = 0.017). However, because of the large sample size, these kind of small and trivial differences often appear to be significant.

As many as 60% of the respondents reporting the most severe forms of disordered gambling were separated or divorced ($\chi^2 = 24.1$, df = 9, $p < 0.005$). The severity of disordered gambling was also compared with marital status, with 67.3% of those respondents with no current presentation of disordered gambling being married or cohabiting. Single status respondents had the highest percentage in both the low (17.5%) and moderate levels (6.9%) of disordered gambling.

Females were significantly more educated than males in this sample ($\chi^2 = 52.94$, df = 1, $p < 0.001$). With regards to unemployment there were no significant differences between men and women ($\chi^2 = 0.87$, df = 1, $p < 0.5$).

#### *5.1.1.2 Gambling measure*

Of all the respondents, 1.1% were problem gamblers with negative consequences and a possible loss of control (8 or more points on the PGSI-scale), with 5.5% of the respondents experiencing moderate levels of disordered gambling. According to this study's results, males suffered from more severe forms of problem gambling than females. Specifically, gender differences in all three PGSI categories were significant as follows: for low level (males = 88.9%, females = 97%), for moderate level (males = 9.0%, females = 2.6%) and for problem gambling level (males = 2.1%, females = 0.3%) ($\chi^2 = 73.47$, df = 2, $p < 0.001$; see Table 4).

**Table 4.** Gender differences in severity level of gambling

| Gender | PGSI level | | | | | Chi-Square Test |
|---|---|---|---|---|---|---|
| | No Problem | Low | Moderate | Problem Gambling | Total | |
| | N (%) | N (%) | N (%) | N (%) | N (%) | |
| ***Male*** | 836 (68.6) | 248 (20.3) | 110 (9.0) | 25 (2.1) | 1219 (44,5) | $\chi 2 = 154.24$, df = 3, $p < 0.001$ |
| ***Female*** | 1329 (87.5) | 145 (9.5) | 40 (2.6) | 5 (0.3) | 1519 (55.5) | |
| ***Total*** | 2165 (79.1) | 393 (14.4) | 150 (5.5) | 30 (1.1) | 2738 (100) | |

### *5.1.1.3 Comorbid disorders*

Risk-level of alcohol consumption was greater among males as compared to females ($\chi^2 = 138.15$, df = 1, $p = 0.001$). Gender differences in smoking were also significant, indicating that males smoked more than females ($\chi^2 = 24.20$, df = 1, $p < 0.001$).

### *5.1.1.4 Gambling types and activity*

The most common form of gambling was lotto, gambled by 56.4% of the respondents. Other popular game types were scratch cards (25.9%) and slot machine gambling (23.8%). Scratch cards was the only game type that was more popular among females (27.3%) than males (24.0%), the difference being marginally significant ($\chi^2 = 3.8$, df = 1, $p = 0.058$). In comparison, males favoured game types such as sports betting (14.1% males, 1.5% females) ($\chi^2 = 163.7$, df = 1, $p < 0.001$), horse race betting (5.7% males, 1.7% females) ($\chi^2 = 32.4$, df = 1, $p < 0.001$) and internet poker (5.4% males, 0.5% females) ($\chi^2 = 61.5$, df = 1, $p < 0.001$).

Upon assessing people who reported some degree of gambling activity, differences in the frequency of gambling exist in the following game types: lotto ($\chi^2 = 21.5$, df = 1, $p < 0.001$), slot machines($\chi^2 = 11.3$, df = 1, $p < 0.01$), sports betting ($\chi^2 = 7.5$, df = 1, $p < 0.01$) and horse race betting ($\chi^2 = 5.0$, df = 1, $p < 0.05$).

### *5.1.1.5 Frequency of gambling and the severity level of gambling*

Table 5 shows types of gambling and the frequency of each game type gambled, less than once a week and at least once a week, within different levels of PGSI. Only subjects who reported at least some amount of gambling are included in the results. Type of games gambled are presented from highest to lowest frequencies.

**Table 5.** Type of games, frequency of gambling and the severity level of gambling

| Type of game | Frequency | PGSI level[a] | | | Total |
|---|---|---|---|---|---|
| | | Low or no Problem N % | Moderate N % | Problem Gambling N % | N % |
| ***1. Lotto****** | < once a week | 795 (55.3) | 36 (34.3) | 6 (26.1) | 837 (53.5) |
| | ≥ once a week | 642 (44.7) | 69 (65.7) | 17 (73.9) | 728 (46.5) |
| | Total | 1437 (100) | 105 (100) | 23 (100) | 1565 (100) |
| ***2. Daily lotteries****** | < once a week | 188 (58.9) | 18 (32.1) | 4 (25.0) | 210 (53.7) |
| | ≥ once a week | 131 (41.1) | 38 (67.9) | 12 (75.0) | 181 (46.3) |
| | Total | 319 (100) | 56 (100) | 16 (100) | 391 (100) |
| ***3.Slot machine****** | < once a week | 412 (79.4) | 50 (47.6) | 11 (47.8) | 473 (73.1) |
| | ≥ once a week | 107 (20.6) | 55 (52.4) | 12 (52.2) | 174 (26.9) |
| | Total | 519 (100) | 105 (100) | 23 (100) | 647 (100) |
| ***4. Scratch cards#*** | < once a week | 581 (92.7) | 58 (87.9) | 10 (83.3) | 649 (92.1) |
| | ≥ once a week | 46 (7.3) | 8 (12.1) | 2 (16.7) | 56 (7.9) |
| | Total | 627 (100) | 66 (100) | 12 (100) | 705 (100) |
| ***5. Sports Betting#*** | < once a week | 103 (74.1) | 24 (72.2) | 9 (50) | 136 (71.6) |
| | ≥ once a week | 36 (25.9) | 9 (27.3) | 9 (50) | 54 (28.4) |
| | Total | 139 (100) | 33 (100) | 18 (100) | 190 (100) |
| ***6. Horse Race Betting**** | < once a week | 49 (75.4) | 10 (52.6) | 4 (40.0) | 63 (67.0) |
| | ≥ once a week | 16 (24.6) | 9 (47.4) | 6 (60.0) | 31 (33.0) |
| | Total | 65 (100) | 19 (100) | 10 (100) | 94 (100) |
| ***7. Internet gambling**** | < once a week | 35 (81.4) | 10 (47.6) | 3 (37.5) | 48 (66.7) |
| | ≥ once a week | 8 (16.8) | 11 (52.4) | 5 (62.5) | 24 (33.3) |
| | Total | 43 (100) | 21 (100) | 8 (100) | 72 (100) |

Note: Not Significant: #; Significant: *< 0.05, **< 0.01, ***< 0.001
[a] No problem gambling included in low level of disordered gambling.
Only subjects who reported at least some amount of gambling were included in the table.

Lotto was the most frequently gambled game in this sample with 53.5% of the players having gambled lotto less than once a week, and 46.5% gambled at least once a week. Daily lotteries were gambled by 53.7% of respondents less than once a week and 46.3% gambled at least once a week. The frequency of lotto and daily lotteries betting was associated with gambling severity ($\chi^2 = 24.4$, df = 2, $p < 0.001$) and ($\chi^2 = 19.57$, df = 2, $p < 0.001$). That is, subjects with more severe level of disordered gambling gambled these games more frequently as compared to those with only low level problems or no current presentation of disordered gambling.

Slot machine gambling attracted 26.9% of the respondents to gamble at least once a week and 73.1% gambled it less than least once a week. Frequent slot machine gambling was associated with more severe level of disordered gambling ($\chi^2 = 52.57$, df = 2, $p < 0.001$).

Scratch cards attracted 7.9% of respondents at least once a week and 92.1% gambled it less than once a week. The frequency of scratch cards gambling was not associated with gambling severity ($\chi^2 = 3.14$, df = 2, $p = 0.24$).

Of the respondents, 28% bet on sports at least once a week. The frequency of sports betting was not associated with gambling severity groups ($\chi^2 = 4.58$, df = 2, $p = 0.10$).

Horse race betting was gambled by 33.0% of respondents with at least once a week frequency. Frequent horse race betting was associated with more severe level of disordered gambling ($\chi^2 = 7.14$, df = 2, $p = 0.03$).

Internet gambling was gambled by 33.3% of respondents with at least once a week frequency. Frequent internet betting was associated with more severe level of disordered gambling ($\chi^2 = 10.7$, df = 2, $p = 0.005$).

### *5.1.1.6 Association between socio-demographic characteristics and levels of gambling severity*

The multinomial regression model (Table 6) shows the association between socio-demographic variables and levels of gambling severity. Covariates in the model were age, gender, years of education, unemployment, risk-level alcohol consumption and daily smoking. Younger age was significantly associated with all problem gambling levels. Male gender was similarly recognized to be strongly associated with all problem gambling levels. Education (less than twelve years) was also found to be significantly associated with both a low level of problem gambling and even more strongly with a moderate level of problem gambling. Unemployment was most strongly associated with problem gambling. Risk-level alcohol consumption (at least 6 units at least once a week) was significantly associated with low and moderate levels of disordered gambling. Smoking had a strong and significant association with all severity levels of disordered gambling (daily smoking was compared with occasional- and non-smoking).

According to the likelihood ratio test, the fit of the multinomial regression model was good ($\chi^2 = 275{,}9$, df = 18, $p < 0.001$.). Correct classification rate was 79.2%.

**Table 6.** Multinomial regression analysis of variables associated with problem gambling severity[a]

| Measures | Low level of problems | | Moderate level of problems | | Problem gambling | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| ***Age[b]*** | 0.98*** | (0.97-0.99) | 0.98** | (0.97-0.99) | 0.97* | (0.94-0.99) |
| ***Male gender*** | 2.46*** | (1.94-3.12) | 3.91*** | (2.62-5.83) | 7.51*** | (2.78-20.29) |
| ***Education (< 12yrs)*** | 1.28* | (1.02-1.61) | 1.95*** | (1.36-2.81) | 1.23 | (0.56-2.69) |
| ***Unemployed*** | 1.15 | (0.72-1.83) | 1.25 | (0.64-2.44) | 4.78** | (1.89-12.07) |
| ***Risk-level alcohol consumption[c]*** | 1.62** | (1.21-2.16) | 1.96** | (1.3-2.95) | 0.74 | (0.28-1.95) |
| ***Smoking (daily)*** | 1.78*** | (1.35-2.33) | 1.80** | (1.21-2.68) | 6.08*** | (2.71-13.61) |

Note. * p < .01 ** p < .001 *** p < .0001
OR = Odds ratio, CI = Confidence interval
[a] Reference group: non-problem gambling.
[b] Analysed as a continuous variable.
[c] Risk-level alcohol consumption is defined as consuming at least 6 units at least once a week.

## 5.1.2 Results of Study II

### *5.1.2.1 Bivariate analysis: associations between socio-demographic characteristics and gambling subgroups*

There were 3,451 participants (53.2% males and 46.8% females) with the mean age of 44.27 years (SD = 15.97). Overall, there were a greater proportion of males than females in all of the subgroups of gamblers. Compared with non-problem gamblers (52.2%) the percentage of males was greater amongst problem gamblers (85.7%) and PGs (70.0%) ($\chi^2 = 35.374$, df = 2, $p \leq 0.001$). According to this study's results, PGs were younger as compared to the other groups ($\chi^2 = 15.061$, df = 6, p = 0.019). There were statistically significantly more gamblers with twelve or less years of education in the problem gambling group (57.1%) as compared to non-problem gamblers (39.5%) and to PGs (47.5%) ($\chi^2 = 9.792$, df = 2, p = 0.007). Most of the non-problem gamblers (66.9%) were married or lived in a registered relationship or were cohabiting, while the corresponding figures for problem gamblers were 39.7 % and for PGs 50.0 %.

### 5.1.2.2 Bivariate analysis: associations between gambling-related factors and gambling subgroups

Onset age of gambling, namely below 18 years, was lower among problem and pathological gamblers than among non-problem gamblers ($\chi^2 = 22.174$, df = 2, $p < 0.001$). The significant others of DGs gambled more often than the significant others of non-problem gamblers ($\chi^2 = 33.177$, df = 2, $p < 0.001$). Problem gamblers (88.4%) gambled more frequently (once a week or more) as compared to PGs (77.5%) or non-problem gamblers (44.4%).

Problem gamblers spent more money on gambling than the other subgroups of gamblers (more than 5€ per week). However, the percentage of gamblers who did not know the amount they had spent on gambling was greatest among PGs ($\chi^2 = 80.405$, df = 4, $p < 0.001$).

Lotto was the most often gambled game among all subgroups of gamblers. Non-problem gamblers gambled lotto (87.6%) slightly more often than problem gamblers (87.1%) or PGs (80.0%) ($\chi^2 = 2.112$, df = 2, $p = 0.348$). Scratch cards were gambled more frequently by problem gamblers (62.3%) and PGs (62.5%) as compared to non-problem gamblers (43.4%) ($\chi^2 = 15.45$, df = 2, $p < 0.001$). Similarly, slot machine gambling was the most prevalent among problem gamblers: 90.0% of the problem gamblers, 82.5%, of the PGs and 40.7% of the non-problem gamblers ($\chi^2 = 94.750$, df = 2, $p < 0.001$) gambled slot machines. Casino gambling was the most prevalent among PGs (30.8%) as compared with problem gamblers (7.2%) or non-problem gamblers (2.4%) ($\chi^2 = 117.664$, df = 2, $p < 0.001$). Internet gambling was also the most prevalent among PGs (55%) as compared to problem gamblers (48.6%) and non-problem gamblers (23.6%) ($\chi^2 = 43.377$, df = 2, $p < 0.001$).

### 5.1.2.3 Bivariate analysis: Perceived health and well-being and gambling subgroups

Problem gamblers reported feelings of loneliness more often than the other subgroups of gamblers ($\chi^2 = 27.509$, df = 2, $p < 0.001$). Problem gamblers also smoked more on a daily basis than other subgroups of gamblers ($\chi^2 = 57.468$, df = 2, $p < 0.001$). According to the results, PGs consumed more alcohol at risk-level (71.4%) than problem gamblers (68.8%) and non-problem gamblers (26.9%), ($\chi^2 = 86.394$, df = 2, $p < 0.001$). PGs also experienced clinically significant mental health problems more often than the other subgroups of gamblers ($\chi^2 = 33.024$, df = 2, $p < 0.001$). However, with general health, there were no significant differences between the studied subgroups of gamblers. All in all, problem gamblers reported loneliness and smoked tobacco more than PGs, and PGs, in turn, consumed alcohol at risk-level and had mental health problems more often than problem gamblers.

### *5.1.2.4 Multivariate-adjusted multinomial logistic regression analysis: simultaneously analysed factors and the severity of Disordered Gambling*

The simultaneously analysed socio-demographic characteristics, gambling-related factors and perceived health and well-being and the severity of DG was examined by multinomial regression analysis (Table 7). In the model used for the analysis, male gender was the only socio-demographic characteristic that was statistically significantly associated with problem gambling (OR 2.48, CI 1.20-5.12). Young age (15-35) and education ≤ 12 years were not significantly associated with either problem gambling or PG. Game type was significantly associated with DG. Past-year slot machine gambling was significantly associated with problem gambling (OR 6.88, CI 3.05-15.56) and PG (OR 4.70, CI 1.72-12.85). Likewise was the case with past-year internet gambling with problem gambling (OR 2.15, CI 1.26-3.38) and PG (OR 2.88, CI 1.40-5.92). Associations with perceived health and well-being were found to be significant with problem gambling as follows: loneliness (OR 3.47, CI 1.98-6.05), daily tobacco smoking (OR 2.01, CI 1.15-3.49) and risky alcohol consumption (OR 2.57, CI 1.43- 4.63). Similarly, risky alcohol consumption was associated with PG statistically significantly (OR 3.09, CI 1.38-6.94). In addition, mental health problems were significantly associated with PG (OR 4.01, CI 1.41-11.43).

In the multinomial model, socio-demographic characteristics (male gender, young age, education ≤ 12 years), gambling-related factors (played slot machines, internet gambling) and perceived health and well-being (loneliness, daily tobacco smoking, risky alcohol consumption, mental health problems) explained 22.9% of the variation in severity of DG (Table 7).

**Table 7.** Simultaneously analysed factors: socio-demographic characteristics, gambling-related factors and perceived health and well-being and the severity of disordered gambling (Problem and Pathological gambling)

| | Problem gambling n = 67 | | Pathological gambling n = 39 | |
|---|---|---|---|---|
| Variable | OR | 95% CI | OR | 95% CI |
| ***Socio-demographic*** | | | | |
| Male | 2,48* | 1.20-5.12 | 1.10 | 0.49-2.46 |
| 15-34 years old | 0.86 | 0.50-1.46 | 1.29 | 0.63-2.66 |
| ≤ 12 years education | 1.53 | 0.90-2.60 | 1.25 | 0.61-2.54 |
| ***Gambling-related*** | | | | |
| Played slot machines, past 12 months | 6.88*** | 3.05-15.56 | 4.70** | 1.72-12.85 |
| Internet gambling, past 12 months | 2.15** | 1.26-3.38 | 2.88** | 1.40-5.92 |
| ***Perceived health and well-being*** | | | | |
| Feeling lonely | 3.47*** | 1.98-6.05 | 1.78 | 0.78-4.04 |
| Smoking daily | 2.01* | 1.15-3.49 | 1.58 | 0.74-3.37 |
| Risk alcohol, AUDIT-C | 2.57** | 1.43-4.63 | 3.09** | 1.38-6.94 |
| Mental health problem, MHI-5 | 1.40 | 0.50-3.88 | 4.01** | 1.41-11.43 |

Note. OR = Odds ratio, CI = Confidence interval,. The data (N = 3451) were weighted based on gender, age and residency; Multivariate-adjusted multinomial logistic regression analysis,*< 0.05, **< 0.01, ***< 0.001

[a] Reference group: Non-problem gamblers (n = 3345). AUDIT-C, the Alcohol Use Disorders Identification Test, score for risk consumption ≥ 5 among women and ≥6 among men. MHI-5, the Mental Health Inventory, scaled into 1-100, clinically significant problem ≤ 52.

## 5.2 Findings of the Treatment studies

Basic findings of the treatment Studies III and IV were that age, onset age, length of the time gambled, alcohol use and depression were associated with disordered gambling. Furthermore, urge to gamble and impaired control of gambling were the strongest predictors for disordered gambling.

Study IV extended Study III by investigating the efficacy of the offered treatment. The significant improvements after treatment were found in the following variables: gambling-related problems (NODS), urge to gamble, alcohol consumption, gambling-related erroneous thoughts and depression. Improvements were also observed with increased control of gambling and decrease of gambling-related negative social consequences.

## 5.2.1 Study III

### *5.2.1.1 Socio-demographic characteristics*

The mean age of participants was 34.5 years (SD = 11.8). Females were older (M = 40.1, SD = 14.2) than males (M = 32.0, SD = 9.73) (t = -7.23, df = 466, p < 0.001). The mean onset age was 23.3 years (SD = 12.2). Males had started gambling significantly earlier (M = 20.1, SD = 9.55) as compared to females (M = 30.6, SD = 14.38) (t = -9.344, df = 462, p < 0.001). Correspondingly, males had gambled longer (M = 11.96, SD = 7.50) than females (M = 9.17, SD = 7.37) (t = 3.66, df = 461, p < 0.001).

### *5.2.1.2 Gambling measure*

Of the total 459 participants, 6.7% had no current presentation of disordered gambling, 10.0% gambled at risk-level, 14.8% were problem gamblers and 64.0% were categorized as pathological gamblers. Specific gender differences are shown in Table 8. Females had slightly more severe level of disordered gambling (M = 5.53, SD = 2.96) than males (M = 3.54, SD = 2.68), but this difference was not statistically significant.

**Table 8.** Four categories of NODS Scores and percentages in each category with gender differences

| Score | | | N | Percentage |
|---|---|---|---|---|
| *NODS* | Males | 0 | 29 | 9.3 |
| | | 1-2 | 31 | 10.0 |
| | | 3-4 | 43 | 13.8 |
| | | 5-10 | 208 | 66.9 |
| *Total* | | | 311 | |
| *NODS* | Females | 0 | 2 | 1.4 |
| | | 1-2 | 17 | 12.0 |
| | | 3-4 | 26 | 18.3 |
| | | 5-10 | 97 | 68.3 |
| *Total* | | | 142 | |

Note. Score: 0 = no gambling problem, 1-2 risky gambling habits, 3-4 = problem gambling, 5-10 = PG

### *5.2.1.3 Comorbid disorders: depression and alcohol consumption*

In this particular treatment-seeking sample, females were found to be more depressed (M = 16.6, SD = 8.71) as compared to males (M = 14.70, SD = 8.81; the one-way ANOVA: F (1.434) = 5.08, p < 0.025). Males consumed more alcohol (M = 8.92, SD = 2.09) than females (M = 7.39, SD = 8.71); F (1.406) = 44.34, p < 0.001).

### 5.2.1.4 *Gambling-related erroneous thoughts, gambling urge, impaired control and social consequences*

Males (M = 5.21, SD = 2.87) had significantly more gambling-related erroneous thoughts than females (M = 4.61, SD = 2.56), the one-way ANOVA, F (1.471) = 3.45, $p < 0.064$. All participants scored rather high regardless of gender: males (M = 8.86, SD = 1.29) and females (M = 8.86, SD = 1.27). Females had slightly better control over their gambling (M = 2.45, SD = 1.12) as compared to males (M = 2.28, SD = 1.02). Yet the difference was not statistically significant.

### 5.2.1.5 *Types of gambling and wagers*

Among this treatment-seeking sample, slot machine was the most gambled game (57%). Males gambled significantly more than females ($\chi^2 = 13.480$, df = 1, $p < 0.001$). 34.3% of the participants gambled betting games and the Lotto by Veikkaus (Finnish National Betting Agency), with males betting significantly more than females $\chi^2 = 7.180$, df =1, $p < 0.01$. Miscellaneous internet gambling was gambled by 30.1% of the participants with no gender differences. Internet poker by RAY (Finnish Slot Machine Association) was gambled by 19.7% of all participants, males gambling significantly more than females ($\chi^2 = 20.429$,df = 1, $p < 0.001$). Other internet gambling, e.g., internet poker by PAF and international poker sites, were gambled by 5.6% of the participants. Casino gambling was gambled by 11.3% of the participants. Track horse race betting was gambled by 4.2% of participants.

The money wagered in gambling (€) per one week over the past month was (M = 305.05, SD = 765.50). Weekly money wagered during the past year was (M = 795.70, SD = 390.20). Money wagered in each gambling session per past month was (M = 148.50, SD = 390.20). Money wagered in each gambling session over the past year was (M = 605.00, SD = 5308.40). No specific gender differences were found.

### 5.2.1.6 *Predictors for disordered gambling*

Predictors for disordered gambling using gender, duration of gambling (in years), gambling-related erroneous thoughts, social consequences, depression, alcohol use, urge to gamble and impaired control were created in three steps. In the first step, gambling-related erroneous thoughts and negative social consequences were significant predictors (B = 0.097, t = 1.998, $p < 0.05$) explaining only 0.82% of the problem. In the second step, depression seemed to overpower previous predictors (B= 4.16, t = 8.335, $p < 0.001$) explaining 2.16% of the problem. In the third step, depression (B = 0.254, t = 6.331, $p < 0.001$), urge to gamble (B = 0.184, t = 3.820, $p < 0.001$) and impaired control (B = 0.254, t = 5.215, $p < 0.001$) were the strongest predictors of disordered gambling, explaining 3.1% of the problem.

## 5.2.2 Study IV

In Study IV, there were 224 participants that completed the treatment program. The retention rate was 48.0%. The 6-month follow-up retention rate was 16.2% and 12-month follow-up retention rate was 8.8%.

### *5.2.2.1 Severity of gambling*

Severity of disordered gambling measured by NODS declined after the treatment (OR = 0.041, p < 0.001). Table 9 shows NODS scores in baseline, post-treatment and 6-month follow-up.

**Table 9.** NODS scores at the baseline, post-treatment and 6-month follow-up phases

| Time | NODS score N (%) | | Total |
|---|---|---|---|
| | 0-4 | 5-10 | |
| *Baseline* | 151 (33) | 308 (67) | 459 (100) |
| *Post-treatment* | 203 (92) | 18 (8) | 221 (100) |
| *6-month follow-up* | 70 (95) | 4 (5) | 74 (100) |

### *5.2.2.2 Comorbid disorders: depression and alcohol consumption*

The results show that depressive mood improved after the treatment (B = -7.80, p < 0.001). Also, consumption of alcohol decreased after the treatment (B = -0.66, p < 0.001). Males consumed significantly more alcohol as compared to females (B = -1.32, p < 0.001). Onset age of gambling was also found to be associated with alcohol consumption (B = -0.032, p < 0.001), indicating that those who had started their gambling earlier consumed more alcohol as compared to those who had started their gambling later (Table 10).

### *5.2.2.3 Social consequences and gambling-related erroneous thoughts*

An improvement in social consequences occurred after the treatment (B = -0.25, p < 0.001) and remained unchanged in the 6-month follow-up (B = -0.63, p < 0.001). Gambling-related erroneous thoughts declined significantly (B = -1.96, p < 0.001) after 8 weeks of treatment. Gambling-related erroneous thoughts were also linked with earlier onset age of gambling (B = -0.04, p < 0.001), indicating that those who had started to gamble earlier fostered more gambling-related erroneous thoughts (Table 10).

**Table 10.** Linear regression table: Estimates (B) and standard deviations (SD) for alcohol consumption (AUDIT-C), social consequences, gambling-related erroneous thoughts and depression (MADRS-S)

| Variable | AUDIT-C | | Social consequences | | Erroneous thoughts | | MADRS-S | |
|---|---|---|---|---|---|---|---|---|
| | B | SD | B | SD | B | SD | B | SD |
| *Baseline – Post-treatment* | -0.66*** | 0.13 | -0.25*** | 0.05 | -1.96*** | 0.19 | -7.8*** | 0.53 |
| *Post-treatment – 6 months* | -0.33 | 0.32 | -0.63*** | 0.11 | 0.48 | 0.3 | -0.34 | 1.09 |
| *Female* | -1.32*** | 0.25 | 0.07 | 0.07 | 0.06 | 0.25 | 0.95 | 0.80 |
| *Onset Age* | -0.032*** | 0.009 | -0.002 | 0.002 | -0.038*** | 0.01 | -0.013 | 0.03 |

Note: CI = Confidence Interval. *p < 0.05. **p < 0.01. ***p < 0.001. Generalized Estimating Equations (GEE) were used to estimate the regression parameters.

### *5.2.2.4 Gambling urge and impaired control*

The urge to gamble decreased significantly from baseline to post-treatment phase (OR = 0.53, p < 0.05). In turn, participants' control over gambling increased significantly after the treatment (OR = 0.88, p < 0.001) (Table 11).

**Table 11.** Logistic regression table: Odds ratios (OR) and confidence intervals (CI) for severity of disordered gambling (NODS), gambling urge and impaired control of gambling

| Variable | NODS | | Gambling urge | | Impaired control | |
|---|---|---|---|---|---|---|
| | OR | 95% CI | OR | 95% CI | OR | 95% CI |
| *Baseline – Post-treatment* | 0.041*** | 0.024 - 0.067 | 0.036*** | 0.018 - 0.069 | 0.088*** | 0.049 - 0.157 |
| *Post-treatment – 6 months* | 0.69 | 0.22 - 2.15 | 0.53* | 0.31 - 0.90 | 0.96 | 0.30 - 3.08 |
| *Female* | 1.09 | 0.70 - 1.68 | 1.13 | 0.65 - 1.70 | 1.31 | 0.87 - 1.99 |
| *Onset Age* | 1.00 | 0.98 - 1.01 | 0.99 | 0.97 - 1.01 | 1.00 | 0.98 - 1.01 |

Note: OR = Odds Ratio, CI = Confidence Interval. *p < .05. **p < .01. ***p< .001. Cut-offs in the outcomes were: > 4 for NODS score (PG), > 5 for Gambling urge and > 2 for Impaired control. Generalized Estimating Equations (GEE) were used to estimate the regression parameters.

A significant decrease in wagering occurred after the treatment. On average the participants wagered 133.73 € less each week (t (153) = -4.08, p < 0.001).

The therapists of the program revealed that the qualitative feedback from the participants was extremely positive.

# 6 Discussion

The present thesis approaches disordered gambling from two angles. The epidemiological angle provides an overall picture of the current situation in Finland. The treatment angle studies disordered gambling from an individual standpoint.

The epidemiological part of the thesis investigates the prevalence of disordered gambling and related socio-demographic factors, commonly co-occurring psychiatric disorders and types of gambling among the Finnish adult population sample. Additionally, associations between gambling-related factors and severity of disordered gambling were studied. The treatment part of the thesis investigates socio-demographic correlates and co-occurring psychiatric disorders of treatment-seeking gamblers and moreover, evaluates how the only treatment option, using an evidence-based approach, currently offered in Finland worked in practice.

## 6.1 Epidemiological Studies I and II

### 6.1.1 Prevalence

The epidemiological Study I shows that the current prevalence rate of disordered gambling in Finland has stayed unchanged for the past few years, and is within the average rate category according to international comparisons (Williams et al., 2012). However, the results of the epidemiological Study II suggest that the less severe level of gambling could be higher than expected, and should be closely monitored in the future. Here, the less severe level of gambling refers to gamblers who score low in gambling screens (sometimes referred to as at-risk level gamblers). The follow-up of this specific group of gamblers is important because disordered gambling is transient in nature, and shifts from one severity level to another may occur. Those individuals who are currently experiencing moderate levels of problems caused by gambling may be at risk of developing more severe forms of disordered gambling, especially in surroundings where gambling opportunities are abundant.

### 6.1.2 Socio-demographic characteristics

This thesis indicates that particular socio-demographic characteristics are evidently associated with disordered gambling. Predominantly, they are: younger age, early onset age of gambling, male gender, low socio-economic status (unemployment and lower level of education) and "divorced" or "single" marital status as also found in several previous studies (Black et al., 2012; Johansson et al., 2009; Kessler et al., 2008; Welte et al., 2008; Blanco et al., 2006; Toneatto & Nguyen, 2007).

It is important to acknowledge that early onset age of gambling as well as young age are both associated with disordered gambling and contribute to its development. Young males seem to be especially more at risk for developing disordered gambling. Some studies suggest that young males are characteristically sensation seekers and have a higher susceptibility of developing addictions in general (Blaszczynski et al., 1985; Bonnaire et al., 2009). These particular characteristics of sensation seeking may reflect the tendency of males to prefer games that are riskier in nature (betting games and internet poker).

Young males may be at a greater risk of having and developing disordered gambling than young females or females in general. However, females should also be taken into account when developing public health prevention and treatment programs, as a vast body of research shows that the progression of disordered gambling is more rapid in females as compared to males (Ladd & Petry, 2002). The recent study of Grant, Odlaug and Mooney (2012) revealed that female gamblers have both higher mean age of gambling initiation than males, as also found among the treatment-seeking participants analysed in this thesis, and shorter time of developing disordered gambling than males. This gender-specific course is called the telescoping phenomenon (Grant et al., 2010). The telescoping phenomenon should be seen as a gender-specific course of disordered gambling that is unrelated to psychiatric comorbidities as suggested by Grant, Odlaug and Mooney (2012).

The present epidemiological Study I finds that less than twelve years of education, and unemployment are associated with disordered gambling. The second epidemiological study confirms that a low level of education is associated with disordered gambling. Viewing low level of education and unemployment as a reflection of low socio-economic status, there have been some hypotheses proposed as to an explanation of this association. Some proposed hypotheses are that individuals with low socio-economic status have challenges in understanding the probabilities of gambling (Petry, 2005). Individuals with challenging and distressed life situations may be more risk-prone to gamble (Yu & Lagnado, 2012), and despairing economical situations may have an impact on overall psychological well-being (Costello, Compton, Keeler & Angold, 2003). These, in turn, may lead to deterioration in social status (Dohrenwend, 1990), which could then increase a vulnerability to psychiatric well-being. With this in mind, it is important to recognize that low socio-economic status is a vulnerability factor with disordered gambling.

The present epidemiological Study II finds that "single" marital status was especially associated with disordered gambling, as also found in a Norwegian epidemiological study (Bakken, Götestam, Grawe, Wentzel & Oren, 2009). This study finds that there are more separated, divorced or widowed individuals who have disordered gambling as compared to non-problem gamblers, as also found by Black, Shaw, McCormick, and Allen (2012). Divorced or separated individuals may be so either as a result of having disordered gambling, or they may be more hesitant to engage themselves because of an incapability to form a permanent relationship (Petry, 2004).

### 6.1.3 Types of games gambled

Previous studies have found that accessibility and availability of gambling opportunities increases the risk of disordered gambling (Wardle et al., 2012; Rush et al., 2007). Lotto appears to be the most popular game in Finland, as shown by the present epidemiological Studies I and II. However, slot machine gambling appears to be the one that is causing the most trouble among treatment-seeking individuals, as was found in the present treatment Study III. This is confirmed with the similar notion from a clinical setting in Finland (Jaakkola, Murto, Pajula, 2012). Furthermore, Studies I and II also found slot machine gambling to be associated with more severe level of disordered gambling (Wardle et al., 2012; Hodgins et al., 2012; Dixon et al., 2012; Productivity Commission, 2010; Gerstein et al., 1999). In addition, more frequent gambling, especially in lotto, daily lotteries, slot machines, horse race betting and internet gambling, was logically increasing the severity of disordered gambling. Finland offers unique possibilities to gamble: widespread locations of slot machines from kiosks to round-the-clock fuel stations allure passers-by to try their luck with the game of chance.

Although the prevalence of disordered gambling in Finland is within the range of other European countries, it could be lower by reducing gambling opportunities.

### 6.1.4 Comorbidities

The results of this thesis are in agreement with most previous research outcomes. The present results show that common comorbid substance use, alcohol and nicotine use in particular, were often co-occurring with disordered gambling. Males consume more alcohol as compared to females. According to these results, alcohol use is also found to be a significant predictor for disordered gambling. In addition to alcohol use, nicotine dependency is associated with disordered gambling as was also discovered by other research groups (Götestam & Johansson, 2003; Sproston et al., 2000; Gerstein et al., 1999). Nicotine dependence and disordered gambling could be linked together, as suggested by Potenza and colleagues (2004), as they found that nicotine-dependent gamblers were more likely to have problems with other dependencies as well. Furthermore, one dependence may serve as a prime for another, as noted by McGrath and Barrett (2009). Nicotine-dependent gamblers are also reported to have less control of gambling (Petry & Oncken, 2005).

Along with other co-occurring dependencies, disordered gambling was found to be associated with depression, overall negative self-perceived mental health status and loneliness. This confirms the earlier findings in both epidemiological and treatment samples (Park et al., 2010; Black et al., 2008; Kessler et al., 2008). Loneliness in particular was found to be associated with disordered gambling. Loneliness may reflect either vulnerability or the consequence of disordered gambling (Trevorrow & Moore, 1998). Loneliness may also reflect the social isolation or boredom linked with disordered gambling (McCormack et al., 2012; Hopley et al., 2010; Trevorrow & Moore, 1998; Blaszczynski et al., 1990).

## 6.2 Treatment Studies III and IV

### 6.2.1 Socio-demographic characteristics and comorbidities of the treatment-seeking sample

The present treatment Study III evaluates socio-demographic characteristics and comorbidities of the treatment-seeking sample. 78.8% of the participants were disordered gamblers. The socio-demographic characteristics of the treatment-seeking sample are rather similar when compared to epidemiological studies. Males gamble more than females and their onset age of gambling is lower than that of females. Females in this sample appear more depressed than males, which is in line with previous studies (Grant et al., 2012). In turn, males use more alcohol than females.

The unique finding of this study was that early onset age of gambling is associated with more gambling-related erroneous thoughts and alcohol consumption. Those who had started gambling earlier had more of those thoughts and used more alcohol as compared to those who had started gambling later. Early onset age of gambling and alcohol use as risk factors for disordered gambling were discussed above, and should be noted along with the other possible risk factors of early onset age and gambling-related cognitive erroneous thoughts. It could be possible that the earlier one starts gambling, the deeper the roots of erroneous thoughts or beliefs related to gambling extend.

### 6.2.2 Evaluation of PP Program

Treatment options for disordered gambling are still very limited in a small country like Finland. The only treatment currently available in Finland that uses an evidence-based approach is PP program's internet-based therapy, with weekly therapist phone support using CBT. The results of this explorative study reveal that the PP program addresses disordered gambling adequately and clear improvements were observed after the treatment and even in the six-month follow-up phase. Implementation of the PP program significantly reduces gambling-related problems, gambling-related erroneous thoughts, gambling urge and improves control of gambling. In addition, the mood of participants improved, the alcohol use decreased and the participants reported their social situations to be improved after the treatment. These observed changes are in line with the previous findings of a similar internet-based program, conducted in Sweden, by Carlbring and Smit (2008) and Carlbring and colleagues (2012).

The results of Study IV are encouraging and suggest that the ingredients of the PP program are effective at treating disordered gambling, in this sample. It is vital to identify the most meaningful elements of this program, especially in a Finnish context, where there is yet no consensus on how disordered gambling should be treated. The main elements of the PP program are motivational enhancement,

recognition of gambling behaviour, and recognition of gambling-related erroneous thoughts and reflection of social consequences of gambling.

Motivational interviewing and enhancement (Miller, 1983; Miller & Rollnick, 2002) are important components in treating addictions, because they keep participants engaged with their process of change. If the gambling-related erroneous thoughts, such as illusion of control, misperception of randomness and independence of events, that are fuelling gambling (Langer, 1975; Hill & Williams, 1998; Ladouceur, 2004; Toneatto, Bliz-Miller et al., 1997; Toneatto & Ladouceur, 2003) are properly addressed, participants would perceive their gambling situations more realistically. Impaired control, which is a central component in the construct of addiction (Gossop et al., 2006) and dependency (Martins et al., 2006), also improved after the treatment. Improvements in both the understanding of gambling-related erroneous thoughts and control of gambling are crucial because, as proposed by Cantinotti and colleagues (2009), gambling-related erroneous thoughts relate to positive expectations of success and in a gambling situation may actually influence erroneous perceptions, which in turn may contribute to feeling less in control in a gambling situation, and potentially lead to a vicious circle of disordered gambling as shown in Figure 2 (Ladouceur & Lachance, 2007).

These findings are fundamental in a Finnish context. The PP program reaches individuals who may not have access to any treatment facilities at all around the country. Therefore, the PP program should be continued as a low threshold treatment option for disordered gambling in Finland. The findings of this study should also be taken into account for planning face-to-face treatment options for disordered gamblers. As based on international meta-analyses of treatment options for disordered gambling, cognitive and cognitive behavioural therapies are clearly recommended as evidence-based treatment options for disordered gambling (PGTRC, 2011; Lahti et al., 2012b).

## 6.3 Limitations

### 6.3.1 Epidemiological Studies I and II

Despite the large sample size and the good representation of the Finnish population there are a number of challenges regarding the comparison of the two epidemiological studies.

First, the method of survey administration was different in the two epidemiological studies. One was a self-administered postal survey, and the other a telephone interview. Self-administered surveys tend to produce more valid reports of sensitive behaviour as compared to responses given to an interviewer (Tourangeau & Smit, 1996; van der Heijden et al., 2000). Williams and colleagues (2012) suggest that a good comparison between these two would be achieved by using correction weights as based on each survey's response rate.

Second, another important methodological difference known to have an impact on disordered gambling prevalence rates, is how the survey is described to participants. One study was a health-related questionnaire and the other a gambling survey. In fact, a gambling survey tends to produce higher prevalence rates as compared to a health survey. The pitfall here is that a gambling survey creates a sampling bias by causing gamblers, who are interested in this topic, to participate actively and a greater refusal by non-gamblers who are not interested (Williams et al., 2012).

Third, the two surveys used different instruments: SOGS and PGSI. PGSI has been identified as more conservative than SOGS because of its wider cut-off points (8 points in PGSI and 5 points in SOGS).

Last but not least, a considerable methodological limitation is that neither scale is validated in a Finnish cultural context. This thesis brings up the importance of the need for validation of gambling scales, epidemiological and treatment, in a Finnish cultural context.

### 6.3.2 Treatment Studies III and IV

A limitation of the present treatment studies was a relatively low retention rate, especially with 6-and 12-month follow-up phases. Two reasons were found for this: a) the treatment program was implemented mainly for clinical purpose and therefore the data collection was not appropriately followed through, and b) in the follow-up phases the questionnaire sent to the participants was not carefully monitored, causing missing data or incomplete answers.

The treatment Studies III and IV used NODS as an instrument of measuring disordered gambling. However, NODS tends to produce a higher rate of problems when compared to clinical interview (Murray, Ladouceur & Jacques, 2007). These problems arise first, because NODS uses a dichotomous modality, which restricts participants' choices in rating criteria. Second, NODS has a maximum score of 10, which is considered small, because one misunderstood question is enough to categorize a person incorrectly (Murray et al., 2007). The main limitation of the treatment studies was the lack of a comparison group or even the use of a wait-list comparison.

## 6.4 Conclusions and clinical implications

### 6.4.1 Increasing awareness

Disordered gambling is often a hidden problem, creating feelings of shame and guilt due to excessive gambling. Denial of the problem is also rather common and can therefore be undetected and unrecognized for a considerable time. Hence, the early identification of disordered gambling within a health care system can be challenging.

Therefore, by increasing health care practitioners' awareness of disordered gambling and its common comorbid disorders, early detection can be achieved. For example, including gambling screens to usual health checks would possibly increase early detection. In addition, the second epidemiological study found association between smoking and disordered gambling, found earlier by Petry and Oncken (2002). Therefore, it is important to acknowledge this existing association both in a public health setting and when planning treatment. Smoking can be an indicator that a person may have other addictive disorders, and have even more severe psychological stress that may have an influence on the response to treatment as suggested by Petry and Oncken (2002).

### 6.4.2 Choice to gamble vs. informed choice to gamble

As stated in the Reno Model by Blaszczynski and collaborators (2004), the comprehensive suggestions for a responsible gambling program have two fundamental principles: "1) the ultimate decision to gamble resides with the individual and represents a choice, and 2) to properly make that decision, individuals must have the opportunity to be informed". This statement stems from the context of civil liberties, where external organizations cannot remove an individual's right to make decisions.

In looking at gambling as a choice, accurate information would provide the foundation upon which individuals form opinions and make choices to gamble or not to gamble. As encouraged in the Reno Model the gambling industry should adopt a policy of accurate disclosure. In practice, this means that they should offer realistic information of probabilities and likelihood of winning as well as schedules of payouts. In addition, industry standards of ethical practice should be met: advertising should not present misleading information or misrepresentations of a chance to win.

Another suggestion in the Reno Model is to enhance collaboration between key stakeholders and researchers.

In addition to responsible gambling policy, perhaps implementing a product warning, providing information about the harmful effects and possible negative consequences of gambling should be considered. This method of protecting the public has worked in the fields of alcohol and tobacco. It would do no harm to implement the same to gambling products as well.

### 6.4.3 Availability, accessibility and acceptability

Results of this thesis show that availability and accessibility factors were associated with disordered gambling. Easily available and accessible slot machines are a strong predictor for disordered gambling, and the most trouble causing type of gambling for treatment-seeking gamblers in Finland. Regarding availability and easy access to

gambling opportunities, much can be done especially in Finland. There are examples of where reduction of gambling opportunities have been implemented (Marshall, 2009; Caraniche Pty Ltd, 2005). When the new casino opens in the eastern part of Finland (Murto, 2012), it will be important to closely monitor the impact of gambling-related harms in that specific region. The reason for suggesting this is the results of the Cox, Yu, Affifi and Ladouceur (2005) study showing that a high concentration of slot machines, and the presence of a permanent casino were associated with an increased prevalence of gambling.

Regarding acceptability as to lotto gambling, there is a need for research. Some studies have found that lottery gambling especially attracts individuals with a low socio-economic status (Barnes, Welte, Tidwell & Hoffman, 2011). These findings should be studied in a Finnish context.

### 6.4.4 Follow-up of age limit and target for prevention

The recently set age limit to gamble (18 years) is a positive preventive step, but needs to be monitored carefully in the future, based on the Warpenius et al. (2012) findings that the implementation of age restriction was not accurately followed up by shopkeepers in the gambling venues (e.g., kiosks, supermarkets and fuel stations). Minors should be prohibited from engaging in gambling activities according to law, as has been done in the fields of alcohol and tobacco. In addition, more attention should be paid to the popular tax-free cruises between Finland's south and west coast to Estonia and Sweden. Although the law has set the age limit, the control of that law particularly on those ships leaves room for improvement. This is a vital point, because early onset age of gambling is a clear risk factor for further development of disordered gambling.

As younger age is a clear risk factor of developing disordered gambling, a prevention programme for schools is highly recommended. Prevention programs should target possible future generations of gamblers primarily adolescents. Excellent examples of prevention programs are in use in the US and Canada.

### 6.4.5 Treatment of disordered gambling

Treatment options for disordered gambling in Finland are still very limited. It would indeed be beneficial to include evidence-based treatment options for individuals in need of treatment. At the moment though, there is no consensus on how disordered gambling should be treated in Finland. This discrepancy possibly stems from an overall tradition of treating addictions in Finland. In a Finnish cultural context, treatment of addictions has been provided by social workers based on a supportive model while the international treatment approach, especially for disordered gambling, has been based on a medical model which includes a strong research interest to evaluate the efficacy of the treatments provided. Despite the cultural tradition for the treatment of addictions, evidence-based treatment should be put into practice in Finland. In

order to ensure that the best practice available is applied to treat disordered gamblers in Finland, international research and recommendations and ethical principles of clinical practice should be carefully followed (e.g., competence, responsibility and integrity; cf. EFPPA, Meta-code of ethics, 1995). Investments made in new pilot projects (collaboration between psychiatric and addiction clinics) offer an excellent opportunity to apply research-based treatment options into practice.

It is highly recommended to consider manualised treatments to the choice of treatment options for disordered gambling to further evaluate their efficacy in a Finnish cultural context.

### 6.4.6 Future research

This thesis used samples from the adult population. In the future, more studies from different age groups are needed. The association of elderly individuals' quality of life and possible loneliness with disordered gambling has thus far been little studied. In addition, more studies are needed about disordered gambling among Finnish adolescents.

More studies are also needed about gender-specific differences of disordered gambling in Finland.

Validation of the gambling screens in a Finnish cultural context is also needed.

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