Zeppelin Universität

Department Communication and Cultural Management

Master Thesis

Who dares to guess: Risky choice and gambling attitudes in an experimental research design of *Who Wants To Be A Millionaire?*

Author: Johanna Rahn

Matriculation number: 10200237

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First reviewer: Jun. Prof. Dr. Marco Hubert

Second reviewer: Dr. Susanne Leder

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Abstract

How do gambling affine players differ from non-affine players in their gaming behavior? Fifty-four low and high gambling affine participants played the *Who Wants To Be A Millionaire?* quiz in a laboratory setting in two different gaming modes. The normal mode is more likely to be chosen by non-gamblers, and behavior is more safety-driven, participants using more lifelines and denoting smaller losses ($p<.05$) than players in the risk mode. However, within the modes, gamblers as opposed to non-gamblers are observed to act more carefully, also using more lifelines ($p<.05$), denoting smaller losses ($p=.054$), and being more likely to end the game voluntarily ($p<.01$). It is suggested that caution is moderated by experience and emotional involvement in the game. In a second study, behavior and outcomes of thirty-four participants in the TV setting were observed, finding an overall similarity between the modes. The impact of loss aversion is suggested to differ between the settings, allowing more diversity in the outcomes in the laboratory setting.

Zusammenfassung

Wie unterscheiden sich glücksspielaffine und nicht-glücksspielaffine Spieler in ihrem Spielverhalten? Vierundfünfzig Spieler mit niedriger und hoher Glücksspielaffinität spielten in einem Labor das Quiz *Wer wird Millionär?* in zwei verschiedenen Spielmodi. Der normale Spielmodus wird öfter von nicht-glücksspielaffinen Spielern gewählt und das Spielverhalten zeichnet sich durch mehr Vorsicht aus, indem Teilnehmer mehr Joker einsetzen und geringere Verluste verzeichnen ($p<.05$) als Spieler im Risikomodus. Allerdings zeigt sich innerhalb der Modi, dass glücksspielaffine Teilnehmer ebenfalls vorsichtiger agieren als nicht-affine Spieler. Auch sie benutzen mehr Joker ($p<.05$), verzeichnen geringere Verluste ($p=.054$) und beenden das Spiel öfter freiwillig ($p<.01$). Dieses vorsichtige Verhalten wird vermutlich durch Erfahrung und emotionale Beteiligung. In einer zweiten Studie wurden das Spielverhalten und die Ergebnisse von 34 Teilnehmern in der Fernsehquizshow beobachtet und eine allgemeine Ähnlichkeit zwischen den Modi festgestellt. Dies wird auf Unterschiede in der Verlustaversion zwischen den Szenarien zurückgeführt, die zu einer größeren Ergebnisvielfalt in der Laborstudie führen.

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1 Introduction

Individuals differ largely in their attitude toward gambling. While some people are inclined to make guesses and enjoy the thrill of uncertainty, others avoid these kinds of situations whenever possible. Within a game based on uncertainty, this can lead to considerable differences in behavior.

In the huge field of risk taking research, gambling behavior has attracted the attention of economists, psychologists, sociologists, mathematicians, anthropologists, and experts from many other disciplines. Indeed, the questions behind the concept of gambling are intriguing: Who are the people that like to take risks? What motivates them? And what kinds of risk are acceptable?

In this context, Kahneman and Tversky's prospect theory has received a lot of attention, describing the irrational behavior of decision-makers. Based on their approach, gambling behavior has been examined from different angles. One of these angles is economic decision making with large stakes. In order to analyze real gambling behavior when huge amounts of money are involved, researchers have repeatedly used data material of gaming shows like *Who Wants To Be A Millionaire? (WWTBAM)*. These studies have shown how cultural and social factors influence gaming behavior, or calculated optimal gaming strategies. However, no study could be found that analyzes gaming behavior in a *WWTBAM* scenario based on differences in gambling attitudes. Filling this gap, this paper takes a unique approach by recreating the *WWTBAM* game in a laboratory setting and comparing gaming behaviors of gambling-affine and non-affine players. Based on findings in prospect theory, the analysis focuses on the impact of loss aversion and cognitive biases on participants' risk taking behavior in the game.

The findings of this paper are based on two studies. In the first study, the game was adapted to a laboratory setting and tested with college students. The second study is based on observations of the TV quiz show. The results of the

latter serve to compare the findings from the laboratory settings to a real-life-scenario. Hereby, differences can be identified and used for future improvements of the of the laboratory setting.

In the first part of the paper, the theoretical background of the topic is depicted, focusing on prospect theory and the measurement of gambling attitude. Second, the qualification of the *WWTBAM* game as a gambling scenario is discussed. Based on this, the expected results of using the game as a risk scenario and the impact of low and high gambling affinities on risk perception and risk behavior are put into hypotheses.

In the empirical section of the paper, Study 1 tests the adjusted gaming scenario in a laboratory setting, whereas in Study 2, observations of the TV show are analyzed. In the general discussion, findings of both studies are compared and put into a relationship, in order to estimate the value of using the *WWTBAM* game in gambling research and to further improve it.

2 Background

In the economic context, risk taking behavior has long been linked to the expected utility framework. As part of decision theory, it provides a normative model of how choices should be made (von Neumann & Morgenstern, 1944/2004). However, critics of the model have repeatedly stated that, as a normative model, this approach is not fit to explain real decision behavior (Allais, 1953; Markowitz, 1952; Slovic, Fischhoff, Lichtenstein, Corrigan, & Combs, 1977; Fishburn, 1977). Most famously, Kahneman and Tversky (1979) collected all violations of the model, which was the origin of prospect theory. Advocating a descriptive approach, prospect theory accounts for the irrational decision-maker who is loss-averse and prone to cognitive biases. One of its most important features is its definition of gains and losses not depending on the final states of assets, but in terms of changes in wealth relating to a context dependent reference point. Furthermore, prospect theory emphasizes the

distinction of negative and positive lotteries, defining loss aversion as risk aversion for gain-frames, but as risk-seeking behavior in lotteries that are based on losses.

The assumed loss aversion of prospect theory is also one of the crucial elements in the psychological approach to decision theory. Loss aversion is seen as one of the most constant factors in risk taking behavior (Pratt, 1964; Slovic, 1964; Slovic, 1987; Weber, Blais, & Betz, 2002) and is referred to as the *attitude toward a perceived risk*. The term has been introduced by Weber and Milliman (1997)[1] who thereby renewed the concept of *risk repugnance* (Yates & Stone, 1992), avoiding emotional evaluations in the term. The idea, however, has remained the same, stating that people always evaluate risk negatively as long as it is related to gains. All counterevidence, according to Weber et al. (2002), is merely a result of discrepancies between the observer and the decision maker. In other words, there is always a reason why people take risks.

In addition to the attitude toward a perceived risk, *risk perception* is a second variable in the psychological risk-return framework, which is used to explain behavioral differences that are observed in spite of people's overall risk aversion. Risk perception is the subjectively perceived riskiness of choices and therefore less predictable. It varies between individuals as well as between contexts. Slovic (1964, p.228) captures the concept well, giving the example of a lion tamer and his audience:

> „(...) lion tamers perform their duties with a nonchalance arising from a realistic knowledge of the probabilities of injury, amidst excited crowds who, projecting their own subjective probabilities of failure, feel that the performers are taking great risks."

Risk perception, in any domain, is thus the "intuitive risk judgment" (Slovic, 1987, p. 281) that is primarily based on the relationship between perceived probabilities, which depend on perceived controllability and familiarity, and losses. In terms of a quiz, guessing when the answer to a question is unknown

[1] The exact term used by Weber & Milliman (1997) is *perceived-risk attitude*, but in later work it is reframed as the *attitude toward a perceived risk.*

can thus be defined a risk whose severity depends on the circumstances of the game and the gravity of perceived probabilities and losses.

Different attempts have been made in order to explain and predict risk taking behavior, which is influenced by both, the attitude toward a perceived risk and the perception of the risk. Budner (1962) developed the *Intolerance of Ambiguity Scale*, measuring the agreement to sixteen statements in order to determine an individual risk taking score, based on risk perception. Kogan & Wallach (1964) introduced the *Risk-Attitude Scale*, operating with twelve forced choice dilemmas from different domains. Again, a final score was calculated to measure individuals' risk attitudes. Although measured across different domains, these single final scores do not provide information about differences in risk-attitudes in different domains. Yet, different contexts have been found to have significant impact on risk perception (Ajzen & Fishbein, 1977; Zuckerman, 1979). Depending on the context, not only familiarity with risks and the feeling of controllability vary, also the affection toward risks differs depending on the domain (Loewenstein, Weber, Hsee, & Welch, 2001).

Zuckerman therefore developed the *Sensation-Seeking Scale*, which has been updated frequently and currently exists in its fifth version (2007). It measures the attitude toward sensation seeking for thrill- and adventure-seeking, experience-seeking, disinhibition, and boredom susceptibility. An alternative model has been developed by Weber et al. (2002), who use specific context-categories in their *domain specific risk taking (DOSPERT)* scale. In its revised form (Blais & Weber, 2006) it measures risk perception and the attitude toward perceived risks in five domains: social decisions, ethical decisions, recreational decisions, health/safety decisions, and financial decisions, which are further divided into gambling and investments decisions. All of these domains have been identified by literature before (MacCrimmon & Wehrung, 1990; Slovic, Fischhoff, & Lichtenstein, 1982) and are rather task-specific, so they allow measurements very well suited for financial decision-making under risk.

Thus, provided a gaining frame, risk aversion is one of the fundamental behavioral patterns in risk taking of human beings. However, the influence of subjective risk perception still creates a variety of different choices between individuals and for each individual between different risk domains. Gambling has been defined as such domain (Slovic 1964; Weber et al. 2002). While falling under the category of financial risk taking, it differs from other kinds of risky decision, for example investments, in its properties of controllability (March & Shapira, 1987). Risks being decisions in which skills and information can reduce uncertainty, the odds of gambles are determined exogenously, thus cannot be influenced. This managerial approach is in lines with more general economic definitions of gambles as decision-making under uncertainty, which assume the independence of probabilities from the decision-maker (von Neumann & Morgenstern, 1944/2004; Pratt, 1964; Bolen & Boyd, 1968; Kahneman & Tversky, 1979). Psychological definitions of gambling often distinguish between social gamblers and problem gamblers, contrasting the objectively given probabilities with irrational and erroneous beliefs of control of problem gamblers (Ladouceur, 2004; Sundali & Croson, 2006). Although differentiating between people with low and high gambling affinity (in the following referred to as *gamblers* and *non-gamblers*), this paper explicitly does not involve any assessment of gambling as a disease.

3 *Who Wants To Be A Millionaire* as a scenario in risk research

3.1 Description of the game

The TV quiz show *Who Wants To Be A Millionaire?* (*WWTBAM*) has been on air in Germany since 1999, broadcasted twice a week with an average market share of 15-20% (Schering, 2012).

The game consists of up to 15 multiple choice knowledge questions, which must be answered to win the full amount of 1 Million €. With each question, four

possible answers are provided. After hearing a question, a candidate has always three options: (i) to quit the game voluntarily with the money won so far; (ii) to give an answer and to continue if it is correct, or to end the game with a fix amount of money if it is incorrect; (iii) to use a lifeline and then decide whether to give an answer, quit, or use another lifeline. The amount of money that can be won rises with each question, starting with 50€, and always almost doubling in value with each question.

Before starting the game, candidates must choose between two modes. In terms of decision theory, this can be seen as a trade off between two different kinds of insurances. The *normal mode* is the original format in which each contestant has three lifelines and two fix security levels at which the money won so far is banked and cannot be lost, even when a wrong answer is given (500€ after the fifth question and 16000€ after the tenth question). In the *risk mode*, introduced to the game in 2007, candidates play with only one security level (500€ after the fifth question), but with four lifelines. The lifelines are (i) the *50/50 option*, which removes two wrong answer possibilities; (ii) *asking the audience*, a lifeline which offers the audience's take in the answer in percentages; (iii) *phoning a friend*, a lifeline that allows the contestant to call one of three previously assigned persons and talk to him or her for 30 seconds. Finally, in the risk mode, the contestants have the fourth (iv) *additional lifeline*, in which they can ask who in the live audience believes to know the answer and then pick one member of the audience to consult with. The member of the audience can win 500€ if the answer he or she gives is correct, independent from the answer the candidate finally chooses. Every lifeline can only be used once, but the candidates can use as many lifelines as they like for each question, and they can still quit the game voluntarily after using one or more lifelines.

3.2 *WWTBAM* as a scenario in risk research

Investigating a TV quiz show to study economic decision making, and gambling behavior in particular, is a common approach when very high stakes

must be involved (Post, van den Assem, Baltussen, & Thaler, 2008). Examples are examinations of *Deal or no deal* (Post et al. 2008; de Roos & Sarafidis, 2009), *Card Sharks* (Gertner, 1993), and *Jeopardy!* (Metrick, 1995). TV formats are in a position to offer real incentives in quantities that research cannot provide[2] and thus provide data that otherwise could not be gained. Also, the probabilities of losing and gaining money are very clear in the games and the setting is rather stable. It has been argued, though, that the sample of contestants is far from representative (Lehmann & Warning, 2003; Franzen & Pointner, 2009). Despite this common criticism, no study was found that simulates a TV quiz show in a controlled laboratory environment.

This is also true for *WWTBAM*. Most research on the format has been based on observations of the show, sometimes supplemented by questionnaires completed by former participants of the show (Franzen & Pointner, 2009). So far, investigations can be categorized into the following groups: examinations of the relation of gender and financial risk taking (Lehmann & Warning, 2003; Holmes, 2005; Johnson & Gleason, 2009), the identification of success factors or factors influencing risk aversion (Hartley, Lanot, & Walker, 2006; Prinz & Wiendl, 2005; Franzen & Pointner, 2009), the comparison of cultural differences in risk taking (Hetsroni & Tukachinsky, 2003; Hetsroni, 2004; Daghofer, 2007), and the mathematical calculation of optimal gaming strategies or of the value of the different lifelines within the game (Quinn, 2003; Dalang & Bernyk, 2004; Perea & Puerto, 2007). The German version of the game show has been examined in terms of risk by Lehmann and Warning (2003), Prinz and Wiendl (2005), and Franzen and Pointner (2009), however none of the studies include the unique option of the second gaming mode. Therefore, this paper fills a research gap by applying the game to a laboratory setting and examining the consequences of having two gaming modes with different kinds of risk insurances and connotations of risk.

In order to analyze the game from the perspective of decision theory, it can be summarized as a series of compound lotteries with fix probabilities (Figure

[2] With the exception of some studies conducted in countries with a relatively low income average, in which comparatively high incentives could be paid (Binswanger, 1981).

1). Every question level (Q1-Q15) consists of two parts. First, there is the initial choice between taking a certain amount of money and ending the game, or entering into the next lottery. Then, if entered, each lottery has a .25 probability of winning, and a .75 probability of losing. After reaching a security level, participants still play for the opportunity to continue playing. Thus, even when candidates have reached a free-shot question, the loss in terms of an early end of the game and no further and higher winnings is to be considered.

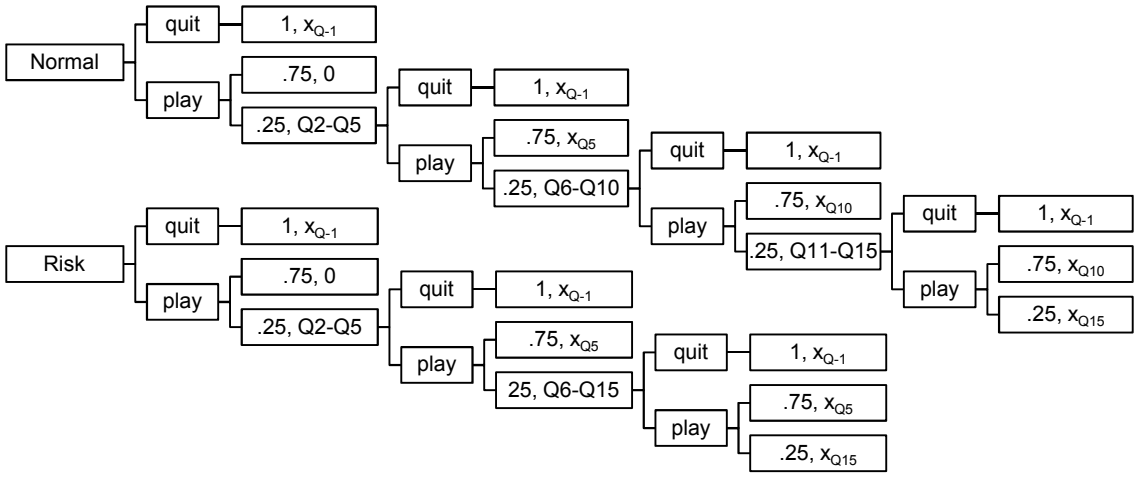

Figure 1: Decision tree

The probabilities can be outweighed by knowledge, that is, when the candidate knows the correct answer or can exclude one or two options, either through knowledge or by using a lifeline. Dalang and Bernyk (2004, p.6) define the five most common states of knowledge in the game:

State 0: the player definitely knows the answer (zero uncertainty).
State 1: the player is confident, but not certain, that he knows the correct answer.
State 2: the player hesitates between 2 answers (the other two are unlikely).
State 3: Two answers were just eliminated by the computer by using the 50:50 lifeline, but the player still hesitates between the two remaining answers.
State 4: the player has no idea of the answer (hesitates between all 4 answers).

Two additional states can be added, based on own observations:

State 5: the player can exclude one answer but hesitates between the remaining three answers
State 6: one answer is strongly indicated to be correct by a lifeline, but the answer contradicts the player's own assumed knowledge or intuition.

Statistics show that only seven regular and three celebrity participants won the jackpot since the beginning of the show. Thus, for the overwhelming majority, at least the last question played can be defined as a gamble with an objective 1:4 or 1:2 probability.

In a review of several traditional gambling games like coin flipping, *Black Jack*, or *Roulette*, and other commonly used gambling scenarios like the *Iowa Gambling Task* (Bechara, Damasio, Damasio, & Anderson, 1994), the *Cup Task* (Levin, Weller, Pederson, & Harshman, 2007), or the *Columbia Card Task* (Figner, Mackinlay, Wilkening, & Weber, 2009) the following criteria were identified as being crucial for a gambling task: the task needs to require participants to make a choice under uncertainty, probabilities must be distributed clearly, and there are better and worse outcomes, providing a risk premium for those who decide to continue playing. Finally, participants must also comprehend the game, which can be a challenge with more complex tasks. Based on this and the analysis above, the *WWTBAM* game design provides all necessary characteristics to qualify as a gambling task in risk research. Also, being very popular with a majority of the population, it has a definite advantage over other scenarios.

In contrast to most of the other risk tasks, the *WWTBAM* scenario is not primarily based on repetition. Although the scheme repeats itself, stakes grow and lifelines decrease, and as soon as a participant gives a wrong answer or decides to quit, the game is over. This can however be used as an advantage of the game, fortifying high involvement and making advancement in the game one of the defining factors of the outcomes. Further value is gained from the impact that knowledge contributes to the game, which allows game manipulations using certain areas of expertise, or comparisons of groups with different educational background. Finally, the bisection of the game into the choice of the mode and the sequence of questions offers an integrated 1x2 design, providing sets of data that can be interpreted separately, compared, and related to gambling behavior.

4 Hypotheses

The paper's focus lies on the examination of the relation of gaming behavior and gambling attitude. This is done using a risk scenario that researchers have repeatedly observed on TV, but that has never been reproduced in a laboratory setting. In this simulation of *WWTBAM*, it is generally expected to find that gamblers behave differently from non-gamblers. In the following, this assumption will be broken down into four main hypotheses.

Analogous to the naming in the TV show, the two modes compared in the study are called *normal mode* and *risk mode*. The choice between the two modes can be described as the choice between two kinds of insurances: either, the candidate can secure a certain amount of money once the tenth level is reached, or he or she chooses to have a fourth lifeline and thus the option of reducing uncertainty at any level.

Analyzing these two modes, it can be argued that the first option would be more appealing to risk-seeking players. It provides fewer options for securing an answer, but compensates the increase in uncertainty by offering a risk premium, which is a higher certain payoff, once the tenth question is answered. This option is favorable if it is assumed that the tenth question can be reached and answered correctly with only three lifelines, and if participants are inclined to gamble when higher stakes are at risk.

The second option seems well suited for risk-averse players, offering them an additional option to increase probabilities of winning at any decision point. Contestants preferring this option could be assumed to want to avoid gambling, especially when high stakes are involved. Therefore, a second security level is only beneficial to them under three conditions: if they reach the second security level, in case they do not know the answer to the eleventh question, and if they cannot reduce uncertainty by using a lifeline.

This interpretation of the two gaming modes, however, is inconsistent with the actual framing of the gaming modes. In the game, both modes are defined

by the number of security levels rather than by the value of a fourth lifeline. Assuming that participants in the game are familiar with the rules, and accounting for the conflict with the framing effect (Kahneman & Tversky, 1979), it is expected to find irregularities in the perception of both modes. While some players are expected to interpret the modes in the way shown above, ascribing more risk to the normal mode and more safety to the risk mode, others will disagree or rely on the framing.

H1: Modes do not significantly differ in the perception of riskiness.

Second, theory states that almost all persons have a negative attitude toward perceived risks (Kahneman & Tversky, 1979; Slovic, 1964; Slovic, Finucane, Peters, & MacGregor, 2004; Blais & Weber, 2006), which suggests that all participants will choose the mode that they perceive as safer. However, risk perception has been proved to differ between individuals and between different kinds of risk domains (Blais & Weber, 2006; Weber, Blais, & Betz, 2002; Hanoch, Johnson, & Wilke, 2006). Thus, some people are expected to like gambling more than others and to be more willing to engage in it.

Still, in order to convince someone to prefer a riskier alternative to a safer alternative, the risky option must offer a valuable risk premium; otherwise it will be dominated by the alternative option and be sorted out (Kahneman & Tversky, 1979). A risk premium is a perceived benefit, which can be a surplus in enjoyment or outcome. In the *WWTBAM* scenario it depends on the evaluation of the two insurances, which in turn determines the magnitude of the perceived risks and the perceived benefits in the two modes. Therefore, differences in the perceived riskiness of gambling and in the value of perceived benefits are expected to cause inconsistencies between loss aversion and gambling behavior. This leads to participants with high gambling affinity choosing the mode they perceive as more risky, because of higher perceived benefits. However, due to the ambiguities in the framing and the analysis of the mode (H1), mode is not expected to comply with this behavior.

H2.1: Gambling attitude and choice of mode are not related.
H2.2: Gamblers will be more likely to choose the mode they perceive as riskier.
H2.3: Non-gamblers will be more likely to choose the mode they perceive as safer.

In the same line of argumentation, it is expected that further decisions in the game will be congruent with the first decision of choosing a gaming mode. Again, since there is no homogeneity expected in the evaluation of the riskiness of the modes, gaming behavior will not differ significantly between the modes, but depend largely on gambling attitude.

H3.1: Gaming behavior will not differ significantly between the two gaming modes.
H3.2: Gaming behavior will differ significantly depending on risk attitude.

Furthermore, gamblers are expected to take more risks in the gaming process than non-gamblers. In a few cases, gamblers are expected to advance especially far in the game, but generally, due to their tendency to guess rather than to quit the game, they probably suffer more and higher losses in comparison to non-gamblers, use a smaller share of lifelines, and continue playing until they give an incorrect answer.

H3.3: Gamblers take more risks than non-gamblers.
H3.4: Gamblers generally have lower outcomes than non-gamblers.

Finally, it is expected that participants rate the riskiness of their gaming behavior according to the certainty they experience during the game and their success, which manifests in the outcomes. Therefore, evaluations will differ rather between gamblers and non-gamblers than between modes.

H4.1: The evaluated riskiness of the gaming behavior is expected to be similar for both gaming modes.

H4.2: The evaluated riskiness of the gaming behavior is expected to be higher for gamblers than for non-gamblers.

All in all, the framing of the two modes is not expected to have a major impact on the choice of the gaming mode, nor on gaming behavior or the evaluation of the riskiness of the game. Rather, low and high values in gambling attitude are expected to determine these factors.

A comparison with the original TV version of the game is expected to support these findings, and to possibly offer suggestions to improve the scenario.

Conceptual model

The conceptual model summarizes the quintessence of these hypotheses (Figure 2). Gambling behavior is expected to play a more important role in explaining differences in gaming behavior, outcomes, and the evaluation of the riskiness of one's behavior than to the choice of the gaming mode. The perception of the riskiness of the modes, however, is not expected to differ significantly between gamblers and non-gamblers, due to the interaction of the analysis of the two modes and their counter-intuitive framing.

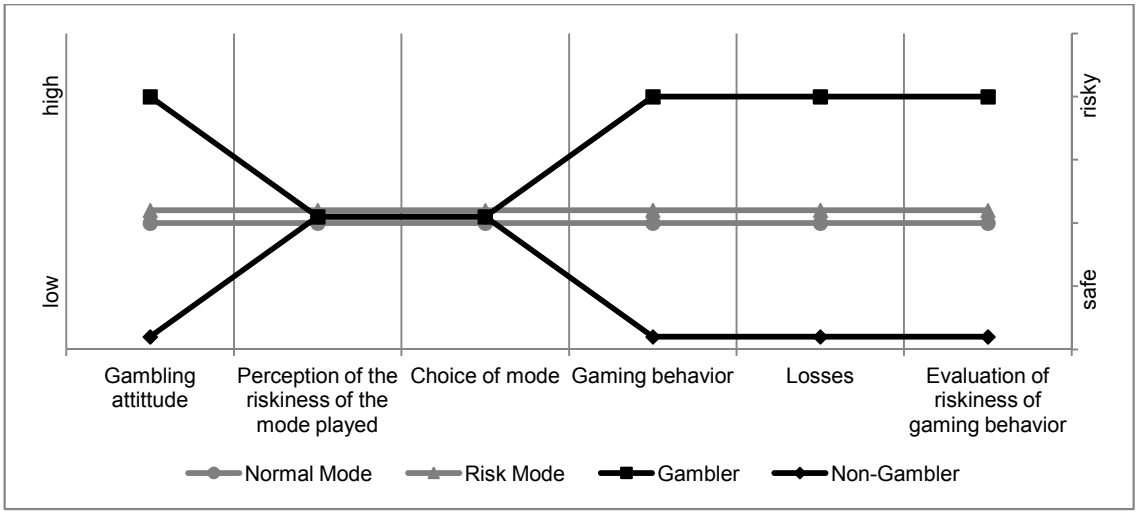

Figure 2: Conceptual model

5 Study 1

In this study, the properties of the *WWTBAM* scenario are tested and the impact of low and high gambling attitudes is examined.

5.1 Methods

5.1.1 Design

The study consists of two parts. At first, participants were asked to fill out a questionnaire concerning their general risk taking attitudes, using the revised DOSPERT scale (Blais & Weber, 2006)[3]. Then, they played the game and evaluated the different gaming modes and their behavior. The whole study was programmed on the online platform *Unipark*, making three major adjustments to the game.

First, like most experimental economic studies, this research project faced the problem of offering real monetary incentives. Simulating the almost doubling growth rate of winnings at each level, starting with 0.01€ lead to possible winnings of over 150€ per person at the last question, whilst offering incentives of under 1€ up to the eighth level. This not only seemed problematic working with a given budget, but also very unattractive for participants during the early steps of the game. Therefore, winnings were set to range from 0,60€ (the price of one cup of coffee in the cafeteria) to 15€ (Figure 3). Winnings were paid out in cash immediately after the game[4].

Second, all lifelines were altered to fit the study design. The 50/50 option always eliminated the same two answers for each question for all participants, in order to avoid differences in variance due to the selection of answers. For practical reasons as well as for comparability, the telephone lifeline was replaced by a text field, which always gave the same information for each question in direct speech, with declining attributes of certainty (“I know that is...”

[3] Cf. Appendix for instructions and items on the German DOSPERT scale and the gambling subscale.

[4] The study was supported by funds of the Zeppelin University department for research funding.

for question one to four, “I think that must be …” for question five to nine, “I guess it could be ...” for question ten to fourteen, “I don’t know the right answer, but I know it is not …” for question fifteen). The audience lifeline was similarly adjusted, providing the same percentage distributions for level 1 to 4, 5 to 9, 10 to 14, and one for question 15. The additional lifeline offered advice on a question by giving the correct answer, or giving a definition or explication of the right answer. All these adjustments were presented in detail before the game started.

Third, in the TV show, in order to enter the main stage and play the game, contestants have to win the fast finger round, which means being the fastest in answering a selection question correctly. This selection phase was not part of the experiment, neither was any other part of the appliance and selection process of the TV format.

All participants indicated being familiar with the concept of the show and to understand the modifications that were made. After explaining the rules of the game, participants were presented the following visualization when asked to make the choice between the two modes:

Figure 3: Gaming modes

The experimental design was applied to a pre-test with ten persons between 21 and 54, including four women. Feedback initiated some changes in design and in the formulation of instruction texts as well as the extension of the evaluation questionnaire with a few new items.

5.1.2 Sample

Sixty students and alumni of Zeppelin University, aged between 19 and 33 (M=22.79, SD=2.90) took part in the study. Four participants had to be excluded due to data recording problems, so that the final sample included 34 male and 22 female persons. Participants were recruited via social networks, flyers, mailing lists, and personal approaches, asking them to participate in a *Who Wants To Be A Millionaire?* game, including information about the range of possible winnings and the differences between the two playing modes.

5.1.3 Setting and Procedure

A preliminary online questionnaire with clear instructions was sent to all participants by email, one to three days before conducting the study. The revised DOSPERT scale for adults (Blais & Weber, 2006) was used to measure the likelihood of taking risks in different domains, taking about five minutes. With the exception of three participants completing it on the spot, the questionnaire was completed up until four hours before the experiment started.

The main experiment was composed of gaming instructions, the choice of the gaming mode, the game, and a questionnaire evaluating gaming strategies. The latter was created after watching 21 episodes of the game show and is based on comments and behavior of the contestants and comments of participants in the pre-test.

Five to ten participants completed the main study at a time in a room with 14 laptops. Participants were instructed to remain silent during the game. Questions and answers were taken from the first official board game of the *WWTBAM* quiz show from the year 2000 and were chosen by chance. Current issue questions were however excluded, due to their topicality. The questions

for each level were drawn from the according deck. All contestants played the same question deck for reasons of comparability and were asked explicitly not to share their knowledge with future participants. No attempts of deception were noticed (e.g. unexpected higher winnings or further advancement in the game of participants at later dates).

5.2 Measurements and Results

5.2.1 Gambling attitude, the perception of riskiness, and the choice of the gaming mode

In order to test the hypotheses, first, the relationship between gaming modes and risk attitude is examined.

Two thirds of the participants in the sample chose the normal gaming mode over the risk mode. This distribution is already seen as a first indicator for a perceived difference in risk between the two modes. Further analysis supports this assumption. After playing the game, all participants were asked to indicate how safe they evaluated their gaming mode on a 7-point scale. Results show a highly significant difference between participants of the two modes ($T(26{,}641)=-5.270$, $p<.001$) with $M_{normal}=6.14$, $SD=1.49$ and $M_{risk}=3.16$, $SD=2.22$. Safety is evaluated higher in the normal mode than in the risk mode.

Additionally, open answers concerning the reasons for the choice of the gaming mode were coded and found to give evidence for the perception of the riskiness of the modes. Assuming that the intention to gamble is an indicator for a more risk-seeking attitude, participants who independently mentioned that they chose the mode that offered more opportunities to gamble significantly more often chose the risk mode than the normal mode ($\chi^2=5.127$, $Phi=.303$, $p<.05$). Thus, players in the normal mode evaluated their gaming mode safer than players in the risk mode, and participants who stated an intent to gamble were more likely to play the risk mode.

Gambling attitude was measured using the revised domain specific risk taking (DOSPERT) scale (Weber et al., 2002; Blais & Weber 2006). The scale

is based on the psychological risk-return model, which includes apparent risk taking behavior, risk perception, and the attitude toward perceived risk as variables, in order to explain and predict risk behavior. Construct validity of all subscales has been proven repeatedly (Zuniga & Bouzas, 2006; Harrison, Young, Butow, Salkeld, & Solomon, 2005; Johnson, Wilke, & Weber, 2004), also regarding the German translation of the scales (Johnson et al., 2004). In the following analysis, it is focused on the gambling subscale, which was assessed by asking for the likelihood of engaging in risky behavior. Then, a mean score was computed for each participant. Participants are found to use almost the full range of the scale (*Min*=1.00, *Max*=5.67; *SD*=1.37), and reliability is confirmed (*Cronbach's α*=.82).

Comparing the means of gambling attitudes of participants of the two modes, a highly significant difference is found (Table 1). Contrary to previous expectations, there seems to be a relationship between gambling attitude and the choice of mode, in that participants who chose the risk mode generally score higher on the gambling scale and participants playing the normal mode score lower ($T(54)=-2.78$, $p<.01$).

	Choice of Mode	N	Mean	Standard Deviation	Standard Error (Mean)
Gambling Attitude	Normal	37	2,5135	1,16692	,19184
	Risk	19	3,5263	1,51256	,34701

Table 1: Gambling attitude and choice of mode

Since the choice of mode proves to be rather consistent with the gambling attitude, in addition to looking for differences between the modes, further analyses will examine interactions of gambling attitude and the choice of mode. Inducing a media split on the gambling scale and separating participants according to mode, four groups of framing-attitude matches and mismatches evolve (Table 2).

		Gambling Attitude	
		Non-Gambler (NG)	Gambler (G)
Mode	Normal mode (N)	Match	Mismatch
	Risk mode (R)	Mismatch	Match

Table 2: Framing-attitude matches and mismatches (FAMM)

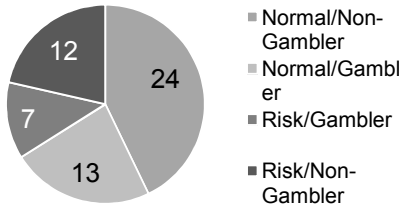

Figure 4: FAMM distribution

In line with the findings above, there are more matches than mismatches in each mode (Figure 4). Accordingly, there are no significant effects or interactions of gambling attitude and the mode in the perception of safety of the gaming modes. Because the number of participants in the groups is rather small, all analyses based on the FAMM design must however be considered carefully in terms of the generalization of findings.

The perceived benefits of the two modes are drawn from the open answers and also do not show significant differences between gamblers and non-gamblers. Players of the normal mode consistently base their choice on two points: the additional safety level being worth more than a single expert opinion, and the additional safety level granting enough safety for participants to continue the game with high stakes even when they are not completely certain of their answer. Respectively, the perceived benefit of the risk mode is seen in the fourth lifeline being worth more than a second security level, allowing further advancement in general.

To sum up, different than expected, there is a clear distinction in the perception of safety between the two modes, the risk mode being rated significantly more risky than the normal mode. Gambling attitudes and the choice of mode are found to be closely related, in that gamblers are more likely to choose the risk mode, and non-gamblers to choose the normal mode. Interactions between mode and gambling attitude do not play a significant role in risk perception. Also, the assessment of values of perceived benefits of each mode is similar for gamblers and non-gamblers.

5.2.2 Gaming behavior

Gaming behavior was expected to differ rather between gamblers and non-gamblers than between modes. With previous findings in mind, the impact of the choice of the mode, gambling attitude, and interactions within the FAMM framework are analyzed. In this analysis, the term *gaming behavior* describes all decisions that are made during the game after the choice of mode, including the usage of available lifelines, the circumstances of the end of the game, and gaming attitude and certainty during the game.

Lifelines

Lifelines mark a player's options to reduce uncertainty at any given time during the course of the game. Although the two modes provide different numbers of lifelines, by analyzing the share of lifelines used, the role of lifelines can be compared.

Results show a significant difference in the share of lifelines used between the gaming modes and accordingly, gambling attitudes (Table 3).

Dependent variable: Share of lifelines used

Choice of Mode	Gambling Attitude	Mean	SD	N
Normal	Non-Gambler	,6111	,34983	24
	Gambler	,6923	,31802	13
	Total	,6396	,33682	37
Risk	Non-Gambler	,2143	,22493	7
	Gambler	,5833	,45644	12
	Total	,4474	,42146	19
Total	Non-Gambler	,5215	,36386	31
	Gambler	,6400	,38619	25
	Total	,5744	,37527	56

Table 3: Shares of lifelines used within the FAMM framework

This ANOVA shows that players on average use 64% of their lifelines before the end of the game in the normal mode, whereas players in the risk mode use about 45% of the lifelines ($F(1,52)=5.83$, $p<.05$, $\eta^2=.10$). Surprisingly though, at the same time gamblers are found to use a significantly higher share of lifelines than non-gamblers ($F(1,52)=4.62$, $p<.05$, $\eta^2=.08$). Within the risk mode, this leads to a significant interaction of mode and gambling attitude ($T(16,745)$=-

2.353, p<.05), indicating that non-gamblers who played the risk mode used the smallest share of lifelines.

End of game

Out of all participants, only ten chose to quit the game voluntarily, whereas forty-six participants ended the game by answering a question incorrectly. There is no difference between the gaming modes concerning these circumstances of the end of the game. There is, however, a highly significant difference in the means of gambling attitude between the two groups (Table 4), unexpectedly showing higher gambling scores in both modes to be related to quitting the game voluntarily (T(54)=2.93, p<.01).

	End of game	N	Mean	Standard Deviation	Standard Error (Mean)
Gambling Attitude	Quit	10	3,9333	1,30337	,41216
	Wrong	46	2,6232	1,27968	,18868

Table 4: Gambling attitude and circumstances of the end of game

Attitudes and certainty

In order to measure participants' general attitudes toward the game, open answers were analyzed. The item *Taking the game easy* was created out of three claims made by participants. The first is based on the statement that this is a game with gains only, the second emphasizes taking a light approach to the game, and the third notes that only little money was involved. Mentioning one or more of the items is seen as an indicator for an easy approach. The easy attitude differs significantly between the modes (T(26,302)=-2.32, p<.05) with M_{normal}=.24, SD=.49 and M_{risk}=.68, SD=.75. Gambling attitude, however, is far from being a significant factor.

Certainty in gaming behavior refers to the certainty with which wrong answers were given. Correspondingly, it was measured only once and only for participants that ended the game with a wrong answer. It was refrained from measuring certainty after each question in order not to disturb the gaming process. After ending the game with a wrong answer, the correct answer was displayed on the screen and participants were asked how certain they had been

of their answer, offering four answer possibilities ranging from “very certain” over “I had an idea” to “I was struggling between two answers” and “I took a guess”. Surprisingly, certainty does not differ significantly between any of the groups, neither mode, nor gambling attitude or any kind of interaction of the independent variables affects certainty.

5.2.3 Outcomes

Outcomes refer to all kinds of achievements in the game. The term relates to advancement, which is the question up to which participants stayed in the game, winnings, and losses. Winnings are defined as the actual final winnings. Losses only occurred in case a question was answered incorrectly. They are defined as the difference between the last certain amount of money participants could have left the game with voluntarily, and the actual payout, established by the last safety level.

On average, participants in the normal mode and the risk mode, as well as gamblers and non-gamblers played between seven and eight questions. Therefore, advancement does not differ significantly, and due to the high share of players who ended the game with a wrong answer, winnings are also very similar (*M*=2.20, *SD*=2.16, with 64% winning 1.50€). However, there is a significant difference in losses (Table 5).

Dependent Variable: Losses (in Euro)

Choice of Mode	Gambling Attitude	Mean	Standard Deviation	N
Normal	Non-Gambler	,4833	,54267	24
	Gambler	,1923	,38397	13
	Total	,3811	,50708	37
Risk	Non-Gambler	,8714	,62106	7
	Gambler	,5500	,58387	12
	Total	,6684	,60190	19
Total	Non-Gambler	,5710	,57457	31
	Gambler	,3640	,51306	25
	Total	,4786	,55291	56

Table 5: Losses within the FAMM framework

Participants in the normal mode had smaller losses than participants in the risk mode ($F(1, 52)=5.74$, $p<.05$, $\eta^2=.10$). The reason for this is that players in the risk mode answered incorrectly before reaching the first safety level more

often and that many players in the normal mode answered the sixth question wrong, which is a free-shot question and thus did not lose anything.

On the other hand, non-gamblers have higher losses than gamblers ($F(1,52)=3.87$, $p=.054$, $\eta^2=.07$), and the highest losses are found in the group of non-gamblers in the risk mode, which shows a significant difference to all other players ($T(54)=-2.07$, $p<.05$) with $M_{Non\text{-}Gamblers}=.87$, $SD=.62$ and $M_{Rest}=.42$, $SD=.53$. In the normal mode, a marginally significant difference in losses is found. Filtering out extreme values in winnings[5], this is caused by significant differences in the circumstances of the end of the game ($T(10,000)=2,39$, $p<.05$) with 100% of non-gamblers versus 64% of gamblers giving a wrong answer and accordingly significant differences in winnings ($T(28)=-2.81$, $p<.01$) with $M_{Non\text{-}Gamblers}=1.34$, $SD=.47$ and $M_{Gamblers}=1.91$, $SD=.63$, which equals more than one gaming level.

This means that, although players in both modes advance up to the same level and have similar winnings, participants in the risk mode lose more money when giving a wrong answer than participants in the normal mode, but also, non-gamblers lose more money than gamblers.

5.2.4 Evaluation of riskiness of gaming behavior

Individual evaluations of the riskiness of the gaming behavior were measured after the game with ten items (four safety-framed, six risk-framed) on a 7-point scale. Safety-framed items included statements like “I grew more and more cautious in the course of the game”, risk-framed items included “I trusted my gut feeling when I was not sure about the answer” or “I took too many risks”[6]. Reliability was tested and confirmed (*Cronbach’s α*=.82). Means differ between the two modes significantly (Table 6).

[5] Filtering out seven participants with winnings over 4 Euros.
[6] Cf. Appendix for complete list of items.

Dependent Variable: Evaluation riskiness

Choice of Mode	Gambling Attitude	Mean	Standard Deviation	N
Normal	Non-Gambler	4,6167	,98628	24
	Gambler	4,4385	1,39973	13
	Total	4,5541	1,13225	37
Risk	Non-Gambler	5,8714	,47157	7
	Gambler	5,3917	1,01306	12
	Total	5,5684	,87054	19
Total	Non-Gambler	4,9000	1,03666	31
	Gambler	4,8960	1,29855	25
	Total	4,8982	1,14978	56

Table 6: Evaluation of the riskiness of the own gaming behavior within the FAMM framework

Participants in the risk mode evaluate their gaming behavior more risk-seeking than participants in the normal mode ($F(1,52)=12.57$, $p<.01$, $\eta^2=.20$), although both values can be considered rather high. The reason for this is probably the high share of participants who ended the game with an incorrect answer, leading to an overall high rating of riskiness.

5.3 Discussion

Based on the results of the analysis above, the overall dominance of the choice of the mode on the game is discussed. Also, the unexpected caution of gamblers as opposed to non-gamblers is analyzed, and due to diversity in results, the *WWTBAM* laboratory scenario is recommended for further usage in risk research.

In terms of the perceived riskiness of the modes, results show that there is a rather distinct classification all participants agree on. Evaluated by those who played it, the risk mode is seen as less safe, and respectively, the normal mode is seen as safer. These findings are highly significant, although they seemingly contradict participants' analyses of perceived benefits. Those follow a similar chain of thought as the analysis of the modes in chapter 4. Participants in the normal mode declare unanimously that the second safety level will allow participants to guess even when higher stakes are involved. Respectively, participants in the risk mode expect the fourth lifeline to guarantee further advancement in general, without having to guess.

There are two possible explanations for this misfit. Either, the majority of players does not agree with setting a safety net in order to secure a higher amount when guessing to be a strategy for gamblers rather than non-gamblers, and securing advancement with certain answers to be a strategy for non-gamblers rather than gamblers; or, most players base their decision on the framing of the mode rather than on their own risk-assessment. The latter point is supported by literature. Framing effects have proven very powerful and stable in previous research (Kahneman & Tversky, 1979; Prelec & Loewenstein, 1991). Framing one mode as risky and the other one as normal is a suggestive way of influencing participants' perception. The effect was tried to be diminished in the study by briefing participants about the advantages and disadvantages of each mode when recruiting them, and again when sending them an invitation to the study. The impact of framing as well as the differences in the perception of risk will be discussed in more detail based in comparison with the results of Study 2 in chapter 7.

Another reason for the difference between expectations and results in the perception of riskiness of the two modes can be found in the method of measurements. In order not to influence the choice of mode by asking for its perceived riskiness beforehand, the evaluation of the riskiness of the two gaming modes was conducted after the game. Therefore, it is likely that the evaluation of riskiness was not only based on pure information about the modes, but also influenced by the outcomes of the game. Since losses are greater in the risk mode and smaller in the normal mode, this must be taken into account in the evaluation. Including the impact of losses also provides further explanation into why the framing of the modes and the perception of riskiness are consistent. In spite of the perceived benefits defined by the players suggesting that the risk mode has virtues that satisfy needs of risk-averse players, and that the normal mode is better suited for risk-seeking players, the losses that were experienced just prior to the evaluation are likely to outweigh this initial analysis.

The difference in the perception of the riskiness of the modes is reflected in the participants' choice of mode. Gamblers are found to be more likely to choose the risk mode and non-gamblers to choose the normal mode. This is in line with previous predictions that low values in gambling affinity are related to the choice of the mode that is perceived as more safe, and high values to the choice of the mode that is perceived as less safe, which now has been found to coincide with the framing of the two modes.

The choice of mode is the first decision made in the game. Apart from the influence of framing discussed above, heuristics, like the default-effect, must be considered playing a role in this decision (Kahneman, Knetsch, & Thaler, 1991; Brown & Krishna, 2004). The normal mode has been the only gaming option for the first eight years of the game show, and thus can be defined as the original mode. In contrast, the risk mode might be considered a variation of the norm, introduced first in 2007, and defined by its neglect of the second safety level rather than by its additional value, the fourth lifeline. Kahneman et al. (1991) found that loss aversion and the endowment effect provide insights into which characteristics of a default lead to stronger and weaker effects on choice; the greater the emphasis of a default on loss aversion, the stronger the effect. Given that modes are primarily defined in terms of security levels, the normal mode immediately addresses loss aversion as opposed to the risk mode, and thus gains additional power in being the default choice.

As results show, in Study 1, the normal mode was chosen in two out of three cases. This overall dominance is seen as further evidence for a connotation of loss aversion with the choice of the normal mode. Gambling attitude and choice of mode are therefore related more closely than anticipated in the beginning.

Findings in the area of outcomes support this interpretation. As already mentioned, there are significantly higher losses in the risk mode than in the normal mode. However, gambling attitudes are no longer in line with the mode in this section of the game. Non-gamblers are found to have higher losses than gamblers. Relating these outcomes to gaming behavior (the usage of lifelines

and the circumstances of the end of the game), the picture that emerges gains more contour.

In terms of lifelines, results show that players of the normal mode use a larger share of their lifelines than players of the risk mode. This suggests a more careful behavior in the normal mode, indicating less guessing. However, this does not translate to gambling attitudes. Gambling scores show an opposite trend, with non-gamblers using smaller shares of their lifelines than gamblers. Counter-intuitively, this implies that non-gamblers act less carefully than gamblers. The reasons for this could be that on the one hand, non-gamblers have less experience with gambles and are not as accustomed to evaluating a risky decision as gamblers, resulting in an increase in risk taking compared to gamblers. On the other hand, since most non-gamblers play the normal mode, they generally have to manage with one lifeline less than gamblers. Thus, these players might be less willing to play a lifeline due to their limited number. However, since non-gamblers in the risk mode were found to use the smallest share of lifelines, and gamblers in the normal mode to use most, this undermines the impact of the absolute number of lifelines.

Concerning the end of the game, it needs to be remembered that only a very small share of participants quit the game voluntarily. Within this share, the mode does not make a significant difference. Gamblers are however found to be more likely to quit than non-gamblers. A similar explanation as above, focusing on experience playing a crucial role, is supported by Slovic's (1964) definition of perceived risk based on the two factors of familiarity and (perceived) controllability. Experience with gambles increases familiarity with the situation, leading to a different evaluation of the risk at hand and its controllability. At this point, an analysis of anticipated regrets and the evaluation of the effectiveness of coping strategies as done by (Harnick, Van Dijk, Van Beest, & Mersmann, 2007) would provide further insights. Applying their findings to these results, gamblers are expected to imagine their reaction to a loss to be more negatively than non-gamblers, due to higher emotional involvement in the gambling situation. Therefore, they are more likely to quit, whereas non-gamblers show

less anticipated regret and end the game with a wrong answer more often. Further research should examine this relationship more closely.

The differences in the outcomes and in gaming behavior within the FAMM framework are captured in Figure 5 and Table 7:

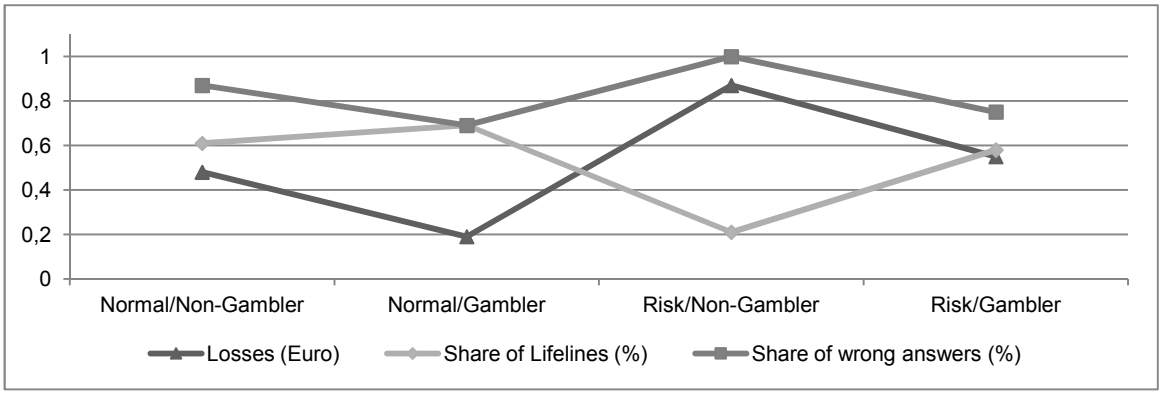

Figure 5: Losses, share of lifelines, and end of game within the FAMM framework

	FAMM	Losses (Euro)	Share of Lifelines (%)	Share of wrong answers (%)
Normal/Non-Gambler	Match	0.48	0.61	0.87
Normal/Gambler	Mismatch	0.19	0.69	0.69
Risk/Non-Gambler	Mismatch	0.87	0.21	1
Risk/Gambler	Match	0.55	0.58	0.75

Table 7: Means of losses, shares of lifelines, and end of game within the FAMM framework

Considering interactions between the modes and participants' gambling attitudes, gaming behavior and outcomes are more similar within matches than between matches and mismatches. All extreme values in behavior can be found in the groups of mismatches. Significant differences in behavior between the modes are thus likely to be caused by these extreme values. According to the theory of planned behavior (Ajzen, 1991), part of the explanation for these differences in behavior can be found in differing attitudes toward the game. Support for the TPB to be used in analyzing gambling behavior has recently been found by (Martin et al., 2010). While using a smaller share of lifelines and denoting higher losses, especially in cases of mismatches, participants in the risk mode entered the game more often with an easy attitude. Carrying an optimistic mindset, they tend to define the pre-game state in wealth as the overall reference point for the game, accounting only for gains and dispatching losses. This approach is in line with assumptions of expected utility theory,

since participants presume that the lottery they play can only have a neutral or a positive outcome and do not account for shifts of the reference point during the game. With the same item not being mentioned by players in the normal mode, this could indicate that they have a more specific goal in mind and every outcome beneath this reference point is considered a loss.

Another factor that defines the easy attitude is the low evaluation of possible winnings. At this point, the background of the game must be considered. Simulating the game *Who Wants To Be A Millionaire?*, participants are likely to devaluate the winnings in the study by comparing them to possible winnings in the TV show. Prelec and Loewenstein (1991) refer to these kinds of observations as the peanuts effect. In the context of a strictly positive lottery, the effect is defined as the propensity to be more risk-seeking when small gains are involved, and to grow more and more cautious the higher the magnitude of the gains. Entering the game with the estimation that any amount of gains will be small fulfills this exact precondition. However, with non-linearly growing stakes and the emotional arousal of the gaming situation, the initial peanuts effect is expected to diminish over time. Therefore, the effect does not contradict the previous assumption that gamblers are believed to have more severe feelings of anticipated regret at the point of the last question.

Furthermore, with attitude being measured after the game, it must also be considered that participants might have wanted to minimize feelings of regret triggered by losses (which are greater in the risk mode, and especially with non-gamblers) by applying coping strategies that justify the own behavior and decisions made. Remembering the initial attitude with which the game was started, or imagining one, would comply with such a strategy, and help avoid cognitive dissonance between the hopes set on the perceived benefits of the risk mode, linking it to further advancement, and the loss-intense outcome.

Finally, looking at how participants evaluated the riskiness of their own gaming behavior, results display a mirrored pattern of the initial perception of safety of the modes (Figure 6).

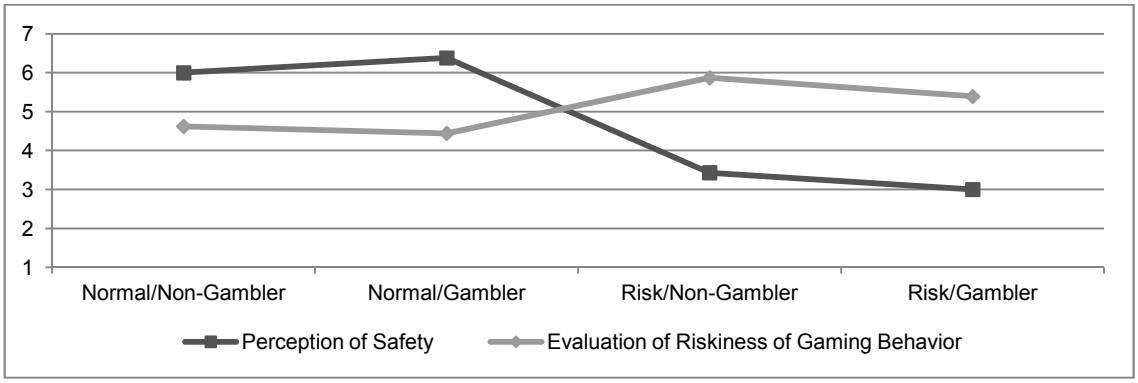

Figure 6: Perception of safety and evaluation of riskiness of gaming behavior within the FAMM framework

	FAMM	Perception of Safety	Evaluation of riskiness of gaming behavior
Normal/Non-Gambler	Match	6	4.62
Normal/Gambler	Mismatch	6.38	4.44
Risk/Non-Gambler	Mismatch	3.43	5.87
Risk/Gambler	Match	3	5.39

Table 8: Perception of safety and evaluation of riskiness of gaming behavior within the FAMM framework

The pattern shows that the perception of safety of the modes and the evaluation of the riskiness of the gaming behavior are consistent, although the effect in the evaluation of the own gaming behavior is smaller. The reason for this is probably the overall similarity in advancement and winnings. Also, framing must be considered influencing the evaluation, again lead by the impulse to strive for cognitive alignment. The evaluation of the riskiness of the own gaming behavior therefore, other than expected, depends more on the mode than on gambling attitude, just like the perception of safety discussed above.

In conclusion, Study 1 shows that the scenario provides relevant data for research in the field of gambling. First, it has been found that the framing of the modes has an important impact on the perception of safety as well as on the evaluation of the riskiness of the own gaming behavior, although similarities in winnings weaken the effect for the evaluation of riskiness. Both are consistent with gaming behavior, showing that participants in the normal mode perform better than participants in the risk mode. Furthermore, the analysis of gambling

attitudes gives valuable insights into differences in outcomes and in gaming behavior within the modes, explaining the origin of extreme values in losses and carefulness. Gambling attitude is the sole hint in explaining differences in quitting behavior, embedding the game in the bigger framework of gambling behavior in general. This includes bridging the findings to the impact of gambling experience, emotional arousal and anticipated regret as well as dynamics of gambling and their impact on attitudes, claiming they are a changing factor within the theory of planned behavior. All in all, these findings support the use of the *WWTBAM* game as a scenario in risk research.

5.4 Limitations

Being an exploratory study with the goal to test the value of the *WWTBAM* game for risk research, the results of this study are limited by the size of the sample and its homogeneity. Almost all participants were students at a private university, which provides data with little internal noise, however limiting external validity of the findings. Also, conducting all measurements after the game might have influenced results as indicated above. Therefore, future studies should measure the perception of safety of the two modes prior to the game. Also, the impact of the framing of the modes needs to be examined more closely, starting in the next chapter of this paper.

6 Study 2

In order to compare the present findings to the original game and to better understand the consequences of the adjustments that were made in creating the scenario, a second study was conducted. The show was already observed closely before creating the scenario, however, by analyzing it and comparing the findings, this study's goal is to discover ways to improve the scenario.

6.1 Methods

6.1.1 Design

In the second study, 21 episodes of the German TV version of *WWTBAM* were watched. The episodes aired between December 2011 and March 2012, special episodes with celebrity guests were excluded.

6.1.2 Sample

The observation included 34 candidates (20 male, 13 female, 1 transsexual) between 19 and 77 years (*M*=33.8, *SD*=13.12). In ten cases, female contestants' age was not specified in the show. In two cases, newspaper articles about the candidates revealed the age, in the remaining cases it had to be estimated by the researcher[7].

6.2 Measurements and Results

Data was collected by watching the show and filling out forms that included the same item categories as Study 1, as far as data was accessible. In addition, comments about the choice of mode and remarks during the game were noted and coded. Unfortunately, there was neither the opportunity to measure the candidates' gambling attitude, nor to get access to their personal evaluations of the riskiness of their gaming behavior. Results were controlled for gender effects, not showing significant differences.

6.2.1 The perception of riskiness and the choice of the gaming mode

Only five candidates made comments on their choice of mode, indicating that they chose the mode that offers more security. All of these candidates chose to play the normal mode. The share of players choosing each mode, however, shows a rather balanced distribution over both modes. More than half of the candidates chose to play the risk mode (N=18).

[7] Cf. data in appendix.

6.2.2 Gaming behavior

As in Study 1, gaming behavior is measured looking at the share of lifelines used in the game and the circumstances of the end of the game. Instead of analyzing attitudes, candidates' goals of what to do with the money won are examined. Interestingly, neither the share of lifelines, nor goals (in terms of spending the money on pleasure versus paying debts) show significant differences between the modes. However, the circumstances of the end of the game differ significantly between the modes ($T(14{,}000)=-2.65$, $p<.05$), with 31% of participants in the normal mode ending the game with a wrong answer versus 0% of participants in the risk mode.

6.2.3 Outcomes

Similar to Study 1, outcomes are divided into advancement, winnings, and losses. With a minimum advancement of nine questions and a maximum of fifteen, there is a mean advancement of $M=12.06$ questions ($SD=1.28$), with no significant differences between the modes. Also very similar in both modes, winnings range from 500€ to 500000€ ($M=54691$, $SD=85082$) with 38% of the candidates winning 32000€.

As found above, only five contestants ended the game with a wrong answer (three female, age range between 23-50 years), all of which played the normal mode. In three of these cases contestants played a free-shot question, having just reached a safety level, so no money was lost. Therefore, only two candidates denote losses. Thus, although the circumstances of the end of the game differ between the modes, losses must be considered a rare exception that only occurred in about 6% of all cases.

6.3 Discussion

In the following, the analysis of the original gaming format of *WWTBAM* on TV is discussed. The focus of interest lies in the role the mode plays in the game and the rather balanced distribution of participants across the two groups.

This indicates a different gaming approach and differences in the perceived safety of the modes.

With 85% of all contestants ending the game voluntarily, using an average of 96% of their lifelines, all participants in the show are found to behave extremely loss-averse. Reasons for this safety-driven behavior are probably the high stakes that are involved, as well as the performance in the game being broadcasted on television. Based on this, the distribution of contestants by mode is seen as an indicator for the subjective risk perception of the modes.

As the results show, slightly more participants play the risk mode than the normal mode. Assuming the position of players in Study 1, this would mean that more participants on TV chose the mode that is perceived as less safe than participants in the laboratory setting. Although previous studies suspect especially risk-seeking persons to participate in the show (Lehmann & Warning, 2003; Johnson & Gleason, 2009; Franzen & Pointner, 2009), this claim has not been sustained by follow up studies, and neither has it been specified in terms of risk differences across domains. Therefore, it remains open if the sample consists of above average gambling-affine players. Also, the rather balanced distribution of participants across both modes contradicts the assumption. Therefore, another factor is expected to influence the distribution. Results show that participants in the normal mode are found to openly evaluate their mode as safer, whereas players in the risk mode do not share the reasons for their choice of mode. However, an overall risk aversion in the game was established above, based on extremely high stakes and public display on TV. In addition, a safety-driven behavior of almost all players was noticed, showing in high quitting rates and the usage of most lifelines. This suggests that all players chose the mode they perceived as safer according to their own gaming strategy, rather than more people being inclined to gamble. As a consequence, participants who would consider gambling when high stakes are involved are more likely to choose the normal mode in order to secure higher winnings. Persons who cannot imagine risking their certain winnings at any point and

intend to quit the game voluntarily rather than to guess, on the other hand, are found more likely to choose the risk mode.

Concentrating on the sole difference in gaming behavior between the two modes, the circumstances of the end of the game, it could be argued that contestants in the normal mode do not only plan ahead to take risks in their choice of mode, but actually are more willing to take a risk and gamble. However, since three out of five candidates did not lose any money giving the wrong answer, there was no risk in answering the question for most of them, especially with no lifelines left participants considered helpful. As a consequence, the only significant difference between the modes found above mostly derives from the game design. In contrast to the risk mode, the normal mode provides one free-shot question, and participants with no other option used it to make a guess. Therefore, although strategies might have differed at the point of choosing the mode, gaming behavior and outcomes are very similar between the modes, both dominated by loss aversion.

6.4 Limitations

The data in Study 2 shows some irregularities that could only partly be recorded, due to the influence of the quizmaster. In one case, he granted a participant the additional lifeline although she played the normal mode. In other cases, he interfered before the candidate could give a final answer, inventing the so-called *migrant-lifeline*, helping candidates that were not born in Germany with questions involving proverbs in the early stages of the game. Furthermore, accounting for the TV requirements of entertainment, personal stories of the candidates were told, distracting them from the gaming task. In addition to that, many contestants, independent from the mode played, mentioned that they felt more stressed than expected, sitting on the hot seat in the TV quiz. The immediacy of possibly high winnings caused excitement, and being on TV and in front of a life audience triggered a need for social image management. These are some of the special factors that must be accounted for in influencing the

course of the game in Study 2, apart from the rules of the game. Also, the small size of the sample limits the validity of the findings.

7 General Discussion

The aim of the paper is to introduce a new risk taking scenario in which gambler versus non-gambler behavior is tested. Findings do not support the expected dominance of gambling attitude over the choice of mode. However, gambling attitudes make a difference within the modes played. Contrary to the hypotheses, it is found that gamblers act more carefully than non-gamblers.

The first study, testing the scenario in a laboratory setting, shows high conformity between low and high gambling attitudes and the choice of mode, with an overall perception of the risk mode being less safe. It was suggested that the reason for this evaluation is primarily based on framing and the impact of the default bias rather than on preferences of the insurances offered by the modes. This deduction is supported by findings in Study 2, which shows a very balanced distribution of participants across both modes.

The difference in the perception of the riskiness of the mode has several reasons, which can be traced back to the absolute beginning of the game. While participants in Study 1 were recruited by the researcher, participants in Study 2 applied for participating in the show themselves and went through several steps in the selection process. This suggests not only a difference in involvement, but also in experience with the game and in preparation. It is argued that participants in Study 2 are likely to develop their own gaming strategy before entering into the game. As comments on the show demonstrate, all but one candidate chose the mode without hesitation, suggesting that the decision was made prior to the game. In contrast, participants in the laboratory study were briefed about the full range of adjustments only just before the game started, thus the final decision based on all information and with knowledge of

the full context had to be made on the spot. Considering these differences in terms of access, time and expertise in the game, it is estimated that participants follow a more heuristic approach in Study 1 and a more analytical processing of the alternatives in Study 2.

In order to minimize the impact of cognitive biases in the laboratory scenario, participants could be asked to choose a mode without framing them as risky or normal. However, since all participants knew the game show, the recognition of the modes is expected to be rather high. This could create unnecessary suspicions between participants regarding the study. Therefore, it is suggested to implement a small set of questions of preference before the game. Here, participants should indicate how they would act in certain gambling situations and which kind of insurance they would prefer. Thus, at the end of the set, participants get a recommendation which mode matches their preferences. This is expected to reduce the impact of the framing effect most efficiently, since it enforces an individual risk assessment of the modes.

The second difference between the studies is found in an almost mirrored pattern in gaming behavior and outcomes (Figure 7 and Figure 8). While candidates on the TV show had higher winnings and almost always ended the game voluntarily, the laboratory study showed surprisingly low winnings and the highly significant trend for players to end the game with a wrong answer.

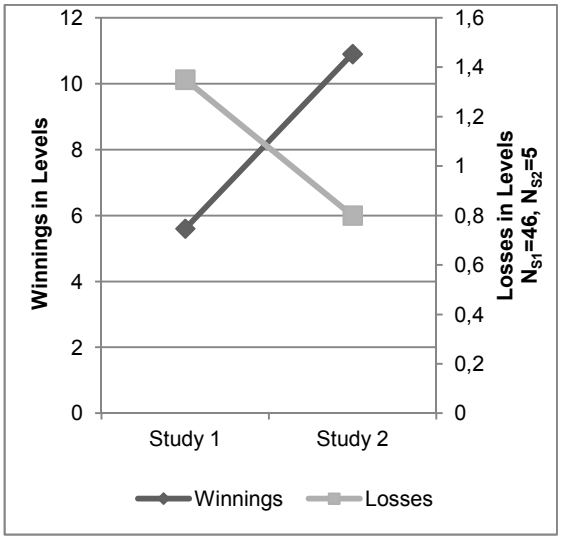

Figure 7: Mean outcomes Study 1 and Study 2

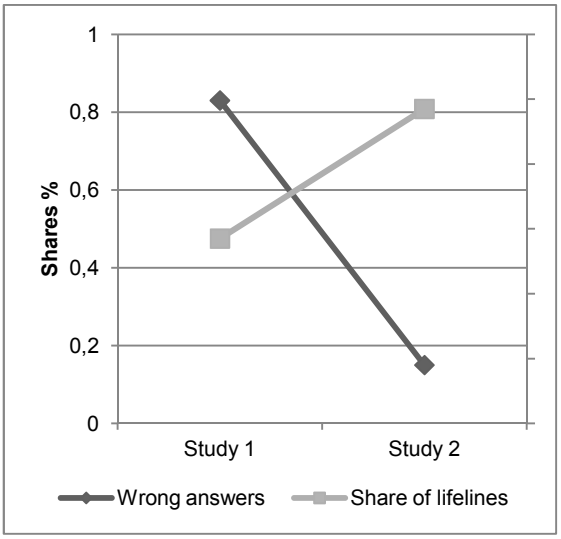

Figure 8: Gaming behavior Study 1 and Study 2

While the choice of mode does not make a considerable difference in Study 2, in the laboratory study, modes have an effect on the share of lifelines used as well as in terms of losses. In order to explain this inconsistency between the studies, the influence of the magnitude of stakes on gaming behavior needs to be considered. Larger stakes in Study 2, as established before, are expected to trigger a stronger loss aversion. On the other hand, smaller amounts, especially compared to very high winnings in the original game are more likely to activate the peanuts effect. For participants in Study 1 “gains loom larger than losses” (Harnick et al., 2007), thus, participants are likely to take on more risks than participants in Study 2, who show the rather homogeneous gaming behavior. This is a definite advantage of the laboratory study over the TV setting, allowing for significant differences between groups.

Probably the most exciting result in the study was found in the analysis of gamblers versus non-gamblers, which unfortunately could only be conducted in the second study. Gamblers surprisingly more often chose to play safer than non-gamblers, using higher shares of lifelines in the risk mode, denoting smaller losses in the normal mode, and being more likely to end the game voluntarily.

In order to examine interactions of the gaming mode and gambling attitudes, the FAMM framework was developed, categorizing players in framing-attitude

matches and mismatches. Subsamples of these groups unfortunately were rather small, so that future studies should be conducted to validate results. Reasons for this careful behavior of gamblers were suggested to be more experience with gambling and thus with losing, as well as a possible difference in terms of involvement in the game, causing higher levels of anticipated regret. This ties this research to the field of experiential risk research, investigating feelings during the decision-making process (Loewenstein, Weber, Hsee, & Welch, 2001; Slovic, Finucane, Peters, & MacGregor, 2004). In order to examine the background of the differences between gamblers and non-gamblers in this scenario further, future studies should find ways to include measurements of general arousal and anticipated regret during the game. One possible way could be the recording of psychophysiological responses to the game, like electrodermal activity and the measurement of the heart rate, as done by Wilkes, Gonsalvez & Blaszczynski (2009).

In conclusion, it was found that the *WWTBAM* scenario applied to laboratory experiments on risk research offers highly interesting insights into gambling behavior. The surprising finding that gamblers act more carefully than non-gamblers calls for further investigations. A generally less intense loss aversion in Study 1 was found beneficial to the scenario, since it allows for differences in outcomes. Adjustments should however be made in educating participants about the gaming modes or providing recommendations in order to reduce the impact of cognitive biases.

Future studies

Apart from the adjustments within the experimental design proposed above, which should be applied to further studies, several connecting factors to other fields of research and points of departure for more in-depth analysis were identified throughout the work on this paper. First, valuable insights from studies comparing pre- and post-game evaluations of riskiness, attitudes, and moods are to be expected. Provided finding a non-disturbing way to measure certainty continuously throughout the game, this data would offer useful insights into gambling dynamics in the scenario. Furthermore, it would be interesting to apply

a certain field of knowledge to the scenario, measuring gambling attitudes of experts and laypersons, and to investigate correlations of gaming behavior with attitudes in other risk domains. Connecting factors to other fields of research have been found in the role of anticipated regret as well as in experiential approaches to risk research. Finally, in order to find further support for the findings provided in this paper, more repetitions of the study are necessary, including larger samples, and in order to test the hypotheses of differences in the perception of riskiness of the two modes, it would be a great gain if candidates of the TV quiz would participate in a survey, also providing the opportunity to measure their gambling attitudes which are often speculated about.

8 Conclusion

Prospect theory has identified loss aversion as one of the main drivers in decision-making behavior. Gambles as a special kind of decisions are likewise steered by the desire to avoid losses. However, with different stakes and contexts involved, loss aversion can shift, and risk behavior has been found to vary depending on the domain.

In this paper, the format of the TV quiz *Who Wants To be A Millionaire?* was applied to a laboratory setting, which is a new approach in investigating gambling attitudes and their relationship to gaming behavior. Therefore, the game was adjusted in terms of the magnitude of stakes, lifelines, and the environment. Moreover, the comparison of the two gaming modes with different connotations of risk is a unique feature in this research project.

In order to test the *WWTBAM* game as a laboratory scenario in risk research, two studies were conducted. In the first study, participants' risk perception and gaming behavior were observed depending on the mode and gambling attitudes in a laboratory setting. Results show that the normal mode is linked with a perception of more safety and more careful behavior compared to the risk

mode, reflecting in smaller losses and the use of a higher share of lifelines. At the same time, gamblers are found to act more carefully than non-gamblers, and also to be more likely to end the game voluntarily. There is a majority of framing-attitude matches in both modes, gamblers playing the risk mode and on non-gamblers playing the normal mode; however, all extreme values can be retraced to mismatches in each mode.

In the second study, the gaming behavior and the outcomes of participants in the original TV quiz were observed. All participants show high similarities in their behavior, resulting in homogeneous outcomes. Also different from Study 1, risk perception in more balanced between the modes.

It is suggested that the adjustments to the game in Study 1 are likely to have strengthened the impact of cognitive biases on the perception of riskiness and to have lowered loss aversion. More diversity in the area of losses is however seen as an advantage of the laboratory setting, allowing for behavioral differences between the modes and between gamblers and non-gamblers. Differences between gamblers and non-gamblers could only be measured in Study 1, and differences between the two groups are expected to be moderated by experience and involvement in the game. Findings in Study 2 suggest adding educational elements to the laboratory scenario, in order to reduce the impact of the framing effect and the default effect. All in all, the *WWTBAM* scenario must be seen as an independent task that differs significantly from the TV quiz. It is however similar enough to be easily comprehensible, and the recruitment of participant benefits from the game's popularity.

Investigating the gaming behavior of people with low and high gambling attitudes can be used to explain risk-seeking or risk-averse behavior. In this paper, the impact of the mode and a surprising caution of gamblers have been revealed, which should be investigated further. As far as a recommendation is concerned, based on the present findings, gamblers as well as non-gamblers should choose the normal mode when playing *Who Wants To Be A Millionaire?*, regardless of the setting.

Appendix

A Study 1

The complete data and the codebook of the questionnaire are attached digitally.

Lfdn	Age	Gender	Mode[1]	Gambling Attitude[2]	Advancement (Levels)	Winnings (Levels)	Share of Lifelines	End of game[3]	Perceived safety[4]	Evaluation riskiness[5]
6	25	1	0	0	13	13	1	0	6	5,2
7	21	0	1	0	5	0	0	1	4	6,6
9	25	0	0	0	6	5	0,67	1	7	5,6
10	22	0	0	1	7	7	1	0	6	2,7
11	22	1	0	1	6	5	0,33	1	7	5,6
12	23	0	1	1	6	5	0,5	1	1	5
13	22	0	0	1	6	6	1	0	3	2,6
14	23	0	0	1	8	5	0,67	1	7	3,9
16	19	0	1	1	8	5	1	1	5	4,7
17	22	1	0	1	8	8	1	0	7	2,8
18	24	1	1	0	9	5	0,5	1	2	5,6
19	24	0	0	1	7	5	0,67	1	7	5,2
20	22	1	1	1	14	14	1	0	6	5,7
21	21	1	1	1	5	0	0,25	1	1	6,4
24	24	1	1	0	6	5	0	1	6	5,4
27	20	0	0	0	8	5	1	1	7	2,2
29	19	0	0	1	6	5	0,33	1	7	6,7
31	23	0	0	0	5	0	0	1	6	4,4
32	20	1	0	0	6	5	0,33	1	7	5,5
33	23	0	0	0	8	5	0,67	1	7	4,8
35	22	1	1	1	8	5	1	1	1	4,5
36	33	1	0	0	6	5	0,33	1	7	5
39	24	0	1	1	7	7	1	0	2	3,9
40	22	1	1	0	8	5	0,25	1	5	5,4
41	19	0	1	1	8	5	1	1	7	6,4
43	22	0	0	0	9	9	1	0	6	4,5
44	27	1	0	0	11	10	0,67	1	6	5,4
47	26	0	0	1	8	5	0,33	1	7	4,7
48	25	1	1	1	6	5	0	1	5	5,2
49	26	1	1	1	5	0	0	1	1	6,3

Lfdn	Age	Gender	Mode[1]	Gambling Attitude[2]	Advancement (Levels)	Winnings (Levels)	Share of Lifelines	End of game[3]	Perceived safety[4]	Evaluation riskiness[5]
50	20	1	0	1	8	8	1	0	6	3,2
51	21	0	0	0	7	5	0,67	1	7	4,7
52	22	0	0	1	6	5	0,33	1	7	5,6
55	28	1	0	0	6	5	0,33	1	7	5,7
56	20	1	0	0	5	0	0	1	7	5,2
57	23	1	1	1	8	5	0,25	1	1	6,2
66	27	1	0	0	9	9	1	0	5	3,4
67	25	1	1	1	11	11	1	0	5	3,8
69	29	1	0	1	11	10	1	1	7	5,4
73	25	1	0	0	8	5	1	1	7	3,3
84	26	1	0	0	8	5	0,67	1	7	5,4
85	21	1	0	0	9	5	0,67	1	2	5,6
86	24	1	0	0	11	10	1	1	7	3,6
88	25	1	0	1	11	10	1	1	5	5,9
91	27	1	1	1	6	5	0	1	1	6,6
100	20	1	0	1	6	5	0,33	1	7	3,4
101	20	1	1	0	6	5	0,25	1	5	5,9
102	19	1	1	0	5	0	0	1	1	6,4
103	21	1	0	0	7	5	1	1	5	4,2
104	21	1	0	0	6	5	0,33	1	7	4,7
105	20	1	0	0	8	5	1	1	7	6
106	20	0	1	0	8	5	0,5	1	1	5,8
107	20	0	0	0	6	5	0,33	1	7	3,6
109	19	1	0	0	7	5	0,33	1	1	3,8
110	21	0	0	0	6	5	0	1	5	3,4
111	22	0	0	0	8	5	0,67	1	4	5,6

[1]Mode: 0=normal, 1=risk; [2]Gambling Attitude: 0=low, 1=high; [3]End of game: 0=quit, 1=wrong; [4]Perceived Safety: 1=low, 7=high; [5]Evaluation riskiness: 1=safe, 7=risky

Gambling Attitude

DOSPERT Scale for adults, German (Blais, Weber 2006)

Geben Sie für jede der folgenden Aussagen an, mit welcher **Wahrscheinlichkeit** Sie der genannten Aktivität oder Verhaltensweise nachgehen würden.
Benutzen Sie dafür bitte folgende Skala von **1 bis 7**:

1	2	3	4	5	6	7
Sehr unwahr-scheinlich	Unwahr-scheinlich	Eher unwahr-scheinlich	Nicht sicher	Eher wahr-scheinlich	Wahr-scheinlich	Sehr wahr-scheinlich

1. zugeben, dass Ihr Geschmack anders ist als der Ihrer Freunde?
2. in der Wildnis fernab von Zivilisation und Campingplätzen zelten?
3. ein Tageseinkommen beim Pferderennen verwetten?
4. 10% Ihres Jahreseinkommens in ein mäßig wachsendes Wertpapierdepot investieren?
5. fünf oder mehr Gläser Alkohol an einem einzigen Abend zu sich nehmen?
6. einen bedeutenden Betrag vom Einkommen nicht in der Steuererklärung angeben?
7. bei einem wichtigem Thema anderer Meinung sein als Ihr Vater?
8. bei einem Pokerspiel ein Tageseinkommen aufs Spiel setzen?
9. eine Affäre mit einem verheirateten Mann oder einer verheirateten Frau haben?
10. die Arbeit von jemand anderem als die eigene ausgeben?
11. eine Skipiste befahren, die Ihre Fähigkeiten übersteigt oder geschlossen ist?
12. 5% Ihres Jahreseinkommens in eine sehr spekulative Aktie investieren?
13. während der starken Wasserströmung im Frühling an einer Wildwasser-Schlauchboot-Tour teilnehmen?
14. Ihr Tageseinkommen auf das Ergebnis eines Sport-Ereignisses (Fußball, Basketball, etc.) setzen?
15. sich auf ungeschützten Sex einlassen?
16. ein Geheimnis Ihres Freundes jemand Anderem verraten.
17. sich auf dem Beifahrersitz im Auto nicht anschnallen?
18. 10% Ihres Jahreseinkommens in ein neues Unternehmen investieren.
19. einen Kurs im Fallschirmspringen besuchen.
20. ohne Helm Motorrad fahren?
21. einen Job, der Spaß macht, einem Job mit Prestige aber weniger Spaß, vorziehen?
22. eine heikle Sache, an die Sie glauben, bei einem öffentlichen Anlass verteidigen?
23. sich der Sonne aussetzen, ohne sich eingecremt zu haben?
24. wenigstens einmal Bungee-Jumping ausprobieren?
25. Ihr eigenes, kleines Flugzeug fliegen, wenn Sie die Gelegenheit hätten?
26. nachts alleine durch einen unsicheren Stadtteil nach Hause gehen?
27. in eine Stadt weit entfernt von Ihrer Familie ziehen.
28. Mitte 30 die berufliche Laufbahn wechseln.
29. Ihre kleinen Kinder für eine Besorgung allein zu Hause lassen.
30. eine gefundene Geldbörse mit 200 Euro nicht zurückgeben.

Gambling Scale = Items 3, 8, 14

Game Design

Normal Mode

Risk Mode

Perception of safety of the gaming mode

Dependent Variable: I played the safer mode

Choice of Mode	Gambling Attitude	Mean	Standard Deviation	N
Normal	Non-Gambler	6,0000	1,64184	24
	Gambler	6,3846	1,19293	13
	Total	6,1351*	1,49373	37
Risk	Non-Gambler	3,4286	2,07020	7
	Gambler	3,0000	2,37410	12
	Total	3,1579*	2,21769	19
Total	Non-Gambler	5,4194	2,02935	31
	Gambler	4,7600	2,50466	25
	Total	5,1250	2,25681	56

*p<.001

Evaluation of riskiness

Answers were given on a 7-point scale

1="stimme voll zu" – 7="stimme gar nicht zu"

Wie sehr stimmen Sie den folgenden Aussagen zu?
Wenn eine der Aussagen nicht auf Sie zutrifft, z.B. weil Sie den Joker nicht benutzt haben, lassen Sie diese Frage einfach aus.

1. Ich bin beim Spielen Risiken eingegangen.
2. Ich bin beim Spielen zu viele Risiken eingegangen.
5. Im Laufe des Spiels wurde ich immer vorsichtiger.
8. Wenn ich mir nicht sicher war, habe ich auch mal eine Antwort geraten.
16. Im Laufe des Spiels habe ich immer mehr riskiert.
19. Wenn ich mir nicht sicher war habe ich das Ausschlussverfahren genutzt (d.h. ich konnte falsche Antworten identifizieren und ausschließen).
20. Wenn ich mir nicht sicher war habe ich meinem Bauchgefühl vertraut.
21. Ich habe zu vorsichtig gespielt.
23. Ich bin beim Spielen zu wenige Risiken eingegangen.
24. Wenn Sie den 50/50 Joker benutzt haben: nachdem ich den 50/50 Joker eingesetzt habe, habe ich die Antwort geraten.

Items 5, 21, 23 were recoded.

The complete data is attached digitally.

Nr	Name	Date	Age	Gender	Mode[1]	Advancement (Levels)	Winnings (Levels)	Share of Lifelines	End of game[2]	Goals
1	Stefan Schneider	30.12.11	29	m	1	12	11	0,75	0	Kredit abbezahlen, Einkaufen für Freundin
2	Yvette Zippel	30.12.11	30[3]	w	1	12	11	1	0	Endschalldämpfer, finanzieller Puffer um Buch zu schreiben
3	Emal Fakhri	30.12.11	23	m	1	13	12	1	0	das Leben finanzieren, Wecker, elektrische Zahnbürste, nichts genaues
4	Sabrina Knoke	02.01.12	25[3]	w	0	9	5	0,67	1	
5	Rene Stolle	02.01.12	38	m	1	11	10	1	0	
6	Yasmin Golla	06.01.12	40[3]	w	0	12	11	1,33[4]	0	Dauerkarten Fußball kaufen
7	Sissis Kamarianakis	06.01.12	34	m	1	13	12	1	0	Kanadareise, Couch, Fallschirmsprung über dem Amazonas
8	Alexander Bull	06.01.12	27	m	1	10	9	1	0	Sparen
9	Stefanie Bretz	09.01.12	25[3]	w	1	12	11	1	0	Reise Australien, Harry Potter Sammelband
10	Floyd Fürstenau	09.01.12	27	m	0	11	10	1	1	sorgenfrei Studieren, Kaffeevollautomat, Australien, Haus mit Musikstudio
11	Ayyoub Affani	13.01.12	27	m	1	12	11	1	0	Reise nach Mekka (Eltern)
12	Armin Hegen	16.01.12	42	m	1	12	11	1	0	Schulden bezahlen, 4-türiges Auto, Bett
13	Julia Behrens	16.01.12	33[3]	w	0	11	10	1	1	Reise in Antarktis
14	Klaus Rizzin	20.02.12	38	m	0	13	12	1	0	Camper
15	Marlee Nolze	20.02.12	24	w	1	11	10	1	0	Monatsmieten, Zeit bis zum Referendariat überbrücken
16	Daniel Schoofs	23.01.12	27	m	0	12	11	1	0	Shoppen mit Freundin, Auto behalten, Studium finanzieren, Reise (Über Atlantik segeln)
17	Martina Buchmeyer-Gallegos	27.01.12	18	w	0	10	9	1	0	Party
18	Frederik Reimann	27.01.12	22	m	1	13	12	1	0	Auslandsjahr für die Schwester; Auslandssemster in China für sich selbst, Rest anlegen

19	Gabriele Urban	30.01.12	65[3]	w	0	13	12	1	0	Fliesen für Badezimmer (nach Rohrbruch wird gerade renoviert) und Küche („aber ein bisschen Luxus“); Ahnenforscher für die Mutter
20	Michael Osius	30.01.12	41	m	1	12	11	1	0	Kleinigkeiten, Sofa, Fernseher
21	Tim Vogt	06.02.12	28	m	0	10	9	1	0	
22	Stefanie Jacobi	10.02.12	23[3]	w	0	12	10	0,67	1	Sixt Platinum Card (Mutter), Bahncard 100, Reise Japan (Bruder), Motorrad (Vater), Kur (Oma), 20% an Cousin
23	Angelina Wendt	10.02.12	20	w	0	12	11	1	0	sicheres Studium, Auslandssemester, Auto
24	Claudia Weber	13.02.12	24	w	0	12	11	1	0	Kleiderschrank kaufen, Studium finanzieren, Reise mit Freund, Handtasche
25	Matthias Veit	13.02.12	38	m	0	13	12	1	0	neue Posaune, Ring für die Frau
26	Vera Rohrdantz	17.02.12	60	m/w	0	13	12	1	0	Schulden bezahlen
27	Heiko Arlhäuser	20.02.12	30	m	1	12	11	1	0	Kinderzimmer einrichten, Kinderwagen, für die Frau Schuhe, Dauerkarte BVB
28	Theodor Köster	24.02.12	77	m	1	15	14	1	0	Enkel, Freunden helfen, neues Auto, Besuch in Pakistan, Reisen
29	Anja Weller	27.02.12	29	w	1	14	13	1	0	Bafög rückzahlen, mit Freund zusammenziehen, ein Fahrrad für den Freund, eine Luxuskamera, gut Essen gehen
30	Martin Ermen	27.02.12	45	m	1	14	13	1	0	Putzfrau engagieren, Beerdigung der Frau bezahlen, Flachbildfernseher, auf Sicherheit etwas weglegen, Urlaub in Liverpool
31	Laura Banz	05.03.12	24[3]	w	1	12	11	1	0	Studium bezahlen, Fußballkarte, Schuhe
32	Philipp Witchow	09.03.12	34	m	0	14	13	1	0	Fußball WM Brasilien besuchen, Sommelier-Ausbildung, Selbstständigmachen der Frau finanzieren
33	Klaus Fudickar	12.03.12	50	m	0	11	10	0,67	1	
34	Thomas Wagner	16.03.12	35	m	1	12	11	1	0	Kochschule eröffnen

[1]Mode: 0=normal, 1=risk; [2] End of game: 0=quit, 1=wrong; [3]Age estimated by researcher; [4] Four lifelines in normal mode

References

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*, 179-211.

Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. *Psychological Bulletin, 84* (5), 888-918.

Allais, M. (1953). Le comportement de l'homme rationnel devant le risque: critique des postulats et axiomes de l'école Américaine. *Econometrica, 21* (4), 503-546.

Bechara, A., Damasio, A., Damasio, H., & Anderson, S. (1994). Insensitivity to future consequences following damage to human prefrontal cortex. *Cognition, 50*, 7-15.

Binswanger, H. (1981). Attitudes toward risk: Experimental measurement in rural India. *Economic Journal , 91*, 867-890.

Blais, A.-R., & Weber, E. (2006). A Domain-Specific Risk-Taking (DOSPERT) scale for adult populations. *Judgment and Decision Making, 1* (1), 33-47.

Bolen, D., & Boyd, W. (1968). Gambling and the problem gambler: A review and preliminary findings. *Archives of General Psychiatry, 18*, 617-629.

Brown, C., & Krishna, A. (2004). The skeptical shopper: A metacognitive account for the effect of default options on choice. *Journal of Consumer Research, 31* (3), 529-539.

Budner, S. (1962). Intolerance of ambiguity as a personality variable. *Journal of Personality, 30* (1), 29-50.

Daghofer, F. (2007). Financial risk-taking on ‘‘Who Wants to Be a Millionaire’’: A comparison between Austria, Germany, and Slovenia. *International Journal of Psychology, 42* (5), 317-330.

Dalang, R., & Bernyk, V. (2004). A mathematical model for “Who wants to be a millionaire?”. *The Mathematical Scientist, 29* (2), 85-100.

de Roos, N., & Sarafidis, Y. (2009). Decision making under risk in Deal or no Deal. *Journal of Applied Econometrics, 25* (6), 987-1027.

Figner, B., Mackinlay, R. J., Wilkening, F., & Weber, E. (2009). Affective and deliberative processes in risky choice: Age differences in risk taking in the Columbia Card Task. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 35* (3), 709–730.

Fishburn, P. (1977). Mean-risk analysis with risk associated with below-target returns. *The American Economic Review, 67* (2), 116-126.

Franzen, A., & Pointner, S. (2009). Wer wird Millionär? Eine empirische Analyse der Erfolgsdeterminanten in der gleichnamigen Quizshow. *Zeitschrift für Soziologie, 38* (3), 239-256.

Gertner, R. (1993). Game shows and economic behavior: Risk-taking on "Card Sharks”. *The Quarterly Journal of Economics, 108* (2), 507-521.

Hanoch, Y., Johnson, J., & Wilke, A. (2006). Domain specificity in experimental measures and participant recruitment: An application to risk-taking behavior. *Psychological Science, 17* (4), 300-304.

Harnick, F., Van Dijk, E., Van Beest, I., & Mersmann, P. (2007). When gains loom larger than losses: Reversed loss aversion for small amounts of money. *Psychological Science, 18* (12), 1099-1105.

Harrison, J., Young, J., Butow, P., Salkeld, G., & Solomon, M. (2005). Is it worth the risk? A systematic review of instruments that measure risk propensity for use in the health setting. *Social Science & Medicine, 60*, 1385-1396.

Hartley, R., Lanot, G., & Walker, I. (2005). Who Really Wants to be a Millionaire: Estimates of Risk Aversion from Game Show Data. *Social Research, 719.* University of Warwick, Department of Economics. Retrieved 29/05/2012 from http://wrap.warwick.ac.uk/1471/

Hetsroni, A. (2004). The Millionaire Project: A cross-cultural analysis of quiz shows from the United States, Russia, Poland, Norway, Finland, Israel, and Saudi-Arabia. *Mass Communication & Society, 7* (2), 133-156.

Hetsroni, A., & Tukachinsky, R. (2003). “Who Wants To Be a Millionaire” in America, Russia, and Saudi Arabia: A celebration of differences or a unified global culture? *The Communication Review, 6*, 165–178.

Holmes, S. (2005). 'It's a woman!': the question of gender on Who Wants to be a Millionaire. *Screen, 46* (2), 155-173.
Johnson, D., & Gleason, T. (2009). Who REALLY wants to be a millionaire? Gender differences in game show contestant behavior under risk. *Social Science Quarterly, 90* (2), 243-261.
Johnson, J., Wilke, A., & Weber, E. (2004). Beyond a trait view of risk-taking: A domain-specific scale measuring risk perceptions, expected benefits, and perceived-risk attitude in German-speaking populations. *Polish Psychological Bulletin, 35*, 153-172.
Kahneman, D., & Tversky, A. (1979). Prospect Theory: An analysis of decision under risk. *Econometrica, 47* (2), 263-292.
Kahneman, D., Knetsch, J., & Thaler, R. (1991). Anomalies: The endowment effect, loss aversion, and status quo bias. *The Journal of Economic Perspectives, 5* (1), 193-206.
Kogan, N., & Wallach, M. A. (1964). *Risk taking: A study in cognition and personality.* New York: Holt.
Ladouceur, R. (2004). Perceptions among pathological and non-pathological gamblers. *Addictive Behaviors, 29*, 555-565.
Lehmann, E. E., & Warning, S. (2003). *The impact of gender in individual decisions: evidence from the "Millionaire Show".* Retrieved 05/13/2012 from Diskussionsbeiträge "Grüne Reihe" FB Wirtschaftswissenschaften, http://nbn-resolving.de/urn:nbn:de:bsz:352-opus-11742
Levin, I., Weller, J., Pederson, A., & Harshman, L. (2007). Age-related differences in adaptive decision making: Sensitivity to expected value in risky choice. *Judgment and Decision Making, 2* (4), 225-233.
Loewenstein, G., Weber, E., Hsee, C., & Welch, N. (2001). Risk as feelings. *Psychological Bulletin, 127* (2), 267-286.
MacCrimmon, K. R., & Wehrung, D. A. (1990). Characteristics of risk taking executives. *Management Science, 36* (4), 422-435.
March, J., & Shapira, Z. (1987). Managerial perspectives on risk-taking. *Management Science, 33* (11), 1404-1418.
Markowitz, H. (1952). The utility of wealth. *The Journal of Political Economy, 60* (2), 151-158.
Martin, R., Nelson, S., LaPlante, D., Usdan, S., Umstattd, M., Perko, M., et al. (2010). Using the Theory of Planned Behavior to predict gambling behavior. *Psychology of Addictive Behaviors, 24* (1), 89-97.
Metrick, A. (1995). A natural experiment in "Jeopardy!". *The American Economic Review, 85* (1), 240-253.
Perea, F., & Puerto, J. (2007). Dynamic programming analysis of the TV game ‘‘Who wants to be a millionaire?’’. *European Journal of Operational Research, 183* (2), 805-811.
Post, T., van den Assem, M., Baltussen, G., & Thaler, R. (2008). Deal or No Deal? Decision making under risk in a large-payoff game show. *American Economic Review, 98* (1), 38-71.
Pratt, J. (1964). Risk aversion in the small and in the large . *Econometrica, 32* (1/2), 122-136.
Prelec, D., & Loewenstein, G. (1991). Decision making over time and under uncertainty: A common approach. *Management Science, 37* (7), 770-786.
Prinz, J., & Wiendl, A. (2005). Humankapitalparadoxon auf dem deutschen Fernsehmarkt? Das Beispiel der Quiz-Show "Wer wird Millionär?". *Schmollers Jahrbuch, 125*, 405-425.
Quinn, R. (2003). Exploring the probabilities of ‘Who Wants to be a Millionaire?’. *Teaching Statistics, 25* (3), 81-84.
Schering, S. (2012). *Quotenmeter*. Retrieved 05/30/2012 from Primetime-Check, http://www.quotenmeter.de/cms/?p1=n&p2=56730&p3
Slovic, P. (1964). Assessment of risk taking behavior. *Psychological Bulletin, 61* (3), 220-233.
Slovic, P. (1987). Perception of risk. *Science, 236* (4799), 280-285.
Slovic, P., Finucane, M., Peters, E., & MacGregor, D. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis, 24* (2), 311-322.
Slovic, P., Fischhoff, B., & Lichtenstein, S. (1982). Why study risk perception? *Risk Analysis, 2* (2), 83-93.
Slovic, P., Fischhoff, B., Lichtenstein, S., Corrigan, B., & Combs, B. (1977). Preference for insuring against probable small losses: Insurance implications. *The Journal of Risk and Insurance, 44* (2), 237-258.
Sundali, J., & Croson, R. (2006). Biases in casino betting: The hot hand and the gambler's fallency. *Judgement and Decision Making, 1* (1), 1-12.

von Neumann, J., & Morgenstern, O. (1944/2004). *Theory of games and economic behavior.* Princeton, Oxford: Princeton University Press.
Weber, E., & Milliman, R. (1997). Perceived risk attitudes: Relating risk perception to risky choice. *Management Science, 43*, 122-143.
Weber, E., Blais, A.-R., & Betz, N. (2002). A domain-specific risk-attitude scale: Measuring risk perceptions and risk behaviors. *Journal of Behavioral Decision Making, 15*, 263-290.
Wilkes, B., Gonsalvez, C., & Blaszczynski. (2009). Psychophysiological responses to win and loss events during electronic gaming machine (EGM) play: A pilot investigation. *Gambling Research, 21* (2), 22-34.
Yates, J. F., & Stone, E. R. (1992). The risk construct. In J. F. Yates, *Risk Taking Behavior* (pp. 1-25). New York: John Wiley & Sons.
Zuckerman, M. (1979). *Sensation seeking: Beyond the optimal level of arousal.* New York: Wiley.
Zuckerman, M. (2007). The sensation seeking scale V (SSS-V): Still reliable and valid. *Personality and Individual Differences, 43* (5), 1303-1305.
Zuniga, A., & Bouzas, A. (2006). Consumo de alcohol en los adolescentes: Perceptión de consecuencias positivas y negativas. *Revista Mexicana de Psicología, 23* (1), 97-110.

EHRENWÖRTLICHE ERKLÄRUNG

Ich erkläre hiermit ehrenwörtlich, dass ich meine Masterarbeit mit dem Titel:

"Who dares to guess: Risky choice and gambling attitudes in an experimental research design of *Who Wants To Be A Millionaire?*"

selbstständig und ohne fremde Hilfe angefertigt habe.

Die Übernahme wörtlicher Zitate sowie die Verwendung der Gedanken anderer Autoren habe ich an den entsprechenden Stellen der Arbeit kenntlich gemacht.

Ich bin mir bewusst, dass eine falsche Erklärung rechtliche Folgen haben wird.

Ort, Datum Unterschrift