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Development of an assessment tool to evaluate the risk potential of different gambling types*

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Based on different characteristics of gambling types, this study aimed to develop an assessment tool to evaluate the risk potential of available and planned gambling types in German-speaking countries. In the first module, 26 experts were interviewed over the course of a Delphi study, and an analysis of those results led to the selection of relevant characteristics and scaling values. Building on the first module, the second module consisted of standardized data collection of nonproblem, problem and pathological gamblers (characteristics: $n = 363$; scales: $n = 356$), which served as an empirical validation. Ten characteristics were identified with different weights and differentiated scaling values to evaluate the risk potential, and a psychometric validation indicated that the assessment tool was reliable ($\alpha = 0.91$; $r_{ik} = 0.50$; $r_{it} = 0.33–0.80$). The correlation measures from data of epidemiological studies ($R^2 = 0.84$) and a treatment survey ($p < 0.001$) demonstrated that the assessment tool was valid. This assessment tool, which was verified by psychometric validation, can serve the legislation and jurisdiction, the gaming industry and consumers as a future basis for risk evaluation of gambling types.

Keywords: gambling; pathological gambling; assessment tool; risk potential; validation

1. Introduction

The development of pathological gambling is based on a complex interaction of various risk factors that are associated with the individual himself or herself, social environment and specific features of gambling (Meyer & Bachmann, 2005). Although past research on pathological gambling has focused on biological, psychological and social risk conditions, characteristics of gambling activities have recently become increasingly important. The gambling characteristics mentioned by Abbott (2007) and Parke and Griffiths (2007) provide a theoretical explanation for empirical findings and indicate that specific types of gambling lead to the development of individual gambling-related problems more frequently than others. Moreover, they allow for differentiated and theory-based evaluation of the risk potential of different types of gambling.

Components of gambling activities can be divided into situational and structural characteristics (Figure 1). Situational characteristics, such as availability and accessibility,

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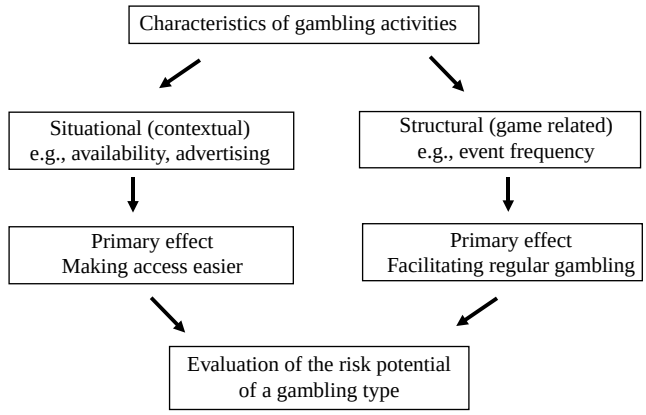

Figure 1. Characteristics of gambling activities: an analytic schema (Meyer & Hayer, 2005).

facilitate the access to gambling activities for potential gamblers or encourage people to gamble for the first time (e.g. advertising campaigns). Structural characteristics, such as event frequency and prize-back ratio, are core features of the game that are primarily responsible for reinforcement, which facilitates excessive gambling (Meyer & Hayer, 2005).

The relationships between certain gambling types and specific risk potentials are empirically supported by several epidemiological studies and studies on treatment demands in inpatient and outpatient healthcare facilities. In regards to prevalence rates of problem and pathological gambling in Germany, national surveys found the highest rates among slot machines and table games in casinos, sports bettors and poker players. The reported rates varied from 1.4% up to 9.0% (Bühringer, Kraus, Sonntag, Pfeiffer-Gerschel & Steiner, 2007; Buth & Stöver, 2008; BZgA, 2008).

Although national surveys found that lotteries were the most common type of gambling, this type of gambling activity holds the lowest risk potential (at 0.1–0.7%). In addition, empirical findings on the risk potential of different types of gambling can be found in studies of treatment demands of pathological gamblers in counselling and treatment facilities. In a German patient survey by Meyer and Hayer (2005), 79.3% of pathological gamblers experienced gaming machines (i.e. slot machines that are operated in arcades and pubs) as problematic types of gambling, and 32.4% reported having problems with gambling machines (i.e. slot machines that are operated only by casinos). Roulette, black jack, card games, dice and the German sports betting 'Oddset' belonged to the most frequently reported types of problematic gambling. In contrast, the lottery 'Lotto 6 out of 49' and class lottery were mentioned by only 6% and 0.7% of pathological gamblers, respectively.

Findings from international studies have been consistent with the German results. Surveys from the UK (Sproston, Erens & Orford, 2000; Wardle et al., 2007) and Australia (Productivity Commission, 2010) revealed considerably higher prevalence rates of problem gambling related to slot machines, sports betting and table games in casinos. In contrast, the engagement of pathological gamblers in scratch cards and other lotteries was rather low. The British charity institution GamCare (2007) reported that a high proportion of help-seeking gamblers were users of casino table games, bettors and slot machine gamblers (fruit machines and fixed odds betting terminals). Interestingly, only 2% of clients had participated in scratch cards, and only 0.5% had participated in lotteries. In Austria, 84% of patients in a counselling and therapy centre (Spielsuchthilfe, 2007) had problems with gaming machines (operated in arcades and pubs), and 13.4–21.3% reported

roulette, betting and casino slot machines as problematic types of gambling. In contrast, the lottery and scratch cards were only reported as problematic by 4.2% and 1.9% of the respondents, respectively.

The first two scientific approaches to a formalized assessment of the risk potential of gambling activities were made in the UK and Finland (Airas & Järvinen, 2008; Griffiths, Wood & Parke, 2008; Veikkaus, 2008). Griffiths et al. (2008) developed 'GAM-GaRD' (Gambling Assessment Measure – Guidance about Responsible Design) by taking into account recent empirical findings on relevant characteristics of gambling activities and the knowledge of an international panel of experts who employed the Delphi method. The 'GAM-GaRD' is based on the following 10 items with divergent scaling and scores: event frequency, multiple game/stake opportunities, stake size, prize-back ratio, jackpot size, near-miss opportunities, continuity of play, accessibility, currency/ease of pay and illusion of control features (Wood, Griffiths & Parke, 2008). The total score allows for a classification of low, medium or high risk for vulnerable gamblers. A decrease in risk potential can be achieved by varying an element in game design or by taking into account further responsible gambling features. The Finnish instrument, 'Product Evaluation Method for Reducing Potential Hazards', is part of the responsible gambling strategy of the Finnish lottery Veikkaus (Airas & Järvinen, 2008; Veikkaus, 2008). This assessment tool is based on the following eight items: basic product elements; risk of financial loss; prize and stake structure; role of skills, chance and rules; product and environment attractiveness; social aspects; additional attractive aspects; and accessibility. Both of these tools, however, have been presented only at conferences and have not been published in scientific journals. There is a lack of transparency concerning methods and outcomes of both assessment tools.

There are similar approaches to risk evaluation in the field of substance use disorder research (van Amsterdam, Best, Opperhuizen & de Wolff, 2004; Nutt, King, Saulsbury & Blakemore, 2007). Nutt et al. (2007) developed a classification tool that allowed the grouping of psychoactive substances according to their risk potential. In a study employing the Delphi method, 20 legal and illegal drugs were rated by experts using the criteria of the 'Risk Assessment Matrix'. Because of divergent results in ranking compared with current regulatory systems, the authors emphasized the need for classification based on scientific background, a classification system which would ensure the evaluation of present and future addictive substances.

Considering these previous findings, the objective of the current study was to develop an assessment tool based on empirically validated criteria to allow for an objective evaluation of the risk potential of present and future types of gambling. The development of this tool, which was designed to address the sociocultural conditions of German-speaking countries, was based on insights gained from Switzerland, Austria and Germany.

2. Methods

2.1. Design

The development of the present assessment tool was carried out in two modules that were based on one another. The first module consisted of interviews with a panel of experts (i.e. the Delphi method). In a separate study, which was carried out concurrently with the Delphi study, Beutel and Mörsen (2009) analysed the literature and empirically validated 12 characteristics of gambling activities that resulted in conducting surveys of gambling providers and recreational and pathological gamblers. The results of the Beutel and Mörsen study were taken into account in the second module (Figure 2), which surveyed social, problem and pathological gamblers.

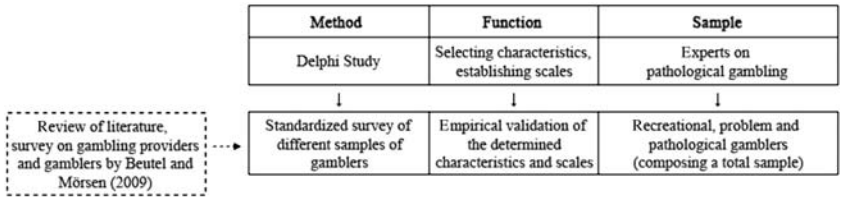

Figure 2. Two-staged design of the study.

The fundamental concept of the Delphi method is an assessment of experts' opinions on a problem, including anonymous feedback (Häder & Häder, 2000). In the first step, the problem is operationalized by the researchers carrying out the Delphi survey. The aim of the process is to deduce tangible characteristics and submit them to experts in the form of a questionnaire for a rating. Single inputs from participants are statistically grouped together (e.g. mean), and feedback is given anonymously. Next, a reappraisal is carried out by the experts and the process is continued until the predefined stop criterion is achieved (e.g. reaching a consensus or replicated stability of the answers).

The standardized survey on social, problem and pathological gamblers conduces to the empirical validation of the assessment tool. Essential test quality criteria, such as reliability and validity, should be determined in several ways.

2.2. Samples

The following criteria served as a basis for selection of experts in German-speaking countries (Germany, Switzerland and Austria):

- many years of experience in research and publications on pathological gambling
- membership in relevant professional organizations
- many years of experience and practice in counselling and treating pathological gamblers.

We made a list of experts that met these criteria, and we aimed to include 25–30 experts in the present study. Most of the experts were contacted by phone or email (response rate: 83.3%), and a total of 26 (9 female and 17 male) committed to participation in the Delphi survey. Among this group, seven experts were active in research, 11 were active in clinical practice and six were active in both science and clinical practice. Fifteen of the experts were from Germany, six were from Austria and five were from Switzerland.

German problem, pathological and social gamblers were recruited from inpatient treatment facilities, self-help groups, gambling venues and the internet.

To participate in the questionnaire survey, subjects had to meet at least one of the following inclusion criteria within the last year:

- participants regularly engaged in one type of gambling (at least once a month), but had also gambled using at least one other type of gambling
- participants currently or had ever gambled using at least three different types of gambling.

Lottery, scratch cards and raffles via phone, should each be combined with at least one faster type of gambling (e.g. betting). A total of 1028 gamblers were asked to participate in the survey, and the response rate was approximately 70%. Overall, 719 questionnaires were included in the analysis.

Two different samples of gamblers were recruited to evaluate the ascertained characteristics and develop the scales using two distinct questionnaires (see Section 2.3). Concerning the evaluation of the ascertained characteristics, the sample size amounted to 363 gamblers. One hundred fifty-three respondents were classified as social gamblers (fulfilling a maximum of 2 DSM-IV criteria), 37 respondents were classified as problem gamblers (fulfilling three to four criteria) and 173 respondents were classified as pathological gamblers (fulfilling more than four criteria). For further analyses, subjects with missing values in the ranking orders were excluded. Of the included participants, 73.0% were male ($n = 265$), and 27.0% were female ($n = 98$). The mean age of the participants was 34.46 ± 11.86 years (the range was 18–78 years). The total sample consisted of 14 German experts of the Delphi study, 141 social gamblers and 186 problem and pathological gamblers. To obtain equal relevance for each subsample, the effects of each group were weighted. Ratings of experts from Austria and Switzerland were not included at this point because these experts were not able to rate four types of German gambling and further analyses were intended to be broadly based.

Concerning the development of the scales, the sample was composed of 150 social gamblers, 33 problem gamblers and 173 pathological gamblers ($n = 356$). Among the included participants, 73.3% were male ($n = 261$) and 26.7% were female ($n = 95$). The mean age of the participants was 34.65 ± 11.73 years (the range was 18–78 years). All experts were included in the weighted total sample because the evaluation of the characteristic scales was not based on country-specific features.

2.3. Procedure and instruments

The Delphi study included four survey phases. The first two phases applied to the selection of relevant characteristics concerning the risk potential of gambling types. Prior to the first phase of the survey, the monitoring team established a comprehensive list of all characteristics stated in the literature and sent it to the experts via email. The experts had to evaluate each characteristic concerning its potential effect on gambling behaviour of vulnerable gamblers and determine individual risk factors using a 7-point Likert-type scale (1 was low risk potential and 7 was high risk potential). In addition, the experts were asked to comment on the relevance of the single characteristics and the completeness of the list to suggest aggregations, exclusions and supplements.

In the second phase of the survey, the experts were informed about the results of the first phase. In addition, their data regarding the risk potential were aggregated, and supplemented characteristics were assessed. Furthermore, out of 15 total characteristics, the experts were required to select the characteristics that showed the highest potential to affect gambling behaviour of vulnerable gamblers (according to usability and existing tools).

The third phase of the survey mainly focused on the development of scales for single characteristics. The resulting scales were composed of different values of characteristics. In the first step, scales were constructed by the monitoring team based upon tangible scaling values of various characteristics for each gambling type, and scales were subsequently forwarded to the experts with feedback on the final selection of characteristics. The experts had to judge single scales concerning risk potential on a 5-point Likert-type scale ranging from ‘very low risk potential’ to ‘very high risk potential’. In addition, the experts suggested modifications of wording and semantic content when applicable. Furthermore, the experts were asked to arrange 12 different types of gambling in a ranking order according to their risk potential.

The fourth phase of the survey included an assessment of risk potential of single characteristics on a 5-point Likert-type scale with regards to different types of gambling. In addition, necessary modifications in the scaling of several characteristics required a reappraisal of the experts.

The results of the Delphi study were incorporated into two questionnaires for validation of ascertained characteristics (questionnaire 'characteristics') and developed scales (questionnaire 'scales'). In addition, both questionnaires assessed data on gambling experience and symptoms of problem and pathological gambling behaviour according to diagnostic criteria of the DSM-IV (Stinchfield, 2002).

Ten characteristics defined in the gambling provider and gambler survey by Beutel and Mörsen (2009) were confirmed by the experts in the present study. Furthermore, the list of characteristics was extended by the 'jackpot' and 'advertisement' characteristics that proved to be relevant in their survey, but had been excluded in the expert study. Thus, the extensions required subsequent evaluation of risk potential and respective scaling by the experts of the Delphi study.

According to the Delphi study, respondent gamblers were required to make an evaluation of the risk potential of characteristics and arrange 12 types of gambling in a ranking order in the 'characteristics' questionnaire. Ratings of the risk potential of each characteristic were assessed using a 5-point Likert-type scale in the 'scales' questionnaire.

The final selection of relevant characteristics to assess the risk potential of gambling types and determine their weights was based on the consolidation of experts' and gamblers' ratings. The weighting was based on the assumption that characteristics entered the overall evaluation of a gambling types' risk potential with different relevance and intensity. The determination of characteristic rankings was also based on integration of expert and gambler data.

2.4. Data analyses

The data of experts and gamblers were encoded after assessment to guarantee the anonymity of participants. Statistical analyses were conducted with SPSS (version 11.0, IBM, Munich, Germany). Descriptive statistics were applied to analyse the data of the Delphi study. These included means and standard deviations, which were based on the 7-point scales. Potential aggregations of characteristic scalings were based on paired *t*-tests. If two scaling values were aggregated, the arithmetic mean was calculated from both original means. The means of the characteristic scalings formed the basis of the scoring of the scales.

To determine the weights, an ordinal logistic regression analysis was carried out using single characteristics as covariates and the ranking of the 12 types of gambling as dependent variables. The most relevant characteristics were identified by stepwise regression with backward elimination (i.e. the successive removal of characteristics until all characteristics become significant).

The scale evaluation was based on testing differences between results of experts and gamblers using *t*-tests for independent samples, including results of the total sample.

Factorial validity for testing the instruments' dimensionality was based on principal component analysis of characteristics. Reliability was determined by parameters of internal consistency (Cronbach's α), homogeneity (mean inter-item correlation) and adjusted item-total correlations of single characteristics. To investigate the assessment tool's criterion-related validity, we employed Spearman's rank correlation, multiple linear

regression and binary logistic regression. Results of the assessment tool were related to empirical data on problematic types of gambling in surveys of gamblers seeking treatment (Meyer & Hayer, 2005), data on estimated odds ratios in national samples (BZgA, 2008) and data on the overall evaluation of risk potentials of gambling types (Beutel & Mörsen, 2009). According to Bühner (2006), correlation coefficients higher than 0.30 indicate an adequate criterion-related validity.

The coefficient of validity was determined by computing a Spearman's correlation between modes of ranking and results of the model. Ward's method of clustering was applied to classify different types of gambling by means of computed scores.

3. Results

Taking into account the experts' suggestions on retentions, aggregations, exclusions and supplements of single gambling activity characteristics, the original catalogue was reduced from 61 to 27 characteristics in the first phase of the Delphi survey (see Section 2.3).

In the second phase of the Delphi survey, the experts were required to select 15 characteristics out of the 27 that showed the highest potential to affect the gambling behaviour of vulnerable gamblers. Because only 14 of the 27 characteristics showed distinct frequencies of selection that were higher than the other characteristics, only 14 characteristics (instead of the intended 15) were included in further analyses. The 14 characteristics were event frequency, availability, method of payment, anonymity, light and sound effects, variable stake size, prize-back ratio, multi-game/stake opportunities, probability of winning, illusion of control features, cashout interval, near miss, continuity of the game and attraction of the maximum prize. Furthermore, two characteristics (i.e. 'jackpot' and 'advertisement') (Beutel & Mörsen, 2009) that had previously been empirically confirmed in a survey on gambling providers and gamblers were included in the subsequent analyses. Therefore, subsequent analyses were based on 16 characteristics.

The scaling of characteristics followed a synthesis of ratings of drafts acquired by the monitoring team and a specification of scalings by experts. For instance, a scale with nine scaling values for the characteristic 'event frequency' was presented to the experts. The results of the *t*-test suggested that the experts did not differ in the lower time scale of seconds [$t(24) = 0, p = 1$]. This led to the aggregation of the two scaling values, 'less than 6 seconds' and '6–15 seconds', into 'less than 15 seconds'.

Because single characteristics were assessed with different precision, the scaling varied between them. Scores resulting from the means were rounded up to 0.0 or 0.5. For instance, the scaling values 'gambling opportunities within 100 km' had a mean score of $M = 1.04$, which was rounded to a score of $p = 1$.

The scaling value 'gambling opportunities at home or at work' had a mean score of $M = 3.52$ and was rounded to a score of $p = 3.5$. Depending on the scaling of a characteristic, scores could vary between 0 (very low risk potential) and 4 (very high risk potential) on a 5-point Likert-type scale.

As a result of the survey on gamblers, the characteristic 'anonymity' was excluded from further analyses because the rating of the characteristic distinctly differed from the experts' rating. Surprisingly, gamblers rated the usage of electronic communication media for attendance of a game (e.g. purchase order or submission of a lottery ticket via internet) to be more risky than playing exclusively in a social environment. One possible explanation for this discrepancy was the ambiguity of the characteristic because social influences can act protectively and hazardously.

Ten relevant characteristics resulted from stepwise regression (with a level of significance of 0.05). For reasons of practicality, the weights of the 10 characteristics (computed by parameter estimates of the ordinal logistic regression ($0.092 \leq x \leq 0.612$) were transformed into values between 1 and 3 (Table 1). Method of payment, probability of winning, illusion of control features, advertisement, attraction of the highest profit and anonymity were not included in the final tool.

The experts' characteristic scales were essentially confirmed by either the results of the gambler survey or the total sample. However, with respect to single scalings of the characteristics, there were some marginal differences in scoring between the experts and the gamblers. The overall evaluation of these marginal differences led to preserving the experts' scales with involvement of modes. For reasons of practicality, we changed the wording of the characteristic 'multigame and multi-stake opportunities' (Table 2).

Reliability

The instrument showed an internal consistency of $\alpha = 0.91$. Item-total correlations ranged from 0.52 to 0.80, with the exception of the 'jackpot' characteristic ($r_{it} = 0.33$). The mean inter-item correlation amounted to $r_{ik} = 0.50$.

Factor structure

A principle component analysis revealed that a one-factor solution explained 56.82% of the assessment tool's total variance. The characteristics' loading on the factor ranged from 0.383 ('jackpot') to 0.865 ('event frequency').

Validity

The following data allowed an examination of criterion-related validity of the present assessment tool: (1) current empirical data on problematic types of gambling in surveys of treatment seeking gamblers in inpatient and outpatient facilities (Meyer & Hayer, 2005); (2) data on estimated odds ratios in national samples (BZgA, 2008); and (3) data on overall evaluation of risk potentials of gambling types on a Likert-type scale ranging from 0 (low risk) to 4 (high risk) (Beutel & Mörsen, 2009).

Binary logistic regression analyses revealed a significant relationship between the types of gambling experienced as problematic by gamblers (Meyer & Hayer, 2005) and the assessment tool's results [$W(1) = 568,\ 32;\ p < 0.001$]. Referring to representative

Table 1. Weighting of the characteristics.

Characteristics	Regression weights	Transformed weights
Event frequency	0.612	3.0
Multigame/ stake opportunities	0.354	2.0
Prize-back ratio	0.264	1.7
Light and sound effects	0.230	1.5
Variable stake size	0.184	1.4
Availability	0.173	1.3
Jackpot	0.171	1.3
Cashout interval	0.157	1.3
Near miss	0.143	1.2
Continuity of the game	0.092	1.0

Table 2. Definition and scaling of the characteristics.

Characteristic	Definition	Scaling							
Event frequency	Time unit between stake, outcome and proximate stake opportunity	More than 6 days	More than 24 hours to 6 days	More than 4 hours to 24 hours	More than 30 minutes to 4 hours	More than 3 minutes to 30 minutes	More than 1 minute to 3 minutes	15 seconds to 1 minute	Less than 15 seconds
		0	1	1.5	2	2.5	3	3.5	4
Cashout interval	Interval between game outcome and cashout	More than 3 days	More than 24 hours to 3 days	More than 4 hours to 24 hours	More than 30 minutes to 4 hours	More than 3 minutes to 30 minutes	More than 1 minute to 3 minutes	15 seconds to 1 minute	Less than 15 seconds
		0.5	1	1.5	2	2.5	3	3.5	4
Jackpot	Potential pool cumulated by stake amounts if wins have not been cashed out	Not available	0–99 euros	100–999 euros	1000–9,999 euros	10,000–99,999 euros	100,000–999,999 euros	1 million–50 million euros	More than 50 million euros
		0	1	1.5	2	2.5	3	3.5	4
Continuity of the game	Extent to which the game can be continued steadily or a change between different games is possible without a break	0–5 minutes of continuous gambling	More than 5 minutes to 15 minutes of continuous gambling	More than 15 minutes to 30 minutes of continuous gambling	More than 30 minutes to 1 hour of continuous gambling	More than 1 hour to 3 hours of continuous gambling	More than 3 hours of continuous gambling		
		0	1	2	3	3.5	4		
Prize-back ratio	Probability of winning (including prizes lower than the amount of stake)	0–4%	More than 4% to 24%	More than 24% to 49%	More than 49%				
		1	2	3	4				

Table 2 – *continued*

Characteristic	Definition	Scaling			
Availability	Ease of access to gambling	Gambling opportunies within a radius of more than 100 km	Gambling opportunies within a radius of 10–100 km	Local gambling opportunies within a radius of 10 km	Gambling opportunies at home or at work
		1	2	3	3.5
Multigame/stake opportunities	Opportunity to apply multiple stakes or engage in multiple games simultaneously	One game and one-stake opportunity	One game and multi-stake opportunities	Multigame and multi-stake opportunities	
		2	3	4	
Variable stake size	Extent to which the gambler can determine the stake size himself/herself	Fixed stake size	Variable but limited stake size	Unlimited stake size	
		2	3	4	
Light and sound effects	Auditory and visual effects during the game and the presentation of the game	Not available	Either light or sound effects available	Light and sound effects available	
		0	2	3	
Near miss	Game outcomes suggesting a near miss	Not intentionally generated, occurring randomly	Intentionally generated by the game provider/ producer, occuring frequently		
		1	4		

samples (BZgA, 2008), multiple linear regression yielded an R^2 value of 0.84. This result implies that 84% of the variance of odds ratios could be explained by the assessment tool's calculated total score in single types of gambling. Spearman's rank correlation coefficient between the overall evaluation of risk potential of gambling types (Beutel & Mörsen, 2009) and the results of the assessment tool was 0.92.

Calculation of risk potential of gambling types

The calculation of the risk potential of gambling types was conducted by multiplying the single weights with each of the characteristics' scaling values and summing the scores to obtain a total score. This required an exact determination of evaluation criteria within a scoring manual. Therefore, the definition of scaling values was based on real conditions rather than legal specifications. For example, according to the German Gambling Ordinance, the highest possible profit per game when using gaming machines was limited to two Euros. Gamblers, however, could achieve profits of up to an equivalent of €10,000 by winning credits and then transferring them into money (Meyer, 2008).

Cluster analysis

Based on the scoring manual, we calculated the total scores of 14 German types of gambling (Meyer & Bachmann, 2005). Total scores ranged from 11.65 (minimum score) to 60.65 (maximum score). Five clusters, which were determined with reference to Ward's method and the dendrogram, represented differential risk potentials of gambling types and allowed a classification of the risk potential.

Slot machines (in casinos) and gaming machines (in arcades) were embraced in the scope of the first cluster and were associated with a *very high* risk potential. The second cluster consisted of gambling types with a *high* risk potential, such as online poker, live sports betting using the internet and roulette in casinos. Scratch cards, fixed odds betting and TV raffles ranked among the third cluster, which reflected a *moderate* risk potential. Keno, lottery 'Lotto 6 out of 49', class lottery on the internet and local lottery agencies were assigned to the fourth cluster, which had a *low* risk potential. A *very low* risk potential was obtained by social or charity lotteries on TV, that provide tickets on the internet and by local lottery agencies (Figure 3).

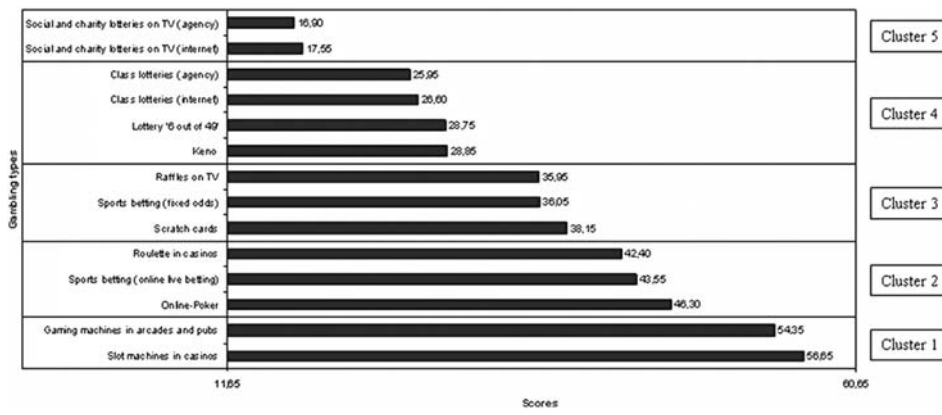

Figure 3. Application of the assessment tool: classification of gambling types.

The average of the highest score of one cluster and the lowest score of another formed the boundaries between the two adjacent clusters. The mean distance to an existing group can alternatively be used to evaluate a new gambling type because this demarcation essentially serves as an orientation. In addition to the transformation of weights, the scores of gambling types, for example, can be transferred into a range of 0 to 100.

4. Discussion

The development of the present assessment tool began with the realization that gambling types can be distinguished by characteristics resulting in different risk potentials for vulnerable gamblers. Through theoretical and conceptional analyses, gambling types demonstrating a quick succession and an immediate feedback of wins and losses (e.g. slot machines, roulette) were considered to be more hazardous in terms of addiction.

We also conducted an evidence-based evaluation of the risk potential by means of rule-governed assessment and the weighting of structural (related to game itself) and situational (related to context of game) characteristics. The 10 characteristics determined by the Delphi study and the gambler surveys represented an expansion and a higher differentiation of characteristics compared with previously identified characteristics.

With respect to empirical analysis, the characteristics showed high homogeneity and internal consistency. Except for the 'jackpot' characteristic, item-total correlations were high. The correlation coefficient of the 'jackpot' characteristic was higher than the required criteria of 0.30 (Bühner, 2006); therefore, we can assume high reliability and minor procedure-based influences on the results of the measure (Lienert & Raatz, 1998). Homogeneity and consistency were also reflected by the one-dimensional structure of the selection of the characteristics. All 10 characteristics were assigned to one common factor and we assumed that the assessment tool allowed measurement of the risk potential of gambling types in terms of a consistent construct. In contrast, theory-based classification in situational and structural characteristics (Abbott, 2007; Parke & Griffiths, 2007) was not reproduced by the characteristic selection of the assessment tool. This can be attributed to a focus on structural aspects in the characteristic selection determined by regression analyses. Except for 'availability', all characteristics needed to be classified as structural characteristics. One should bear in mind, however, that theory-based classification of the situational and structural characteristics, and their relations to other influencing variables (e.g. structure of the present gambling market), have not been sufficiently examined.

Significant positive correlations of the assessment tool with data on problematic gambling patients from treatment facilities (Meyer & Hayer, 2005), prevalence rates of problem and pathological gambling behaviour related to different gambling types (BZgA, 2008), and the overall evaluation of risk potential of gambling types (Beutel & Mörsen, 2009) indicate a sufficient measure of risk potential and validity of the assessment tool's characteristic selection.

A comparison of the selection of characteristics and the instrument used by Griffiths et al. (2008) demonstrates that 8 out of 10 characteristics correspond to each other with regards to content, although they are based on different scalings. In contrast, the characteristics 'currency/ease of pay' and 'illusion of control' listed in the Anglo-American instrument failed to reach statistical significance in the regression analysis. Instead, 'cashout interval' and 'light and sound effects' were empirically supported. Therefore, based on expert ratings and comparison with the instrument used by Griffiths et al. (2008), good face validity can be assumed for the characteristics of the present assessment tool.

Such a tool is of practical relevance for legislation, jurisdiction, administrative practice, gambling providers and gamblers (Wissenschaftliches Forum Glücksspiel, 2008, 2010). In addition, the present assessment tool may serve as a basis for future political and legal decision processes. Current demand for such a tool has been supported by the European Parliament's request with the majority of the EU commission on 10 March 2009, to clarify the possibility of establishing a common European classification of gambling types according to their risk potential (Ausschuss für Binnenmarkt und Verbraucherschutz, 2009).

Gambling providers can utilize the assessment tool to examine and modify risk potential of current gambling products, and recognizable risks could potentially be reduced during the development of new products. If the evaluation of a game leads to a high risk potential, changes involving single or multiple structural characteristics of the game, such as lowering event frequency, duration of continuous gambling or reduction of multigame/stake opportunities, may lower the risk potential. Furthermore, primary prevention measures, such as limitations on stake and loss size, pop-up information on current losses, game duration or the use of smart cards for early detection of gambling related problems, could be implemented. The extent to which these measures influence gambling behaviours concerning harm reduction has already been rudimentally examined (e.g. Blaszczynski, Sharpe & Walker, 2001; Monaghan, 2008; Schellinck & Schrans, 2004, 2006), but a final evaluation of the efficacy requires further convincing research.

Regarding the consumer's perspective, the assessment tool provides orientation and detailed information on single risk factors, and promotes responsible gambling. High-risk types of gambling can be more readily identified and the modification of gambling behaviour, including the abandonment of engagement, is a possible consequence. Potential outcomes for consumers, however, depend on individual factors, such as subjective gambling experiences and development of their addiction. Certainly, this tool will not be noticed by an addicted gambler.

Regarding the interpretation of the current findings, it should be noted that test objectivity has not been evaluated. A detailed manual focusing on gambling products is required to ensure high independence of the rater. In addition, new types of structural and situational characteristics have to be taken into account due to technological improvements and the dynamics of the gambling market. These factors demand ongoing advancement of the assessment tool. A product-focused determination of the risk potential greatly neglects different populations of gamblers, interactions with consumers and social and cultural conditions. For instance, adolescents are attracted to different types of gambling than adults (Hayer & Meyer, 2008). Specific traits of gamblers, such as personality traits and affective disorders, can also affect the preference of specific types of gambling (Meyer & Bachmann, 2005). The preference of Pachinko among Japanese (Tanioka, 2000), card games and dice among Chinese (Raylu & Oei, 2004) and lotteries among the poor population of South Africa (Collins & Barr, 2006) demonstrate examples of the influence of cultural and social conditions. Measures of player protection, including prevention concepts that obligate early detection among gambling providers and intending gambling exclusions, are not assessed by the present tool.

Furthermore, interactions or exponential effects between characteristics should be taken into account because the identified characteristics do not act independently on risk potential (i.e., they are mutually dependent). For example, one characteristic may be effective only when another characteristic is present. Although the limitations of validity described in the present study suggest the need for further research, the necessity of including an assessment tool for gambling risk in public health strategies for the prevention of gambling addiction cannot be disputed.

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References

Abbott, M.W. (2007). Situational factors that affect gambling behavior. In G. Smith, D.C. Hodgins, & R.J. Williams (Eds.), *Research and measurement issues in gambling studies* (pp. 251–278). Burlington, MA: Academic Press.

Airas, A., & Järvinen, A. (2008, July). *Tool for responsible games*. Paper presented at the 7th European Conference on Gambling Studies and Policy Issues, Slovenia, Nova Gorica.

Ausschuss für Binnenmarkt und Verbraucherschutz (2009). *Bericht über die Integrität von Online-Glücksspielen*. [Report on the integrity of online gambling]. Retrieved 17 March 2009 from http://www.europarl.europa.eu/sides/getDoc.do?pubRef=-//EP//NONSGML+REPORT+A6-2009-0064+0+DOC+PDF+V0//DE

Beutel, M., & Mörsen, C. (2009, February). *Ergebnisse der Validierungsstudie* [Results of the validation study]. Paper presented at the workshop of the Wissenschaftliches Forum Glücksspiel, Bonn, Germany.

Blaszczynski, A., Sharpe, L., & Walker, M. (2001). The assessment of the impact of the reconfiguration on electronic gaming machines as harm minimisation strategies for problem gambling, final report. Sydney, Australia: University of Sydney.

Bühner, M. (2006). *Einführung in die Test- und Fragebogenkonstruktion* [Introduction in test and questionnaire design] (2nd ed.). München: Pearson.

Bühringer, G., Kraus, L., Sonntag, D., Pfeiffer-Gerschel, T., & Steiner, S. (2007). Pathologisches Glücksspiel in Deutschland: Spiel- und Bevölkerungsrisiken [Pathologic gambling in Germany: gambling and population based risks]. *Sucht*, *53*, 296–308.

Buth, S., & Stöver, H. (2008). Glücksspielteilnahme und Glücksspielprobleme in Deutschland: Ergebnisse einer bundesweiten Repräsentativbefragung [Gambling and gambling problems in Germany: Results of a national survey]. *Suchttherapie*, *9*, 3–11.

BZgA (Bundeszentrale für gesundheitliche Aufklärung) (2008). *Glücksspielverhalten und problematisches Glücksspielen in Deutschland 2007. Ergebnisse einer Repräsentativbefragung* [Gambling behaviour and problem gambling in Germany 2007. Results of a representative survey]. Retrieved 5 January 2009 from http://www.bzga.de/studien

Collins, P., & Barr, G. (2006). *Gambling and problem gambling in South Africa. The national 2006 prevalence study*. Kapstadt, South Africa: National Centre for the Study of Gambling.

GamCare (2007). *Care services report*. Retrieved 2 February 2009 from http://www.gamcare.org.uk/data/files/publications/a4_care_services_report_final.pdf

Griffiths, M.D., Wood, R.T.A., & Parke, J. (2008). GAM-GaRD*: A new social responsibility tool*. Retrieved 29 January 2009 from http://www.ncpgambling.org/files/members/NCPG_Fall08-newsVol11_I3_.pdf

Häder, M., & Häder, S. (2000). Die Delphi-Methode als Gegenstand methodischer Forschungen [The Delphi method as subject of methodic research]. In M. Häder & S. Häder (Eds.), *Die Delphi-Technik in den Sozialwissenschaften. Methodische Forschungen und innovative Anwendungen* [The Delphi method in social science. Methodological research and innovative applications] (pp. 11–31). Wiesbaden, Germany: Westdeutscher Verlag.

Hayer, T., & Meyer, G. (2008). Problematisches Glücksspielverhalten [Problem gambling behaviour]. In H. Scheithauer, T. Hayer, & K. Niebank (Eds.), *Problemverhalten und Gewalt im Jugendalter* [Problem behaviour and violence in adolescence] (pp. 161–179). Stuttgart, Germany: Kohlhammer.

Lienert, G.A., & Raatz, U. (1998). *Testaufbau und Testanalyse* [Test design and test analysis] (6th ed.). Weinheim, Germany: Beltz.

Meyer, G. (2008). Glücksspiel – Zahlen und Fakten [Gambling – facts and figures]. In Deutsche Hauptstelle & für Suchtfragen (Eds.), *Jahrbuch Sucht 2008.* [Addiction Yearbook 2008] (pp. 120–137). Geesthacht, Germany: Neuland.

Meyer, G., & Bachmann, M. (2005). *Spielsuch:. Ursachen und Therapie* [Gambling addiction: Causes and therapy] (2nd ed.). Heidelberg: Springer.

Meyer, G., Häfeli, J., Mörsen, C., & Fiebig, M. (2010). Die Einschätzung des Gefährdungspotentials von Glücksspielen: Ergebnisse einer Delphi-Studie und empirischen Validierung der Beurteilungsmerkmale [The risk potential of different gambling types: Results of a Delphi study and empirical validation of assessment criteria]. *Sucht*, *56*, 405–414.

Meyer, G., & Hayer, T. (2005). *Das Gefährdungspotenzial von Lotterien und Sportwetten. Eine Untersuchung von Spielern aus Versorgungseinrichtungen* [The risk potential of lotteries and sports betting. A survey on gamblers from health care facilities]. Düsseldorf, Germany: Ministerium für Arbeit, Gesundheit und Soziales des Landes Nordrhein-Westfalen.

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*, 214–222.

Nutt, D., King, L.A., Saulsbury, W., & Blakemore, C. (2007). Development of a rational scale to assess the harm of drugs of potential misuse. *The Lancet*, *369*, 1047–1053.

Parke, J., & Griffiths, M.D. (2007). The role of structural characteristics in gambling. In G. Smith, D.C. Hodgins, & R.J. Williams (Eds.), *Research and measurement issues in gambling studies* (pp. 218–249). Burlington, MA: Academic Press.

Productivity Commission (2010). *Gambling, Report no. 50*. Canberra, Australia: Australian Government.

Raylu, N., & Oei, T.P. (2004). Role of culture in gambling and problem gambling. *Clinical Psychology Review*, *23*, 1087–1114.

Schellinck, T., & Schrans, T. (2004). Identifying problem gamblers at the gambling venue: Finding combinations of high confidence indicators. *Gambling Research*, *16*, 8–24.

Schellinck, T., & Schrans, T. (2006). *Raising the bar: Using loyalty data to manage risk*. Paper presented at the 13th International Conference on Gambling and Risk Taking, USA, Lake Tahoe.

Spielsuchthilfe (2007). *Tätigkeitsbericht* [Activity report]. Retrieved 12 February 2009 from http://www.spielsuchthilfe.at/pdf/tatigkeitsbericht2007btas.pdf

Sproston, K., Erens, B., & Orford, J. (2000). *Gambling behaviour in Britain: Results from the British Gambling Prevalence Survey*. London: National Centre for Social Research.

Stinchfield, R. (2002). Reliability, validity, and classification accuracy of the South Oaks Gambling Screen (SOGS). *Addictive Behaviors*, *27*, 1–19.

Tanioka, I. (2000). *Pachinko and the Japanese Society*. Osaka, Japan: Osaka University of Commerce.

van Amsterdam, J.G.C., Best, W., Opperhuizen, A., & de Wolff, F.A. (2004). Evaluation of a procedure to assess the adverse effects of illicit drugs. *Regulatory Toxicology and Pharmacology*, *39*, 1–4.

Veikkaus (2008). *Veikkaus' Year 2007: Annual report, corporate responsibility report*. Vantaa, Finland: Veikkaus.

Wardle, H., Sproston, K., Orford, J.M., Erens, B., Griffiths, M., & Constantine, R. (2007). *British Gambling Prevalence Survey 2007*. London: National Centre for Social Research.

Wissenschaftliches Forum Glücksspiel (2008). Mess- und Bewertungsinstrumente zur Feststellung des Gefährdungspotentials von Glücksspielprodukten [Assessment tool to measure and evaluate the risk potential of gambling products]. *Zeitschrift für Wett- und Glücksspielrecht*, *1*, 1–11.

Wissenschaftliches Forum Glücksspiel (2010). Mess- und Bewertungsinstrumente zur Feststellung des Gefährdungspotentials von Glücksspielprodukten [Assessment tool to measure and evaluate the risk potential of gambling products]. *Zeitschrift für Wett- und Glücksspielrecht*, *5*, 305–311.

Wood, R.T.A., Griffiths, M.D., & Parke, J. (2008). *GAM-GaRD: Gaming Assessment Measure – Guidance about Responsible Design*. Retrieved 12 February 2009 from http://www.gamgard.com/documents/GAM-GaRD%20IRGO.pdf