Stockholm University

Preventing problem gambling: Focus on overconsumption

Jakob Jonsson

Doctoral Thesis in Psychology at Stockholm University, Sweden 2019

Preventing problem gambling: Focus on overconsumption

Jakob Jonsson

Academic dissertation for the Degree of Doctor of Philosophy in Psychology at Stockholm University to be publicly defended on Friday 18 October 2019 at 10.00 in David Magnussonsalen (U31), Frescati Hagväg 8.

Abstract

A proportion of gamblers experience problems. The role of overconsumption in developing gambling problems is sparsely described in the literature and there is little scientific knowledge about the prevention of gambling problems. There are some promising results regarding personalized feedback on gambling habits, and there is a need for more research. The overall aim of this thesis was to explore the role of overconsumption in problem gambling and target it in a preventive intervention. The preventive intervention was to give gambling consumption feedback to high consumers in order to make them reflect upon their gambling habits and enhance their motivation for change. **Study I** aimed to explore the dimensionality of GamTest, an online test of gambling behaviour, and validate it against PGSI and the gambler's own perceived problems. Data came from four Nordic gambling sites, n = 10,402. In an ESEM analyses, GamTest had a high degree of correspondence with the players' own perceived problems and with the PGSI. In an EFA, GamTest captured five dimensions of problematic gambling (i.e. overconsumption of money and time, and negative financial, social and emotional consequences). A bifactor approach showed a general factor and four specific residual factors, negative emotional consequences contribute to the dominant part of the general factor. **Study II** aimed to examine both the psychometric properties of the Jonsson-Abbot Scale (JAS) and its predictive validity with respect to increased gambling risk and problem gambling onset. The results are based on repeated interviews with 3,818 participants within the Swedish longitudinal gambling study. The results indicate an acceptable fit of a three-factor solution in a CFA, with 'Overconsumption (OC),' 'Gambling fallacies (GF),' and 'Reinforcers (RI)' as factors. When controlled for risk potential measured at baseline, GF and RI were significant predictors of gambling risk potential, and GF and OC were significant predictors of problem gambling onset at 12-month follow up. **Study III**'s primary objective was to investigate the effects of providing personalized feedback on gambling intensity among high consumers in Norway. An RCT design was used to evaluate how behavioural feedback by telephone or letters affects subsequent gambling expenditure. A sample of 1,003 statistical matched triplets, from the top 0.5 % of customers, were randomly assigned to telephone, letter, or a no-contact control condition. Over 12 weeks, theoretical loss decreased 29 % for the telephone, and 15 % for the letter, conditions, compared with 3 % for the control group. **Study IV** was a 12-month follow-up of Study III, aimed to investigate the relative effects over twelve months. The telephone group showed a 30 % reduction in theoretical loss, the letter group 13 %, both outperforming the control group with a 7 % reduction. Less than 1% in all groups stopped playing at Norsk Tipping. These four studies indicate that overconsumption of gambling plays different roles in problem gambling. The role of overconsumption in preventing gambling problems is discussed. Contacting high consumers about their gambling expenditure appears to be an effective method for gambling companies to meet their duty of care for customers. Technical evolution has made it possible for gambling companies to fulfil their duty of care, but this has to be regulated and mandatory if it is to be effective.

Keywords: *gambling, problem gambling, prevention, overconsumption, responsible gambling, online self-test, ESEM, psychometric properties, predictive, longitudinal, CFA, gambling fallacies, reinforcers, personalized behavioural feedback, motivational interviewing, gambling expenditure, RCT, 12-month follow-up, spel om pengar, problematiskt spelande, prevention, överkonsumtion, spelansvar, online självtest, ESEM, psykometriska egenskaper, prediktiv, longitudinell, CFA, tankefällor om spel, psykologiska förstärkare, personifierad återkoppling på beteende, motiverande samtal, spelutgifter, RCT, 12-månaders uppföljning.*

Stockholm 2019
http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-172446

ISBN 978-91-7797-743-8
ISBN 978-91-7797-744-5

Department of Psychology

Stockholm University, 106 91 Stockholm

PREVENTING PROBLEM GAMBLING: FOCUS ON OVERCONSUMPTION

Jakob Jonsson

Stockholm
University

Preventing problem gambling: Focus on overconsumption

Jakob Jonsson

ISBN print 978-91-7797-743-8
ISBN PDF 978-91-7797-744-5

Printed in Sweden by Universitetsservice US-AB, Stockholm 2019

Overexposed, commercialized
Handle me with care

Harrison et al, 1988a

Abstract

A proportion of gamblers experience problems, and certain gambling forms have a stronger association with gambling problems than others. The role of overconsumption in developing gambling problems is sparsely described in the literature and there is little scientific knowledge about the prevention of gambling problems. In the field of secondary prevention, there are some promising results regarding personalized feedback on gambling habits, and there is a need for more research.

The overall aim of this thesis was to explore the role of overconsumption in problem gambling and target it in a preventive intervention. The preventive intervention was to give gambling consumption feedback to high consumers in order to make them reflect upon their gambling habits and enhance their motivation for change.

Study I aimed to explore the dimensionality of GamTest, an online test of gambling behaviour, and validate it against the Problem Gambling Severity Index (PGSI) and the gambler's own perceived problems. A recent psychometric approach, exploratory structural equation modelling (ESEM), was used. Well-defined constructs are identified in a two-step procedure fitting a traditional exploratory factor analysis model as well as a so-called bifactor model. Using data collected at four Nordic gambling sites in the autumn of 2009 (n = 10,402), the GamTest ESEM analyses indicated a high degree of correspondence with the players' own understanding of their problems and with the PGSI, a validated measure of problem gambling. GamTest captures five dimensions of problematic gambling (i.e. overconsumption of money and time, and negative financial, social and emotional consequences) with high reliability. The bifactor approach, composed of a general factor and specific residual factors, reproduces all of these factors except one, negative emotional consequences, which contribute to the dominant part of the general factor. The results underscore the importance of tailoring feedback and support to online gamblers with particular focus on how to handle emotions in relation to their gambling behavior.

Study II aimed to examine both the psychometric properties (internal consistency and dimensionality) of the Jonsson-Abbot Scale (JAS) and its predictive validity with respect to increased gambling risk and problem gambling onset. The JAS comprises 11 items and seeks to identify early indicators,

examine relationships between indicators and assess their capacity to predict future problem progression. The results are based on repeated interviews with 3,818 participants. The response rate from the initial baseline wave was 74 %. The original sample consisted of a random, stratified selection from the Swedish population register aged between 16 and 84. The results indicate an acceptable fit of a three-factor solution in a confirmatory factor analysis, with 'Overconsumption,' 'Gambling fallacies,' and 'Reinforcers' as factors. Reinforcers, Overconsumption and Gambling fallacies were significant predictors of gambling risk potential, and Gambling fallacies and Overconsumption were significant predictors of problem gambling onset (incident cases) at 12-month follow up. When controlled for risk potential measured at baseline, the predictor Overconsumption was not significant for gambling risk potential at follow-up. For incident cases, Gambling fallacies and Overconsumption remained significant when controlled for risk potential.

Study III's primary objective was to investigate the effects of providing personalized feedback on gambling intensity among high consumers of venue-based and online gambling in Norway. A randomized, controlled trial design was used to evaluate how behavioural feedback by telephone or letters sent via surface mail affects subsequent gambling expenditure and use of responsible gambling tools as well as whether a follow-up contact increases the effect. Gambling expenditure, the primary outcome, was measured using theoretical loss, which is the actual cost to the player, adjusted for the house advantage. From the top 0.5 % of customers, based upon annual expenditure, a sample of 1,003 statistical triplets, matched for sex, age, and net losses, were randomly assigned to the feedback intervention, i.e. telephone, letter, or a no-contact control condition. Participants assigned to the telephone call or letter were also randomly assigned to receive, or not receive, a subsequent follow-up contact. The results showed that over 12 weeks, theoretical loss decreased 29 % for the telephone, and 15 % for the letter, conditions, compared with 3 % for the control group. A positive effect of the follow-up contact was limited to participants, who at the initial call indicated an interest in receiving a follow-up call. Contacting high consumers about their gambling expenditure appears to be an effective method for gambling companies to meet their duty of care for customers.

Study IV aimed to investigate the relative effects of feedback on gambling intensity among high consumers over twelve months. The project evaluated how behavioural feedback by telephone and letter affects gambling consumption and use of responsible gambling tools. This was a 12-month follow-up of Study III. The telephone intervention had a stable effect over 12 months. The telephone group showed a 30 % reduction in theoretical loss, the letter group 13 %, both outperforming the control group with a 7 % reduction. The telephone condition was superior to the letter and control conditions, both per protocol and intention to treat. The letter condition performed better than

controls regarding intention to treat but showed a trend to move towards the control condition over time. Less than 1% in all groups stopped playing at Norsk Tipping. One interesting finding, nuancing the results in Study III, was that moving customers into the action stage of motivation, without setting limits during the telephone call, was as effective as if they were motivated and had set limits during the call. The use of responsible gambling (RG)-measures showed no differences between the groups, except that more in the telephone group lowered their loss-limits at least once compared to the letter group and controls.

Taken together, these four studies indicate that overconsumption of gambling plays different roles in problem gambling. The role of overconsumption in preventing gambling problems is discussed, and how contacting high consumers with consumption feedback affects the customers and the gambling companies. The need for more regulation in moving the prevention of gambling problem forward is obvious. Technical evolution has made it possible for gambling companies to fulfil their duty of care, but this has to be regulated and mandatory if it is to be effective.

Key words: gambling, problem gambling, prevention, overconsumption, responsible gambling, online self-test, ESEM, psychometric properties, predictive, longitudinal, CFA, gambling fallacies, reinforcers, personalized behavioural feedback, motivational interviewing, gambling expenditure, RCT, 12-month follow-up.

Sammanfattning

Bland dem som spelar spel om pengar utvecklar en andel problem med sitt spelande, och vissa spelformer är mer förknippade med problem än andra. Vilken roll överkonsumtion har i utvecklingen av spelproblem hos individen är sparsamt beskrivet i den vetenskapliga litteraturen. Det finns relativt lite vetenskaplig kunskap om hur man bäst förebygger spelproblem. När det gäller sekundär prevention finns det bland annat lovande resultat avseende personlig återkoppling på spelvanor, och det behövs mer forskning kring detta.

Den här avhandlingens övergripande syfte var att undersöka vilken roll överkonsumtion har i problemspelande och att tillämpa kunskaperna vid prevention av spelproblem. Den förebyggande åtgärd som testats var att ge återkoppling på spelkonsumtion till högkonsumenter i syfte att få dem att reflektera över sina spelvanor och öka deras motivation till att förändra dessa.

Studie I syftade till att undersöka dimensionaliteten i GamTest, ett onlinetest av spelvanor, och validera det mot Problem Gambling Severity Index (PGSI) och spelarnas självupplevda problem. Explorativ structural equation modelling (ESEM) användes. Väldefinierade konstrukt kunde identifieras i ett tvåstegsförfarande med god anpassning för både en traditionell explorativ faktoranalys samt en så kallad bifaktormodell. Data samlades in på fyra nordiska spelsajter hösten 2009 (n = 10 402). I ESEM-analyserna visade GamTest en hög grad av samband med spelarens egen förståelse för sina problem och med PGSI, ett validerat mått på problemspelande. GamTest fångade fem dimensioner av problematiskt spelande (överkonsumtion av pengar och tid och negativa ekonomiska, sociala och emotionella konsekvenser) med hög tillförlitlighet. Bifaktormodellen visade en generell faktor och fyra specifika residualfaktorer, reproducerade alla dessa fem faktorer förutom en, negativa känslomässiga konsekvenser, som bidrar till den dominerande delen av den generella faktorn. Resultaten understryker vikten av att skräddarsy återkoppling och stöd till onlinespelare med särskild inriktning på hur man hanterar känslor i förhållande till sitt spelbeteende.

Studie II syftade till att undersöka både de psykometriska egenskaperna (intern konsistens och dimensionalitet) för Jonsson-Abbot Scale (JAS) och dess prediktiva validitet avseende ökad risknivå för spelande samt utvecklande av spelproblem. JAS består av 11 frågor och försöker identifiera tidiga tecken på spelproblem i kategorierna överkonsumtion, tankefällor och förstärkare. Det

gav också en möjlighet att titta på hur olika kategorierna i JAS samspelar och predicerar spelproblem. Resultatet är baserad på upprepade intervjuer (ett års mellanrum) med 3,818 deltagare med 75 % svarsfrekvens från den första mätningen. Det ursprungliga urvalet var stratifierat och slumpmässigt draget ur det svenska befolkningsregistret för åldrarna 16-84 år. Resultatet av en konfirmatorisk faktoranalys visade en acceptabel anpassning för en trefaktorlösning med överkonsumtion, tankefällor och förstärkare som faktorer. Överkonsumtion, tankefällor och förstärkare var signifikanta prediktorer för ökad risknivå på spelandet, och tankefällor och överkonsumtion var signifikanta prediktorer för incidenta fall av spelproblem vid ettårsuppföljningen. Då vi kontrollerade för risknivå på spelandet vi baslinjemätningen, var överkonsumtion inte längre signifikant som prediktor. För incidenta fall, fortsatte tankefällor och överkonsumtion att vara signifikanta då vi kontrollerade för risknivå på spelandet vid baslinjemätningen.

Studie III syftade till att undersöka effekterna av att ge personlig återkoppling på spelvanor till högkonsumenter av spel. Högkonsumenterna spelade online och hos ombud på Norsk Tipping. Designen var en randomiserad kontrollerad studie för att utvärdera i vilken utsträckning återkoppling av spelvanor via telefon eller brev påverkade deras spelutgifter och användande av spelansvarsåtgärder. Vidare om en uppföljning efter en månad ökade effekten. Det primära utfallsmåttet, spelutgifter, mättes med teoretisk förlust. Teoretisk förlust tar hänsyn till återbetalningsprocenten på varje spelform. Satsar en person 100 kronor på ett spel med 75 % återbetalning blir den teoretiska förlusten 25 kronor. Bland de 0,5 % av kunderna på Norsk Tipping som förlorat mest pengar det senaste året drogs ett urval av 1,003 statistiska tripplar, matchade på kön, ålder och nettoförlust. Inom varje trippel lottades en person att få brev, en till att bli uppringd och en att vara med i kontrollgruppen. Bland dem som lottats till brev eller telefon blev hälften slumpmässigt utvalda till att få en uppföljande kontakt efter en månad. Syftet med kontakten var att få kunderna att reflektera över sina spelvanor, få kunskap om sin konsumtion och att motivera de till att förändra sina spelvanor om de så önskade. Resultatet visade att de som kontaktats via telefon sänkte sin teoretiska förlust med 29 % 12 veckor efter interventionen jämfört med de 12 veckorna före interventionen. Motsvarande siffror för brev var 15 % och 3 % för kontrollgruppen. Effekten av uppföljningen var begränsad till de som efter ett första samtal var positiva till att bli kontaktade igen. En slutsats är att kontakta högkonsumenter utgör en viktig del i omsorgsplikten för spelbolagen.

Studie IV var en 12-månadersuppföljning av Studie III. Syftet var att undersöka effekten över 12 månader av att kontakta högkonsumenter. Studien utvärderade hur återkoppling på spelvanor och av att aktivt arbeta med motivation via telefon eller brev påverkade konsumtion av spel och användande av spelansvarsåtgärder. Resultaten visade att telefongruppen hade en stabil minskning över 12 månader, de hade minskat sin teoretiska förlust med 30 %,

brevgruppen med 13 % och kontrollgruppen med 7 %. Telefon hade större effekt än brev och kontroll, både då man tittar på de som verkligen kontaktats och då man utgår från alla som var tänkta att kontaktas (så kallad ”intention to treat, ITT). Brev var bättre än kontroll ITT, men det var en trend att gruppen rörde sig mot kontrollgruppens resultat över tid. Ett intressant fynd som nyanserade resultaten i Studie III var att om kunderna i telefonsamtalen blev mer motiverade men då inte satte gränser, var det lika effektivt som för de som blev motiverade och satte gränser. Det var inga skillnader avseende användande av spelansvarsåtgärder mellan grupperna, utom att fler i telefongruppen sänkte sina förlustgränser jämfört med övriga grupper.

Sammantaget visar de fyra studierna att överkonsumtion spelar olika och viktiga roller vid utvecklingen av spelproblem. Överkonsumtionens roll i att förebygga spelproblem diskuteras, och hur kunder och spelbolag påverkas av att högkonsumenter kontaktas och får återkoppling på sina spelvanor. Behovet av mer reglering för att vidare utveckla prevention av spelproblem är uppenbart. Den tekniska utvecklingen har gjort det möjligt för spelbolagen att uppfylla sin omsorgsplikt, men den behöver vara tydligt reglerad och obligatorisk för att vara effektiv.

Nyckelord: spel om pengar, problematiskt spelande, prevention, överkonsumtion, spelansvar, online självtest, ESEM, psykometriska egenskaper, prediktiv, longitudinell, CFA, tankefällor om spel, psykologiska förstärkare, personifierad återkoppling på beteende, motiverande samtal, spelutgifter, RCT, 12-månaders uppföljning.

List of publications

I. Jonsson, J., Munck, I., Volberg, R., & Carlbring, P. (2017). GamTest: Psychometric Evaluation and the Role of Emotions in an Online Self-Test for Gambling Behavior. *Journal of Gambling Studies*, 33(2), 505-523. doi:10.1007/s10899-017-9676-4

II. Jonsson, J., Abbott, M.W., Sjöberg, A. and Carlbring, P. (2017). Measuring Gambling Reinforcers, Over Consumption and Fallacies: The Psychometric Properties and Predictive Validity of the Jonsson-Abbott Scale. *Frontiers in Psychology*. 8:1807. doi: 10.3389/fpsyg.2017.01807

III. Jonsson, J., Hodgins, D. C., Munck, I., & Carlbring, P. (2019). Reaching out to big losers: A randomized controlled trial of brief motivational contact providing gambling expenditure feedback. *Psychology of Addictive Behaviors,* 33(3), 179-189. http://dx.doi.org/10.1037/adb0000447

IV. Jonsson, J., Hodgins, D. C., Munck, I., & Carlbring, P. (2019). Reaching out to big losers: Brief motivational contact leads to sustained reductions in gambling over one year. Submitted manuscript.

Contents

Abbreviations

AIC	Akaike's Information Criterion
BIC	Bayesian Information Criterion
BTS	Behavioural Tracking System
CAD	Canadian dollar
CFI	Comparative Fit Index
EGM	Electronic Gaming Machine
ESEM	Exploratory Structural Equation Modelling
ITT	Intention To Treat
JAS	Jonsson-Abbott Scale
LCA	Latent Class Analysis
MET	Motivational Enhancement Therapy
MI	Motivational Interviewing
NFI	Normed Fit Index
NOK	Norwegian kroner
PPGM	Problem Pathological Gambling Measure
PGSI	Problem Gambling Severity Index
RG	Responsible Gambling
RMSEA	Root-Mean-Square Error of Approximation
SEK	Swedish kronor
SFS	Svensk Författningssamling
SOGS-R	South Oaks Gambling Screen – Revised
SOU	Statens Offentliga Utredningar
Swelogs	Swedish Longitudinal Gambling Study
TL	Theoretic Loss
TLI	Tucker-Lewis Index
VLT	Video Lottery Terminal (a form of gambling machine)

Introduction

On gambling

There are many forms of gambling; from games of pure chance, such as lotteries, gambling machines and roulette, to games with a skill factor, such as sports betting, poker and betting on horses. A definition of gambling is that one stakes money on an event with an uncertain outcome, in the hope of winning more, while risking the loss of the money staked. Gambling can be a private event among friends or more often a commercial product/activity. As a commercial product, there is always a house advantage. The only 'safe bet' is that the gambling companies win in the long run. This makes peoples' choice to gamble a paradox: in order to win money, they participate in an activity that, with a high probability, will make them poorer in the long run. So how can we understand why people gamble? If we look on an individual level, we can see that people have different motives for gambling. From a psychological perspective, gambling can be rewarding in many different ways, with both positive and negative reinforcement, and even rewarding when experiencing a near win (Cote et al., 2003). Binde (2013) has presented a model with five motivational dimensions. There are four motives for gambling: The dream of hitting the jackpot, social rewards, intellectual challenge and mood change. Binde sees the fifth motive, the chances of winning, as the core in the model, which is always present in all forms of gambling. The other motives vary depending on the gambler and the gambling activity. Playing bingo in a bingo hall has a clear social motive for many, as has discussing forthcoming games at the betting shop. When playing the lottery, the dream of hitting the jackpot may be central, whereas the intellectual challenge may be of greater importance when playing poker. When looking at the mood change motive, the interaction between gambling form and the individual, which is always present for all motives, is quite clear. Not all people experience positive feelings when gambling. Some focus on potential losses and interpret the excitement as something frightening. However, for others, the mood change is central when gambling. It can be exciting and create a sense of flow or relaxation. The mood change becomes more rewarding if one struggles with stress, anxiety or depression (Blaszczynski & Nower, 2002).

Apart from differences in pure chance and skill elements, there are structural characteristics that differ between gambling forms, such as availability, event frequency and interval of payback, as well as lights, colours and sound effects, which are sometimes connected with a near win experience. (Griffith, 1993, Meyer et al., 2011).

Gambling in Sweden

The oldest known law in the world regulating gambling is Swedish. In 1350, King Magnus Eriksson created a law that limited gambling stakes and banned gambling on credit. One could say it was about time, since the first evidence of gambling in Sweden dates from the third century, when dice were made from sheep bone. The oldest Swedish lottery was held in 1699, and the first state lottery in 1752. From 1772 to 1841 there was a state-owned lottery company. It was shut down for moral reasons. This is a good example on the theme of government attitudes shifting between permitting and controlling. A further example is that casinos were found in some health resorts during the first half of the 19th century but were banned in 1846. It took more than 150 years until there were casinos with international rules in Sweden again. (Binde, 2014a; Wessberg, 2012). Gambling on horse racing was allowed in 1923 after a 25-year ban, and the company ATG was founded in 1974, owned by trotting and horse racing organisations, and controlled by the state.

Another theme is canalization of illegal gambling. In 1934, the private company, Tipstjänst, was created and given the sole right to arrange weekly result pools on football matches. This was in response to illegal (private) pools and bookmaking. The company, Tipstjänst was later nationalized (Jonsson & Rönnberg, 2009). Gambling machines were banned in Sweden in 1979 due to the negative social effects, and were allowed again in 1996, partly to counteract the proliferation of illegal machines (Jonsson, 2012). Online poker was allowed in 2006 with canalization as the main argument (SOU 2008.36). The re-regulation of the Swedish gambling market in 2019 (see below) is the final example, inviting off-shore companies, without a licence, selling online gambling to Swedes to become part of the licensed gambling market.

A third theme is raising money for good causes. State-run and non-governmental organisations (folkrörelserna) started with bingo, lotteries and scratch cards during the 1960s. In 1989, the lottery company Folkspel was founded, owned by more than 70 voluntary organisations. Political parties and the temperance movement have financed some of their activities through lotteries. (Jonsson & Rönnberg, 2009). Gambling has also contributed to the state's

finances over the years through varying degrees of taxation (Cisneros Örnberg & Tammi, 2011).

A fourth theme is commercialization. Until the 1980s, the Swedish gambling market was dominated by state-owned and state-controlled gambling companies, that were restrictive in their methods of selling the products, aiming at meeting the demand for gambling rather than stimulating it (Binde, 2013). One exception is Tipsextra that, in 1969, started a TV programme showing one football match from the English league, included in the pools coupon, every Saturday from November to March (Wigert, 2009). It was broadcast by the state-owned TV company and clearly stimulated playing the pools. During the 1980s, there was a clear shift. New products, such as Lotto and Oddset (bookmaking), were introduced and marketed actively (Binde, 2013). In 1985, 86 % of the Swedish population played Lotto (national lottery) at least once a year (Gustavsson & Svanell, 2012). The trend of commercialization has increased since then; in 2017 the gambling market stood for around 10 % of all marketing in Sweden (Mediavision, 2018).

Technical development is the fifth theme. For many years, gambling was a totally physical product, consisting of lottery tickets with monthly draws and pools coupons on football and horse racing, with no possibility of remote gambling. During the 1980s we started to see connected terminals at the retailers, enabling later submission of games, and a greater flexibility of gambling objects. The internet changed the gambling scene totally, introducing online casino, bingo and poker, and live betting. Sweden has been in the frontline of internet penetration; in 2018, 98 % of Swedes had an internet connection at home and 9 out of 10 currently have a so-called 'smartphone' (Internetstiftelsen, 2019). Regarding internet gambling, the trend is clear: in the first Swedish prevalence study, 1997-1998, 1-2 % had played on the internet (Rönnberg et al., 1999); in 2015 the corresponding figure was 18 %. In 2017, internet gambling stood for 45 % of the net losses (Lotteriinspektionen, 2018).

A sixth and final theme is regulatory struggles. Since the 90s, several public investigations have been carried out. The gambling market investigation (Spelmarknadsutredningen, Ds 1991:51) reviewed the organisation of the three government owned or controlled gambling companies (Tipstjänst, Penninglotteriet and ATG). One result was a suggestion of a clearer division between the companies' product portfolios to avoid too much competition and cost. The Lottery investigation (SOU 1992:130) had the task of investigating possibilities for the non-profit organisations, looking at the prospects of new gambling forms, with the non-profit organisations as the takers. The investigation lay the ground for a new Lottery Act (SFS 1994:1000). In a report from the Department of Finance (Ds 1995:61), a merger of the two governmental gambling companies, Tipstjänst and Penninglotteriet, was suggested. The merger went through in 1997. Due to technical developments, in combination

with pressure from lobby groups representing the global on-line industry and the European community, there were two investigations at the start of the millennium; ”From Tombola to Internet – a review of the Lottery Act” (SOU 2000:50) and ”Gambling in a changing world” (SOU 2006:11). The concrete consequences of these investigations were meagre. The online gambling companies without Swedish permission continued to increase their market share, without paying taxes and being outside Swedish regulation. Eventually, there was a political majority in Sweden to re-regulate the Swedish gambling market. After a major investigation (SOU 2017:30), a new Lottery Act (SFS 2018:1138) changed the gambling landscape in Sweden. Since January 2019, there has been a licensing system for commercial online gambling (poker, casino, bingo and betting), free for any company to seek. There is one type of licence for non-profit organisations (lotteries and land-based bingo) and one for governmental gambling (casinos with international rules, physical gambling machines and various sorts of lottery). Beside these major licence types, there are specific ones for restaurant casinos, poker tournaments and gambling on ships in international waters. The type of licence for commercial online gambling stipulates, besides the legal introduction of online casinos, ambitious gambling responsibility measures. The gambling companies have a duty of care for their customers, including registered gambling, monitoring gambling patterns, mandatory deposit limits and communication with players exhibiting risky behaviour. There is also a central self-exclusion register, where it is possible to self-exclude from all gambling companies in the commercial licensed gambling market.

The evolution of the gambling market in Sweden is in line with what has been happening globally, especially in Europe. Increased availability and re-regulation as a result of technical developments are strong trends. In the Nordic countries, Denmark has a licensing system and Finland, Iceland and Norway have strict national gambling regulations, not allowing online gambling offered from abroad.

Definition of gambling disorder

Gambling is often described as something entertaining, fun and exciting. Something that can help people dream; how would their lives change if they hit the big jackpot? These descriptions are, of course, fuelled by marketing and lobbying from the gambling industry. In real life, the happy big jackpot-winners are greatly outnumbered by people experiencing problems with their gambling. The Russian writer, Fjodor Dostojevski, described gambling addiction in the book ”The Gambler” (1887), and during the 18th century, the artist William Hogarth, engraved the Rake’s ruin at the gaming table (Paulson,

1971). In modern times, gambling addiction has been a psychiatric diagnosis since 1980 (American Psychiatric Association, 1980). Over the years, different names have been used for the most severe gambling problems: pathological gambling, gambling addiction and gambling disorder are some examples. Milder, sub-clinical problems are often described as problem gambling or moderate risk gambling. The term gambling problems when used in this thesis include at-risk gambling, problem gambling and gambling disorder.

In DSM 5 (American Psychiatric Association, 2013), the diagnostic criteria for gambling disorder is described as persistent and recurrent problematic gambling behaviour. The gambling behaviour should lead to clinically significant impairment or distress. The individual shall exhibit four (or more) of the following nine criteria in a 12-month period: *Tolerance.* Needs to gamble with increasing amounts of money in order to get the same thrill. *Withdrawal symptoms.* Is restless or irritable when trying to cut down or stop gambling. *Loss of control.* Has made repeated unsuccessful efforts to control, cut back, or stop gambling. *Preoccupation.* Is often preoccupied with gambling. *Escape.* Often gambles when feeling distressed. *Chasing.* After losing money gambling, often returns another day to get even. *Lying.* Lies to conceal the extent of involvement with gambling. *Jeopardizing important things in life.* Has jeopardized or lost important relationship, job, or educational or career opportunity because of gambling. *Bail out.* Relies on others to provide money to relieve desperate financial situations caused by gambling. An exclusionary criterion is that the gambling behaviour could not better be explained by a manic episode. The gambling disorder is considered mild if 4–5 criteria are met, moderate if 6–7 criteria met and severe if 8–9 criteria met.

The DSM 5 diagnosis for gambling disorder mirrors that of alcohol use disorder to a certain extent, i.e. 5 out of 9 criteria are similar. The criteria Escape, Chasing, Lying and Bail out are not found in the alcohol use disorder. In DSM-IV (American Psychiatric Association, 2000), legal problems was a criterion for both alcohol abuse and pathological gambling. It was removed in both cases in DSM 5 (Petry et al., 2014).

Measuring gambling problems

The diagnostic criteria in DSM 5 provide the basis for a clinical diagnosis, made in a clinical setting by a doctor or psychologist. From a public health perspective, it makes sense to measure gambling problems in the population to estimate the need for preventive efforts and treatment. Several instruments have been developed and used over the years, typically in prevalence studies

and treatment research. The most commonly used are described below along with a quite new instrument.

SOGS - South Oaks Gambling Screen (Lesieur & Blume, 1987) - is a 2 x 20 item questionnaire, half in 'ever' format, half in the 'past year' format (in the revised version SOGS-R). If the respondent's answer is positive on an 'ever-question', the same question is administered again in the 'past year' format. The first 10 questions cover different aspects of the gambling problem, the final 10 questions address how the gambling is financed. The response format is 'yes/no'. All positive answers are summarized in one dimension. A score of 3-4 indicates problem gambling, and a score of 5-20 indicates probable pathological gambling. Usually, a score of 0-2 is labelled non-problem gambling, but a score of 1-2 has been used as an indicator of at-risk gambling in some studies. SOGS-R was the most used instrument in prevalence research from 1986 to 2000 (Williams et al, 2012). One criticism of SOGS-R is that it does not identify less severe problems, and views problem gambling as a categorical rather than a continuous problem (Holtgraves, 2009; Strong et al., 2003). Several studies have shown a single factor solution (e.g. Stinchfield, 2002; Strong, Lesieur, Breen, Stinchfield & Lejuez, 2004), but later research, using modern statistical methods, has found two dimensions (Salonen et al., 2017).

PGSI - Problem Gambling Severity Index (Ferris & Wynne, 2001) - is a 9-item questionnaire covering different aspects of gambling problems. The response categories are never/sometimes/most of the time/almost always. Three of the questions cover problem gambling behaviours, five questions address negative consequences and one, self-perceived gambling problems. Each item is scored 0-3; the scores for each item are added together to yield a total score. A total score of 0 indicates no problem, 1-2 low risk, 3-7 moderate risk and 8-27 problem gambling. PGSI was constructed to measure a single problem gambling factor and used accordingly in practice. This single factor assumption has been both questioned (Holtgraves, 2009) and supported (Orford et al., 2010). The PGSI was developed to measure problem gambling in the general population, on a continuum of problem gambling severity. It has, together with DSM-IV instruments (e.g. NODS), been the most used instrument in prevalence studies since 2001 (Williams, Volberg & Stevens, 2012).

NODS - NORC DSM-IV Screen for Gambling Problems (Gerstein et al., 1999; Wickwire et al., 2008) is a 17-item questionnaire covering the 10 DSM-criteria with yes/no response alternatives. The maximum score is 10 (one for each criterion fulfilled); the score 0 indicates no problem, 1-2 at-risk gambling, 3-4 problem gambling and 5-10 pathological gambling. It is considered to be a one-dimension instrument.

The above instruments have shown high reliability through test-retest and high internal consistency. They have also shown good validity in classifying help-

seeking problem gamblers, but a fair to weak correspondence between problem gamblers identified in population surveys and the classification of the same individuals in clinical interviews. They all have the underlying assumption that they measure a single gambling factor. (Williams & Volberg, 2014)

PPGM - Problem and Pathological Gambling Measure (Williams & Volberg, 2010) - is an 18-item questionnaire with yes/no response alternatives. It is scored in three dimensions: problem, loss of control and other (pre-occupation, withdrawal symptoms and tolerance). It classifies gamblers into pathological gambler, problem gambler, at-risk gambler and recreational gambler. To be classified as a pathological gambler, one has to score on both the problem and loss of control dimensions. The PPGM has shown good classification properties regarding non-problem and problem gamblers in a large population of gamblers taken from the general population (Williams & Volberg, 2014).

When exploring dimensionality of the above instruments, with the exception of the PPGM, a major weakness has been the use of prevalence studies with large samples from the general population but with very few problem gamblers. A large majority scores 0 on every or most items, leading to very little statistical variation. (Williams & Volberg, 2014). Another weakness is the response formats used, with the exception of the PGSI using dichotomous yes/no, leaving no room for nuanced answers from the respondent. In the case of the PGSI, the response format is a Likert scale, in which ordinal data limits the statistical possibilities to explore, for example, dimensionality.

Overconsumption

The concept of overconsumption regarding gambling behaviour is very sparsely described in the scientific literature and has not received much attention in its own right, even though heavy gambling is a well-known risk factor for gambling problems (Public Health Agency of Sweden, 2016a; Williams & Volberg, 2014). Overconsumption is not well covered in problem gambling screening (Jonsson et al., 2017). SOGS-R has one question on betting more than intended, the PGSI has one question that addresses more severe gambling; to bet more than one can really afford to lose. NODS has no questions on overconsumption, and the PPGM one question covering gambling for longer, with more money or more frequently than intended. From a clinical perspective, overconsumption is seen as an early sign of loss of control and also connected to chasing losses, where the latter seems to create the overconsumption. There is also a connection between increased tolerance, the need to gamble more to experience the same thrill, to escape or alter one's state of mind leads to overconsumption (Bowden-Jones & George, 2015; Grant & Potenza, 2004). From a responsible gambling perspective (described more below), measures are taken to prevent overconsumption, mainly via pre-commitment (setting limits) for the customers.

Knowledge about gambling problems in Sweden

The prevalence of problem gambling in Sweden has been measured in four large scale studies during the past 20 years; 1997-1998, 2008, 2015 and 2018 (Folkhälsomyndigeten 2016a; 2019; Rönnberg et al., 1999; Statens folkhälsoinstitut, 2010). Prior to this, Kühlhorn et al. made a first attempt in 1990 to estimate the number of problem and pathological gamblers in Sweden. Inspired by alcohol research, they used the size of self-reported stakes as criteria. A yearly stake above 50 000 SEK indicated pathological gambling, and above 30 000 SEK problem gambling. In a subsample of the almost 13 861 reached in the study, these criteria identified 0.2 % pathological gamblers and 0.4 % problem gamblers in the adult population. (Kühlhorn et al., 1995)

In 1997-1998, a sample of 9 917 randomly selected[1] 15-74 years old from the total population register was contacted mainly by telephone, reaching 7 139 (response rate 71.9 %). In this sample, 89 % had gambled at least once during the past year, and 95 % some time in their lives. Gambling problems were measured by both SOGS-R and a DSM-screen[2]. According to SOGS-R, 1.4 % (CI[3] 1.1–1.7 %) were problem gamblers and 0.6 % (CI 0.4–0.8 %) probable pathological gamblers in the past year. In the lifetime perspective, 2.7 % (CI 2.3–3.1 %) were problem gamblers and 1.2 % (CI 0.9–1.5 %) probable pathological gamblers. The DSM-IV screen produced lower 12-month figures, 0.6 % (CI 0.4 - 0.8 %) problem gamblers and 0.3 % (CI 0.2-0.4 %) pathological gamblers. Problem and probable pathological gambling were four times higher among men than women, and most common among 15-17 years old and 18-24 years old. There was also an overrepresentation of gambling problems among people born outside Sweden, even though they as a group had lower gambling participation. Most forms of gambling form had a higher correlation with gambling problems, with the strongest correlation for gambling machines, casino games and card games (Rönnberg et al., 1999; Volberg et al, 2001).

In a follow-up of the Volberg et al. study (2001), Jonsson et al. (2003) looked at what characterises Swedish problem gamblers. Each participant in the Volberg et al. study with a SOGS-R lifetime score >2 (n=289), was matched with a participant of the same age and sex but without a gambling problem. The latter participants constituted a control group. Structured in-depth face to face interviews, combined with questionnaires were used, reaching 324 of 578 (56 %). In the analysis, data from 302 participants (151 pairs) were used. Compared with the controls, the problem gambling group reported more socially

[1] There was an oversampling of 15-17 years old and people born outside Sweden.
[2] A modified Fischer screen.
[3] All confidence intervals are 95 % CI.

burdensome factors in their childhood. They showed a higher extent of erroneous beliefs and dissociative experiences when gambling, and more increased their gambling at negative life events. There was a higher occurrence of depressive reactions and risky alcohol habits in the problem gambling group than in the controls.

The second major prevalence study, in 2008-2009, was also the starting point of Swelogs (EP1), the Swedish longitudinal study. From a representative sample of 15 000, 8 165 (54 %) participated. Gambling at least once yearly had decreased to 70 % from 89 % in 1997-1998. According to SOGS-R, the lifetime prevalence of probable pathological gambling was 2.0 % (CI 1.7–2.3 %) and the lifetime prevalence of problem gambling was 2.5 % (2.1–2.9). Corresponding past year estimates were 0.9 % (CI 0.7–1.1 %) and 1.3 % (CI 1.0–1.6 %). Compared to 1997-1998, the increase in lifetime probable pathological gambling was the only statistically significant change. Correlates with gambling problems, PGSI >2, were lower education, income and socio-economic status. There was also a connection between gambling problems and ill-health, only 12 % of the PGSI >7 reported good mental health compared to 70 % among non-gamblers and non-problem gamblers. There was also a connection between problem gambling and risky alcohol consumption for men. Participation in certain gambling forms, such as gambling machines, bingo, poker, casino games and sports betting had a statistical relationship with gambling problems. (Abbott, Romild & Volberg, 2014; Statens Folkhälsoinstitut, 2010).

Within the Swelogs project, the cohort from the 2008-2009 study was reassessed one year later (EP2), enabling an incidence study. The incidence of probable pathological gamblers was 0.42 % (CI 0.25-0.58 %) according to SOGS-R, new cases were 0.32 % (CI 0.17-0.46 %) and relapses 0.10 % (CI 0.02-0.18 %). For problem gamblers the incidence was 0.76 % (CI 0.54-0.98 %), where 0.63 were new cases and 0.14 % were relapses. According to the PGSI, the incidence of problem gamblers was lower, 0.18 % (CI 0.07-0.28) where 0.13 % were new cases and 0.05 % relapses. Moderate cases had an incidence of 1.30 % (CI 1.01-1.59 %) with 1.03 % new cases and 0.28 relapses. Relapses were only present among men in this study. (Abbott, Romild & Volberg 2018)

With the aim of looking at risk-, protective- and recovery factors, an in-depth study was performed within the Swelogs project. In a case control study, all from EP1 and EP2 with a past year PGSI- or a lifetime SOGS-R score above 2 formed the case group matched with three controls per case. A total of 427 cases and 1 583 controls participated, interviewed mainly by telephone[4]. Gambling behaviour, gambling problems and fallacies were measured. Health was thoroughly covered by a modified MINI (Mini International Neuropsychiatric

[4] 134 participated through a postal questionnaire

Interview), as well as general self-efficacy, impulsivity and socio-economic questions. The main findings were that impulsivity, substance abuse and an insecure childhood best explained the difference between problem- and non-problem gamblers. Along with previous gambling problems, these were seen as risk factors. No protective factors were found, but no previous problem gambling and not having substance problems were found to be recovery factors. (Statens folkhälsoinstitut, 2013)

In an eleven-year follow-up of the Jonsson et al. study (2003), 426 of the originally 578 (77 %) participated in a telephone interview, as part of the ongoing Swelogs EP1 data collection in 2009. Interestingly, 90 % in the problem gambler group[5] gambled at least yearly at follow-up, and according to SOGS-R, 24 % were risk gamblers (1-2 points), 7 % problem gamblers and 6 % probable pathological gamblers. There was an association between participation in medium-high and high-risk gambling forms and gambling problems, with a higher occurrence of gambling problems the higher the risk level of the gambling participation. The problem gambling group still differed from the controls in many aspects. Beside gambling problems, there was a higher occurrence of reduced mental health, risky drinking habits and tobacco use. There were more in the problem gambling group with a strained financial situation, a history of unemployment and receiving income support. When dividing the problem gambler group into a younger group (27-35 years) and an older group (36-85 years), several differences were found. At baseline, the younger played gambling machines to a higher extent and more of the older gambled on sports, lotteries and horse racing. At follow-up, the younger players had reduced their gambling to a greater extent than the older ones. There were more people in the older group with severe gambling problems at follow-up, as well as risky drinking habits, poor mental health and a strained economic situation. Factors at baseline predicting gambling problems at follow-up were: severity of gambling problems, money spent on gambling and gambling on high risk games and/or at least monthly gambling on sports or horse racing. Negative experiences in childhood, risky drinking habits and a big win were other predictors. (Folkhälsomyndigheten, 2015)

With the focus on recovery factors, a cohort of 291 players with a PGSI >2 from Swelogs EP1, EP2 or in-depth studies was followed over 4.5 years. Two trajectories were found; a recovered group and a non-recovered group. Two thirds of the participants belonged to the recovery group. Social support during childhood and as an adult, along with a stable social and financial situation were factors promoting recovery. Participation in high risk gambling forms and previous gambling problems decreased the possibility of recovery. So did poor health, alcohol and drug problems. Unsurprisingly, those not in recovery

[5] SOGS-R lifetime >2 in baseline 1997-1998.

were more likely to experience negative consequences due to their gambling. (Public health agency, 2016b)

Starting a new cohort in Swelogs, a prevalence study was carried out in 2015. From a representative sample of 21 000[6], 9 420 (46%) participated, mainly by telephone but also via letter and web questionnaires. Gambling at least once yearly had decreased to 58 % from 70 % in 2008-2009. Around 18 % played online, with the highest figures for males aged 25-44 - 32 %. Underage yearly gambling had decreased in the same period, from around 42 % to 18 % for females, and 61 % to 22 % for males. According to the PGSI, 0.4 % had a gambling problem, 1.3 % moderate risk and 4.2 % low risk. The decrease in low risk gambling was significant. Problem gambling was associated with impaired mental health, risky drinking habits, low income, low education and being born outside Sweden. Participation in gambling forms with a high risk potential had a clear connection with gambling problems. Gambling machines, casino games, poker and bingo had the strongest correlation. (Folkhälsomyndigheten 2016a)

The latest prevalence study was presented in April 2019 (Folkhälsomyndigheten, 2019). From Swelogs prevalence study in 2015, 9 520 persons aged 19-87 were contacted, and another 4 000 randomly selected 16-18 years old were added. The response rate was 38 %. Yearly gambling stayed at 58 %, as in 2015, and online gambling was up to 21 % from 18 %. According to the PGSI, there was a decrease in low risk gambling, at 2.9 %, and moderate risk, 0.7 %. On the other hand, problem gambling increased to 0.6 %, with more women than men reporting problems. Men reported low risk and moderate risk gambling to a higher extent than women. There was an increase in gambling problems among those using casinos, gambling machines and poker online. As much as 70 % of the reported bets on these games came from people with a PGSI score >0.

To summarize, gambling behaviour, problem gambling prevalence and their correlates have been studied extensively in Sweden over the past 20 years with four large prevalence studies, one incidence study, two in-depth studies and two follow-up studies. The level of problem gambling has been stable over the years, but low risk gambling has decreased. There is a clear trend of declining gambling participation. Yearly gambling has declined from 89 % to 58 %. The correlates found in the cross-sectional studies have been confirmed in the longitudinal studies. Different gambling forms have different risk levels, high risk games are mainly characterized by being fast and available. Gambling behaviours have the strongest correlations with gambling problems.

[6] A stratified random sample of 21,000 individuals aged 16–84 years was drawn from the register of the total population, stratified to increase the number of problem gamblers. The results were weighted to represent the total population.

Negative childhood experiences are overrepresented among problem gamblers and predict gambling problems over time. Personality traits, e.g. impulsivity, also play a part, as well as risky drinking habits and socio-economic factors, such as income, education and origin. Earlier gambling problems are clear risk factors for relapses in gambling.

Gambling and gambling problems in the other Nordic countries

Norway

Norway has a strictly regulated gambling market. The two large gambling companies are state owned or state controlled and offer land based and online gambling. Other companies (e.g. Malta based) are not allowed. To date, 10 prevalence studies have been performed in Norway (see Pallesen, 2016 for an overview). The first, in 1997, identified 0.15 % pathological gamblers using a DSM-screen. The yearly gambling participation was 69 %. In 2002, Lund and Nordlund (2003) found yearly gambling participation to be 81%, with 0.2-0.3 % pathological gamblers (using both SOGS-R and NODS) and 0.4 % problem gamblers. In 2007, Bakken et al. (2009) reported a 68 % gambling participation, with 2.8 % at-risk gamblers, 0.4 % problem gamblers and 0.3 % probable pathological gamblers according to NODS. Problem gamblers were overrepresented in the use of slot machines, sports betting and internet gambling. In a nationally representative study, Pallesen et al., (2014), using the PGSI, found that 0.6% were problem gamblers, 2.4 % moderate-risk and 7.8 % low-risk gamblers. Yearly gambling participation was 59 %. There were no significant changes two years later. Pallesen et al., (2016), also using the PGSI, found that 0.9% were problem gamblers, 2.3 % moderate risk and 7.7 % low-risk gamblers. Yearly gambling participation was 58 %, 29 % online. Casino games and bingo were reported to be hardest to control for those with PGSI scores >2.

Denmark

Ekholm et al. (2012) compared gambling problems between 2005 and 2010, using a Lie/Bet-questionnaire in a larger public health questionnaire. This found that the past year prevalence of problem gamblers in Denmark had remained stable, 0.9 % 2005 to 0.8 % in 2010. In 2012, Denmark introduced a licensing system for online gambling on sport betting, gambling machines and

card games. This called for evaluating the effects. Fridberg and Birkelund (2016) compared gambling and gambling problems in Denmark between 2005 and 2016, using NODS. In 2016, 68 % gambled yearly, a decrease from 76 % 2005. Lifetime pathological gambling and at-risk gambling had increased. The past-year prevalence for pathological gambling in 2016 was 0.25 %, problem gambling 0.4 % and at-risk gambling 2.6 %, all higher than 2005 but not significant. When collapsing pathological gambling, problem gambling and at-risk gambling into one group (NODS>0), there was a significant increase from 2005 (2.5 %) to 2016 (3.2 %).

Finland

The gambling market in Finland is strictly regulated[7]. In 2017, they went from a three-party monopoly system with three operators to a single company monopoly, following the merger of the three operators into one company. When comparing gambling and gambling problems in Finland between 2007 and 2011 (Salonen et al. 2015), an increase of yearly gambling was reported (73.4 % to 77.9 %). There was no significant change regarding problem gambling (SOGS >2), in 2007 it was 3.2 % (CI 2.7-3.2), and in 2011 2.7 % (CI 2.2-3.2). Salonen et al. (2018) reported as high as 83 % yearly gambling participation in Finland in 2016, of which 39 % gambled online. Using the PPGM, they found 2.3 % pathological and problem gamblers and 9.6 % at-risk gamblers.

Iceland

Iceland was hit hard by the bank crisis in 2008. From a research perspective, it was a good opportunity to study the effect of economic crisis on gambling and gambling problems. Comparing prevalence studies from 2005 and 2007 with 2011 (Olason et al., 2015;), an increase was found in participation in all gambling forms except gambling machines. Overall, yearly gambling increased from 69 % in 2005 to 76 % in 2011. Gambling problems, PGSI >2, increased from 1.6 % in 2005 and 2007 to 2.5 % in 2011. In 2011, 0.8 % were problem gamblers and 1.7 % moderate-risk gamblers. The increase was explained by participation in online gambling and card games among young men.

The results were not supported in a follow-up study of the 2007 prevalence study, out of the original sample of 3,004, 1,531 participated in the follow-up 2011. There was no difference in the prevalence of problem gambling between 2007 (1.2 %) and 2011 (1.1 %). (Olason et al, 2017)

[7] The island and province of Åland has a province-owned gambling company also targeting the Finnish market.

Summary Nordic countries

There are regulatory differences, even though online non-regulated gambling is available in Finland, Norway and Iceland. Over the years, there has been a decrease in gambling participation in Sweden, Norway and Denmark, and an increase in Finland and Iceland. Regarding gambling problems, the countries are difficult to compare due to methodological differences in the studies. Bearing this in mind, Sweden seems to have a somewhat lower prevalence of problem gambling, pathological gambling included. Traditionally, the density of gambling machines is lower in Sweden than in the other Nordic countries (Jonsson, 2006; Meyer et al, 2009).

Global prevalence

Williams, Volberg et al. (2012) and Calado and Griffiths (2016) have reviewed global prevalence research. Williams et al. also included so-called ”grey literature”, such as governmental reports. They both conclude that most research is performed in Europe, North America and Australia/New Zealand, with very few studies in Africa, Asia and South America. Williams et al. see a trend of decreasing prevalence over the years. Calado and Griffiths report variations in past-year problem gambling rates across different countries in the world (0.12–5.8%) and in Europe (0.12–3.4%). It is also hard to compare these results due to methodological issues, such as the instruments and cut-off points used as well as how data were collected. Williams et al. try to make the studies comparable, in an ambitious approach to standardize the prevalence rates. Taking data collection method, instrument used etc., into account, the past year problem gambling ranged from 0.5 %- 7.6 %, with the lowest prevalence found in Europe, intermediate rates in North America and Australia, and the highest rates in Asia. The average rate of problem gambling for all countries was 2.3 %.

Findings from longitudinal studies

To date, we have seen more than 200 prevalence studies of problem gambling in the general population around the world (Williams, Volberg et al., 2012). Overall, they have provided insight into gambling problems in different countries and jurisdictions that has been important for policy makers, regulation and treatment planning. In these studies, one can, for example, see an association between gambling problems, certain gambling forms and mental illness. As these are cross-sectional studies, there are limitations in understanding

pathways into gambling problems and causal relationships. Is, for example, depression a cause of gambling problems or a consequence?

To understand causality and changes over time among individuals and in society, longitudinal research is needed. During the past decade, a number of large-scale longitudinal gambling problem studies have been conducted in Australia, Canada, New Zealand and Sweden (Abbott, Bellringer et al., 2015; 2016; Billi et al., 2014; el-Gubuebaly et al., 2015; Romild et al., 2014; Statens folkhälsoinstitut, 2012; 2013; Williams, Hann et al., 2015). The longitudinal research on gambling problems has focused mainly on two issues: the migration over time to and from gambling problems, and conditions that predate and predict gambling problems. The longitudinal results from Sweden are presented above (Knowledge about gambling problems in Sweden).

The origins of problem gambling have been addressed in prevalence research. The first systematic follow-up was carried out in New Zealand, with 77 lifetime problem gamblers (SOGS-R) and 66 controls (Abbott, Williams & Volberg, 2004). It showed that a majority of those who were problem gamblers in 1991 did not have a gambling problem seven years later. There was also a decrease in risky alcohol habits and mental illness among the lifetime problem gamblers at follow-up. Ongoing gambling problems at follow-up had been predicted by more severe gambling problems, risky alcohol habits and preferring horse betting at first measurement.

In the Victorian Gambling Study, a cohort, in four waves of data collection, was followed between 2008 and 2012. The original sample size was 15 000, reaching 7 148 in the first wave and 3 586 participating in all four waves (Billie et al., 2014). The results show high stability among the problem gamblers; 55 % remained problem gamblers through all the four waves, and 71 % were likely to remain problem gamblers from one year to the next. Progression from non-problem gambling to a higher risk level, measured by the PGSI, was associated with male gender, speaking a language other than English, lower education, signs of alcohol dependence, a lifetime but not ongoing problem or pathological gambling, anxiety and/or obesity. Being female was the only factor decreasing the risk for gambling problems. Forms of gambling with the strongest association with risk and problem gambling were electronic gaming machines (EGMs), casino table games, informal betting and horse betting. Of the problem gamblers, 68 % had big wins early in their gambling career, compared to 16 % of non-problem gamblers.

As part of the Victorian Gambling Study, 44 qualitative interviews were undertaken with problem gamblers, and 16 of these were thematically analysed. The informants reported that their gambling had increased gradually or through binges. Chasing losses, longing to relive winning experiences and coping with mental illness or escaping from other problems, were among the

most common reasons for gambling. Those problem gamblers reporting most harm due to their gambling often had co-morbidity. They also responded poorly to treatment, possibly because they had parallel problems not addressed in the treatment. The social and emotional harm reported was mainly due to financial problems and other consequences of their gambling. (Victorian Responsible Gambling Foundation, 2012). Even though they are part of a longitudinal project, these data are retrospective and derived from one interview per participant, which limits the generalizability of the study.

In Canada, two large scale longitudinal studies were implemented between 2006-2011, the Quinte longitudinal study (n=4 121) and the Leisure, Lifestyle, and Lifecycle Project from Alberta (n= 1,372 adults + 436 adolescents) (Williams et al., 2015). One finding was that many problem gamblers go in and out of their gambling problem. Approximately 50 % of the problem gamblers were in this category for only one of the five years of the study and only 6.7% were problem gamblers for the whole period. What predicted problem gambling? Being in the at-risk category was the strongest predictor of future problem gambling in a multivariate analysis. Other gambling-related variables added to the predictive power: a past year big win, increased frequency playing EGM and/or casino games. Looking at gambling in the social context, having family members being regular gamblers and/or people close to gambling problems were also predictors. Other predictors were gambling as an escape or to win money and having more gambling fallacies. Besides these gambling-related variables, impulsivity, having a behavioural addiction, a lifetime history of addiction to drugs or alcohol, and a family history of mental health problems were predictors.

What drives problem gambling on a society level?

In addition to general factors, such as the social and economic situation, there are three factors that are directly linked to the actual gambling:

- The total consumption of gambling
- Recruitment of new gamblers
- Transformation of existing customers into playing more continuous and risky gambling forms

The total consumption model states that the higher the availability and consumption of gambling, the higher the prevalence of gambling problems (Productivity Commission, 1999). This has received support (Hansen & Rossow, 2008; 2012; Lund, 2008; Rossow, 2018) but has also been criticised for

not taking into account the full complexity of the matter and suggesting an adaption process (Abbott, 2006, Abbott, Volberg et al., 2004; Shaffer et al., 2004). An adaption process could be caused by factors as increased awareness of problem gambling, attitudes towards gambling, expansion of treatment, other preventive measures and regulatory changes, factors that might decrease gambling problems. Marketing plays an obvious role in driving gambling consumption, even though the scientific evidence for this is low (Hanss et al., 2016). However, in terms of content, message and tone of marketing, it is not uncommon for it to be perceived as extensive, aggressive, misleading, and leading to a negative attitude towards gambling in society (Lee & Chang, 2008; Lamont et al., 2016; Papineau et al., 2015; Sproston et al., 2015). This negative attitude could reduce gambling participation.

The role of recruitment of new gamblers is partly backed by common sense. One has to play in order to develop gambling problems and having a larger base of players should result in a higher number of problem gamblers. Some evidence can be seen in the Swedish incidence study (Statens folkhälsoinstitut, 2012) where a percentage of non-players at year one developed gambling problems by year two. Marketing aims to recruit new customers by affecting attitudes to gambling, act as a normalization of gambling as an activity, arouse desire for gambling and influence gambling behaviour. (Abarbanel et al, 2017; Binde, 2014b; Clemens et al., 2017; Gainsbury, Delfabbro et al., 2016; Gainsbury, King et al., 2015; 2016; Hanss et al., 2015; Hing, Cherney et al., 2014; Hing, Vitartas et al., 2014; Hing, Lamont et al., 2015a; 2015b; Hing, Sproston et al., 2015; Lamont et al., 2016; Lemarié & Chebat, 2015; Sproston et al., 2015). The recruitment of new players also results in people falling back into gambling problems when struggling with abstinence (Binde, 2009; 2014b).

The transformation of existing customers is about making people start to play more continues and risky forms of gambling[8]. There is support for the view that some forms of gambling are more closely associated with problem gambling and the relationship is influenced by the specific forms of gambling in which individuals participate (Binde et al., 2017). Moving customers from low risk games to higher risk games would, thus, result in more gambling problems among them. There is also evidence that people with gambling problems due to marketing develop more serious problems (Binde, 2014b; Derevensky et al., 2010; Gainsbury et al, 2016; Hing, Cherney et al., 2014).

[8] See risk classification of gambling products below.

Aetiology

The development of problem gambling at an individual level is multifactorial. Several factors, such as age, gender and education, have been identified as playing an important role in the development of problem gambling, all within a biopsychosocial framework (Williams et al., 2015). With regard to biological factors, approximately 40-60 % of problem gambling may be predicted by genetic factors (Slutske et al., 2010). Factors that are also of a psychological nature are: a decreased sensitivity to reward (Oberg et al., 2011), and a problem with delaying it (Goudriaan et al., 2004). A purely psychological factor is erroneous beliefs about gambling, such as misunderstanding the concept of chance and not comprehending that each outcome of a gambling machine is independent of all others. Durand Jacobs' general theory of addiction (1986) states that two factors predispose persons to addictions: an abnormal physiological resting state, and childhood experiences producing a deep sense of inadequacy and low self-esteem. These factors are interrelated, and gambling can offer a temporary escape through dissociation, thus a strong negative reinforcement.

Blaszczynski and Nower (2002) proposed three subgroups of gamblers with impaired control: (1) behaviourally conditioned, (2) emotionally vulnerable and (3) antisocial, impulsive problem gamblers. A comprehensive pathway model leading to problem gambling is presented with a focus on psychopathology and gambling motives. Ecological factors (increased availability and accessibility of gambling) and learning factors affecting arousal/excitement as well as cognitive schemas with erroneous beliefs on gambling, form the first steps and are common to all three pathways. All groups may manifest comparable levels of gambling severity, depression and cognitive distortions (Blaszczynski, personal communication, 2008).

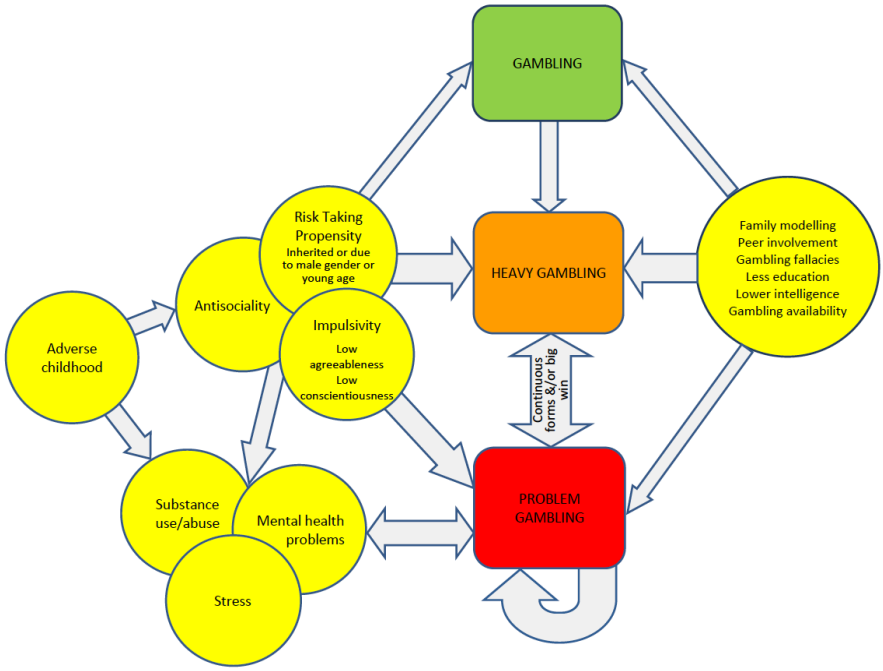
Concerning motives for gambling, in Pathway 2 it is used for emotional escape, e.g. through dissociation. Since gambling relieves psychological pain rather effectively for these gamblers, there is a high risk that they also use it to cope with the emotions caused by the negative consequences of their gambling. With regard to psychopathology, premorbid anxiety and/or depression as well as alcohol dependence are frequently found. The members of Pathway 3 mainly gamble to increase their dominating state of positive excitement while doing so; in addition to anxiety and alcohol dependence they have a dominating personality disorder of impulsiveness. This means difficulties delaying reward and learning from negative experiences. The excitement is considered positive through the association with winning and almost winning and due to its mood changing capacity. Blaszczynski and Nower suggested that a lack of a secure childhood is also found in the second and third pathways.

The pathway model is cumulative. This means that Pathway 1 is not ascribed any desire to modulate affective states and is said to be free from major specific premorbid traits of psychopathology. Members of this pathway are mainly motivated by financial reasons, trying to win back losses or to solve financial crises by gambling. Blaszczynski and Nower do not ascribe an insecure childhood to members of Pathway 1.

With the emphasis on the origin of problem gambling as a process, and on types of gamblers differing concerning premorbid conditions, especially premorbid psychopathology, it is very difficult to test the whole Blaszczynski and Nower model. Longitudinal studies are necessary but few; there must be a broad perspective of variables. The model has received support and it has been suggested that further differentiation would be possible from studies with treatment samples (Álvarez-Moya et al., 2010; Gonzales-Ibanez, 1994; Gonzales-Ibanez et al., 2003; Ledgerwood and Petry, 2006; Lesieur, 2001) and cross-sectional studies with recruitment through advertising (Turner et al., 2008; Vachon and Bagby, 2009) and national surveys (Carragher and McWilliams, 2011; McBride et al., 2010). In a longitudinal study, Allami et al., (2017) found support for the three pathways as well as a fourth pathway, resembling a combination of pathway 2 and 3. They used a Latent Profile Analysis with a set of variables prescribed by the Pathways Model and measured during early adolescence with 180 participants displaying at-risk or problematic levels of gambling at either 16 or at 23 years of age.

Williams et al., (2015) have suggested a comprehensive aetiological model for problem gambling, see Figure 1. Within the biopsychological framework, they propose common factors for gambling and problem gambling, stressing that heavy gambling involvement is the greatest direct risk factor. Environmental factors, such as family modelling, gambling fallacies and gambling availability can play a part. Other factors are more innate, such as personality traits of risk taking and impulsivity. An adverse childhood could affect both comorbidity and personality factors. Comorbidity can be both a consequence and a causal factor. Regarding the transition from heavy gambling involvement to problem gambling, a large win and playing continuous forms of gambling are seen as key factors.

Figure 1. Aetiological Model of Gambling and Problem Gambling from Williams et al (2015), page 145. Used by permission.



Preventing gambling problems

Prevention can take place at different levels. Primary prevention is on a universal level, targets the whole population and aims to avoid the development of problems. Examples are measures that decrease availability through regulation and/or price. In the alcohol field, it is well documented that a decrease in availability has effects on preventing excessive alcohol consumption and related harm (e.g. Middleton et al., 2010). Broad educational campaigns are other examples. Secondary prevention targets groups at risk. In the gambling field, many of the responsible gambling (RG) measures fit into secondary prevention, aimed at helping players stay in, or regain, control of their gambling habits. Tertiary prevention is about helping individuals who have developed a problem, through treatment, peer support and support from relatives.

For many health problems, a combination of primary, secondary and tertiary interventions is needed to ensure an acceptable degree of prevention and protection. From a public health perspective, primary prevention is of course preferable. These measures can be broad. Targeting poverty, lack of education and social alienation would improve people's physical and mental health.

There is a great need for more scientific knowledge about preventing gambling problems. In a systematic review, the Swedish public health agency found some support for broad school interventions in reducing gambling behaviour (Folkhälsomyndigheten, 2016b). They found indications for the effectiveness of limiting availability. In an earlier and less stringent review, including "grey" literature, Williams, West et al., (2012) found childhood interventions to be of moderate high effectiveness (but without any specific studies on gambling). Restricting the availability of gambling was rated as having a moderate to moderately high effectiveness whereas most responsible gambling measures and school-based intervention programs were found to be moderately low or moderate in effectiveness. In a recent systematic review by the Swedish Agency for Health Technology Assessment and Assessment of Social Services (SBU, 2019), their main conclusion was the lack of systematic research in the area. There was an indication that longer educational initiatives (universal prevention) at secondary school reduced the number of gambling days. At an indicated level, personalized feedback on gambling consumption showed promising results, although only one study met the criteria for inclusion in the systematic review. The report identified three urgent research areas: personalized feedback, limits for time or money ("pre-commitment") and training of staff at the gambling companies and their retailers.

As secondary prevention is the scope of this dissertation, a more detailed overview, focusing on responsible gambling measures, is given below, after a brief overview of primary and tertiary prevention in Sweden.

Primary prevention in Sweden

In Sweden, two school-based primary prevention programs have been evaluated. A pilot study with intervention and control groups, using a Swedish translation of Stacked Deck, a Canadian program (Vinberg & Strandberg, 2016; Williams, Wood & Currie, 2010) and a qualitative evaluation of "Prata om spel" (Talk about gambling). These consist mainly of teaching materials for integrating reflecting on gambling in maths, Swedish and art (Blume et al., 2016). The Stacked Deck study found no differences between the intervention group and controls regarding gambling behaviour. However, the intervention group was more negative towards gambling post-intervention. Both studies concluded that there is a need to create room for preventive efforts in the overall school timetable if similar programs are to be successfully implemented.

Regarding primary prevention, by restricting availability through regulation, there are no Swedish studies. Evaluations have been made after the introduction of international casinos and online poker (SOU 2006:64; 2008:36), and in line with this, the licensing system will be evaluated by the Swedish Agency for Public Management.

Tertiary prevention in Sweden

Mutual support groups in Sweden

The first self-help group was started in Stockholm in 1989 by professor Sten Rönnberg. Together with other professionals, problem gamblers and their relatives, he started Riksförbundet Spelberoende (The Union of Gambling Addicts). Later, it was replaced by Spelberoendes Riksförbund (the Gambling Addicts Union) (Binde & Jonsson, 2010). In 2019, there are over 30 mutual self-helps groups spread over Sweden, organized in three organisations[9]. In a mainly qualitative study, Binde (2012) evaluated a mutual self-help group for young (aged 17-25) problem gamblers[10]. His conclusion was that attending the group had a relatively good effect on problem gambling, and that the help was multifaceted, both regarding content and covering all phases of recovery, thus a good complement to treatment.

Helpline

Since 1999, there has been a helpline for problem gamblers and their relatives in Sweden. For the years 2012-2017, approximately 1 500 gamblers and 1 100 relatives contacted the helpline annually. There was an increase in 2018; 1 922 gamblers and 1 315 relatives. Over time, the type of games related to gambling problems have changed. For many years, physical gambling machines dominated as problem game. During the poker boom (2006-2007), online poker was the most common form of gambling reported to be problematic. During the past six years, online casinos have moved from 25 % in 2012 to 62 % 2018. Vegas (physical gambling machines) have moved from 24 % down to 3 % during the same period of time. Sports betting has been fairly stable at approximately 13-16 %. Poker has decreased from 18 % 2012 to 2 % 2018. (Centrum för psykiatriforskning, 2019)

Treatment

The first Swedish treatment study compared online CBT, with telephone support, with a control condition (N=66) (Carlbring & Smit, 2008). The treatment group improved regarding gambling problems, anxiety, depression and quality of life significantly more than the controls, showing clinically meaningful

[9] Spelberoendes riksförbund, Spelberoendegruppen och GA-Sverige
[10] Self-defined.

changes, for example, mean NODS score 8.2 pre-treatment and 2.0 post treatment for the treatment group. The results were sustained even at a 36-month follow-up, where three quarters showed a clinically moderate or large improvement. This study excluded depressed problem gamblers, which limited the possibility to generalize the results. The same treatment, but without excluding depressed patients, was evaluated using a non-comparative, single group study (N=284) (Carlbring et al., 2012). The results from the first study were replicated and found to be sustainable over 36 months.

Carlbring et al., (2010) compared individual motivational interviewing with group treatment CBT, and a control condition (N=150). Receiving treatment showed superiority over the no-treatment control in the short-term regarding reduction in gambling problems. At a 12-month follow-up, both treatments produced significant within-group decreases in gambling problems, gambling behaviour, depression and anxiety. Josephson (2016) re-analyzed the results, finding that CBT in group format was significantly better than MI and the control conditions, and that MI did not reach significance compared to the control group.

In a descriptive study, Håkansson et al., (2017) examined what characterized Swedish help-seeking problem gamblers (N=106). Eighty per cent were men, and 58 % had a parallel psychiatric diagnosis. Non-substance psychiatric diagnoses were significantly more common among women than among men.

Secondary prevention

Responsible gambling - the Reno model and its critics

Over the past 15 years, the agenda for responsible gambling has evolved largely due to the formulation of the "Reno model". The Reno model was introduced in 2004 by the researchers Blaszczynski, Ladoceur och Shaffer (Blaszczynski et al., 2004). It has been modified and clarified in several versions (Blaszczynski et al., 2008; 2011; Collins et al., 2015). In short, the Reno model stipulates that the different stakeholders have different responsibilities to prevent and minimize gambling problems. Society should stipulate the rules, offer treatment and control the gambling market: The gambling companies should offer measures to help their customers stay in control, and refer them to treatment if necessary. The individual is seemed as ultimately responsible, based on informed choice. Over the past years, "positive play" and "responsible play" have become increasingly popular in North America, in accord with the Reno model, including re-labelling of gambling as play and referring to gambling problems in other softer terms (Wood et al., 2017; GameSense, 2019). According to the Reno model, focus should be on problem gambling and high-risk groups. The recreational player should not have their gambling experience disturbed by RG measures. The Reno model has recently

been criticized for being focused on gambling addiction, in order to individualize the problem. It is popular because it does not interfere with the activities of gambling companies and states that are making a great deal of money. It has also been suggested that it lacks a true preventive and public health perspective (Abbott, 2017; Hancock & Smith, 2017). Furthermore, the critics argue although it has been stated that the Reno model is based on research and evaluation, it has rather been built on the gambling companies' agendas. One piquant detail is that the principals behind the Reno model all have a close cooperation with the gambling industry, and in many people's eyes offers an easily digestible and ineffective gambling responsibility dressed up as, "State of the Art" and research-based (Hancock & Smith, 2017). In Sweden, Alexius (2017) has criticized the work with responsible gambling for the same reasons as Abbott and Hancock and Smith (ibid).

The Reno model's idea, not to disturb recreational gamblers with RG measures, has very little empirical support. On the contrary, studies show that consumers generally tend to have positive attitudes towards RG tools (Forsström et al., 2017; Gainsbury, Parke, & Suhonen, 2013). A recent study by Ivanova, Rafi et al., based on 1 223 surveys at an online gambling company, found no grounds for limiting the design and implementation of RG tools due to fears of disturbing recreational gamblers or that it would lead customers to abandon the gambling site.

Risk classification of gambling products

Risk classification instruments can, and are, used by some operators when developing games, and to plan RG measures "surrounding" the game. They are also used by regulators in evaluating of applications for new gambling forms, which could be seen as a more primary prevention if applications for high risk gambling forms are turned down or allowed with the amendment of certain RG measures.

There are three risk classification instruments for gambling products. GamGard is a commercial product (Wood et al., 2007), AsTERriG (Meyer et al., 2011) is freely available, and Tools for responsible games (Airas, 2011) is used internally at Veikkaus[11] only. They are based on the assumption that different gambling forms have different risks, and that there are structural characteristics (parameters) in the gambling form that add up to the risk level. AsTERiG has received support from Swelogs, where a simplified form showed a predictive capacity (Statens folkhälsoinstitut, 2012). People playing gambling forms at a medium high or a high-risk potential year one developed gambling problems to a higher extent year two than those playing at a low risk level. Those playing at a high-risk potential run the greatest risk. GamGard

[11] The state-owned Finnish gambling company

has been evaluated in report form (Cousins, 2018) but no peer-reviewed article has been published.

Behavioural tracking and early detection

Several researchers have stressed that technological developments not only result in increased gambling availability, but also create opportunities to use data to prevent gambling problems (Gainsbury, 2011, Jonsson et al., 2017). In addition to giving gamblers the opportunity to reflect upon their consumption, gambling patterns can also be analysed to see if risky gambling can be identified. The latter is usually referred to as behavioural tracking and thus takes place from a perspective of responsibility.

Predicting self-exclusion

Haefeli et al., (2011) investigated whether it is possible to identify people with gambling problems on the basis of content analysis in customer service contacts. Gambling problems were defined as people who self-excluded from the gambling site. The sample was 150 self-excluders and 150 in a randomly drawn control group. The 1008 e-mails the sample had sent were subjected to a blind analysis. The themes increased limits, reopening of account, account administration, financial transactions and the desire for bonuses, were significantly more common among the self-excluders. Threatening tonality was also significant and was the strongest predictor of self-exclusion in a stepwise logistics regression, with 76.6 % true classifications. One weakness of the study was that the self-excluders and the control group were not matched regarding gambling behaviour. Also focusing on customer service contacts, Gray et al., (2012) examined what gambling behaviours characterized a group of customers (RG cases) contacting customer service with RG-related matters. They included a control group and, not surprisingly, found that RG cases played more often and more intensively. The clearest difference was in live betting behaviour. Methodologically, the study has its weaknesses with large original differences between the groups, since the control group was completely randomly chosen among the customers.

Bravermann and Shaffer (2010) analysed gambling patterns (Bwin data) during the first month of gambling and how they predicted self-exclusion within two years. When self-excluding, the gamblers had stated their reasons for doing so. Three reasons were given, i.e. gambling problems, not wanting to gamble anymore or discontent with the service itself. Four clusters were found, but no differences in gambling behaviour between those self-excluding for gambling problems compared to the other self-excluders. Adami et al., (2013) proposed two new markers for identifying an individual who is developing problematic gambling. This is a development of Bravermann and Sahffer's model (2010), the two markers being: fluctuating wagers, especially reduced wagers, after a period of escalation, and using the number of games as a proxy for time spent. In a cluster analysis of the same Bwin data, as used by

Bravermann and Schaffer, they compared the five clusters to the four found by the latter. They noted a connection between cluster affiliation and the proportion of those who had stated gambling problems as a reason to self-exclude. However, there were many false negatives, i.e. players with gambling problems were part of a cluster that consisted of a majority of players who had not reported gambling problems. Taking another angle, Haeusler (2016), focused on payment behaviour as a predictor of self-exclusion, in a study with Bwin data (n = 2,696). The design included one group of self-excluders and one group randomly selected as past month gamblers. Factors increasing the risk of self-exclusion were the number and size of deposits, cancelled withdrawals, the variation in withdrawals and the use of invoices via a mobile phone. Conversely, the use of electronic wallets and prepaid cards decreased the risk for self-exclusion. Using only payment behaviour, the model did not perform as well as models in other studies that included more gambling or communication data (e.g. Braverman et al., 2013; Haefeli et al., 2015).

Weaknesses in Bravermann and Schaffer, Adami et al. and Haeusler's studies are that the gambling problems are self-reported without any systematic questionnaire being used when they self-excluded. In the group of disgruntled customers there is probably a number of problem gamblers, and this may also be the case for the group that no longer wanted to play. Secondly, the studies cannot control for gambling at other gambling companies, or even know if participants gamble elsewhere. Data therefore only provides information about a fraction of the gamblers' total gambling, since the average online gambler is a customer at least two gambling companies.

Classification methods

Philander (2014) investigated various methods of identifying high-risk online gamblers. Nine different algorithms / methods were compared: stepwise logistics regression, lasso logistics regression, neutral network regression, neutral network classification, support vector machines (eps regression and c-classification and one-classification as well as Random Forest (regression and classification). Random Forest performed best in classifying high-risk problem gamblers, but it showed signs of over-adaptation, and the author believes that it needs to be cross-validated and evaluated carefully if it is to be useful. Percy et al., (2016) focused on 604 self-excluders and 871 in a control group (IGT customers) selected to be representative of the regular customers, on what form of machine learning best predicted self-exclusion. The Random Forest method performed best also in this study, compared to logistics regression, Bayesian networks and neural networks.

User behaviour

Since 2006, Svenska Spel has been using a behavioural tracking tool, Playscan. Forsström et al., (2016) examined how 9 293 customers at Svenska Spel

used it. There was a high usage initially, but a majority used Playscan only once or twice during the observation period of 23 months. Furthermore, there was a low reading rate of the messages generated by the application. A small share, 7.3%, visited Playscan five times or more during the time period. A latent class analysis yielded a five-class solution. The following were identified: self-testers, multifunctional users, recommendation users, site-visitors and non-users. The first three groups used Playscan's functions to a greater extent. They also saw a connection between the risk of gambling problems and the use of Playscan's various functions.

Forsström et al., (2017) interviewed 20 Playscan users, with different risk assessments, and made a qualitative analysis. They found two central themes: use of Playscan and the gambling site as well as the experience of Playscan. Reasons for joining Playscan were the curiosity of finding out what it was, and partly for obtaining a risk analysis. Generally, the users experienced that they received some information and interaction with the Playscan application. The participants understood the purpose behind Playscan and felt that it could have a changing effect on gambling behaviour.

Effects of behavioural tracking systems

The effect of behavioural tracking systems (BTS) has been evaluated to a very limited extent. Auer and Griffith (2015a) matched 1,015 online players who had access to the BTS Mentor with a 15,216 strong control group. They were matched for gender, age and gambling (time and theoretical loss) before the intervention group joined Mentor. Gambling was compared two weeks before they joined the study with two weeks after, thus looking at a very short-term effect. More people in the intervention group reduced their gambling, an effect that was attributed by the authors to the participants receiving personalized feedback from Mentor. An alternative explanation could be the selection effect, i.e. those who have used the tool systematically differ from the controls, e g motivation for change, degree of gambling problem or something else not controlled for in the study.

Wood and Wohl (2015) looked at the effects of Playscan. In a quasi-experimental design, the 779 players who joined Playscan were compared to a matched control group (n = 779), comparing gambling data 24 weeks before the players joined Playscan and 24 weeks after. There was an effect limited to the risk players who joined Playscan, they decreased their gambling significantly more than the controls. There were no differences for those without any problems or the problem gamblers compared to controls.

Summary

In conclusion, there is currently some knowledge about which gambling behaviours have a connection with gambling problems, as well as which statistical methods are most promising for predicting self-exclusion. Less

investigated is the effect of the BTS communication on gamblers and its short- or long-term preventive effect.

Limits and pre-commitment

Pre-commitment is the term for when gamblers set limits for time and/or money before starting to play. It can be mandatory or voluntary. Gamblers are free to set their own limits, sometimes given a maximum limit by the gambling company or authority. The limits can also apply to all gambling at a gambling company or to individual gambling forms. The money limits can refer to deposits, losses or turnover. The rationale behind pre-commitment is that the customer should set a limit in relatively unaffected state, without the arousal and emotions created by gambling. Factors that limit the effectiveness of pre-commitment are the ability to play at other companies, with borrowed customer cards or with the same product but without a customer card, if possible. (Ladouceur et al., 2012, Williams, West et al., 2012)

Use of pre-commitment

When Ladouceur et al., (2012) examined the empirical evidence of pre-commitment, they 17 found relevant empirical studies, both peer-reviewed and report-published results. They found some evidence that a majority of players set private limits for themselves (”today, I will spend a maximum of 1000 SEK”) and that players with problems find it more difficult to stick to them. Furthermore, they noted that a couple of studies from the 2000s with data from online gambling companies showed a very low proportion of customers who set voluntary limits and an extremely limited effect, if any, of these. In a large project in Nova Scotia, Canada, the participants used player cards on slot machines. An obvious weakness in that project was that it was possible to play even without playing cards, which 55 % of the participants in the study did. A majority of the participants appreciated the card and the information it provided. However, it was concluded that the use of the card would have to be mandatory to be more effective. Another part of the Nova Scotia project was carried out in a casino laboratory with participants recruited via the media. Here, the use of cards was mandatory. Very few, less than 4 %, set limits. Half of the participants used one of the RG functions available during the study, most popular was to see their net (how much the person went plus or minus), used by 34 %. Three quarters stated that the gambling responsibility measures via the playing card were perceived as useful for preventing gambling problems. In a third study, with 137 monthly players in a natural gambling environment, about 60 % used one of the RG measures on the playing card. Again, obtaining information about money spent was the most popular function. Initially, 17% of the players set money limits, which decreased to 0 % over time during the study. In the natural gambling environment, gambling with others' playing cards was a problem. When examining the 88 individuals who did not borrow someone else's card, more reduced their gambling than increased it, with the proportions 2 to 1 regarding money and 3 to 1 regarding time.

Regarding whether the system of playing cards helped the players, 70 % responded that this was the case and 57 % reported that they had spent less money on games. Despite this, a large majority of the players at low or no risk, according to PGSI, considered that they did not need the system to play responsibly.

In a study by Schottler Consulting (2009), only 2 % of the players chose to obtain a loyalty card that provided opportunities for setting limits and other RG measures. For the 52 players who participated in the study, the result was mixed with regard to gambling consumption. Interestingly, in default mode, the deposit limit was set at AUD 20, which allowed some players to deposit more money than usual. Furthermore, consumption increased among the cardholders who did not set limits, which a majority did not. In a study initiated by the Government of South Australia, Playsmart was used (Schottler Consulting, 2010). This is a loyalty card which gives the players personal reminders and warning messages on the screen when reaching 50 % and 75 % of their set loss limit. When the players reached their limit, the slot machine emitted a sound to alert the staff to turn off the signal. The players were able to continue gambling without playing cards after they had reached their limit and had talked to the staff. This, of course, drastically reduced Playsmart's effectiveness. Approximately 2/3 included in the study set limits.

Effects of limits used in natural gambling environment

In a comparative study, 154 of the Playsmart users were matched with controls (on age, gender and gambling expenses), Playsmart users had a 32 % lower turnover regarding card data. However, the study did not control for gambling without using the loyalty card or gambling elsewhere. Auer and Griffiths (2013) examined the effect of limits on gambling behaviour via data from the gambling company Win2day, a company where it is mandatory to set time and deposit limits. The deposit limits have a maximum of 800 € per week. The researchers followed limit behaviour during a three-month period for 5.000 players with the highest theoretical loss. When comparing theoretical loss with time spent on games 30 days before, and 30 days after, a money limit change, players lost between 77 % and 90 % the month after. The greatest effect was seen among casino players compared to lottery and poker players. Time consumption was between 73 % and 96 % the month after, with the highest effect for poker players. The effects were less apparent after changing time limits: the theoretical loss the following month was between 88 % and 96 % compared to the month before and, with one exception, monthly time limits, not significant. Time consumption was between 70 % and 99 %, with the lowest figure for the poker players. Limitations in the study were the before and after design, the short follow-up time, and the selection of customers who lost the most money. The corresponding results for other players in the gambling company are not presented. Also, we do not know if the limits worked; did the players hit their limits? The changes could be attributed to the players deciding

to make a change and alter their limits accordingly. Ivanova, Magnusson et al., (2019) conducted a randomised study with online slot-machine players (n=4 328) at the Finnish province owned gambling company Paf. They examined how prompting for voluntary deposit limits at registration, before first deposit or after first deposit affected gambling behaviour compared to a control condition. Even though a higher proportion in the intervention groups set deposit limits compared to controls, there was no effect on net losses measured during 90 days after registration.

Effects of limits from experimental studies

Stewart and Wohl (2013) conducted an experimental study of 59 Canadian students randomized to two groups. Participants were allowed to play slot machines in a VR casino environment, and initially had to set a limit on how much they were prepared to lose (out of the 20 CAD they had to play for). The experimental group was reminded when they had reached the limit, the control group was not. The results showed that the experimental group adhered to their limits to a greater extent and that dissociation was a mediating factor for the control group. The results were supported by Wohl, Gainsbury et al., (2013). This study also used students playing slot machines in VR. Both a reminder that the limit had been reached and watching an animated film about how slot machines work, separately, had the effect of helping the players to stick to their limits. Both studies investigated so-called soft limits that seem to be relatively ineffective in character; the players are reminded that they have reached their limit but can continue playing. In the Nordic countries, firm limits are much more common, and when they are reached, it is not possible to continue playing (SOU 2008: 36). In a small study of 43 students playing slot machines in a laboratory casino, the intervention group chose time limits to a greater extent and played for a shorter time than the control group after receiving a pop-up (Kim et al., 2014). As with many experimental studies in labs, the ecological validity was low. For example, 100% set a time limit after receiving a pop-up although, in a natural environment, such a result would be unlikely. The behaviour in the laboratory can be explained in terms of social desirability bias. Wohl et al., (2014) examined the importance of the design of the message encouraging the gambler to stick to the limit and stop playing when reaching it. The same virtual casino environment as in Stewart and Wohl (2013) was used. Fifty-six university students were randomized: one group received standard messages (control group) and the other group received messages using a traffic light and were asked if they wanted to continue playing as they approached, and when they had reached, their limit. In the experimental group, 92 % adhered to their set limits compared to 62% in the control group.

Walker et al., (2015) investigated how win limits could affect gambling behaviour and conducted several simulation studies with or without win and loss limits. The results indicate that win limits could help players lose less money.

They tried two different types of win limits; one when $ 100 was reached from below and one where the player was allowed to win more than $ 100. In the latter situation the limit was reached from above, i.e. the player first won more than $ 100 and then, having lost, came into contact with their limit 'on the way down'. The validity of the study is low, it is based on statistical simulations and assumptions that the players would set profit limits and stick to them.

Summary

There is some support to indicate that limits influence player behaviour, i.e. they play for less money or a shorter time, but the results are mixed. There are factors that influence the effect of limits, such as they are voluntary, easy to change and that it is possible to play on other game sites (if online) or play unregistered (in the physical field). Theoretically, mandatory limits that cover the whole market would have the strongest effects. As a customer one would have one gambling wallet as a payment solution for all companies that would have to check if the limit had been reached. Furthermore, the design, the user experience and the extent to which the players find the limits helpful affect the outcome.

Feedback to players on gambling behaviour

Cunningham et al., (2012) performed a randomized, controlled trial evaluating the effectiveness, and the sustained efficacy, of personalized feedback intervention online materials for problem gamblers. The problem gamblers (PGSI >2) were recruited from the general Ontario adult population and were randomly assigned to: 1) personalized normative feedback intervention (feedback on PGSI classification, erroneous beliefs and comparison with general population gambling as normative); 2) a partial feedback, as 1 but without the normative feedback content; or 3) a waiting list control condition. The study found no evidence for the impact of normative personalized feedback, but the participants receiving the partial feedback (without norms) reduced the number of days they gambled compared to participants who did not receive the intervention. This in contrast with the results of Neighbors et al., (2015), who carried out a randomized controlled trial involving 252 college students with a SOGS-R score >1. They compared a computer-delivered personalized normative feedback, of showing individuals that their own gambling behaviour is atypical with respect to actual norms, with an attention-control feedback. Follow-up assessments were at 3- and 6-months post-intervention. For the group receiving personalized normative feedback, they showed significant effects in reducing perceived norms for losses and wins, and in reducing actual loss and gambling problems at the 3-month follow-up. At the 6-month follow-up, the effect on gambling problems was no longer significant.

Auer and Griffith (2016) conducted a study with Norsk Tipping's 5,528 online customers where they compared different forms of feedback to the customers with an absence of feedback. The feedback could refer to how much they had

lost during the past month, how other customers lost as a norm and/or RG tool recommendations which formed five intervention groups: 1. Information on losses, 2. Information + recommendations, 3. Information + recommendation + normative, 4. Information + normative, 5. Recommendation. The results showed that all interventions reduced wager and theoretical loss in the short term (gambling 7 days after intervention) and that there were no differences between the intervention groups. However, they observed that different player groups reacted differently to the interventions, with personal information about losses often being the most effective, sometimes in combination with the norm. However, for a smaller group of online casino players, recommendation was most effective. It is not known why this was not further analysed in the article, nor what the players chose to do on receiving the recommendations.

Wohl et al., (2017) published the first study on what has been termed, "reality check" in the context of responsible gambling. They asked 649 gamblers, who were part of a loyalty program at a physical casino in Canada, about how much they had won or lost in the past month. The gamblers then received feedback on the actual results based on registered play from loyalty card data. At group level, players underestimated their bets by a factor of 13. Furthermore, the players underestimated their losses over the three-month period by CAD 567. When following-up gambling three months after the intervention, those who had underestimated their losses showed a decrease in their gambling, and those who said they wanted to reduce their gambling after receiving feedback differed significantly from those who said they would not.

In summary, there is some promising research in the area, and we know that feedback concerning alcohol consumption has an effect (Project MATCH research group, 1998). The results are mixed as to whether adding normative content to the feedback makes it more effective.

Education

Staff

There is some support for the view that staff training at gambling companies, retailers and casinos has an effect on the attitudes, knowledge and ability to intervene with customers at risk (Kalke et al., 2011). Staff who are in contact with customers ask for continuous training on how to handle difficult situations (Hing & Nuske 2011; 2012). Furthermore, identifying and referring problem players to support and treatment have an effect on harm minimization (Productivity Commission, 2009). Ladouceur et al., (2004) was the first study of this issue to be published in a peer-reviewed journal. The study evaluated the follow-up of a two-hour training session of gambling agents with gambling machines. It focused on erroneous beliefs and their connection with gambling

problems, how to identify gambling problems among customers and how to intervene. Seven hundred and seven retailers participated in the study, 496 of whom also participated at a six-month follow-up. Post-training, the retailers reported having better knowledge about erroneous beliefs, being better able to recognize gambling problems as well as having greater self-confidence to intervene. At follow-up, the trained retailers intervened to a significantly higher degree than 504 retailers yet not trained, who constituted the control group. Giroux et al., (2008) conducted a similar study with casino staff, n = 2432, but without a control group at the follow-up, where only 32% participated. The results supported Ladouceur et al., (2004), showing increased knowledge about erroneous beliefs, an enhanced ability to recognise gambling problems and a greater self-confidence in identifying problem gamblers. Staff also had increased knowledge about how to access help at the casino. At follow-up, the increased knowledge about erroneous beliefs and gambling problems remained, but there was a decrease in knowledge of the procedures in place to help players with problems. The authors' conclusion is that follow-up training is needed.

In a study with a control group and an 8-month follow-up, Dufour et al., (2010) investigated the effects of training staff at Video lottery terminal[12] (VLT)-retailers. As many as 826 employees at gambling agents filled in surveys before and after the training, and 55 % participated at the follow-up. The training was inspired by responsible alcohol serving programs. The results showed short-term effects on knowledge about gambling problems, attitudes and intervention behaviour when a test person showed gambling-related problems at the retailer. At follow-up the retailers' knowledge had deteriorated but was still better than prior to training. Surprisingly, both the control and the intervention groups performed significantly worse regarding intervening with problem gamblers than prior to training, which was in contrast to the non-significant improvement the retailers reported themselves. LaPlante et al., (2012) also showed a short-term effect regarding knowledge for American casino staff when evaluating "Play Responsible", a "multimedia-driven" RG training. In a pre-after design without a control group, 116 out of 217 (53 %) participated in both pre- and post-measurement. The results showed increased knowledge about RG-related issues, such as gambling problems and attitudes regarding the importance of RG. On the other hand, employees' own erroneous beliefs were less affected by the training.

Quilty et al., (2015) examined casino employees in Ontario, Canada (n = 130) and how their well-being at work was linked to observing customers with gambling problem as well as how they handled these situations. Of the employees, 94 % had undergone some form of RG training. They reported good knowledge about recognizing gambling problems, but more than half thought

[12] An electronic type of gambling machine

it was difficult to intervene with customers who showed signs of problems. Job satisfaction had a negative relationship with difficulties in intervening with customers with, and how often they saw signs of, gambling problems.

Gamblers

Educating gamblers has become standard at many gambling companies. Information is provided about risks with gambling and responsible gambling, including erroneous beliefs and treatment referral. This may be in the form of information on websites, printed or interactive material. There are also so-called information centres at some casinos. Not much is known about the effects of these initiatives. Boutin et al., (2009) conducted an evaluation of an information centre at a casino in Montreal, Canada. In order to see if a visit to the information centre could change erroneous beliefs and if it could affect gambling behaviour, 67 volunteer customers received questions before, immediately and three months after the visit to the information centre. They were also compared with a control group (n = 74). The results showed a change, with increased knowledge regarding erroneous beliefs after the intervention, but no differences in gambling behaviour or use of RG measures.

Early attempts to educate gamblers on how gambling and probability work have not shown any effect on gambling behaviour in young people (Delfabbro et al., 2006; Williams & Connoly, 2006). Wohl et al., (2010) tested the effects of a nine-minute animated video that addressed how a slot machine works, the importance of setting one's own financial limits for gambling and strategies to avoid gambling problems. Adult slot machine players without gambling problems (n = 242) were randomized to intervention or "control video" groups. The short-term effect was that fewer in the intervention group exceeded their own limits over a 30-day period and had a lower degree of misconceptions about probability and slot machines. In a follow-up study by Wohl, Santesso et al., (2013), a three-minute animated film was compared with the previously used nine-minute film. The shorter film turned out to have the same effects as the longer one: lower degree of misconceptions about how gambling works and that participants kept to their limits to a greater extent. However, the effects did not persist after six months.

Summary

Staff RG training changes attitudes and increases knowledge of gambling problems and responsible gambling. The extent to which it affects the behaviour of staff is less clear. There are short-term effects, but how the company views responsible gambling, what instructions and support the employees receive are of major importance. The effect on customers' behaviour has not been studied.

There is an indication although training of gamblers can change erroneous beliefs, any effects on gambling behaviour are short-lived. At the beginning of the century, Ladouceur and others emphasized the role of erroneous beliefs for developing gambling problems, which had a great influence on what research was conducted. Today, the importance of feelings and feedback is emphasized to a greater extent.

Pop-ups and breaks in play

Cloutier et al., (2006) examined the effects of pop-ups and breaks in playing on slot machines. From 768 university students, they selected the 40 with the highest scores on erroneous beliefs. They were divided into two groups, a pause group and a pop-up group. They played in a bar-like laboratory environment and were given the equivalent of 20 CAD to play for. They could stop playing when they wanted. The pop-up group initially received a pop-up with information on how probability and a slot machine works, in order to affect erroneous beliefs. The pause group instead received the message, "Pause" for seven seconds. Both groups reduced their erroneous beliefs, but the pop-up group reduced them significantly more than the pause group. However, there was no difference in gambling behaviour. The ecological validity of the study was judged to be relatively low. Blaszczynski et al., (2016) examined how mandatory breaks affected the gambling of 141 university students who were allowed to play a simulated online black-jack game without risking their own money. The ecological validity of the study was thus low. Participants were randomized into three groups where 1/3 did not get a break, 1/3 a three-minute break and 1/3 an eight-minute break. The result showed that the breaks created an increased level of play and the authors' somewhat surprising conclusion is that breaks should be combined with a personal, or general warning, message.

Monaghan, has, on her own (2008; 2009) and with others (Monaghan & Blaszczynski 2009; 2010; Monaghan, Blaszczynski & Nower 2009), examined the use of signs and pop-ups in preventing gambling problems. In one of the studies (Monaghan, Blaszczynski & Nower 2009), 93 students participated in a laboratory study looking at the effects of signs on the slot machines, intended to provide information about probabilities of winning and the concept of randomness. There were no differences between the intervention group and the control group regarding erroneous beliefs and gambling behaviour post-intervention. In two other studies published in one article (Monaghan & Blaszczynski 2010), it was found that pop-up messages were more effective than static messages for slot machine players, both in terms of the players remembering them and changing erroneous beliefs and gambling behaviour. This applied to both Australian university students (study 1, n = 127) in a laboratory environment and players in the usual gambling environment (study 2, n = 124). Furthermore, messages encouraging self-appraisal were more effective than ones with more informative content. However, the medium- and

long-term effects are not known, since the follow-up time was only two weeks in both studies. Targeting erroneous beliefs in pop-up messages received further support from Jardin and Wulfert (2012), who randomly assigned 80 "high-frequency" gamblers to four conditions. They played a simulated random game in a laboratory environment. The four groups received no message, a neutral message, an inaccurate and an accurate erroneous belief message respectively. The group receiving an accurate message showed a decrease in risky gambling behaviour, whereas no difference was observed in the other three groups. Trying another content in the pop-ups, Munoz et al., (2010) investigated the effect of eliciting fear via warning signs, in a study with 258 adult slot machine players. They examined how frightening the message was perceived with three different warning signs as well as a neutral one, and from two different sources (medical source or one connected to the gambling company). This was thus a 4 x 2 design with random selection to the groups. The results showed that powerful, frightening warning messages had a short-term effect on the depth of information processing and thus changes in attitude. Furthermore, messages from the medical sender had a stronger effect than those from one with a close connection to the gambling company. The study is based on theories of attitude change and motivation: Protection Motivation Theory and the Elaboration Likelihood Model.

Gallagher et al., (2011) conducted a study with 54 Canadian slot machine players, 27 of whom were problem players according to PGSI, while the other 27 had no, to moderate, risk of problems. They self-reported gambling behaviour over three time periods: a two-week baseline, two-week intervention when a banner was displayed on the screens of all slot machines in the area, and a two-week follow-up. The message on the screen included the information that pay-outs are random and not controlled by the players, and that ”near wins are always losses”. The results showed a reduction in played time during the intervention and follow-up compared to baseline. Furthermore, an interaction on erroneous beliefs for time x gambling problem was found, the participants with gambling problems lowered their scores on Informational Biases Scale. One limitation with the study was recruitment, via advertisements and posters in bars, which affected the selection. Furthermore, there were three information meetings for all participants, where they gave consent and were instructed on how to fill in the gambling diary, thus likely affecting the outcome.

Auer et al., (2014) conducted a study with real data from an online gambling company where they first analysed 400,000 sessions of online slots. Of these sessions, over 4,000 had more than 1,000 rounds, of which five ended spontaneously after just 1,000 rounds, which can be seen as a baseline. A pop-up reminder was introduced; players were informed that they had played 1,000 rounds. Nine times as many players receiving the pop-up message stopped after 1,000 rounds compared to base-line. Although significant, the

intervention had almost no effect at all, as only about 1% of the players quit post intervention. Adding normative and educational content to the pop-up, Auer and Griffiths (2015b) compared it to the message used in Auer et al., (2014). Very few stopped playing after receiving a pop-up, 0.67 % for the standard message and 1.39 % for the more developed version. Introducing a normative and an educational message about erroneous beliefs had a very small effect.

Harris and Parke (2015) conducted a repeated measure experiment where they investigated the effect of a computer-generated self-appraisal message. The message reduced the speed of gambling in a computer-simulated gambling task of players who were on a manipulated losing streak, but not among those on a winning streak. The study was small (n=30), in an artificial gambling environment and the players were students, which reduced the ecological validity. Harris et al., (2016) conducted a literature review, after which they recommended messages with an emotional element. They also argued that messages written by the gambler would be useful in jurisdictions such as Sweden and Norway where registered gambling is mandatory or very widespread.
Gainsbury et al., (2015a) investigated optimal content of dynamic warning messages on EGMs in commercial gambling venues. The content of the messages was either of an informative nature or a more self-assessing character. Of the 667 players who participated, 43.5 % remembered having seen the messages. The most likely outcome was to take a break. A small reduction in gambling behaviour was reported. The conclusion was that pop-ups of more self-assessing character are preferable and that they can play a role in preventing gambling problems if timed to appear so as to interrupt long-term, continuous gambling. The location of the message was most efficient if placed centrally on the screen (Gainsbury et al., 2015b).

In summary, there is some support that pop-ups affect gambling behaviour, but the effects are, at best, moderate. A pop-up can, for example, affect taking pauses. Very little research has been carried out on mandatory breaks.

Self-exclusion

Self-exclusion programs give customers the possibility to self-exclude from a venue (for example a casino), an on-line site or all online sites within a licensing system, which is the case in Sweden. In many jurisdictions it is part of the legislation that the companies should offer the possibility to self-exclude. This may be seen as secondary prevention, but in most cases is tertiary prevention and about minimizing harm. The possibility to play the same kind of gambling form in the same kind of channel is something limiting the effectiveness of self-exclusion. The use of self-exclusion varies depending on the casino and online gambling site. (Williams, West et al., 2012)

Gainsbury (2014) performed a review including 14 studies on self-exclusion. Conclusions were that self-exclusion programs are underutilized by problem gamblers thus putting the onus on the gambling provider to improve their programs. Even though the latter are not 100 % effective in preventing individuals from gambling when they have been barred from other forms of gambling, self-excluders generally report experiencing benefits from programs. They self-report decreased gambling and a positive effect on their wellbeing and overall functioning. With one exception, the studies included in the review were from physical casinos and venues.

McCormick et al., (2018) monitored 269 self-excluders from a physical Canadian casino. They observed a reduction in PGSI scores 6 months after self-exclusion, but for those trying to breach their self-exclusion, the reduction in PGSI scores was smaller. There were no differences in decrease in PGSI scores between those abstaining totally from gambling and those playing other forms of gambling while self-excluded at the casino. In the online environment, Caillon et al., (2019) evaluated a 7-day self-exclusion period at French regulated gambling websites using an RCT. They randomized 60 at risk gamblers according to PGSI, recruited through advertisements, to two conditions: one self-exclusion condition and a control condition. The persons in the self-exclusion condition were asked to self-exclude for 7 days from their favourite online gambling site. The researchers had access to the participants' gambling account information and in follow-up interviews 15 days and 2 months after intervention, PGSI was one of the measures administrated. The results showed no short-term effects (15 days), but over 2 months there were differences in lower PGSI scores in the self-exclusion condition and also less time spent gambling.

Multi-venue self-exclusion gives the customer the possibility to self-exclude from a number of gambling venues by taking just one action in a centralized system. Pickering et al., (2018) followed a sample of 44 self-selected individuals that enrolled in a centralized multi-venue self-exclusion program. They completed an online survey and the majority of participants reported reduced gambling and a sense of greater control over urges and behaviours. Abstinent participants were less depressed and reported a higher quality of life than non-abstinent participants.

Summary and theoretical basis

A proportion of gamblers experience problems, and certain gambling forms have a stronger association with gambling problems. The role of overconsumption in developing gambling problems is sparsely described in the

scientific literature and more research is needed. High gambling consumption is a well-known risk factor for gambling problems but the interplay between high consumption and overconsumption needs more examination and research.

Even though it is described as a multidimensional phenomenon, regarding development and how problems manifest themselves in individuals, problem gambling has been measured unidimensionally in most problem gambling screens.

Regarding prevention of gambling problems, the scientific knowledge is meagre. Looking at secondary prevention, there are some promising results regarding personalized feedback on gambling habits, and there is a call for more research in the area. One example is the effect on gamblers behaviour when staff at the gambling companies promote responsible gambling and intervene with problem gamblers and gamblers at-risk.

This thesis is based on the following theoretical assumptions.

a. Gambling problems can be seen as a continuum, with gambling without problems at one end. One can have mild to severe gambling problems, and an individual can move back and forth along the continuum. Also, it is meaningful to have different preventive measures at different levels of gambling and gambling problems.
b. The aetiology of problem gambling is multifactorial, with various risk factors from the biological, psychological and social domains. Most problem gamblers have more than one or two risk factors, and they are probably additive in increasing risks for gambling problems. Some patterns of risk factors among problem gamblers are more common (as for example suggested by the Pathway Model).
c. Gambling can be psychologically rewarding in various ways. If the gambling is strongly rewarding for the individual, it constitutes a risk factor for overconsumption.
d. Overconsumption of gambling is a precursor of gambling problems and can be seen as an early stage of loss of control.
e. It is possible to prevent gambling problems at different levels, and the easiest way to reach gamblers is via the gambling companies.
f. Mandatory, responsible gambling measures are more effective than voluntary ones, and measures prescribed by regulation are more effective than self-regulation by the gambling industry.

Aims of the study

The overall aim of this thesis was to explore the role of overconsumption in problem gambling and target it in a preventive intervention. The preventive intervention was to give gambling consumption feedback to high consumers in order to make them reflect upon their gambling habits and motivate them to change.

Study 1

The aim of the study was to: (a) explore the multidimensionality of GamTest, and (b) validate the test against two other measures of gambling problems, PGSI and own perceived problems.

Study 2

The aims of this study were to further examine the psychometric properties of the JAS and assess the predictive validity of this new measure. More specifically, it sought to assess the capacity of identified JAS dimensions to predict increases in problem gambling risk level and problem gambling over 1 year.

Study 3

The primary objective of the study was to investigate the relative effects of feedback on gambling intensity among high consumers. The project evaluated how behavioural feedback by telephone and letter affected gambling consumption and use of responsible gambling tools, and whether a booster follow-up contact impacted the results.

Study 4

The primary objective of the study was to investigate the relative effects of feedback on gambling intensity among high consumers over twelve months. The project evaluated how behavioural feedback by telephone and letter affected gambling consumption and the use of responsible gambling tools.

Methods

Data collection and Participants

Study I

Participants were recruited from seven Nordic gambling companies. Participants from three of these companies were not included due to the low number of responses. Data collection took place in 2009 through a web questionnaire. The number of complete answers from individuals aged 18 and above (n = 11,699) was reduced to n = 10,402 for the exploratory structural equation modelling analysis (ESEM) by excluding n = 1,297 cases who had answered, ‘‘Does not apply at all’’ to all of the GamTest questions. The rationale behind excluding these cases was that they did not contribute any substantial information to the modelling analyses. In the dataset used for ESEM, 20 % of the participants were women and 25 % of the participants were under 30 years of age. The mean age was 41.0 years (SD = 13.8).

Study II

Data from the two first waves of the Swedish Longitudinal Gambling Study (Swelogs) epidemiological track were used in this study. A stratified random sampling procedure was applied for extracting 15,000 individuals from the Swedish citizens register of the total population aged 16–84 years at baseline. The baseline Wave 1, performed between October 2008 and August 2009, included 8,165 participants. In Wave 2, 6,021 participants were reassessed between December 2009 and August 2010. Swelogs’ design, sampling and methodological details are provided in Romild et al. (2014).

The 5,048 participants (out of 6,021) who gambled at least yearly in Wave 1 were initially included, although only past year gamblers were given the JAS and PGSI in Wave 1. The mean age was 35.2 (SD D 19.5) years, and 41.7 % were women. The sample was reduced to 3,818 when only participants who reported gambling in both Waves 1 and 2 were included. The mean age was 36.5 (SD = 19.5) years and 40.6 % were women.

Study III and IV

From the Norsk Tipping (NT) customer database, 3,009 participants were randomly drawn from the top half percent who had lost most money during the past 12 months. Statistical triplets were created, matched for net loss, gender and age. The members of each triplet were randomly assigned to one of three conditions: telephone, letter or control. Participants assigned to the telephone and letter conditions were also randomly assigned (50:50 allocation) to receive a follow-up telephone booster call or a second letter at 4 weeks post-intervention.

Data collection took place from February to June 2017. The mean age of participants was 53.4 years, and 19 % were women. The mean loss per week the 12 weeks before intervention was 1,720 NOK, with a median of 1,528 NOK. Their mean annual loss for 2016 was 88,197 NOK.

The participants in the telephone group were contacted by NT staff trained in motivational interviewing. When introducing themselves they said, ”NT has a campaign contacting their customers who have lost most money last year, and you are one of them. Do you have time to talk?”. The customer was asked to estimate their past year’s net result at NT and were asked if they wanted to hear the actual figure. The NT staff aimed to help the customer reflect on his/her gambling habits and reinforce change talk using MI techniques. The NT staff supported action through informing about possible strategies, such as setting limits and taking breaks in play, and also helped the customer to do so if desired.

The content of the letter aimed to mirror the telephone call as well as possible. It included an explanation as to why the customer had been sent the letter followed by personalized information on consumption, questions stimulating reflection, and giving information about possible actions if the customer wanted to make a change. The control group was not given any intervention.

Approximately 73 % in the telephone condition answered, and 85 % of these wanted to have a conversation and thus participate in the study, i.e. approximately 62 %. Due to a small number of letters being returned to sender, 596 complete triplets were analysed per protocol, and all 1,003 triplets were analysed as ”intention to treat”.

Ethical considerations

Especially relevant for Studies I, III and IV, the major ethical question is if the benefit to research and society is greater than the possible discomfort that could be experienced by the participants.

Study II was a secondary analysis of already collected data, where the participants had given consent to participate. The questions analysed, which could be sensitive, mainly questions on gambling problems, could of course cause some kind of discomfort. These questions were given without feedback to the participants. The original Swelogs study plan was approved by the Regional Ethical Review Board in Umeå, an ethical application for the secondary analysis was approved.

Study I targeted online customers at seven Nordic gambling sites. It was clearly stated that this was a research project. The participants were informed that by participating they agreed to be part of a research project where data would be handled with confidentiality and reported only at a group level. These procedures were in line with the 1975 Helsinki Declaration, but unfortunately an ethical application was not submitted. The feedback given in the study was simplified to: no signs of gambling problems, increased risk of developing gambling problems and signs of problematic gambling. Together with the feedback, recommendations for action were given. It was also stated that the test result was neither a diagnosis nor an exact analysis. However, answering questions about one's gambling habits and receiving feedback can cause worry and psychological stress. On the other hand, the test and feedback were intended to help the participants and could be positive. The ethical consideration is that the possible negative consequences for the participants were relatively small, and that the possible positive effects for preventing gambling problems and for the participants outweighed them.

Studies III and IV used the same data collection method. NT would have carried out the project regardless of whether a research study was being conducted or not. A research study meant that the participants were randomized to different conditions. The number contacted by telephone and letter did not change. In their user agreement with NT, the participants had already consented to their gambling data being used for the prevention of negative effects of gambling.

The participants in the study did not know they were participating in a research study. Requiring further consent from potential participants would very likely have led to a very skewed selection of users who would not be representative of customers in general. Also the control group would have received some kind of intervention by being informed of the purpose of the study. The

approach selected was considered necessary for the study in order to obtain meaningful results. The study plans for studies III and IV were approved by the regional ethical review board in Stockholm.

There were several possible unwanted effects of the study from which the participants could suffer. First, the information on losses could adversely affect the individual's mood. Being aware of the money lost could potentially motivate some individuals to, in the short term, increase their gambling intensity in order to win back the money spent. However, this risk has no support in empirical data. For this reason, it was of great importance to investigate the effects empirically in order to learn about and avoid inappropriate, responsible gambling measures. We considered the possible initial reaction as mainly short term, and possibly motivating for change if the figures presented by NT were higher than expected and wanted. They may possibly help the participant to settle on a more sustainable level of gambling - thus creating a positive effect for the participant.

Overall, there is a lack of research regarding responsible gambling in general, and about giving feedback on consumption in particular. The expected result of the study cannot be achieved in any other way that entails less risks to the health, safety and personal integrity of research persons. The conclusion is that the benefits of the project and participants are considered to outweigh the negative consequences for the participants.

Declaration of interest and funding

Jakob Jonsson, the first author of all four studies, is an employee at Sustainable Interaction, a private company working with responsible gambling and online training with the gambling industry. He is a so-called industrial PhD student at the University of Stockholm. Sustainable Interaction has financed his studies to 100 %. Study I was financed by Sustainable Interaction. Jakob Jonsson has also received a salary from the Public Health Agency of Sweden as a member of the Swelogs' advisory board and for writing reports. Study II data collection was financed by the Public Health Agency, but data analyses and the writing of research papers were part of the PhD studies. He has been working as a consultant for the Study III and Study IV projects at the Norwegian gambling operator Norsk Tipping. The data collection and part of the time used for analysis for Studies III and IV were financed by Norsk Tipping. The articles were written without any review or approval by Norsk Tipping regarding any of the content and the research team had full sovereignty over the research. Ingrid Munck and Rachel Volberg have worked as consultants

for Sustainable Interaction. None of the other authors has ever had any financial ties to Sustainable Interaction or Norsk Tipping.

Measures

Study I

The web questionnaire included the GamTest, one question about perceived own gambling problems, gambling frequency, gender, age, and the PGSI in a three-month format (Ferris and Wynne, 2001). GamTest consists of 15 statements theoretically indicating early signs of gambling problems. The answer format for each item is an 11 grade scale ranging from 0, ‘‘Does not apply at all’’ to 10, ’‘Applies completely’’. The GamTest was developed by the first author. A part of the process was using the Delphi method with seven Swedish psychologists and therapists working in the field to reduce the number of statements.

GamTest statements are:

1. Sometimes I gamble for longer than I intend
2. Sometimes I forget the time when I’m gambling
3. Other people say that I spend too much time gambling
4. I devote time to my gambling when I really should be doing something else
5. Sometimes I gamble more money than I intend
6. I sometimes try to gamble back money that I have lost
7. I sometimes gamble with money that really should have been used for something else
8. I sometimes borrow money to enable me to gamble
9. I do not want to tell other people about how much time and money I spend on my gambling
10. People close to me think that I gamble too much
11. Sometimes I feel bad when I think of how much I have lost gambling
12. Sometimes my gambling has left me short of money
13. I feel restless if I do not have the opportunity to gamble
14. Sometimes I feel bad when I think about my gambling
15. My gambling sometimes makes me irritated

The web questionnaire was translated from Swedish into Danish, Norwegian and Finnish, and then back translated by an independent party as a quality check.

Study II

Risk classification

In both Waves 1 and 2, questions on monthly gambling behaviour were asked. Using a simplified version of a gambling risk classification instrument (Meyer et al. 2011), the gambling types were divided into low, medium-high and high risk. All participants were assigned a risk level based on their highest monthly risk gambling participation in Waves 1 and 2. If gambling more seldom than monthly, the participant was assigned a low risk classification.

Gambling problem

The PGSI was used in Waves 1 and 2. It employed the response format Never (0), Seldom (1), Often (2), and Always (3). Participants with an overall PGSI score of 0-2 were classified as No problem, and those with a score of 3-27 were classified as Gambling problem.

An ”incident case” is a participant classified as No problem in Wave 1 and Gambling problem in Wave 2.

JAS

The 11-item JAS was used in Wave 1 only.
The JAS items are:

1. I gamble for the excitement
2. Gambling is one of the most enjoyable things there is
3. Gambling can make me forget everything else for a while
4. My gambling gives me friends
5. I gamble for more money than intended
6. I gamble a longer time than intended
7. I gamble when I should have done other things
8. When gambling, I find it hard to stop
9. My gambling is a way to make money
10. When I win, it is due to my skill
11. If I just gamble enough, my gambling will pay off

The items are categorized into Reinforcers (items 1-4), Over consumption (items 5-8) and Gambling fallacies (items 9-11). JAS has a seven-step response scale ranging from, “Do not agree at all” to “Agree completely.”

Study III and IV

With the exception of physical scratch cards, all gambling at NT is registered at an individual level. Theoretical loss was the primary outcome, Theoretical

loss was calculated as wager x (1 - Payback percentage) per gambling type[13]. Secondary outcome was responsible gambling behaviour. The actions tracked included setting gambling limits, decreases in gambling limits, pauses on single and all games, and self-exclusions on single and all games.

For Study III, data 12 weeks pre-intervention and 12 weeks post-intervention were delivered from the NT customer database, including theoretical loss and use of responsible gambling measures.

For Study IV, the same kind of data as Study III, were collected from the NT customer database. However, the post-intervention follow-up was at 52 weeks, including data for the 52 weeks after intervention.

The NT staff logged the telephone calls. The log included a description of the content of the discussion (information about consumption, limits, self-exclusion, and help referral) and agreements about action to be taken (changing limits, self-exclusion, or help referral). Toward the end of the call, participants were asked to provide a rating about their opinion of NT's policy of making these calls to customers. The Likert scale ranged from 1 (very negative) to 5 (very positive). The interviewers rated the quality of the call with the same response options. In addition, they rated participants' stage of change at both the beginning and the end of the intervention (precontemplation, contemplation, preparation, action).

Analysis

Study I

Exploratory structural equation modelling (ESEM) was used to investigate the psychometric properties of GamTest. ESEM has the advantage of allowing the items to load on more than one factor, and it also helps to identify model misfit (Asparouhov and Muthén 2009; Reise 2012).

In the first step, we searched for an Exploratory factor analysis (EFA) multifactor model. Looking at the goodness of fit measure for one to six factor solutions, we identified our baseline five factor EFA model with good fit and distinct and interpretable content domains behind the factor structure. In

[13] An example: if one bet 1000 SEK on a gambling form with 85 % payback, the theoretical loss would be 150 SEK (1000 X (1 – 0.85) = 150). If the payback is 50 %, then the TL would be 500 SEK (1000 X (1-0.5) = 500).

reporting the baseline GamTest EFA factor structure, we linked interpretation of the latent factor to the most reliable items in each domain.

In a second step we searched for a bifactor model capable of capturing the content domains in the baseline GamTest EFA model. We sought a general factor for all items and a set of specific factors, uncorrelated with the general factor but correlated with each other. Goodness-of-fit testing was guided by the number of factors close to the baseline EFA solution. The best fitting bifactor model reproduced four of the content domains found in the baseline EFA model, while the fifth emotional domain loaded high in the general factor. As for the EFA model, the most reliable item for each domain had a major influence on the interpretation of the domains.

In a final step, we validated the GamTest EFA and bifactor models in relation to the well-established PGSI instrument and in relation to participants' own perceived gambling problems. The first approach was to employ descriptive statistics for GamTest and PGSI sum scores, calculating Cronbach's alpha and Pearson correlations. The second approach was latent variable modeling in Mplus to estimate the correlation between the EFA and Bifactor models factors respectively and two alternative validation variables, (a) PGSI items defining a latent variable and (b) own perceived gambling problems defined as a latent variable by the two indicators, item 5 in PGSI and a question on perceived gambling problems included in the web questionnaire. The correlation analysis using latent variable modelling takes measurement error into account and therefore yields more reliable estimates. Using this approach, we can measure how closely the gambler's own opinion about his/her gambling is linked to the different new constructs. The goodness-of-fit of the SEM models was evaluated using the root mean square error of approximation (RMSEA) and the 90% confidence interval of the RMSEA.

Study II

To investigate if the categorizations suggested in JAS represented three different constructs, confirmatory factor analysis (Bollen, 1989) procedures were used with maximum likelihood estimation in Lavaan (Rosseel, 2012). To evaluate model fit, the likelihood-ratio $\chi 2$ test, the Root-Mean-Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI), the Normed Fit Index (NFI) and the Tucker-Lewis Index (TLI), were used. We relied on MacCallum et al.'s (1996) suggestion to use RMSEA values of 0.01, 0.05, and 0.08 to indicate excellent, good and mediocre fit, respectively. The recommended cut-off values of TLI, CFI, and NFI used were 0.95 or higher (Hu and Bentler, 1999).

Cronbach's alpha was used to measure internal consistency reliability for the overall scale and sub scales. Pearson correlation was used to look at the interplay between the JAS, including sub scales, and PGSI sum scores.

To address the question of whether JAS has any predictive power, logistic regression analyses (Menard, 2002) were used with gambling risk potential and incident cases as dependent variables and the three factors Reinforcer, Overconsumption and Gambling Fallacy as predictor variables. The likelihood ratio test was used to test our models. This is a test of the significance of the difference between the likelihood ratio (- 2 log likelihood) for our model with predictors (called model chi square) minus the likelihood ratio for baseline model with only a constant in the model. Significance at the 0.05 level or lower means that the model with the predictors is significantly different from the one with the constant only (all 'b' coefficients being zero). It measures the improvement in fit that the explanatory variables make compared to the null model. Chi square was used to assess the significance of this ratio. Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) were also used to evaluate the models. The value of AIC and BIC can be used to compare various models for the same data set to determine the best-fitting model. The model having the smallest value is usually preferred (Akaike, 1974; Kass and Wasserman,1995). Both unstandardized (B) and standardized coefficients (b) are reported in the logistic regression analyses (Menard, 2011).

Study III

The study had the following hypotheses:
Hypothesis 1 (H1): The telephone intervention would be more effective than the no-intervention control condition in reducing gambling behaviour.
Hypothesis 2 (H2): The letter intervention would be more effective than the control condition in reducing gambling behaviour.
Hypothesis 3 (H3): The telephone intervention would more effective than the letter condition in reducing gambling behaviour.
Hypothesis 4 (H4): Receiving a booster follow-up contact after telephone intervention would strengthen the effect.
Hypothesis 5 (H5): Receiving a booster follow-up letter after the letter intervention would be more effective than the intervention without the booster.

For the testing of H1-H3, complete triplets were analysed (per protocol). A nonresponse analysis assessed how well this sample reflected the target population. A complementary testing of H1-H3 all triplets was carried out in an intention to treat analysis. Using paired samples t-tests, matched pairs were compared for change in theoretical loss pre- and post-intervention: telephone versus control (H1), letter versus control (H2) and telephone versus letter (H3). Paired samples t-tests were also used for analysing differences in

responsible gambling behaviour. Effect sizes were calculated using Cohen's d. Analysis of variance (ANOVA) was used to compare means for H4 and H5 and within the telephone condition, and a repeated-measures ANOVA analysed time effects and time intervention type interaction across the 4-week period pre- to post-intervention. Pearson chi-square was used to analyse non-response.

ANOVAs were used to compare means for those receiving a booster follow-up (FU) with those without booster (non-FU) for testing H4 and H5, respectively, and within the telephone condition for respondents with different levels of intervention intended and received. In testing H4, we compared telephone FU with telephone non-FU for ITT. For the telephone condition, we compared six groups with different levels of intervention intended and received. In testing hypothesis H5, Letter FU was compared with Letter Non-FU using the ITT sample. Because we have no information whether the respondent actually has opened the letter or read, a completer analysis was not possible.

Study IV

It was hypothesized that over the course of one year:
H1: the telephone intervention would be more effective than the no intervention control condition in reducing gambling behaviour.
H2: the letter intervention would be more effective than the control condition in reducing gambling behaviour.
H3: the telephone intervention would be more effective than the letter condition in reducing gambling behaviour.

For the testing of H1-H3, complete triplets were analysed (per protocol, completed phone intervention and letter received). A complementary analysis tested H1-H3 all triplets including non-response in an intention to treat analysis (ITT). Using paired samples t-tests, matched pairs were compared on change in theoretical loss pre- and post-intervention: telephone versus control (H1), letter versus control (H2) and telephone versus letter (H3). Paired samples t-tests were also used for analysing differences in responsible gambling behaviour. Effect sizes were calculated using Cohen's d. Pearson chi-square was used to analyse differences in gambling participation and use of responsible gambling tools.

Results

Study I

The results indicated that the best fitting solution for GamTest from the EFA analysis was a five factor model with distinct and interpretable factors: Overconsumption time, Overconsumption money, financial negative consequences, social negative consequences and emotional negative consequences.

The bifactor model revealed a general factor dominated by the emotional factor from the EFA, and four specific factors, corresponding to Overconsumption time, Overconsumption money, financial negative consequences and social negative consequences from the EFA. All items in GamTest had factor loadings with the general factor between 0.58 and 0.85.

The sum scores of GamTest and PGSI correlated 0.81. All five EFA-factors in GamTest showed a high correlation with PGSI, a correlation ranging from 0.50 to 0.87, with the highest correlation for the factors: Financial negative consequences (0.87) and Emotional negative consequences (0.84). The correlation between the EFA-factors and perceived own problems ranged from 0.53 to 0.91, with the highest correlation for NC Emotions. The general factor from the bifactor model correlated 0.87 with PGSI and 0.92 with perceived own problems, thus underlining the role of emotions. The specific factors had a very low correlation with gambling problems.

In sum, the ESEM analyses indicate that GamTest has a high correspondence with the players' own understanding of their problems and with the PGSI, a validated measure of problem gambling. GamTest captures five dimensions of problematic gambling. The bifactor approach, composed of a general factor and specific factors, reproduces all these factors except one, the emotional negative consequences factor, which contributes to the dominant part of the general factor.

Study II

The results indicate that the JAS original categorization is confirmed. In a confirmatory factor analysis JAS had an acceptable fit of a three-factor solution with Overconsumption, Gambling fallacies and Reinforcers as factors when item 10 (When I win, it is due to my skill) was allowed to load on two different factors. The internal consistency for the full JAS was 0.83 and for Reinforcers, Over consumption and Gambling fallacies 0.67, 0.82, and 0.58, respectively. The correlation between JAS (all items) and the PGSI was 0.49, and the correlations between subscales and PGSI were for Reinforcers 0.34, Overconsumption 0.59, and Gambling fallacies 0.36.

Reinforcers, Overconsumption and Gambling fallacies were significant predictors of gambling risk potential in Wave 2, and Gambling fallacies and Overconsumption were significant predictors of incident cases in Wave 2. When controlled for risk potential, measured at Wave 1, the predictor Overconsumption was not significant for gambling risk potential at Wave 2. For incident cases, both Gambling fallacies and Overconsumption remained significant when controlled for risk potential.

Study III

Per protocol, the telephone group decreased their theoretical loss with 29 % 12 weeks post-intervention compared to 12 weeks pre intervention. The corresponding figures for the letter group were 15 % and 3 % for Controls. All differences between the groups were significant. Effect sizes, using Cohen's d for the mean differences for telephone versus control, were 0.4, letter versus control 0.19 and telephone versus letter 0.2 for the 12 week post-intervention period. The ITT analyses showed significant mean differences between telephone versus control and letter versus control. The difference between telephone versus letter did not reach significance.

More individuals in the telephone condition lowered their limits during intervention week and the 12 weeks after intervention compared to the other two groups.

Regarding the effect of follow-up, the positive effect was limited to participants who, at the initial call, indicated an interest in receiving a follow-up call.

Focusing on the telephone calls, the customers mean rating of the calls was 4.4 on a 5-point scale ranging from 1 (very negative) to 5 (very positive). Only

0.2 % rated the call as a 1, and 0.7 % as a 2. Informing about consumption and limits were the most common themes in the calls. The customers systematically underestimated their consumption, the large majority with a factor between 1.25 and 5[14] With regard to readiness to change rating at the beginning and end of the call, NT staff reported having managed to move 46 % to the action phase. This group reduced their theoretical loss 12 weeks after the intervention significantly more than those not in the action phase at the end of the call. Those agreeing to set a limit during the call, reduced their theoretical loss more than those who did not.

Study IV

The telephone intervention had a stable effect over 12 months. The telephone group showed a 30 % reduction in theoretical loss, the letter group 13 %, both outperforming the control group with a 7 % reduction. The telephone condition was superior to letter and control conditions both per protocol and regarding intention to treat. The letter condition performed better than controls regarding intention to treat but the trend for the letter condition moved towards the control condition over time. Less than 1 % in all groups stopped playing at Norsk Tipping completely, and between 93% and 95 % gambled during the four week period close to one year after intervention. One interesting finding, nuancing the results in Study III, is that moving the customer into motivation for change without setting limits during the telephone call is as effective as if they are motivated and set limits during the call. The use of RG-measures showed no differences between the groups, except that more in the telephone group lowered their loss-limits at least once compared to the letter group and controls.

[14] This result is based on personal communication from the NT staff, it was not recorded in the log.

Discussion

Study I

When exploring the dimensionality of GamTest, five distinct factors were identified. Although conflicting with most of the earlier research on problem gambling screens, which found a one-factor solution (e.g. Orford et al., 2010; Stinchfield, 2002; Strong, Lesieur, Breen, Stinchfield & Lejuez, 2004), this is in line with later research, using modern statistical methods (Salonen et al., 2017). This study used active gamblers as the sample, in contrast to a sample from the general population that was the case in earlier research.

Using a bifactor model, a general factor and four specific factors were revealed for GamTest, supporting the assumption of a general gambling factor like the g-factor in intelligence (Spearman, 1904). The general factor had a high positive correlation with PGSI and perceived own problems.

Study II

The JAS factors Gambling fallacies and Over consumption were significant predictors of incident cases, as shown in earlier research (Leonard & Williams, 2016; Statens Folkhälsoinstitut, 2010; Williams et al, 2015) but not found in other studies (Statens folkhälsoinstitut, 2013; Folkhälsomyndigheten, 2015). Gambling fallacies and Reinforcers were significant predictors of gambling risk potential. These results fit well the with the Williams et als. (2015) aetiological model and adds the role of reinforcements in starting to gamble at a higher risk-level – something not covered in the model.

Study III and IV

These studies showed short- and long-term effects when high consumers were given feedback on gambling intensity. After receiving feedback in a gentle way by phone or letter, aimed at enhancing motivation for change, they reduced their theoretical loss significantly more than the controls. The results are in line with most earlier research with focus on text-based feedback in the gambling environment (Auer & Griffiths, 2015a, 2016; Auer et al., 2014; Jardin & Wulfert, 2012; Monaghan & Blaszczynski, 2009), with the exception of those of Ladouceur and Sévigny (2009), with no self-reported behavioural change when feedback was restricted to behaviour during one EGM session.

The group receiving feedback by phone reduced their theoretical loss more than the letter group. One possible explanation is that the telephone calls had more MI content and interaction than the letters. MI has shown promise in brief telephone interventions with problem gamblers (Abbott, Hodgins et al., 2018).

The customers in this project continued to be customers at the gambling company, with less than 1 % ceasing to play at the company completely the year after the intervention. Earlier research has reported positive attitudes among customers to responsible gambling measures (Forsström et al., 2017; Ivanova, Rafi et al., 2019), and the results of Studies III and IV contradict the concerns about disturbing customers with responsible gambling (e.g. Blaszczynski et al., 2004; 2008; 2011).

In Studies III and IV, staff from the gambling company's customer support made the telephone calls after a total of five days training in motivational interviewing. As a result of their phone calls, they moved almost half of the customers into the action phase. These customers reduced their theoretical loss more than those not in the action phase. Earlier research has looked at the effects of training on staff RG training. It changes attitudes and increases knowledge of gambling problems and responsible gambling, but how it affects the behaviour of staff is less clear (Dufour et al., 2010; Giroux et al., 2008; Hing & Nuske 2011; 2012; Kalke et al., 2011; Ladouceur et al., 2004; LaPlante et al., 2012). The effects of staff RG training for the gambler's behaviour has not been studied, or at least not published in scientific journals. Studies III and IV suggest the possibilities of using staff from the gambling companies in secondary prevention.

The role of overconsumption

All four studies indicate that overconsumption of gambling plays different roles in problem gambling. It can be a precursor of gambling problems, a dimension of the problem when manifested, and a target for preventive efforts. A person reporting overconsumption, but no other signs of gambling problems runs an elevated risk of developing problems a year later. Overconsumption can be divided into overconsumption of time and overconsumption of money. The bifactor model in Study I showed a general factor dominated by negative emotional items that correlated highly with gambling problems. The two specific overconsumption factors (time and money), had a very low correlation with gambling problems. One possible interpretation of this is that overconsumption, gambling more or longer than intended, is not experienced as gambling problems if not evoking negative feelings. However, it is still considered to be a risk factor though.

There are indications in Study III that high consuming gamblers are not aware of their consumption, and constantly underestimate their losses. Consuming more than they think they have, may be a sign that they are deviating from a planned sum and thus over consuming. This may also ”help” them to avoid fully experiencing the negative experiences associated with the losses, which in turn makes them less likely to perceive and report gambling problems.

Overconsumption forms a distinct factor in JAS, distinguished from the other factors, such as gambling fallacies and reinforcers. Participating in gambling forms with a high-risk potential were predicted by gambling fallacies and reinforcers, but not overconsumption when controlling for risk level at baseline. Over consumption and gambling fallacies predict incident cases, even when controlling for the risk potential of the gambling form.

Possible active elements in preventive interventions

What the active elements are in the interventions has not been studied specifically in these studies, but some indications can be observed:

- Receiving information on gambling consumption creates awareness of overconsumption and negative feelings that can be a call to action for the individual. Both the letter and the telephone interventions showed an effect.
- As discussed above, the telephone intervention showed stronger effect than the letter. One explanation could be that the NT staff worked

actively with the customers' motivation during the calls and tried to encourage change talk. As seen, those customers that moved into action phase during the call reduced their losses over 12 months significantly more than those who did not.

- Setting limits during the call, and in the case of NT, customers to a great extent accepting having limits locked by NT staff, showed a clear effect. Limits are a help in controlling impulses and strengthen the executive functions, both of which are often vulnerable features in over-consumers and problem gamblers (Ellis et al. 2018; Ledgerwood et al. 2012).
- A more speculative ingredient is that the perceived anonymity is broken. Online gambling lacks the social control that is present to a different extent in land-based gambling. A sense of anonymity can be created among online gamblers. Receiving a letter or a call from the company that obviously knows a great deal about one's gambling habits shatters that illusion.
- One speculation regarding the GamTest users, is that the feedback received after doing the test could be perceived as objective and adding to their subjective experience, along with receiving nuanced feedback. In Motivational Enhancement Therapy (MET), assessing the problems is a starting point (Miller et al. 1999). MET has shown promising results treating risk users of alcohol and persons with alcohol problems, (Project match research group, 1998).
- The JAS did not include any feedback, but if it had it may have given information about the interplay between gambling fallacies, the reinforcing effect of gambling and overconsumption.

Financial effects for the customers and the gambling companies.

Study I, using the GamTest, does not yield any information as to whether feedback from a self-test affects customers' gambling behaviour. In another study, it was found that regular gamblers reduced their theoretical loss by 18 % during the two weeks after doing the GamTest (Strandänger, 2016). GamTest could play a role in both secondary and tertiary prevention, the latter through referral to a helpline or suggested self-exclusion. Even though there is little research backing this, it is reasonable to think that the gambling companies' net gains will be negatively affected by having their customers self-assess their gambling habits.

The reduction in net gain for the gambling company is more obvious in Studies III and IV. From the customers perspective, the intervention of, on average, a six minute telephone call reduces the theoretical loss by 30 % over a year; the corresponding figure for receiving a letter is 13 %. This reduction among the 2,006 high consumers it was intended to contact, equals more than 20 million NOK yearly compared to the controls. Responsible gambling is sometimes described as good for the long-term business. Does the intervention have an affect if the customers remain with the company? More than 99 % of the players stayed as customers after the intervention, and there were no differences between the intervention and the control groups. The customers targeted with the intervention remained as customers, but not to a greater extent than those not targeted.

How the preventive measures in Studies I-IV fit into the aetiology of gambling problems

The etiological model, suggested by Williams et al. (2015), stresses the role of gambling behaviour, and that gambling problems are preceded by heavy gambling. Overconsumption can be a part of heavy gambling as well as a bridge to problem gambling and an inevitable part of it. Both GamTest and informing about consumption and suggesting actions, such as limits, aimed at stopping the process moving from heavy gambling to gambling problems. In cases of a manifested gambling problem it might be advisable to refer to treatment and self-exclusion, the latter reducing availability, which is another key aspect in the model. The JAS also assesses gambling fallacies, another aspect of the model. What is obvious, is that most parts of the aetiological model are not covered by the preventive measures tested in these studies, and that the latter rather should be regarded as small parts of the preventive puzzle.

Methodological considerations

Study I

The choice of administering the web questionnaire at Nordic gambling sites was based on two arguments. GamTest was aimed to be available at gambling sites for their customers as a preventive measure and should be tested in its natural environment. Testing it in a context with active gamblers, all

belonging to the target population for which the test items are relevant, rather than a sample from the general population, provides much higher power of the test. It is shown by more statistical variation in the responses, which in turn offers a higher statistical potential to identify and analyse multiple dimensions in the GamTest (Groves et al., 2011).

GamTest was developed with two broad categories: overconsumption and negative consequences. The choice of exploratory factor analysis as a first part of the validation process was influenced by an uncertainty about whether these broad categories were the final best solution when further explored. Based on an assumption that gambling problems are complex and multidimensional, and that these dimensions relate to one another, the analytic method should allow each GamTest indicator to load on more than one factor (Marsch et al., 2014). This facilitates uncovering more empirically grounded trait structures.

One requirement for effective, exploratory structural equation modelling used in the validation process of GamTest is that the respondents are offered a variety of response alternatives that can match their individual experience (Schwartz & Sudman 1995). In GamTest this was assured by the 11-grade response scale.

Many existing problem gambling screens are unidimensional and have a high internal consistency. Besides being tested on a general population giving little statistical variation in the answers (e.g. Orford et al., 2010; Stinchfield, 2002), it could be the case that these tests consist of a general factor and specific factors. Partly to illustrate this, and partly to further explore GamTest, we chose the bifactor modelling approach (Reise, 2012). That allows for the extraction of two factors, a common trait present in responses to every item in the test and at the same time for each item, and a specific trait clarifying the multidimensionality caused by well-defined clusters of items from diverse subdomains (Marsh et al. 2010; Morin et al. 2016; Reise 2012; Reise et al. 2007). In the GamTest analysis represented by four content factors, over consumption of time and money and negative financial and social consequences and a common emotional factor.

Study II

To be able to examine the predictive capacity of an instrument, a longitudinal design is necessary. Swelogs gave the opportunity for this. Based on a representative sample, the results become more generalizable, and the number of active gamblers was sufficient to achieve enough statistical power. Unfortunately, JAS was not re-administered at follow-up, a decision outside the authors' control. The JAS and PGSI were administered to past year gamblers only, since they were not considered relevant for non-gamblers.

We investigated if the scales represented three different constructs by subjecting the items to a confirmatory factor analysis since the JAS was developed with three theoretically based factors (Bollen, 1989).

To investigate the predictive validity of the JAS scale, two logistic regression analyses were conducted (Menard, 2002). The decision to control for gambling risk level at baseline, when investigating the predictive validity, was based on risk potential at baseline being a strong predictor of a high gambling risk potential at follow-up. Also, regular participation in high risk gambling activities has a connection with overconsumption as an early sign of problem gambling.

To obtain more statistical power, PGSI 3+ was used as an indicator of gambling problems, and less than monthly gambling was merged with the group, "low risk gambling", and medium-high and high risk were merged into "high risk gambling."

Study III and IV

It was Norsk Tipping who chose to contact the highest consumers at Norsk Tipping within the study, instead of, for example, young customers or people with a recent increase in their gambling behaviour that had been tested in the pilot phase. The matter was discussed with the first author. The choice fits well into the duty of care concept, where the natural first step is contacting those who have lost most money. Instead of choosing the 3,000 with highest losses, the participants for the study were randomly chosen from the top 0.5 % (equals approx. 10,000). The average past year loss for the sample was 88,197 NOK indicating that the sample consisted of high consumers when drawing it from the top 10,000.

The rationale behind matching the groups on age, gender and net losses was that controlling for these factors gives more statistical power to the analysis.

Using gambling behaviour for the 12 weeks pre-intervention as baseline was motivated by having both a long enough time period to collect more stable data and also that the baseline should mirror recent gambling behaviour.

Strengths

Study I

The sample included active gamblers in their natural setting - at the gambling site. This maximized the possibility of assessing a broad spectrum of gambling experiences and consequences and gives a good level of ecological validity. Another strength of this study is the use of more than one gambling site, having a broad coverage of regulated Nordic online gambling sites. A strength with using a bifactor measurement model is its capacity to capture a common trait and, at the same time, combine this with multidimensionality caused by well-defined clusters of items. The SEM modelling validation analysis has identified the presence of one dimension, the g-factor, that correlates highly with both own perceived problems and the PGSI latent variable. The statistical modelling tools have the capacity to uncover what is behind the observed responses and separate them from substantial parts of measurement error.

Study II

This study uses data from a large, random, general population sample that is nationally representative. Additionally, it is prospective, had relatively low attrition and involved repeated assessment of the same participants 12 months apart. This is a prerequisite for assessing a scale's predictive validity. The study included self-reported gambling behaviour for both time-points. The response format used in JAS gave the possibility to respond to the statements in a nuanced way, an asset for the CFA in that it increases response variation.

Studies III and IV

These studies were well-powered and incorporated many clinical trial design strengths. In addition, using data from the NT customer data base yielded almost 100 % coverage of the primary outcome: the participants gambling at NT. The design of the studies included a control group that allowed assessment of regression to the mean. The study has high ecological validity: the intervention was part of an ongoing project at a gambling company and was performed by existing staff with real customers. The staff had received limited training in MI that was considered sufficient and fully affordable for any gambling company taking this road. This evaluation was conducted at arm's length from NT, which is important given the potential conflict of interest that any company might have in encouraging high-expenditure customers to consider their gambling involvement. Staff conducting the interventions were given the clear and unambiguous task of encouraging customers to reflect upon their gambling expenditure.

Study IV included a 12-month follow-up period which is a definitive strength when looking at long term effects of the intervention.

Limitations

Study I

Due to design issues and restrictive assumptions in the psychometric SEM analysis, this study has some limitations. For example, there was no information on the types of games played by the participants, and it was not possible to link the results of GamTest to actual gambling data. The results do not include separate groups for age and gender. Another limitation is that the study was carried out in the relatively homogeneous Nordic countries, so the results are rather representative for Western countries but not for the rest of the world. Furthermore, turning to the assumptions made for the statistical analysis, we have not controlled for measurement invariance between subgroups in age and gender.

Study II

The study has several limitations, mainly related to the design and choices made due to limited statistical power. One is the use of PGSI 3+ as an indicator of problematic gambling. The cut-off is below the conventional score of 8 for problem gambling. Collapsing gambling participation risk categories is another weakness, also motivated to gain statistical power. We did not control for measurement invariance between subgroups in age and gender. Due to relatively low reliability in two of the JAS dimensions, we have underestimated their predictive capacity. Additionally, JAS was administered at baseline only. Consequently, it was not possible to examine the dimensions' stability and how they varied with changes in gambling behaviour. Another limitation is that the reliability of JAS has not yet been fully explored (e.g., test–retest).

Study III and IV

A major weakness is that we lack information on the participants' gambling elsewhere. The participants could have reduced their gambling at Norsk Tipping and increased it somewhere else. Not knowing if this is the case is a weakness, even if a separate survey by NT points in the other direction. Future research should combine behavioural with self-report data to ensure that all

gambling is captured for each participant. Another limitation is that the quality of the telephone intervention was not monitored. The quality indicators are self-reported by staff and participants, and the participants' openness may have been affected by the lack of anonymity. One weakness of Study III is the short time period (12 weeks) at the follow-up. This is a minor weakness since Study IV's follow-up was over 12 months.

Future research

The studies in this thesis need to be replicated, both in a Nordic setting and in other jurisdictions.

Since the effects of administering the GamTest to gamblers is not known, there is a need for effect studies. One possibility, inspired by MET, would be to integrate the latter into a project contacting gambling high consumers, invite them to do the GamTest where they receive feedback, to see if it affects the use of other RG measures and gambling behaviour.

Regarding JAS, there is a need to replicate the study and include JAS at follow-up, making it possible to examine its stability and see how it covaries with gambling behaviour.

Contacting high consumers will hopefully be more researched, including different methods and combinations of methods. Sending annual consumption letters to all gamblers and/or present such information on site are measures that would be interesting to study. One could also test a stepwise approach, from e-mail through letter to telephone contact if no change is seen. Sending letters to those not answering the telephone is another method that needs evaluation. Another line of research would be to evaluate if subgroups of gamblers respond differently by being contacted. The subgroups could be based, for example, on their gambling behaviour or the subgroups suggested by Blaszczynski and Nower (2002). In the latter case, a more complex data collection procedure would be needed compared to those used in Studies III and IV.

There is a clear need for evaluation and research concerning responsible gambling measures in general, and measures stipulated by regulation in particular. In Sweden, the Swedish Agency for Public Management has been commissioned to evaluate the re-regulation of the Swedish gambling market. However, more research is needed.

Implications

Implications for responsibility and regulation

Responsible gambling has been criticized for individualizing the problem, by laying most of the responsibility on the players (e.g. Alexius, 2017). Even if this criticism is based partly on a misunderstanding of the concept rather than focusing on bad implementation, it is the case that most efforts by the gambling industry have been ineffective and/or have had low usage, stressing the individual's role by messages, such as "play responsibly". Voluntary, rather than mandatory, measures have been advocated, without any convincing research. In the Nordic countries, mandatory measures have been used and put into regulation to a higher extent than elsewhere in the world. The high degree of registered play is a prerequisite for some of these measures. The preventive measures in the studies presented here, mainly Studies III and IV, stress the role and responsibility of the gambling companies, and are in line with the duty of care that is part of the new Swedish gambling regulation. When there are signs and indications of gambling problems, the gambling company is to contact the customer. A self-test, such as GamTest, could play a role in this as an indicator, as well as looking at gambling consumption. Studies III and IV show that providing feedback about gambling consumption, in a gentle manner, is one effective way to fulfil the duty of care.

It is obvious that the responsibility for preventing gambling problem lies with the gambling companies and regulation, even though the individual is responsible for his and her behaviour. Since the suggested measures in Studies I, III and IV mean reduced earnings for the gambling companies, it is naive to suppose that companies owned by private shareholders would adopt these measures voluntarily. This leads us to regulation, and the few examples where private owned gambling companies actively have been contacting customers as part of a duty of care, as stipulated. The regulator's role also includes ensuring that the measures are taken.

There are certain gambling forms where a very large share of the gross gambling revenue comes from at-risk and problem gamblers. In the latest Swedish prevalence study, it was estimated that 70 % of the bets on poker, casino games and gambling machines come from at-risk and problem gamblers, and that 60 % of those playing at casino games and gambling machines at least monthly were at least at-risk gamblers (Folkhälsomyndigheten, 2019). For companies focusing on these products, a well-performed duty of care would probably put their business at risk.

Measures that are mandatory for the companies by regulation, and also mandatory for the customers, are by default more effective than if voluntary. As Ivanova, Rafi et al. (2019) and Study IV indicates, the gamblers are not disturbed by responsible gambling measures. However, there are examples where poor design and implementation have discredited responsible gambling. This has probably contributed to the efforts with registered play at electronic gambling machines in Nova Scotia, Canada, called, ”My-Play System”, not being appreciated by the players and low usage. It was cancelled after two years of mandatory operation. The main reason for cancellation was that it reduced revenue too much and because the registration system was easily circumvented (RGC Centre for the Advancement of Best Practices, 2016).

Implications for the gambling companies

These studies strongly suggest that the gambling companies should offer feedback to their customers, helping them with an ongoing informed choice and possibly preventing gambling problems. Also, they should not be worried losing customers if delivering feedback in a gentle way. The duty of care, which is part of the Swedish gambling regulation, is not yet detailed in its instructions, but these studies suggest that telephone and letters are effective ways of contacting the highest consumers. Sending a letter with expenditure feedback could be a good alternative for those high consumers not reached by telephone and could also be an alternative for contacting customers with a lower, but still worrying, consumption.

Another implication for the gambling industry is that with more effective preventive efforts, they could reduce the share of their GGR from at-risk and problem gamblers. This direct approach towards high consumers, suggested in Studies III and IV, could be a valuable contribution, built on the assumption that there is a high density of at-risk and problem gamblers among the high consumers. Knowing this process involves saying no thanks to money, the gambling industry probably needs help through detailed regulation.

Conclusions

The overall aim of this thesis was to explore the role of overconsumption in problem gambling and target it in a preventive intervention. One conclusion is that overconsumption plays different and important roles in the development of problem gambling and should be targeted in preventing gambling problems. Contacting high consumers and offering feedback on their consumption helps them reduce their losses. This intervention made the customers reflect upon their gambling habits and motivated many to change. Gaining

insight about one's gambling habits, including possible overconsumption, through detailed feedback from a self-test could also be part of secondary and tertiary prevention.

Paper I concludes that GamTest captures five dimensions of problematic gambling with high reliability. A bifactor approach, composed of a general factor and specific factors reproduces all these factors except one, the negative consequences emotional factor, which contributes to the dominant part of the general factor. GamTest shows a high correspondence with two other measures of problem gambling.

Paper II concludes that the three-factor solution of JAS was confirmed. Further, the JAS dimensions Gambling fallacies and Reinforcers predict increases in problem gambling risk level, and the dimensions of Gambling fallacies and Over-consumption predict problem gambling over 1 year.

Papers III and IV conclude that contacting high consumers and giving them feedback on gambling net losses have a significant effect on their short- and long-term gambling behaviour. The group contacted by phone reduced their theoretical losses more than those receiving a letter. The latter reduced their theoretical losses more than a control group.

A final conclusion is that the need for more regulation in moving the prevention of gambling problem forward is obvious. One example is having a general limit within a regulated gambling market, so that the customer just needs to set one global deposit or loss limit. Technical evolution has made it possible for gambling companies to fulfil their duty, but interventions need to be regulated and mandatory if they are to be effective.

Final words and acknowledgements

How is it that I, as a psychologist, have been interested in gambling addiction for more than 25 years? Perhaps it's not that strange. I grew up with a deck of cards in my hand, and my grandmother taught me to play poker when I was five. I have also spent a great deal of time in the world of sport where gambling was often prevalent.

I have also had the opportunity to participate in several major research projects in Sweden; the first prevalence study and its in-depth section, a couple of treatment studies and Swelogs, the Public Health Authority's longitudinal research project. I have met many gambling addicts and relatives in treatment and at self-help meetings, people who often impressed me in their struggle with change and from whom I have learned a lot.

When I, as a psychology student, first visited a self-help meeting for gambling addiction, I probably saw gambling addiction solely as an individual problem and thought that there were major deficiencies in the help available. Gradually, I have become increasingly aware of how much money and politics are involved in the gambling field, and that it is also a social problem. It took until 1/1/2018 before gambling addiction was written into the Social Services Act in Sweden.

Over the years, there have been a tremendous technological developments (which no-one has missed). This has affected the gambling market to a large extent in the form of increased accessibility. It is now possible to play 24/7 via your computer or smartphone, and the technical developments in Sweden have "driven" the need for re-regulation in the form of a licensing system.

Anyone who can read between the lines in this thesis will have a feeling that I am critical of the gambling industry, something I have often expressed publicly. With that in mind, one can ask why three of the four articles that make up the thesis are based on some form of collaboration with the gambling industry. For me, the answer is that part of the preventive work must take place where the players are, and that is with the gambling companies. I have also seen it as important to try to contribute to developing the gambling companies' work on prevention. In the case of Norsk Tipping, I perceive them as world leaders even though there is still much to do.

There are many I wish to thank. Professor Emeritus Sten Rönnberg who generously introduced me to the subject and invited me to the research team conducting the first Swedish prevalence survey. Professor Emerita Ingrid Munck, who is, and has been, a loyal friend with great patience, a research colleague and supervisor with a fantastic ability to make statistics talk and become understandable. Rachel Volberg and Max Abbott who have contributed their rich knowledge and friendship since the mid-90s. My colleagues at Sustainable Interaction (formerly Spelinstitutet). Chiefly, Thomas Nilsson who has always been a positive force and steady as a rock in times of crisis. He has also, together with Johan Brandsten, given me the actual opportunity to be an industrial doctoral student. Johan's humour and support have also been very important. Fredrik Näslund for the dead man's hand. Thanks also to the other co-authors of articles for a great job; Anders Sjöberg and David Hodgins. I would like to thank Norsk Tipping, in particular the project leader Tanja Sveen who is a person with a fantastic capacity, and also Trine Vannzell and Kristin Edvardsen Måsø for doing a great and important job making the phone calls.

A large thank you to my supervisor Per Carlbring. I would also like to thank Anders Stymne, Ulla Romild, Per Binde, Arne Edström, Marianne Bang Hansen, Robert Williams and my PhD-student colleagues at SU and KI for helping me in different ways. And thanks to Steve Wicks who turned my struggles with the English language into proper English.

I would also like to thank my children Fredrika, Olof and Sissela and their mother Katarina Blume for being in my life. My PhD-struggle has taken time from you. I would also like to thank my mother Boel for her emotional support and my sisters Johanna and Pia who have travelled the PhD road before me and shown the way. Thank you Maria, for the love and energy you give me.

The person I want to thank most is my dad Cotto. He handled me with care. He taught me the importance of knowledge and he was a very active part of my research until he passed away in 2017. He had the ability to present his criticism in a clear and prudent manner. I wish I had been quicker in finishing my thesis so that we could have experienced this day together.

The Author, Faludden August 15th, 2019

References

Abarbanel, B., Gainsbury, S. M., King, D., Hing, N. & Delfabbro, P. H. (2017). Gambling Games on Social Platforms: How Do Advertisements for Social Casino Games Target Young Adults? *Policy & Internet*, 9, 184-209. DOI: 10.1002/poi3.135

Abbott, M. (2006). Do EGMs and problem gambling go together like a horse and carriage? *Gambling Research,* 18(1), 7–38.

Abbott, M.W. (2017). Beyond Reno: a Critical Commentary on Hancock and Smith. *International Journal of Mental Health and Addiction*, 15(6), 1177-1186. DOI: 10.1007/s11469-017-9794-3

Abbott, M., Bellringer, M., Garrett, N., & Mundy-McPherson, S. (2015). *New Zealand 2012 National Gambling Study: 12-month follow-up (Wave 2)*. Report Number 4. Auckland: Gambling and Addictions Research Centre, Auckland University of Technology.

Abbott, M., Bellringer, M., Garrett, N., & Mundy-McPherson, S. (2016). *New Zealand National Gambling Study: Wave 3 (2014)*. Report number 5. Auckland: Auckland University of Technology, Gambling and Addictions Research Centre.

Abbott, M., Hodgins, D. C., Bellringer, M., Vandal, A. C., Palmer Du Preez, K., Landon, J., et al. (2018). Brief telephone interventions for problem gambling: A randomized controlled trial. *Addiction,* 113(5), 883–895.

Abbott, M.W., Romild, U. & Volberg, R.A. (2014). Gambling and Problem Gambling in Sweden: Changes Between 1998 and 2009. *Journal of Gambling Studies* 30(4), 985-999. DOI: 10.1007/s10899-013-9396-3

Abbott, M.W., Romild, U. & Volberg, R.A. (2018). The prevalence, incidence, and gender and age-specific incidence of problem gambling: results of the Swedish longitudinal gambling study (Swelogs) *Addiction.* 113(4), 699-707.

Abbott, M.W., Williams, M., & Volberg, R.A. (2004). A prospective study of problem and regular non-problem gamblers living in the community. *Substance Use and Misuse,* 39(6), 855- 884.

Abbott, M.W. Volberg, R. Bellringer, M. & Reith,G. (2004). *A review of research on aspects of problem gambling.* Reported prepared to Responsibility in Gambling Trust. Gambling Research Centre, Auckland University of Technology.

Adami, N., Benini, S., Boschetti, A., Canini, L., Maione, F. & Temporin, M. (2013). Markers of unsustainable gambling for early detection of at-risk online gamblers *International Gambling Studies*, 13 (2), 188-204.

Airas, A. (2011). *Tools for responsible games*. Presentation at 2011 London Workshop on Problem Gambling: Theory and (Best) Practice, Brunel university. http://www.webcitation.org/6A3mwzRwg

Akaike, H. (1974). A new look at the statistical model identification. IEEE Trans. *Automat. Control* 19, 716–723. DOI: 10.1109/TAC.1974.1100705

Alexius, S. (2017). Assigning responsibility for gambling-related harm: scrutinizing processes of direct and indirect consumer responsibilization of gamblers in Sweden, *Addiction Research & Theory*, 25(6), 462-475, DOI: 10.1080/16066359.2017.1321739

Allami, Y., Vitaro, F., Brendgen, M., Carbonneau, R., Lacourse, E. & Tremblay, R.E. (2017). A Longitudinal Empirical Investigation of the Pathways Model of Problem Gambling. *Journal of Gambling Studies* 33(4), 1153-1167. DOI: 10.1007/s10899-017-9682-6

Álvarez-Moya, E.M., Jiménez-Murcia, S., Aymami, M.N., Gómez-Peña, M., Granero, 1R., Santamaria, J., Menchón, J.M. & Fernández-Aranda, F. (2010). Subtyping study of a pathological gamblers sample. *Canadian Journal of Psychiatry,* 55, 498-506.

American Psychiatric Association. (1980). *Diagnostic and statistical manual of mental disorders* (3rd ed). Washington, DC: Author.

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders* (4th ed). Washington, DC: Author.

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed). Washington, DC: Author.

Asparouhov, T., & Muthén, B. (2009). Exploratory structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, 16, 397–438.

Auer, M., Malischnig, D. & Griffiths, M. (2014). Is "pop-up" messaging in online slot machine gambling effective as a responsible gambling strategy? *Journal of Gambling Issue*s, 29, 1-10.

Auer, M., Griffiths, M.D. (2013). Voluntary Limit Setting and Player Choice in Most Intense Online Gamblers: An Empirical Study of Gambling Behaviour. *Journal of Gambling Studies*, 29 (4), 647-660.

Auer, M. M., & Griffiths, M. D. (2016). Personalized Behavioral Feedback for Online Gamblers: A Real World Empirical Study. *Frontiers in psychology*, *7*, 1875. DOI:10.3389/fpsyg.2016.01875

Auer, M. & Griffiths, M.D., (2015a). The use of personalized behavioral feedback for online gamblers: an empirical study. *Frontiers in Psychology,* 6,1406. DOI: 10.3389/fpsyg. 2015.01406

Auer, M. M., & Griffiths, M. D. (2015b). Testing normative and self-appraisal feedback in an online slot-machine pop-up in a real-world setting. *Frontiers in psychology*, 6, 339. DOI:10.3389/fpsyg.2015.00339

Bakken, I.J., Götestam, K.G., Gråwe, R.W, Wenzel, H.G. & Ören, A. (2009). Gambling behavior and gambling problems in Norway 2007. *Scandinavian Journal of Psychology* 50(4), 333-339. DOI:10.1111/j.1467-9450.2009.00713.x

Billi, R., Stone, C.A., Marden, P. & Yeung, K., (2014). *The Victorian Gambling Study: A longitudinal study of gambling and health in Victoria, 2008–2012*. Victoria, Australia: Victorian Responsible Gambling Foundation.

Binde, P. (2009). Exploring the impact of gambling advertising: An interview study of problem gamblers. *International Journal of Mental Health and Addiction*, 7, 541–554. DOI:10.1007/s11469-008-9186-9

Binde, P. (2012). A mutual support group for young problem gamblers. *International Journal of Mental Health and Addiction,* 10(4), 524-536.

Binde, P. (2014a). Gambling in Sweden: The cultural and socio-political context. *Addiction,*109(2), 193-198.

Binde, P. (2014b). *Gambling advertising: A critical research review*. London: The Responsible Gambling Trust.

Binde, P. & Jonsson, J (ed) (2010). *Spelberoendes riksförbund 10 år. En jubileumsskrift*. Östersund. https://ongambling.org/wp-content/uploads/2011/02/sbrf-10ar-jubileumsskrift.pdf

Binde, P. (2013). Why people gamble: A model with five motivational dimensions. *International Gambling Studies*, 13(1), 81-97.

Binde, P., Romild, U. & Volberg, R.A. (2017). Forms of gambling, gambling involvement and problem gambling: evidence from a Swedish population survey, *International Gambling Studies*, 17:3, 490-507, DOI:10.1080/14459795.2017. 1360928

Blaszczynski, A., Collins, P., Fong, D., Ladouceur, R., Nower, L., Shaffer, H., Tavares, T. & Venisse, J. L. (2011). Responsible gambling: General principles and minimal requirements. J*ournal of Gambling Studies*, 27(4), 565–573.

Blaszczynski, A., Cowley, E., Anthony, C. & Hinsley, K. (2016). Breaks in play: Do they achieve intended aims? *Journal of Gambling Studies*, 32(2), 789-800.

Blaszczynski, A., Ladouceur, R. & Shaffer, H.J. (2004). A science-based framework for responsible gambling: The Reno model. *Journal of Gambling Studies*, 20(3), 301-317.

Blaszczynski, A., Ladouceur, R., Nower, L. & Shaffer, H. (2008). Informed choice and gambling: Principles for consumer protection. *Journal of Gambling, Business and Economics,* 2(1), 103–118.

Blaszczynski A & Nower L (2002). A pathways model of problem and pathological gambling. *Addiction,* 97*,* 487-499.

Blume, K., Jonsson, J., Nilsson, E. & Nilsson, T. (2016). *En kvalitativ utvärdering av Prata om spel - Rapport till Lotteriinspektionen december 2016*.

Bollen, K. A. (1989). *Structural Equations with Latent Variables.* New York, NY: JohnWiley & Sons. DOI: 10.1002/9781118619179

Boutin, C., Tremblay, N. & Ladouceur, R. (2009). Impact of visiting an onsite casino information centre on perceptions about randomness and gambling behaviours. *Journal of Gambling Studies*, 25(3), 317-330.

Bowden-Jones, H. & George, S. (eds) (2015). *A clinician's guide to working with problem gamblers.* London: Routledge.

Braverman, J., Laplante, D.A., Nelson, S.E. & Shaffer, H.J. (2013). Using cross-game behavioral markers for early identification of high-risk internet gamblers. *Psychology of Addictive Behaviors*, 27(3), 868-877.

Braverman, J., & Shaffer, H.J. (2010). How do gamblers start gambling: Identifying behavioural markers for high-risk internet gambling. *European Journal of Public Health*, 22(2), 273-278. DOI: 10.1093/eurpub/ckp232.

.

Caillon, J. , Grall-Bronnec, M. , Perrot, B., Leboucher, J., Donnio, Y., Romo, L. & Challet-Bouju, G (2019). Effectiveness of a temporary self-exclusion from gambling websites. *Journal of Gambling Studies* 35(2), 601-615. DOI: 10.1007/ s10899-018-9782-y.

Calado F & Griffiths MD. (2016). Problem gambling worldwide: an update and systematic review of empirical research (2000–2015). *Journal of Behavioral Addictions*. 5, 592–613.

Carragher, N., & McWilliams, L.A. (2011). A latent class analysis of DSM-IV criteria for pathological gambling: Results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Psychiatry Research*, 187, 185-192.

Carlbring, P., Degerman, N., Jonsson, J., & Andersson, G. (2012). Internet-based treatment of pathological gambling with a three-year follow-up. *Cognitive Behavior Therapy*, 41(4), 321-334. DOI: 10.1080/16506073.2012.689323

Carlbring, P., Jonsson, J., Josephson, H. & Forsberg, L. (2010). Motivational Interviewing Versus Cognitive Behavioral Group Therapy in the Treatment of Problem and Pathological Gambling: A Randomized Controlled Trial. *Cognitive Behaviour Therapy*, 39(2), 92-103. DOI: 10.1080/16506070903190245.

Carlbring, P. & Smit, F. (2008). Randomized trial of Internet delivered self-help with telephone support for pathological gamblers. *Journal of Consulting and Clinical Psychology,* 76, 1090–1094.

Centrum för psykiatriforskning (2019). *Stödlinjens årsrapport 2018* http://dok.slso.sll.se/CPF/Stodlinjen/Stodlinjens_arsrapport_2018.pdf

Cisneros Örnberg, J. & Tammi, T. (2011). Gambling problems as a political framing: Safeguarding the monopolies in Finland and Sweden. *Journal of Gambling Issues*, (26), 110–125. DOI: 10.4309/jgi.2011.26.8

Clemens, F., Hanewinkel, R. & Morgenstern, M. (2017). Exposure to gambling advertisements and gambling behavior in young people. *Journal of Gambling Studies,* 33(1), 1-13. DOI: 10.1007/s10899-016-9606-x.

Cloutier, M., Ladouceur, R. & Sévigny, S. (2006). Responsible gambling tools: Pop-up messages and pauses on video lottery terminals *Journal of Psychology: Interdisciplinary and Applied*, 140(5), 434-438.

Collins, P., Blaszczynski, A., Ladouceur, R., Shaffer, H., Fong, G. & Venisse, J.-L. (2015). Responsible gambling: Conceptual considerations. *Gaming Law Review and Economics*, 3, 594–599.

Côté, D., Caron, A., Aubert, J., Desrochers, V. & Ladouceur, R. (2003). Near Wins Prolong Gambling on a Video Lottery Terminal. *Journal of Gambling Studies* 19(4), 433-438. DOI: 10.1023/A:1026384011003

Cousins, J. B. (2018). *Evaluation of Gamgard. A tool to identify gaming risks to vulnerable players under 'normal' playing conditions* Report prepared for: Dr. Richard Wood, GamRes Ltd., Canada Professor Mark Griffiths, Nottingham-Trent University, UK https://crecs.uottawa.ca/sites/crecs.uottawa.ca/files/gamgard_evaluation_report_-_final.pdf

Cunningham, J.A., Hodgins, D.C., Toneatto, T. & Murphy, M. (2012). A Randomized Controlled Trial of a Personalized Feedback Intervention for Problem Gamblers. *PLoS ONE* 7(2): e31586. DOI:10.1371/journal.pone.0031586

Delfabbro, P., Lahn, J., & Grabosky, P. (2006). It's not what you know, but how you use it: Statistical knowledge and adolescent problem gambling. *Journal of Gambling Studies*, 22(2), 179–193.

Derevensky, J. L., Sklar, A., Gupta, R., & Messerlian, C. (2010). An empirical study examining the impact of gambling advertisements on adolescent gambling attitudes and behaviors. *International Journal of Mental Health and Addiction*, 8(1), 21–34. DOI: 10.1007/s11469-009-9211-7

Ds 1991:51. *Spelmarknadsutredningen.* Departementserien 1991:51. Stockholm: Fritzes.

Ds 1995:61. *De statligt styrda spelbolagens koncessioner och organisation m.m: rapport från arbetsgrupp inom Finansdepartementet.* Departementsserien 1995: 61. Stockholm: Fritzes.

Dostojevskiv, F. (1887). *The Gambler*. London: Vizetelly & Co.

Dufour, J., Ladouceur, R. & Giroux, I. (2010). Training program on responsible gambling among video lottery employees *International Gambling Studies*, 10(1), 61-80.

Ekholm, O., Eiberg, S., Davidsen, M. et al. (2014). The Prevalence of Problem Gambling in Denmark in 2005 and 2010: A Sociodemographic and Socioeconomic Characterization. *Journal of Gambling Studies* 30(1), 1-10. DOI: 10.1007/s10899-012-9347-4

el-Guebaly N., Casey, D.M., Currie, S., Hodgins, D.C., Schopflocher, D., Smith, G.J., et al. (2015). *The Leisure, Lifestyle, & Lifecycle Project (LLLP): A Longitudinal Study of Gambling in Alberta.* Final Report for the Alberta Gambling Research Institute.

Ellis, J.D., Carr, M.M. & Ledgerwood, D.M. (2018). Executive Function in Problem Gamblers with and without History of Depression. *International Journal of Mental Health and Addiction* 16(5), 1085-1094. DOI: 10.1007/s11469-017-9804-5

Ferris, J. & Wynne, H. (2001). *The Canadian Problem Gambling Index: Final Report*. Ottawa: Canadian Centre on Substance Abuse. http://www.webcitation.org/6A2XpCMn7

Folkhälsomyndigheten (2015). *Elvaårsuppföljning av spel och hälsa bland personer som tidigare har haft spelproblem. Resultat från Swelogs uppföljningsstudie 1998-2009.* https://www.folkhalsomyndigheten.se/contentassets/ e852e39044b94342a69983507a16521a/elvaarsuppfoljning-spel-halsa-tidigare-spelproblem.pdf

Folkhälsomyndigheten (2016a). *Spel om pengar och hälsa.* Presentation på frukostseminarium 22 juni 2016. https://www.folkhalsomyndigheten.se/contentassets/16e75216d3554a44822541afc24f6afc/presentation-160622-utan-anteckningar.pdf

Folkhälsomyndigheten (2016b). *Metoder för att förebygga spelproblem. En systematisk litteraturöversikt*. https://www.folkhalsomyndigheten.se/contentassets/785be408ff5747bea954ba5ad26bf61f/metoder-att-forebygga-spelproblem-15160.pdf

Folkhälosmyndigheten (2019). *Resultat från Swelogs 2018*. https://www.folkhalsomyndigheten.se/contentassets/e2f80df7971e4abfa615a5edcf460897/resultat-swelogs-2018-2019.pdf

Forsström, D., Jansson-Fröjmark, M., Hesser, H. & Carlbring, P. (2017). Experiences of Playscan: Interviews with users of a responsible gambling tool. *Internet Interventions*, 8, 53-62.

Forsström, D., Hesser, H. & Carlbring, P. (2016). Usage of a responsible gambling tool: A descriptive analysis and latent class analysis of user behavior *Journal of Gambling Studies*, 32 (3), 889-904.

Fridberg, T & Fels Birkelund, J. (2016). *Pengespil og spilleproblemer i Danmark 2005-2016*, Köpenhamn: SFI-report; no 16:23. http://www.sfi.dk/publikationer/pengespil-og-spilleproblemer-i-danmark-2005-2016-12157/

Gainsbury, S. (2011). Player account-based gambling: Potentials for behaviour-based research methodologies *International Gambling Studies*, 11(2), 153-171.

Gainsbury, (2014). Review of Self-exclusion from Gambling Venues as an Intervention for Problem Gambling. *Journal of Gambling Studies* 30(2): 229–251 DOI: 10.1007s10899-013-9362-0

Gainsbury, S.M., Delfabbro, P., King, D.L. & Hing, N. (2016). An exploratory study of gambling operators' use of social media and the latent messages conveyed. *Journal of Gambling Studies* 32(1), 125-141 DOI: 10.1007/s10899-015-9525-2.

Gainsbury, S.M., King, D.L., Hing, N. & Delfabbro.P. (2015). Social media marketing and gambling: An interview study of gambling operators in Australia. *International Gambling Studies* 15(3), 377-393.

Gainsbury, S., Aro, D., Ball, D., Tobar, C. & Russell, A. (2015a). Optimal content for warning messages to enhance consumer decisions making and reduce problem gambling. *Journal of Business Resarch*, 68(10), 2093-2101.

Gainsbury, S., Aro, D., Ball, D., Tobar, C. & Russell, A. (2015b). Determining optimal placement for pop-up messages: evaluation of a live trial of dynamic warning messages for electronic gaming machines. *International Gambling Studie*s, 15(1), 141-158.

Gainsbury, S. M., King, D. L., Russell, A. M. T., Delfabbro, P., Derevensky, J. & Hing, N. (2016). Exposure to and engagement with gambling marketing in social media: Reported impacts on moderate-risk and problem gamblers. *Psychology of Addictive Behaviors*, 30(2), 270-276. DOI: 10.1037/adb0000156

Gainsbury, S., Parke, J. & Suhonen, N. (2013). Consumer attitudes towards Internet gambling: Perceptions of responsible gambling policies, consumer protection, and regulation of online gambling sites, *Computers in Human Behavior*, 29(1), 235-245. DOI: 10.1016/j.chb.2012.08.010.

Gallagher, T., Nicki, R., Otteson, A. & Elliot, H. (2011). Effects of a video lottery terminal (VLT) banner on gambling: a field study. *International Journal of Mental Health and Addiction*. 9(1), 126–133. DOI: 10.1007/s11469-009-9259-4

GameSense (2019). GameSense. Get support. Retrieved from https://www.gamesense.com/support.html

Gerstein, D., Hoffman, J., Larison, C. et al. (1999). *Gambling impact and behaviour study. Report to the National Gambling Impact Study Commission.* Chicago, USA: National Opinion Research Center at the University of Chicago

Giroux, I., Boutin, C., Ladouceur, R., Lachance, S. & Dufour, M. (2008). Awareness training program on responsible gambling for casino employees *International Journal of Mental Health and Addiction*, 6(4), 594-601.

Gonzáles-Ibánez, A. (1994). *Caracteristicas psicológicas y conductuales de los jugadores patológicos de máquinas recreativas con premio.* Unpublished doctoral dissertation, University of Barcelona.

Gonzáles-Ibánez, A., Aymamí, M. N., & Jiménez, S. (2003). Assessment of pathological gamblers who use slot machines. *Psychological Reports*, 93(3), 707-716.

Goudriaan A, Oosterlaan J, de Beursc E & van den Brinka W (2004). Pathological gambling: a comprehensive review of biobehavioral findings. *Neuroscience and Biobehavioral Reviews,* 28(2), 123–141.

Grant J E & M N Potenza (ed) (2004). *Pathological gambling. A clinical guide to treatment*. American psychiatric publishing. Washington DC

Gray, H.M., Laplante, D.A. & Shaffer, H.J. (2012). Behavioral characteristics of Internet gamblers who trigger corporate responsible gambling interventions. *Psychology of Addictive Behaviors*, 26(3), 527-535.

Griffiths, M. (1993). Fruit machine gambling: The importance of structural characteristics. *Journal of Gambling Studies*, 9(2), 101–120.

Groves R.M., Floyd, F., Couper M. P., Lepkowski, J.M., Singer, E. & Tourangeau, R. (2011). *Survey Methodology*, E-book, Wiley, ISBN 9781118211342.

Gustavsson, A. & Svanell, A. (2012). *Spela Lagom!* Stockholm: Natur & Kultur.

Haefeli, J., Lischer, S. & Haeusler, J. (2015). Communications-based early detection of gambling-related problems in online gambling. *International Gambling Studies*, 15(1), 23-38.

Haefeli, J., Lischer, S. & Schwarz, J. (2011). Early detection items and responsible gambling features for online gambling *International Gambling Studies*, 11(3), 273-288.

Haeusler, J. (2016). Follow the money: Using payment behaviour as predictor for future self-exclusion *International Gambling Studies*, 16(2), 246-262.

Hancock, L. & Smith, G. (2017). Critiquing the Reno model I-IV international influence on regulators and governments (2004–2015)—the distorted reality of ”responsible gambling”. *International Journal of Mental Health and Addiction*, 15(6), 1151–1176. DOI:10.1007/s11469-017-9746-y.

Hansen, M.B. & Rossow, I. (2008). Adoloscent gambling and problem gambling: Does the total consumption model apply? *Journal of Gambling Studies*, 24(2), 135-149. DOI: 10.1007/s10899-007-9082-4.

Hansen, M. B., & Rossow, I. (2012). Does a reduction in the overall amount of gambling imply a reduction at all levels of gambling? *Addiction Research & Theory,* 20(2), 145–152.

Hanss, D., Mentzoni, R.A., Griffiths, M.D. & Pallesen. S. (2015). The impact of gambling advertising: Problem gamblers report stronger impacts on involvement, knowledge, and awareness than recreational gamblers. *Psychology of Addictive Behaviors* 29(2), 483-491.

Harris, A., & Parke, A. (2015). The interaction of gambling outcome and gambling harm-minimisation strategies for electronic gambling: The efficacy of computer generated self-appraisal messaging. *International Journal or Mental Health and Addiction*. 14(4), 597-616. DOI:10.1007/s11469-015-9581-y.

Harris, A., Parke, A. & Griffiths, M.D. (2016). The Case for Using Personally Relevant and Emotionally Stimulating Gambling Messages as a Gambling Harm-Minimisation Strategy. *International Journal of Mental Health and Addiction*, 16(2), 266-275.

Harrison, G., Lynne, J, Dylan, B., Petty, T. & Orbison, R (1988a). *Handle with care.* Traveling Wilburys, vol 1 [LP]. Wilbury Records, Warner Bros.

Harrison, G., Lynne, J, Dylan, B., Petty, T. & Orbison, R (1988b). *End of the line.* Traveling Wilburys, vol 1 [LP]. Wilbury Records, Warner Bros.

Hing, N. & Nuske, E. (2011). Assisting Problem Gamblers in the Gaming Venue: A Counsellor Perspective. *International Journal of Mental Health and Addiction*, 9(6), 696-708.

Hing, N. & Nuske, E. (2012). Responding to Problem Gamblers in the Venue: Role Conflict, Role Ambiguity, and Challenges for Hospitality Staff. *Journal of Human Resources in Hospitality and Tourism,* 11(2), 146-164.

Hing, N., Cherney, L., Blaszczynski, A., Gainsbury S.M. & Lubman.D.I. (2014). Do advertising and promotions for online gambling increase gambling consumption? An exploratory study. *International Gambling Studies* 14(3), 394-409.

Hing, N., Lamont, M., Vitartas, P. & Fink, E. (2015a). Sports-embedded gambling promotions: A study of exposure, sports betting intention and problem gambling amongst adults *International Journal of Mental Health and Addiction* 13(1), 115-135.

Hing, N., Sproston, K., Brading, R. & Brook, K. (2015). R*eview and analysis of sports and race betting inducements.* Victoria, Australia: Victorian Responsible Gambling Foundation.

Hing, N., Vitartas, P., Lamont, M. & Fink, E. (2014). Adolescent exposure to gambling promotions during televised sport: An exploratory study of links with gambling intentions. *International Gambling Studies* 14(3), 374-393.

Hing, N., Lamont, M., Vitartas, P. & Fink, E. (2015b). Sports bettors' responses to sportsembedded gambling promotions: Implications for compulsive consumption. *Journal of Business Research,* 68(10), 2057-2066.

Holtgraves, T. (2009). Evaluating the Problem Gambling Severity Index. *Journal of Gambling Studies,* 25(1), 105–120 DOI 10.1007/s10899-008-9107-7

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural. Equational. Modeling – A Multidisciplinary Journal.* 6(1) 1–55. DOI: 10.1080/1070551 9909540118

Håkansson A., Mårdhed E. & Zaar M. (2017). Who Seeks Treatment When Medicine Opens the Door to Pathological Gambling Patients—Psychiatric Comorbidity and Heavy Predominance of Online Gambling. *Frontiers in Psychiatry* 8:255. DOI: 10.3389/fpsyt.2017.00255

Internetstiftelsen (2019). *Svenskarna och internet 2018.* https://www.iis.se/docs/Svenskarna_och_internet_2018.pdf

Ivanova, E., Rafi, J., Lindner, P. & Carlbring, P. (2019). Experiences of responsible gambling tools among non-problem gamblers: A survey of active customers of an online gambling platform, *Addictive Behaviors Reports*, 9, DOI: org/10.1016/j.abrep.2019.100161

Ivanova, E., Magnusson, K., & Carlbring, P. (2019). Deposit Limit Prompt in Online Gambling for Reducing Gambling Intensity: A Randomized Controlled Trial. *Frontiers in Psychology*, 10(639). DOI:10.3389/fpsyg.2019.00639

Jacobs, D.F. (1986). A general theory of addictions: A new theoretical model. *Journal of Gambling* Studies, 2(1), 15-31. DOI:10.1007/BF01019931

Jardin, B. F., & Wulfert, E. (2012). The use of messages in altering risky gambling behavior in experienced gamblers. *Psychology of Addictive Behaviors, 26*(1), 166-170. DOI: /10.1037/a0026202

Jonsson, J., Andrén, A., Nilsson, T., Svensson, O., Munck, I. Kindstedt, A. & Rönnberg, S. (2003). *Spelberoende i Sverige – vad kännetecknar personer med spelproblem*. Stockholm: Statens folkhälsoinstitut.

Jonsson, J. (2006). An Overview of Prevalence Surveys of Problem and Pathological Gambling in the Nordic Countries. *Journal of Gambling Issues,* 18, 31-38

Jonsson, J. (2012). Går ansvar före vinst? Vegas ur ett spelansvarsperspektiv. *Lotteriinspektionens skriftserie.* Nr 1, 2012. Strängnäs: Lotteriinspektionen.

Jonsson, J. Munck, I. Volberg, R. & Carbring, P. (2017). GamTest: Psychometric Evaluation and the Role of Emotions in an Online Self-Test for Gambling Behavior. *Journal of Gambling Studies*, 33(2), 505-523. DOI:10.1007/s10899-017-9676-4

Jonsson, J. & Rönnberg, S. (2009). Sweden. Chapter in Meyer, G., Hayer, T. & Griffiths, M. (eds) (2009) *Gambling problem in Europe. Challenges, prevention, and interventions*. Springer.

Josephson, H. (2016). *Motivational interviewing (MI) and cognitive behavioral group therapy in the treatment of gambling disorder: Efficacy, sensitivity to contemporary alcohol problems, and processes in MI.* (Thesis for doctoral degree, Karolinska Institutet). https://openarchive.ki.se/xmlui/handle/10616/45249

Kalke, J., Verthein, U., Buth, S. & Hiller, P. (2011). Prevention of Pathological Gambling in State-Owned Lottery Companies: Evaluation of Trainings for Lottery Retailers. *Suchttherapie,* 12(4), 178-185 DOI: 10.1055/s-0031-1283125

Kass, R. E. & Wasserman, L. (1995). A reference Bayesian test for nested hypotheses and its relationship to the Schwarz criterion. *J. Am. Stat. Assoc*. 90(431), 928–934. DOI: 10.1080/01621459.1995.10476592

Kim, H.S., Wohl, M.J.A., Stewart, M.J., Sztainert, T. & Gainsbury, S.M. (2014). Limit your time, gamble responsibly: Setting a time limit (via pop-up message) on an electronic gaming machine reduces time on device. *International Gambling Studies*, 14(2), 266-278.

Kühlhorn, E., Ahrens, U.-B., Berg, C., Björ, J., Helenius, K., Leifman, H., et al. (1995). *Spelandet i Sverige*. Brå-rapport 95:1. Stockholm: Fritzes.

Ladouceur, R., Blaszczynski, A. & Lalande, D.R. (2012). Pre-commitment in gambling: A review of the empirical evidence *International Gambling Studies*, 12(2), 215-230.

Ladouceur, R., Boutin, C., Doucet, C., Dumont, M., Provencher, M., Giroux, I. & Boucher, C. (2004). Awareness promotion about excessive gambling among video lottery retailers *Journal of Gambling Studies*, 20(2), 181-185.

LaPlante, D.A., Gray, H.M., LaBrie, R.A., Kleschinsky, J.H. & Shaffer, H.J. (2012). Gaming Industry Employees' Responses to Responsible Gambling Training: A Public Health Imperative. *Journal of Gambling Studies*, 28(2), 171-191.

Ladouceur, R., & Sévigny, S. (2009). Electronic gambling machines: Influence of a clock, a cash display, and a precommitment on gambling time. *Journal of Gambling Issues,* 23, 31–41. DOI: 10.4309/jgi.2009.23.2

Lamont, M., Hing, N. & Vitartas, P. (2016). Affective response to gambling promotions during televised sport: A qualitative analysis. *Sport Management Review*, 19(3), 319-331. DOI:10.1016/j.smr.2015.06.002

Ledgerwood, D. M., Orr, E. S., Kaploun, K. A., Milosevic, A., Frisch, G. R., Rupcich, N. & Lundahl, L. H. (2012). Executive function in pathological gamblers and healthy controls. *Journal of Gambling Studies, 28*(1), 89–103.

Ledgerwood, D. M. & Petry, N. M. (2006). Psychological experience of gambling and subtypes of pathological gamblers. *Psychiatry Research*, 144(1), 17-27.

Lee, Y.-K. & Chang, C.T. (2008). A social landslide: Social inequalities of lottery advertising in Taiwan. *Social Behavior and Personality* 36(10), 1423-1438.

Lemarié, L. & J.-C. Chebat. (2015). Temptation and prevention provided by the gambling industry: Main and interactive effects on gamblers. *RAM - Recherche et Applications en Marketing* 30(4), 51-63.

Leonard, C. A. & Williams, R. J. (2016). The relationship between gambling fallacies and problem gambling. *Psychology of Addictive. Behavior*. 30(6), 694–704. DOI: 10.1037/adb0000189

Lesieur, H. R. (2001). *Cluster analysis of types of inpatient pathological gamblers.* Dissertation Abstracts International: Section B: The Sciences and Engineering, vol. 62 (4-B), 2065., Massachusetts School of Professional Psychology.

Lesieur, H.R. & Blume, S.B. (1987). The South Oaks Gambling Screen (SOGS): a new instrument for the identification of pathological gamblers. *Am J Psychiatry* 1987;144(9):1184-1188.

Lotteriinspektionen (2018). *Spelmarknaden 2017. Den svenska spelmarknaden i siffror*. https://www.spelinspektionen.se/globalassets/dokument/statistik/arssiffror-statistik/hela-spelmarknaden-2017.pdf

Lund, I. (2008). The population mean and the proportion of frequent gamblers: Is the theory of total consumption valid for gambling? *Journal of Gambling Studies*, 24(2), 247–256. DOI:10.1007/ s10899-007-9081-5

Lund, I., & Nordlund, S. (2003). *Pengespill og pengespillproblemer i Norge* [Gambling and gambling related problems in Norway]. Oslo: SIRUS.

MacCallum, R. C., Browne, M. W. & Sugawara, H. M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods* 1(2), 130–149. DOI: 10.1037/1082-989X.1.2.130

Marsh, H. W., Lüdtke, O., Muthén, B., Asparouhov, T., Morin, A. J., Trautwein, U., et al. (2010). A new look at the big five factor structure through exploratory structural equation modeling. *Psychological Assessment*, 22(3), 471–491.

Marsh, H. W., Morin, A. J. S., Parker, P. D., & Kaur, G. (2014). Exploratory structural equation modeling: An integration of the best features of exploratory and confirmatory factor analysis. *Annual Review of Clinical Psychology*, 10, 85–110.

McBride, O., Adamson, G. & Shevlin, M. (2010). A latent class analysis of DSM-IV pathological gambling criteria in a nationally representative British sample. *Psychiatry Research*, 178(2), 401-407.

McCormick, A.V., Cohen, I.M. & Davies, G. (2018). Differential Effects of Formal and Informal Gambling on Symptoms of Problem Gambling During Voluntary Self-Exclusion. *Journal of Gambling Studies* 34(3): 1013-1031. DOI: 10.1007/s10899-018-9743-5

Mediavision (2018). *Swedish gambling market 2017.* Retreived from https://www.mediavision.se/swedish-gambling-market-2017-2/

Menard, S. (2002). *Applied Logistic Regression Analysis*, 2nd Edn. Thousand Oaks, CA: Sage. DOI: 10.4135/9781412983433

Meyer, G., Fiebig, M., Häfeli, J. & Mörsen, C. (2011). Development of an assessment tool to evaluate the risk potential of different gambling types. *International Gambling Studies*, 11(2), 221-236.

Meyer, G., Hayer, T. & Griffiths, M. (eds) (2009). *Gambling problem in Europe. Challenges, prevention, and interventions.* Springer.

Middleton, J. C., Hahn, R.A. Kuzara, J. L., Elder, R., Brewer, R. Chattopadhyay, S., Fielding, J., Naimi, T. S., Toomey, T. & Lawrence, B. (2010). Effectiveness of Policies Maintaining or Restricting Days of Alcohol Sales on Excessive Alcohol Consumption and Related Harms. *American Journal of Preventive Medicine,* 39(6), 575-589. DOI: 10.1016/j.amepre.2010.09.015.

Miller, W. R., Zweben, A., DiClemente, C. C. & Rychtarik, R. G. (1999). *Motivational Enhancement Therapy Manual. A Clinical Research Guide for Therapists Treating Individuals With Alcohol Abuse and Dependence.* National Institute on Alcohol Abuse and Alcoholism; 1999. Projekt MATCH Monograph Series. Volym 2.

Monaghan, S. & Blaszczynski, A. (2010). Impact of mode of display and message content of responsible gambling signs for electronic gaming machines on regular gamblers. *Journal of Gambling Studies*, 26(1), 67-88.

Monaghan, S. & Blaszczynski, A. (2009). Electronic gaming machine warning messages: Information versus self-evaluation. *Journal of Psychology: Interdisciplinary and Applied*, 144(1), 83-96.

Monaghan, S., Blaszczynski, A. & Nower, L. (2009). Do warning signs on electronic gaming machines influence irrational cognitions? *Psychological Reports*, 105(1), 173-187.

Monaghan, S. (2009). Responsible gambling strategies for Internet gambling: The theoretical and empirical base of using pop-up messages to encourage self-awareness. *Computers in Human Behavior*, 25(1), 202-207.

Monaghan, S. (2008). Review of pop-up messages on electronic gaming machines as a proposed responsible gambling strategy. *International Journal of Mental Health and Addiction*, 6 (2), 214-222.

Morin, A. J., Arens, K. & Marsh, H. W. (2016). A bifactor exploratory structural equation modeling framework for the identification of distinct sources of construct-relevant psychometric multidimensionality. *Structural Equation Modeling: A Multidisciplinary Journal,* 23(1), 116–139. DOI:10.1080/10705511.2014.961800.

Munoz, Y., Chebat, J.-C. & Suissa, J.A. (2010). Using Fear Appeals in Warning Labels to Promote Responsible Gambling Among VLT Players: The Key Role of Depth of Information Processing. *Journal of Gambling Studies*, 26 (4), 593-609.

Neighbors, C., Rodriguez, L. M., Rinker, D. V., Gonzales, R. G., Agana, M., Tackett, J. L., & Foster, D. W. (2015). Efficacy of personalized normative feedback as a brief intervention for college student gambling: A randomized controlled trial. *Journal of Consulting and Clinical Psychology,* 83(3), 500-511. DOI: 10.1037/a0039125

Oberg S., Christie G. & Tata M. (2011). Problem gamblers exhibit reward hypersensitivity in medial frontal cortex during gambling. *Neuropsychologia,* 49 (13), 3768-3775.

Olason, D.T., Hayer, T., Brosowski, T. & Meyer, G. (2015). Gambling in the Mist of Economic Crisis: Results From Three National Prevalence Studies From Iceland. *Journal of Gambling Studies* 31(3): 759. DOI: 10.1007/s10899-015-9523-4

Olason D.T., Hayer T., Meyer G. & Brosowski T. (2017). Economic Recession Affects Gambling Participation But Not Problematic Gambling: Results from a Population-Based Follow-up Study. *Frontiers in Psychology*. 8:1247. DOI: 10.3389/fpsyg.2017.01247

Orford J., Wardle H., Griffith M., Sproston, K. & Erens, B. (2010). PGSI and DSM-IV in the 2007 British Gambling Prevalence Survey: reliability, item response, factor structure and inter-scale agreement. *International Gambling Studies* 10(1), 31-44. DOI: 10.1080/14459790903567132

Pallesen, S., Hanss, D., Mentzoni, R. A., Molde, H. & Morken, A. M. (2014). *Omfang av penge- og dataspillproblemer i Norge 2013.* Bergen: Universitetet i Bergen [Prevalence of gambling and video game problems in Norway in 2013]

Pallesen, S., Molde, H., Mentzoni, R. A., Hanss, D. & Morken, A. M. (2016). *Omfang av penge- og dataspillproblemer i Norge 2015.* Bergen: Universitetet i Bergen. https://lottstift.no/wp-content/uploads/2016/06/WEBRapport_befolkningsundersokelsen.pdf [Prevalence of gambling and video game problems in Norway in 2015]

Papineau, É., Lemétayer, F. Diogo, A. Biron, B. & Biron, J.-F. (2015). Lottery marketing in Québec and social deprivation: Excessive exposure, insufficient protection? *International Gambling Studies* 15(1), 88-107.

Paulson, R. (1971). *Hogarth: His Life, Art and Times*, 2 vols. New Haven and London: Yale University Press.

Percy, C., França, M., Dragičević, S. & d'Avila Garcez, A. (2016). Predicting online gambling self-exclusion: an analysis of the performance of supervised machine learning models. *International Gambling Studies*, 16(2), 193-210.

Petry, N. M., Blanco, C., Jin, C. & Grant, B. F. (2014). Concordance Between

Gambling Disorder Diagnoses in the DSM–IV and DSM-5: Results From the National Epidemiological Survey of Alcohol and Related Disorders. *Psychology of Addictive Behavior*, 28(2): 586–591.

Philander, K.S. (2014). Identifying high-risk online gamblers: A comparison of data mining procedures *International Gambling Studies*, 14(1), 53-63.

Pickering, D., Blaszczynski,A. & Gainsbury, S.M. (2018). Multi-Venue Self-Exclusion for Gambling Disorders: A Retrospective Process Investigation. *Journal of Gambling Issues* 38, 127-151 DOI: 10.4309/jgi.2018.38.7

Productivity Commission (1999). *Australia's gambling industries: Inquiry report.* Productivity Commission, Canberra. Available from: www.pc.gov.au/projects/inquiry/gambling/docs/ report.

Productivity Commission (2009). *Draft Report: Gambling.* Commonwealth of Australia, Canberra.

Project MATCH Research Group (1998). Matching Alcoholism Treatments to Client Heterogeneity: Three-Year Drinking Outcomes. Alcoholism: *Clinical and Experimental Research*, 22(6), 1300-1311).

Public Health Agency of Sweden (2016a). *Gambling and gambling problems in Sweden 2008-2010. Swedish Longitudinal Gambling Study SWELOGS. Findings from wave one and wave two.* Östersund. ISBN 978-91-7603-643-3.

Public Health Agency of Sweden (2016b). *Recovery from problem gambling: Results from the in-depth Swelogs study.* Retrieved from https://www.folkhalsomyndigheten.se/contentassets/72ab8a8965f44f8581f398c40e3d4075/aterhamtning-konsekvenser-problemspelande-16040-webb.pdf (The report is in Swedish with a english summary)

Quilty, L.C., Robinson, J. & Blaszczynski, A. (2015). Responsible gambling training in Ontario casinos: employee attitudes and experience. *International Gambling Studies*, 15(3), 361-376.

Reise, S. P. (2012). The rediscovery of bifactor measurement models. *Multivariate Behavioral Research*, 45(5), 667–696. DOI:10.1080/00273171.2012.715555.

Reise, S. P., Morizot, J. & Hays, R. D. (2007). The role of the bifactor model in resolving dimensionality issues in health outcomes measures. *Quality of Life Research,* 16(Suppl), 19–31.

RGC Centre for the Advancement of Best Practices. (2016). *My-Play system evaluation: Final report*. RGC Centre for the Advancement of Best Practices. Retrieved from https://gamingns.ca/wpcontent/uploads/2017/01/My-Play-FINAL-Report.pdf

Romild, U. Abbott, M. & Volberg, R. (2014). The Swedish Longitudinal Gambling Study (Swelogs): design and methods of the epidemiological (EP-) track. *International Journal of Methods in Psychiatric Research,* 23(3): 372–386. DOI: 10.1002/mpr.1449

Rosseel, Y. (2012). lavaan: an R package for structural equation modeling. *Journal of Statistical Software,* 48, 1–36. DOI: 10.3389/fpsyg.2014.01521

Rossow, I. (2018). The total consumption model applied to gambling: Empirical validity and implications for gambling policy. *Nordic Studies on Alcohol and Drugs.* 36(2), 66-76. DOI: 10.1177/1455072518794016

Rönnberg, S., Volberg, R., Abbott, M., Moore, L., Andrén, A., Munck, I., Jonsson, J., Nilsson, T. & Svensson, O. (1999). *Spel och spelberoende i Sverige*. *Rapport nr 3 i Folkhälsoinstitutets serie om spel och spelberoende.* Stockholm: Folkhälsoinstitutet.

Salonen, A. H., Alho, H. & Castrén, S. (2015). Gambling frequency, gambling problems and concerned significant others of problem gamblers in Finland: Cross-sectional population studies in 2007 and 2011. *Scandinavian Journal of Public Health,* 43(3), 229–235.

Salonen, A.H., Hellman, M., Latvala, T. & Castrén, S (2018). Gambling participation,gambling habits, gamblingrelated harm, and opinions on gambling advertising in Finland in 2016. *Nordic Studies on Alcohol and Drugs* Vol. 35(3) 215–234

Salonen, A.H., Rosenstrom, T., Edgren, R., Volberg, R., Alho, H. & Castrén, S. (2017). Dimensions of the South Oaks Gambling Screen in Finland: A cross-sectional population study. A *Scandinavian Journal of Psychology*, 58(3), 228–237 DOI: 10.1111/sjop.12357

Shaffer, H. J., LaBrie, R. A. & LaPlante, D. (2004). Laying the Foundation for Quantifying Regional Exposure to Social Phenomena: Considering the Case of Legalized Gambling as a Public Health Toxin. *Psychology of Addictive Behaviors, 18*(1), 40-48. DOI: 10.1037/0893-164X.18.1.40

SBU (2019). Att förebygga problem med spel om pengar. En systematisk översikt. https://www.sbu.se/contentassets/03bcc8f6b1664182a1c46042d0b3da15/forebygga_problem_spel_pengar.pdf

Schottler Consulting. (2009). *Major findings of a trial of a card-based gaming product at the Redcliffe RSL*. Brisbane: Shottler Consulting.

Schottler Consulting. (2010). *Major findings and implications: Player tracking and precommitment trial.* Adelaide: Treasury Department.

Schwarz, N & Sudman, S. (1995). *Answering Questions - Methodology for Determining Cognitive and Communicative Process in Survey*. Jossey-Bass Inc US, ISBN 9780787901455.

SFS 1994:1000. *Lotterilag*. Svensk Författningssamling 1994:1000. Available at https://www.riksdagen.se/sv/dokument-lagar/dokument/svensk-forfattningssamling/lotterilag-19941000_sfs-1994-1000

SFS 2018:1138. *Spellag.* Svensk författningssamling 2018:1138. Availble at http://rkrattsbaser.gov.se/sfst?bet=2018:1138

Slutske W., Zhu G., Meier, M. & Martin, N. (2010). Genetic and environmental influences on disordered gambling in men and women. *Archives of General Psychiatry,* 67(6), 624-630.

SOU 1992:130. *Lotteriutredningen.* Statens offentliga utredningar 1992:130. Stockholm: Frizes.

SOU 2000:50. *Från tombola till Internet. Översyn av lotterilagstiftningen.* Statens offentliga utredningar 2000:50. Available at https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2000/07/sou-200050/

SOU 2006:11. *Spel i en föränderlig värld.* Statens offentliga utredningar 2006:11. Available at https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2006/01/sou-200611/

SOU 2006:64. *Internationella kasinon i Sverige. En utvärdering.* Statens offentliga utredningar 2006:64. Available at https://www.regeringen.se/49bb39/contentassets/dbf5f21f5b3f48d08b14ce9d35a229b8/internationella-kasinon-i-sverige---en-utvardering-sou-200664

SOU 2008:36. *Svenska Spels nätpoker: En utvärdering*: Statens offentliga utredningar, 2008:36. Available at: http://www.regeringen.se/download/b939d9d8.pdf?major=1&minor=1024 58&cn=attachmentPublDuplicator_0_attachment

SOU 2017:30. *En omreglerad spelmarknad.* Statens offentliga utredningar 2017:30. Available at https://www.regeringen.se/rattsliga-dokument/statens-offentliga-utredningar/2017/03/sou-201730/

Spearman, C. (1904). `General Intelligence' objectively determined and measured. *American Journal of Psychology,* 15, 201-293.

Sproston, K., C. Hanley, C. Brook, K., Hing, N. & Gainsbury, S. (2015). *Marketing of Sports Betting and Racing.* Melbourne: Gambling Research Australia. http://www.gamblingresearch.org.au/resources/071d1081-3ee4-474a-98d1-944701ca229a/gramarketingofsbandrb.pdf

Statens folkhälsoinstitut (2010). *Spel om pengar och spelproblem i Sverige 2008/2009*. Huvudresultat från SWELOGS befolkningsstudie. *R 2010:23*. Statens folkhälsoinstitut: Östersund.

Statens folkhälsoinstitut (2012). *Spel om pengar och spelproblem i Sverige 2009/2010*. *Resultat från Swelogs ettårsuppföljning*. *R 2012:04*. Statens folkhälsoinstitut: Östersund.

Statens folkhälsoinstitut (2013). *Risk- och skyddsfaktorer för problemspelande*. *Resultat från Swelogs fördjupningsstudie. R 2013:07*. Statens folkhälsoinstitut: Östersund.

Stewart, M.J. & Wohl, M.J.A. (2013). Pop-up messages, dissociation, and craving: How monetary limit reminders facilitate adherence in a session of slot machine gambling. *Psychology of Addictive Behaviors*, 27(1), 268-273.

Stinchfield, R. (2002). Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS), *Addictive Behaviors*, 27(1), 1-19. DOI: 10.1016/S0306-4603(00)00158-1.

Strandänger, Z. (2016). *The effect of responsible gambling*. Paper presented at EASG conference in Lisbon 2016.

Strong, D.R., Lesieur, H.R., Breen, R.B., Stinchfield, R. & Lejuez, C.W. (2004). Using a Rasch model to examine the utility of the South Oaks Gambling Screen across clinical and community samples, *Addictive Behaviors*, 29(3) 465-481. DOI: 10.1016/j.addbeh.2003.08.017.

Strong, D. R., Breen, R. B., Lesieur, H. R. & Lejuez, C. W. (2003). Using the Rasch model to evaluate the South Oaks Gambling Screen for use with nonpathological gamblers. *Addictive Behaviors,* 28(8), 1465–1472. DOI: 10.1016/S0306-4603(02)00262-9.

Turner, N.E., Jain, U., Spence, W. & Zangeneh, M. (2008). Pathways to pathological gambling: Component analysis of variables related to pathological gambling. *International Gambling Studies*, 8(3), 281-298.

Vachon, D.D. & Bagby, R.M. (2009). Pathological gambling subtypes. *Psychological Assessment,* 21(4), 608-615.

Victorian responsible gambling foundation (2012). *The Victorian Gambling Study. Report of Findings from Qualitative Interviews*. www.responsiblegambling.vic.gov.au/__data/assets/pdf_file/0011/4025/VictorianGambling-Study-Qualitative-Component-Report.pdf

Vinberg, M. & Strandberg, A. (2016). *Spelprevention i skolan*. Centrum för psykiatriforskning. Karolinska institutet/Stockholms läns landsting.

Volberg, R., Abbott, M., Rönnberg, S. & Munck, I. (2001). Prevalence and risks of problem gambling in Sweden. *Acta psychiatrica Scandinavica*. 104. 250-6. 10.1034/j.1600-0447.2001.00336.x.

Walker, D.M., Litvin, S.W., Sobel, R.S. & St-Pierre, R.A. (2015). Setting win limits: An alternative approach to "responsible gambling"? *Journal of Gambling Studies*, 31(3), 965-986.

Wessberg G. (2012). *Om spel i svensk lagstiftning fram till år 1900* [About gambling in Swedish law until 1900]. Lotteriinspektionens skriftserie 2012; 12–21. Available at: http://www. lotteriinspektionen.se/Documents/Externa%20dokument/cc162832-15ab-42d5-a35e-56766a858d8a.pdf (accessed 6 February 2019) (Archived by WebCite® at http://www. webcitation.org/6A2T2JJdY).

Wigert, U. (2009). *Tipsextra: den heliga eftermiddagen*. Recito Förlag AB

Wickwire, E. M., Burke, R. S., Brown, S. A., Parker, J. D. & May, R. K. (2008). Psychometric Evalua-tion of the National Opinion Research Center DSM-IV Screen for Gambling Problems (NODS). *American Journal on Addictions*, 17(5), 392-395.

Williams, R. J. & Connolly, D. (2006). Does learning about the mathematics of gambling change gambling behavior? *Psychology of Addictive Behaviours*, 20, 62–68.

Williams., R.J., Hann, R.G., Schopflocher, D., West, B., McLaughlin, P., White, N. et al. (2015). *Quinte Longitudinal Study of Gambling and Problem Gambling.* Report prepared for the Ontario Problem Gambling Research Centre. Guelph, Ontario. February 20, 2015. http://hdl.handle.net/10133/3641

Williams, R. J. & Volberg, R. A. (2010). *Best practices in the population assessment of problem gambling*. Guelph: Ontario Problem Gambling Research Centre.

Williams, R.J. & Volberg, R.A. (2014). The classification accuracy of four problem gambling assessment instruments in population research. *International Gambling Studies*, 14(1), 15-28, DOI: 10.1080/14459795.2013.839731

Williams, R.J., Volberg, R.A. & Stevens, R.M.G. (2012). *The Population Prevalence of Problem Gambling: Methodological Influences, Standardized Rates, Jurisdictional Differences, and Worldwide Trends.* Report prepared for the Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care. May 8, 2012. Retrieved from http://hdl.handle.net/10133/3068

Williams, R.J., West, B.L. & Simpson, R.I. (2012). *Prevention of Problem Gambling: A Comprehensive Review of the Evidence, and Identified Best Practices*. Report prepared for the Ontario Problem Gambling Research Centre and the Ontario Ministry of Health and Long Term Care. October 1, 2012. Retrieved from http://hdl.handle.net/10133/3121.

Williams, R.J., Wood, R.T. & Currie, S.R. (2010). Stacked Deck: an effective, school-based program for the prevention of problem gambling. *The journal of primary prevention,* 31(3), 109-25.

Wohl, M. J.A., Christie, K-L., Matheson, K. & Anisman, H. (2010). Animation-Based Education as a Gambling Prevention Tool: Correcting Erroneous Cognitions and Reducing the Frequency of Exceeding Limits Among Slots Players. *Journal of Gambling Studies* 26: 469-486

Wohl, M.J.A. & Davis, C.G. & Hollingshead, S.J. (2017). How much have you won or lost? Personalized behavioral feedback about gambling expenditures regulates play. *Computers in Human Behavior*, 70, 437-445.

Wohl, M.J.A., Parush, A., Kim, H.A.S. & Warren, K. (2014). Building it better: Applying human-computer interaction and persuasive system design principles to a monetary limit tool improves responsible gambling. *Computers in Human Behavior*, 37, 124-132.

Wohl, M.J.A., Gainsbury, S., Stewart, M.J. & Sztainert, T. (2013). Facilitating Responsible Gambling: The Relative Effectiveness of Education-Based Animation and Monetary Limit Setting Pop-up Messages Among Electronic Gaming Machine Players. *Journal of Gambling Studies*, 29(4), 703-717.

Wohl, M.J.A., Santesso, D.L & Harrigan, K. (2013). Reducing Erroneous Cognition and the Frequency of Exceeding Limits among Slots Players: A Short (3-minute) Educational Animation Facilitates Responsible Gambling. *International Journal of Mental Health and Addiction,* 11(4). 409-423.

Wood, R. T. A., Griffiths, M. D. & Parke, J. (2007). *GAM-GaRD Gaming Assessment Measure – Guidance about Responsible Design (formerly known as GAM-RiSC).* Presentation at the IRGO confererence, Stockholm. http://www.webcitation.org/6A3nqkX5H

Wood, R.T.A. & Wohl, M.J.A. (2015). Assessing the effectiveness of a responsible gambling behavioural feedback tool for reducing the gambling expenditure of at-risk players. I*nternational Gambling Studies*, 15(2), 324-339.

Wood, R.T.A., Wohl, M.J.A., Tabri, N. & Philander, K. (2017). Measuring Responsible Gambling amongst Players: Development of the Positive Play Scale. *Frontiers in Psychology*. 8:227. DOI: 10.3389/fpsyg.2017.00227

Well it's all right, even if you're old and grey
Well it's all right, you still got something to say
Well it's all right, remember to live and let live
Well it's all right, the best you can do is forgive

Harrison et al, 1988b