The Effects of Loss of Control on Risk Taking

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Birgit Mirjam Wimmer

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1. Referent: Prof. Dr. Thomas Götz

2. Referent: PD Dr. Marco Steinhauser

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Contents

Summary

Given the ongoing, rapid development in today's modern society, the circumstances of our daily lives as well as our everyday working and living conditions are continuously and quickly changing and are characterized by increasing complexity. This poses a great challenge to the people who have to constantly orient and adapt to new living and working conditions. In this sense, experiences of uncertainty and uncontrollability can become a frequent part of our everyday lives, and dealing with experiences of a lack of control can be considered a key competence for living in modern societies; the more so as uncontrollable events obstruct people's fundamental need to perceive themselves as competent and capable persons who are in control of relevant situations, actions, and outcomes. Besides the fact that experiences of uncontrollability conflict with this need and are known to be related to a broad range of negative outcomes with respect to emotions, motivation, and behavior, maintaining one's ability to immediately continue with daily business is necessary. As one frequent and important aspect of our personal and professional lives is to decide between alternatives with unpredictable or chance-related outcomes, the present dissertation aimed to investigate the effects of subjective loss of control experiences on subsequent risk-related decision making. With experiences of lacking control and decisions under risk being a common occurrence in everyday life, this question bears wide theoretical and practical relevance, but nevertheless has not received much attention in research so far.

The theoretical framework of this dissertation is based on the well-established model of control beliefs by Skinner, Chapman and Baltes (1988) which proposes that subjective loss of control experiences can arise from impairments in different aspects of contingency relations between persons (agents), their behavior (means), and their outcomes (ends). Furthermore, the nature of the consequences elicited by subjective loss of control experiences for risk-related decisions is generally considered to be influenced by the character of prior experiences and their subjective cognitive appraisals. For example, subjective loss of control due to personal failure or lack of ability to meet the requirements is assumed to exert different effects on future decision making than subjective loss of control due to changes in external conditions lying outside one's own accountability. To this end, the effects of subjective loss of control

experiences on risk taking were investigated in two separate sets of studies, each focusing on one specific cause. Study I concentrated on the effects of distortions in the relation between characteristics of a given task (difficulty) and the individual's capability, thus capturing the agent-means relation. In contrast, Study II investigated the impact of subjective loss of control due to changes in external conditions within the relation between means and ends.

In a set of two pilot and two main experiments, Study I investigated the effect of subjective loss of control, referring to the agent-means relation, on subsequent risk propensity. Making allowance for the lack of existing appropriate experimental designs, a one factorial pre-post experimental-control group paradigm was first developed and tested within the two pilot experimental studies (N_1 = 34, 74% female; N_2 = 42, 50% female). This set of studies aimed at inducing subjective loss of control in reference to the relation between the task and people's capabilities to fulfill it within an experimental incentive-related computer-game setting by gradually increasing the task difficulty. In the two main experimental studies the paradigm was applied to investigate the effects of difficulty-related subjective loss of control on risk propensity. In order to capture the decision-making process in more detail, the two main experimental studies focused on the effects on risk perceptions with respect to a case vignette (N = 50, 50% female) and actual risk-taking behavior (N = 47, 49% female), respectively, thus assessing both a cognitive and behavioral indicator of risk propensity. Supporting the hypotheses, prior subjective loss of control experiences affected subsequent risk-related decision making in terms of decreasing risk propensity. Results demonstrated increased levels of risk perceptions and decreased risk-taking behavior following the experimentally induced subjective loss of control experiences. As the risk-related decision was objectively unrelated to the prior subjective loss of control experiences, these results further argue for their spillover effects on subsequent decision-making contexts beyond the initial setting where they are elicited.

Study II focused on another cause of subjective loss of control, that is, the relation between means and ends due to changes in external control conditions. As both Study I and Study II deal with the same basic research aim, namely, examining the effects of subjective loss of control experiences on risk-related decision making, the settings of the two studies were intended to be as similar as possible in order to allow for comparisons between the two studies. To this end, in a pilot study (N = 44, 50% female) the newly

developed experimental design of Study I was adapted to the specific objective of Study II, leaving the experimental settings identical with only the one critical aspect of interest differing between the designs. As the subjective loss of control experiences were intended to be attributed externally toward changes in objectively given control, the accuracy with which the participants' actions during the computer-game setting were implemented into the game was gradually decreased, thus generating a lack of control due to changes in the relations between behavior (means) and outcomes (ends). At the same time – in contrast to Study I – the task difficulty remained stable on a relatively low level. The effects of the hereby induced externally attributable subjective loss of control experiences on risk-related decisions were investigated by assessing actual risk-taking behavior in a computer-game setting. To further deepen the understanding of the processes by which prior subjective loss of control experiences impact risk taking, Study II additionally pursued two other research questions in its two main experiments. By proposing that spillover effects impact subsequent, objectively unrelated settings, the question of the linking pathways arises. Considering the importance of control appraisals in the emergence of emotions, Study II explored their influence as a possible linking variable in this relationship. More precisely, since the experimental design was assumed to arouse anger – an emotion commonly regarded as elicited by experiences where one's goal attainment has been blocked by externally attributable causes similar to the present experimental manipulation – the role of anger as a mediating mechanism in the relationship between subjective loss of control and risk taking was investigated. Furthermore, the issue of cross-cultural generalizability of the proposed relationships was tackled by investigating and comparing samples from two different cultural backgrounds, namely from Germany (N = 84, 54% female) and China (N = 125, 64% female). Results in both samples consistently showed that the externally attributed subjective loss of control considerably impacted subsequent risk-taking behavior. More specifically, risk propensity was increased following externally caused subjective loss of control and this effect was explained by the mediating role of anger. Thus, the experimental manipulation of the means-ends relation did not only induce subjective loss of control experiences, but also aroused anger which in turn let people act riskier in the subsequent decision-making setting. Based on theoretical models, anger's encouraging effect towards risk-taking behavior might be due to its habitually accompanying high certainty and control appraisals which seem to work even after

experiences of uncontrollability. Moreover, multiple group comparisons revealed similar patterns of results in both the German and Chinese sample affirming the findings' cross-cultural generalizability.

In summation, both studies provided empirical evidence for the impact of subjective loss of control experiences on subsequent risk-related decisions. Though the studies dealt with two different aspects of control beliefs due to objectively differing experimental manipulations that focused either on the agent-means relation (Study I) or means-ends relation (Study II), risk-related cognitions and behavior were shown to be strongly impacted by preceding experiences of personal control. However, with the two studies reporting opposite – decreasing (Study I) versus increasing (Study II) – effects on risk taking, the relevance of the perceived causes of uncontrollability is highlighted as they are considered to shape its consequences. A possible general advantage of perceiving the causes of uncontrollability in a certain way in order to contribute to ideal future risk taking cannot be stated per se, however, making people aware of the effects that experiences of subjective loss of control, their attributed causes, and resulting emotions can exert on risk-related decisions appears most promising from a more applied perspective. The major strengths of this dissertation include the investigation of several aspects of subjective loss of control effects from different perspectives, as well as the methodological contribution of developing and successfully testing new experimental paradigms for inducing subjective loss of control experiences which provide various possibilities for adaptation to related research objectives and whose cross-cultural applicability has already been demonstrated. Several suggestions for future research and practice, especially including a more detailed focus on the effects of emotions and on the results' transferability to more applied settings and real life, are offered.

Zusammenfassung

Angesichts der anhaltenden raschen Entwicklungen, die moderne Gesellschaften heutzutage auszeichnen, sind wir fortwährend mit veränderten Bedingungen im Alltags- und Berufsleben sowie steigender Komplexität konfrontiert. Sich ständig neu orientieren und den neuen Lebens- und Arbeitsbedingungen anpassen zu müssen, stellt eine große Herausforderung dar. In diesem Sinne sind Erfahrungen von Unsicherheit und Unkontrollierbarkeit ein häufiger und alltäglicher Teil unseres Lebens geworden. Mit diesen Kontrollverlusterfahrungen angemessen umgehen zu können, kann daher als eine Kernkompetenz für das Leben in modernen Gesellschaften betrachtet werden, die umso bedeutsamer erscheint, als diese Erfahrungen dem fundamentalen menschlichen Bedürfnis entgegenstehen, sich selbst als kompetente, fähige Person zu erleben, die für sie relevante Situationen, damit verbundene Verhaltensweisen und Ergebnisse kontrollieren kann. Neben der Tatsache, dass Unkontrollierbarkeitserfahrungen mit diesem Bedürfnis konfligieren und bekanntermaßen mit einer Vielzahl negativer psychologischer Konsequenzen verbunden sind, beispielsweise hinsichtlich Emotionen, Motivation und zukünftigen Verhaltens, ist es für den Einzelnen unerlässlich, trotz dieser Erfahrungen die individuelle Handlungsfähigkeit aufrechtzuerhalten, um den Alltagsgeschäften weiterhin nachgehen zu können. Da wir in unserem privaten und beruflichen Alltagsleben häufig mit Entscheidungen konfrontiert sind, bei denen wir zwischen Alternativen mit kaum oder nicht vorhersagbaren Konsequenzen wählen müssen, wird in dieser Dissertation speziell der Frage nachgegangen, wie sich subjektive Kontrollverlusterfahrungen auf solche nachfolgenden Risikoentscheidungen auswirken. Diese Fragestellung zeichnet sich – da wir im alltäglichen Leben sowohl Unkontrollier-barkeitserfahrungen als auch Risikoentscheidungen ausgesetzt sind – durch hohe theoretische und praktische Relevanz aus, hat jedoch bislang in der Forschung kaum Beachtung gefunden.

Der theoretische Rahmen dieser Dissertation basiert auf dem etablierten Modell zu Kontrollüberzeugungen von Skinner, Chapman und Baltes (1988), nach dem subjektiver Kontrollverlust durch die Beeinträchtigung von verschiedenen Aspekten in den Kontingenzbeziehungen zwischen der agierenden Person (agent), der Handlung (means) und dem resultierenden Ergebnis (ends) entstehen kann. Wie sich Erfahrungen

subjektiven Kontrollverlusts im Detail tatsächlich auf Risikoentscheidungen auswirken, wird im Allgemeinen als von zwei Aspekten abhängig angesehen: Von der Art der vorausgegangenen Kontrollverlusterfahrung sowie von deren subjektiver kognitiver Bewertung. Beispielsweise wird sich ein subjektiver Kontrollverlust, der auf persönliches Versagen oder einen Mangel an Fähigkeiten, die vorgegebenen Anforderungen zu erfüllen, zurückgeführt wird, vermutlich in anderer Art und Weise auf nachfolgende Entscheidungsprozesse auswirken als Unkontrollierbarkeitserfahrungen, die äußeren, persönlich nicht beeinflussbaren Umständen zugeschrieben werden. Daher wurden die Auswirkungen von subjektiven Kontrollverlusterfahrungen auf Risikoentscheidungen in zwei separaten Studienreihen untersucht, wobei jede aus mehreren Experimenten bestand und sich mit jeweils einer spezifischen Ursache von subjektivem Kontrollverlust befasste: Studienreihe I beschäftigte sich mit Kontroll-verlust aufgrund von Störungen in der Person-Handlungs-Beziehung (agent-means relation); hierbei standen Beeinträchtigungen in der Relation zwischen Aufgaben-charakteristika (Schwierigkeit) und der persönlichen Fähigkeit, diese zu lösen, im Fokus. Im Gegensatz dazu wurden in Studienreihe II die Auswirkungen von subjektivem Kontrollverlust aufgrund von Veränderungen in äußeren Umständen untersucht, die die Beziehung zwischen Handlung und Ergebnis beeinträchtigten (means-ends relation).

Im Rahmen der Studienreihe I wurde in einer Abfolge von zwei Pilotstudien und zwei Hauptexperimenten untersucht, wie sich subjektiver Kontrollverlust, der auf Beeinträchtigungen in der Person-Handlungs-Beziehung (agent-means relation) zurückzuführen ist, auf Risikobereitschaft auswirkt. Um dem Mangel an bislang existierenden geeigneten experimentellen Designs Rechnung zu tragen, wurde zunächst in zwei Pilotstudien (N_1 = 34, 74% weiblich; N_2 = 42, 50% weiblich) ein neues einfaktorielles Experimental-Kontrollgruppen-Prä-Post-Design entwickelt und vorgetestet. Das Ziel des Paradigmas bestand darin, subjektiven Kontrollverlust zu induzieren, der sich auf die Relation zwischen den Charakteristika der Aufgaben und der persönlichen Fähigkeit, die Aufgaben zu erfüllen, bezog. Hierfür wurde im experimentellen Setting die Aufgabenschwierigkeit im Rahmen eines anreizbezogenen Computerspiels zunehmend gesteigert. In den beiden Hauptexperimenten wurde anschließend mittels dieses neu entwickelten experimentellen Designs untersucht, wie die subjektiven Kontrollverlusterfahrungen aufgrund steigender Aufgabenschwierigkeit nachfolgende Risikoentscheidungen beeinflussen. Um die Auswirkungen auf den

Risikoentscheidungsprozess genauer zu erforschen, wurden in den beiden Hauptexperimenten dieser Studienreihe die Effekte sowohl auf Risikoeinschätzungen mittels einer vorgegebenen Fallvignette (N = 50, 50% weiblich) als auch auf tatsächliches Risikoverhalten (N = 47, 49% weiblich) untersucht und somit je ein kognitiver und ein behavioraler Indikator von Risikobereitschaft erfasst. Im Einklang mit den Hypothesen beeinflussten vorangegangene subjektive Kontrollverlusterfahrungen nachfolgende Risikoentscheidungen in signifikanter Weise und bewirkten verringerte Risikobereitschaft. Nach experimentell induzierten Kontrollverlusterfahrungen schätzten die Versuchsteilnehmer ein vorgegebenes Fallszenario in signifikanter Weise als riskanter ein und verhielten sich weniger risikobereit. Da die Risikoentscheidungen objektiv betrachtet von den vorangegangenen subjektiven Kontrollverlusterfahrungen unabhängig waren, sprechen diese Ergebnisse zudem dafür, dass sich diese Erfahrungen mittels Spillover-Effekten über das ursprüngliche Setting hinaus auf nachfolgende Entscheidungskontexte auswirken.

In Studienreihe II stand anschließend eine andere Ursache für subjektiven Kontrollverlust im Fokus der Untersuchung, und zwar Beeinträchtigungen in den Handlungs-Ergebnis-Beziehungen (means-ends relation) aufgrund von Veränderungen in objektiven Gegebenheiten. Da sich jedoch sowohl die Studienreihe I als auch die Studienreihe II mit derselben übergeordneten Fragestellung, nämlich den Auswirkungen subjektiver Kontrollverlusterfahrungen auf Risikoentscheidungen, beschäftigen, sollten die experimentellen Settings der beiden Studien soweit wie möglich identisch sein, um größtmögliche Vergleichbarkeit zu gewährleisten. Zu diesem Zweck wurde das in Studienreihe I neu entwickelte experimentelle Design in einer Pilotstudie (N = 44, 50% weiblich) an die spezifische Fragestellung von Studienreihe II angepasst, wobei das experimentelle Setting identisch belassen wurde und nur der entscheidende Aspekt, nämlich die Ursache des Kontrollverlusts, verändert wurde. Um external attribuierbaren subjektiven Kontrollverlust aufgrund von Veränderungen in objektiven äußeren Gegebenheiten zu induzieren, wurde im Rahmen des experimentellen Computerspiel-settings die Genauigkeit, mit der die Spielzüge der Probanden in das Computerspiel übertragen wurden, schrittweise reduziert. Auf diese Weise wurden subjektive Kontrollverlusterfahrungen aufgrund von Veränderungen in der Beziehung zwischen der Handlung des Probanden (means) und den resultierenden Ergebnissen (ends) erzeugt. Die Aufgabenschwierigkeit des Computerspiels blieb dabei – im Gegensatz zur

Studienreihe I – stabil auf einem relativ niedrigen Niveau. Die Auswirkungen des dadurch induzierten external attribuierbaren subjektiven Kontrollverlusts auf Risikoentscheidungen wurden durch Erfassung von tatsächlichem Risikoverhalten in einem Computerspielkontext untersucht. Um darüber hinaus zu einem besseren Verständnis der zugrundeliegenden Mechanismen, wie sich vorangegangene subjektive Kontrollverlusterfahrungen auf Risikoverhalten auswirken, beizutragen, wurde in den beiden Hauptexperimenten der zweiten Studienreihe zwei weiteren Forschungsfragen nachgegangen. Durch die Annahme, dass sich subjektive Kontrollverlusterfahrungen mit Spillover-Effekten auf nachfolgende Kontexte auswirken können, wurde die Frage aufgeworfen, welche Variablen die Funktion eines möglichen Bindeglieds zwischen diesen, objektiv betrachtet unabhängigen, Settings übernehmen könnten. Angesichts der Wichtigkeit von Kontrollappraisals für die Entstehung von Emotionen sollte in Studienreihe II deren Funktion in diesem Zusammenhang genauer erforscht werden. Es wurde angenommen, dass das experimentelle Design von Studienreihe II vermutlich Ärger auslösen würde, da diese Emotion nach allgemeinem Verständnis durch die Wahrnehmung entsteht, dass ein eigenes Ziel aufgrund äußerer Blockaden nicht erreicht werden kann. Daher wurde untersucht, ob die Emotion Ärger möglicherweise als Mediator des Zusammenhangs zwischen subjektivem Kontrollverlust und Risikoverhalten dienen könnte. Darüber hinaus wurde der Frage nach der kulturübergreifenden Generalisierbarkeit der angenommenen Zusammenhänge nachgegangen, indem zwei Stichproben mit unterschiedlichem kulturellen Hintergrund, aus Deutschland (N = 84, 54% weiblich) und aus China (N = 125, 64% weiblich), untersucht und verglichen wurden. Die Ergebnisse zeigten konsistent in beiden Stichproben, dass external attribuierter subjektiver Kontrollverlust nachfolgendes Risikoverhalten signifikant beeinflusste: Die Risikobereitschaft war nach dem external verursachten subjektiven Kontrollverlust signifikant höher, wobei dieser Effekt durch Ärger mediiert wurde. Die experimentelle Manipulation der Handlungs-Ergebnis-Beziehung (means-ends relation) hatte also nicht nur subjektive Kontrollverlust-erfahrungen induziert, sondern auch Ärger ausgelöst, der wiederum zu riskanterem Verhalten im nachfolgenden Entscheidungssetting führte. Auf Grundlage theoretischer Modelle könnte die Förderung riskanten Verhaltens durch Ärger darauf zurückzuführen sein, dass diese Emotion unter Anderem mit der Einschätzung einhergeht, selbst über hohe Kontrolle zu verfügen. Offenbar können diese Einschätzungen ihre Wirkung sogar

nach Unkontrollierbarkeitserfahrungen – wie in Studienreihe II induziert – entfalten. Auch zeigten Multigruppenvergleiche eine sehr große Übereinstimmung in den Ergebnismustern zwischen der deutschen und der chinesischen Stichprobe, so dass die kulturübergreifende Generalisierbarkeit der Ergebnisse bestätigt werden konnte.

Zusammenfassend lieferten beide Studienreihen empirische Evidenz für den Einfluss von subjektiven Kontrollverlusterfahrungen auf nachfolgende Risikoentscheidungen. Trotz der Tatsache, dass sich die beiden Studienreihen mit verschiedenen Aspekten von Kontrollüberzeugungen beschäftigten, da sich die experimentellen Manipulationen auf die Person-Handlungs-Beziehung (agent-means relation) in Studienreihe I beziehungsweise auf die Handlungs-Ergebnis-Beziehung (means-ends relation) in Studienreihe II bezogen, zeigten die Ergebnisse übereinstimmend, dass sowohl Risikoeinschätzungen als auch Risikoverhalten stark durch vorangegangene Kontrollerfahrungen beeinflusst werden. Da in den beiden Studienreihen jedoch entgegengesetzte Effekte auf Risikoentscheidungen gefunden wurden – in Studienreihe I sank die Risikobereitschaft nach subjektivem Kontrollverlust, während sie in Studienreihe II zunahm – ist darüber hinaus die Relevanz der wahrgenommenen Ursachen für den subjektiv erlebten Kontrollverlust im Hinblick auf die nachfolgenden Konsequenzen zu betonen.

Auf Grundlage dieser Ergebnisse können keine allgemeingültigen Aussagen darüber gemacht werden kann, wie Ursachen für Unkontrollierbarkeit eingeschätzt werden sollten, um nachfolgende Risikoentscheidungen zu optimieren. Daher erscheint es aus praktisch-angewandter Perspektive am sinnvollsten, explizit darauf hinzuweisen und bewusst zu machen, in welcher Weise sich subjektive Kontrollverlusterfahrungen sowie damit verbundene Kausalattributionen und Emotionen auf Risikoentscheidungen auswirken können. Eine Stärke der vorliegenden Dissertation liegt in der Untersuchung der Effekte unterschiedlicher Facetten von subjektivem Kontrollverlust aus unterschiedlichen Perspektiven. Außerdem wurde ein methodischer Beitrag geleistet, indem neue und erfolgreich getestete experimentelle Paradigmen zur Induktion subjektiver Kontrollverlusterfahrungen vorgestellt wurden, die zudem nach geringfügiger Anpassung eine Vielzahl von Möglichkeiten zur Untersuchung verwandter Forschungsfragestellungen bieten und deren kulturübergreifende Anwendbarkeit bereits bestätigt wurde. Vorschläge und Implikationen für die Praxis und für zukünftige Forschungsaktivitäten, die beispielsweise eine genauere Untersuchung der

Emotionseffekte sowie der Übertragbarkeit der Ergebnisse auf stärker angewandte Kontexte beinhalten, werden abschließend diskutiert.

1 General Introduction

1.1 Overview

People want to perceive themselves as competent, capable, and in control of actions, things, and situations around them, especially if they are personally relevant to them and may have particularly positive or negative consequences associated, or perhaps a combination of both. Everyone wants to feel self-determined and efficacious, and the wish of gaining and maintaining personal control is even referred to as a fundamental human need (Heckhausen & Schulz, 1995; Skinner, 1996). However the ongoing technological and societal developments, the circumstances of our daily lives, and our everyday working and living conditions are continuously changing and are characterized by increasing complexity (Schober, Finsterwald, Wagner, Lüftenegger, Aysner, & Spiel, 2007). We have to face new challenges every day which – at least until we find our way to adapt and cope with them – might arouse feelings of uncertainty and a lack of control. Experiences of uncontrollability can be related to a broad range of negative and unpleasant outcomes, but even in the face of these negative experiences we still need to immediately continue our daily lives, such as carrying on with our work and handling any sort of business.

One frequent and important aspect of our personal and professional functioning is that we have to make decisions. Every day we face countless situations in which we have to choose between different alternatives; often these situations are associated with unpredictable outcomes whose consequences for our future could range from negligible to enormous. Thus, a question arises that thus far has not received much attention in research, that is, whether our decision-making process is impaired following recent experiences of uncontrollability. How do subjective loss of control experiences – of particular importance as they seem to be a frequent and momentous part of everyday life – influence people's subsequent decision making? Since decisions within a risk context are particularly characterized by perceived controllability and thus might be especially affected by prior control perceptions, this dissertation focuses on the effects of subjective loss of control experiences on risky decision making. Specifically, it is

concerned with questions such as: Do subjective loss of control experiences impact the subsequent risk-related decision-making process? Do they affect both cognitions and behavior even in new, objectively unrelated settings? Do people make decisions in an overly risk-averse or risk-seeking way following loss of control experiences? Do the circumstances and perceived reasons associated with loss of control influence the consequences or do they – once experienced – have a uniform impact across different perceived causes? What underlying mechanisms might be able to explain how prior loss of control experiences are transferred between contexts and impact subsequent decisions? Finally, in regard to concerns of generalizability, are there are any cultural influences on the relationships and underlying mechanisms of interest to the current set of studies?

These issues are quite complex and likely influenced by a number of other variables. As such, when undertaking the initial steps of investigations aimed at pursuing the answers to these questions, a highly standardized, laboratory experimental setting enabling the study to control for possible confounds and undesirable effects appears most suitable.

Therefore, two separate empirical studies are presented in this dissertation, each consisting of a set of experiments. Study I contains two pilot and two main experimental studies, while Study II consists of one pilot and two main experimental studies. In order to contribute to a deeper understanding of the effects of loss of control experiences due to a variety of reasons, the main difference between the two studies lies in the methodological ways subjective loss of control is induced, both of which are pretested in the pilot studies. Following the experimental induction, the main parts of both studies then intensively focus on the effects of loss of control on subsequent risk-related decisions. While Study I assesses both cognitions and behavior as indicators of risk propensity, Study II exclusively concentrates on behavioral decisions. Study II additionally takes a more detailed look at the underlying mechanism by investigating the role of emotions, namely anger, in the relation between loss of control and risk taking. Finally, Study II also tackles the issue of the results' generalizability by examining samples from two different cultural backgrounds and, thus, enabling cross-cultural comparison. In summary, this dissertation deals with the circumstances of how subjective loss of control experiences impact subsequent risk-related decision making from several perspectives.

1.2 Definition and Aspects of Subjectively Perceived Control

Subjective perceptions of personal control are considered to be a very powerful psychological variable that exerts an impressive amount of influence on one's overall functioning and well-being. Typically, perceived control is defined as a person's belief about the extent to which he or she can predict or influence events (Bandura, 1989). Skinner, Chapman and Baltes (1988; see also Skinner, 1996) postulate that control beliefs, also called agent-ends beliefs, result from the combination of both agent-means and means-ends beliefs (cf. *Figure 1.1*). Means-ends beliefs represent the conviction that one's behaviors and outcomes are contingently connected and thus refer to the "extent to which certain classes of potential causes are effective in producing desired outcomes" (Skinner et al., 1988, p. 118). Agent-means beliefs, also referred to as agency beliefs, then deal with the question of whether one is able to perform the required behavior successfully, thus "the extent to which he or she possesses these means" (Skinner et al., 1988, p. 118).

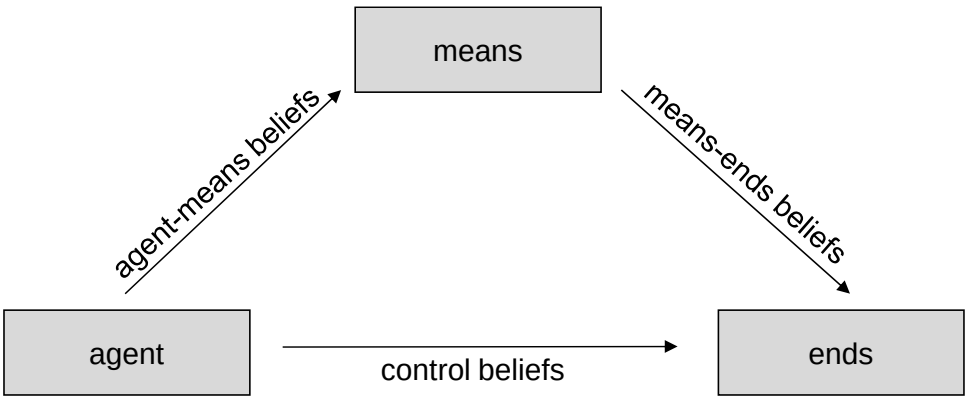

Figure 1.1: Relations of beliefs between agents, means, and ends (Skinner, Chapman, & Baltes, 1988)

Although the model has been extended and adapted to several contexts since it was originally introduced (e.g., see Rheinberg, 2004, for the motivational context), this framework allows a more detailed look at possible facets of control beliefs. Additionally, it enables the integration of different approaches, helps to analyze and classify potential causes of loss of control experiences, and facilitates the investigation and interpretation

of their subsequent consequences. It is important to note that no matter what facet of control beliefs is specifically considered it is this subjective estimation of personal control, rather than objectively given extent of control, which largely determines the following consequences (e.g., see Langer, 1979).

1.3 Consequences and Spillover Effects of Experiences of Lack of Control

It is generally argued that the consequences associated with experiences of lack of control can be momentous and can affect a broad range of psychological variables. A group of early, already classic studies (e.g., see Hiroto, 1974; Hiroto & Seligman, 1975) have demonstrated that experiences of a lack of control can compromise subsequent behavior and performance and can even cause physiological and health-related impairments. Based on these findings, the Theory of Learned Helplessness (Abramson, Seligman, & Teasdale, 1978; Seligman, 1975) was developed. This theory proposes a theoretical framework for explaining these empirically well-illustrated detrimental consequences. It postulates that experiences of lack of control – specifically those that elicit expectations of future uncontrollability by attributing the prior cause of uncontrollability in a dysfunctional way – can have negative effects on emotions, motivation, and cognitive functioning. Furthermore, this model also explains how subjective experiences of lack of control can exert a negative influence even beyond the original setting, that is, it can be transferred into new, objectively unrelated settings. This phenomenon is generally known as a spillover effect.

1.4 Perceived Control as an Antecedent of Emotions and Behavior

Building on these findings, perceived personal control today is now considered a central variable in various psychological theories on emotion, motivation and behavior. For example, it is consistently regarded as one of the most important dimensions in cognitive emotion theories (e.g., Lazarus, Averill, & Opton, 1970; Scherer, Schorr, & Johnstone, 2001). These models claim that cognitive evaluations of events (i.e., appraisals), and not the events per se, play a causal role in the emergence of emotions. These appraisals are further assumed to be characterized by several underlying

dimensions, among which the dimension of perceived control is proposed in several theories (e.g., Pekrun, 2000, 2006; Roseman, Antoniou, & Jose, 1996; Scherer, 1982; Smith & Ellsworth, 1985). Similarly, the dimension of controllability is one of the central aspects in Weiner's (1985) prominent attribution theory. While the research findings thus far mentioned deal with the retrospective evaluation of events, perceived control also plays a role with respect to motivation and future decision making. A considerable group of theoretical models suggests motivation and decision making largely depend on the individual's expectations to obtain the desired outcome, though other components (e.g., personal value of possible outcomes) may also be relevant (cf. Expectancy-Value Theory: Atkinson, 1957; Wigfield & Eccles, 2000; Valence-Instrumentality-Expectancy Theory: Vroom, 1964; Control Theory: Glasser, 1984; Theory of Planned Behavior: Ajzen, 1988, 1991; Fishbein & Ajzen, 1975). The expectancy component in these models can either be objectively given (e.g., objective probabilities) or due to the subjective estimation of probabilities shaped by experiences and expectations of control (i.e., perceived control).

1.5 General Conditions for Spillover Effects of Subjective Loss of Control

Given the previously mentioned consequences of experiences of lack of control, and also considering the role of perceived control for motivation and future behavior, it seems plausible to suggest that prior subjective loss of control impacts subsequent decision making. This dissertation investigates the consequences of subjectively perceived loss of control experiences and thereby concentrates on their effects on decision making in the context of risk. Based on the presented empirical findings, this impact is assumed to be due to spillover effects. In the present study, the exploration of these effects is related to several assumptions on the nature of the proposed spillover effects.

1.5.1 The Impact of Relevance

Initially, of concern is why it is important to focus on the effect of loss of control experiences on risk decisions in particular. It seems likely that prior experiences more strongly exert their influence in a subsequent, objectively unrelated setting when

important aspects of the prior experiences are also relevant in the new setting. Therefore, in this study, the spillover effects of subjective loss of control experiences are to be investigated in the face of decision making under risk, as the aspect of controllability is regarded to also be relevant in risky contexts. Risky actions are characterized by the uncertainty of their outcomes whether positive or negative, while risk is defined as containing two elements, namely, probability and severity of the outcomes (Renn, 1998). Although an objective assessment of risk might be possible, it is the subjective estimation of risk that guides individual decision making and behavior. For this reason, the influences of prior control experiences are assumed to be as follows: First, perceived controllability and illusions of control (Langer, 1975; for a review see Thompson, Armstrong, & Thomas, 1998) have been shown to play a crucial role for risk perceptions. Second, people's risk-taking decisions are impacted by their actual state (e.g., emotions) and immediately preceding experiences, a fact that has been included in several theories on risk-related decision making (e.g., risk-as-feelings-approach: Loewenstein, Weber, Hsee, & Welch, 2001). Thus, in the present dissertation the close association of control and risk as well as the relevance of control perceptions for risky decisions and behavior account for the choice of using a risky setting in order to investigate the spillover of subjective loss of control experiences.

1.5.2 Objective and Subjectively Perceived Causes

The nature of spillover effects is generally considered to be caused by the character of prior experiences and their subjective cognitive appraisals. More precisely, loss of control experiences which are caused by and/or perceived to be due to personal failure or a lack of ability might have different consequences than loss of control experiences caused by and/or perceived to be due to changes in objective circumstances that are not personally influenced. Taking into account the lack of research on the decision-related effects of prior loss of control experiences, this study aims at addressing this gap by investigating the risky decision-related consequences of two different "types" of subjective loss of control.

In regard to the context of the experimental studies, computer-related tasks are chosen to align with today's modern working conditions. The two aspects of objectively given control targeted during the experiments for the purpose of inducing subjectively perceived loss of control are related to the previously presented model of control beliefs

(Skinner et al., 1988). The first aspect targeted is the connection between the task and the individual's capability (agent-means relation) and thus is likely internally ascribed (Study I). In contrast, the second induction of loss of control is thought to pertain to the relation between one's behavior and the outcome (means-ends relation; Study II). According to the model, both experiences refer to subjective control beliefs, but these two separate aspects might shape their associated and subsequent consequences differently.

The development of experimental paradigms for investigating loss of control experiences and their consequences is also an important part of this dissertation for two reasons. First, there are currently very few experimental designs for inducing loss of control experiences. This topic has not received much attention in research, especially more recently, and there is a general lack of appropriate experimental paradigms, though these two facts might be mutually dependent. The few existing paradigms are rather out-dated (e.g., Hiroto, 1974; Rotter & Mulry, 1965) and do not meet some of the demands necessary in current empirical studies (e.g., ethical standards, contemporary external validity). Second, this dissertation aims at investigating the effects of subjective loss of control experiences due to two different causes. To ensure comparability between the results of both studies, the settings should be as similar as possible and should ideally differ in only this one aspect. Thus, new experimental paradigms meeting these requirements are developed and tested within this dissertation.

1.5.3 Linking Mechanism

Since spillover effects impact decision-making behavior in even objectively unrelated settings, the processes of how these are transferred to new contexts is also at issue. A part of this dissertation is concerned with this matter and, as such, aims to evaluate the following questions: What are the underlying mechanisms? And, what are the variables that are able to bridge the gap between the two settings? Because perceived control is such a central variable in cognitive emotion theories, the role of emotions in this relationship is considered. This investigation is an essential part of Study II which is concerned with the effects of objective changes within the relations between one's behavior and outcomes (means-end relations). Thus, because the circumstances of this experimental setting are assumed to arouse subjective control experiences due to external conditions which impair one's outcomes, but do not pose a personal threat, the

emotion of anger is expected to be elicited. The role which anger plays as a consequence of loss of control experiences as well as how it impacts subsequent risk-related decision making is traced in Study II in an attempt to uncover the mechanism linking spillover effects of subjective loss of control experiences and subsequent risk-taking behavior.

1.5.4 Generalizability and Cultural Influences

Finally, the generalizability of the spillover effects is a topic of great importance. Do the spillover effects impact individual decision making universally? Can findings on spillover effects be generalized across samples? This issue is particularly relevant for the current dissertation due to the fact that control experiences and their impact are typically considered to be culturally influenced. Control beliefs are even regarded as an important variable used to characterize similarities and differences between cultures (see for example the cultural dimensions by Hofstede, 2001). However, despite possible cultural differences in habitual control levels, the general need for personal control is considered to be a fundamental human motive (Heckhausen & Schulz, 1995; Skinner, 1996), thus arguing for the universality of momentous consequences in the case that this need is not fulfilled. Additionally, when considering the rather ambiguous empirical evidence on cultural influences on risk perception and behavior, cross-cultural generalizability with respect to the proposed spillover effects seems worthwhile to examine more closely (cf. Study II).

1.6 The Present Dissertation: Objectives and Outline

This dissertation aims to investigate the influences of experiences of loss of control on decisions in subsequent risky contexts. For this purpose, two separate and independent empirical studies are presented in the following chapters (Chapter 2 and 3), each of them consisting of several pilot and main experiments and tackling specific issues under the general research objective.

More precisely, the two studies concentrate on the effects of two differing experiences of subjective loss of control while investigating their impact on subsequent risk propensity. Study I (Chapter 2) focuses on loss of control experiences within the relation between the characteristics of the task (difficulty) and the individual's capability (difficulty-related loss of control). Thus, these experiences capture the agent-

means relation and the causes are assumed to be perceived to lie in one's own responsibility (lacking ability). In contrast, Study II (Chapter 3) deals with the impact of loss of control experiences due to changes in external conditions within the relation between means and ends. Thus, these kinds of loss of control experiences should be perceived to clearly lie outside of one's own accountability and thus should be attributed externally.

Facing a lack of appropriate experimental paradigms, the development of new paradigms which meet the distinct research purposes was one of the objectives of both Study I and Study II. While both studies deal with the same basic research aim, namely examining the effects of subjective loss of control experiences on risk-related decision making, the settings of the two studies are intended to be identical with only the one critical aspect of interest differing between the designs. Therefore, the two studies take place within the same experimental setting (including instruction, participants, recruiting, laboratory location, incentives, etc.), and only the experimental induction of subjective loss of control by implying a rather internal versus external attribution based on the model of relations between agents, means, and ends (Skinner et al., 1988) is intended to differ between the two paradigms.

Furthermore, both Study I and Study II assess actual risk-taking behavior in order to examine how perceptions of control impact risk-taking decisions. Actual behavior represents the final outcome of the decision process, and is therefore strongly tied to real life decision-making settings, thus ensuring the current study meets validity criteria.

Apart from these similarities, each of the two studies is concerned with its own exclusive research aims that are associated with the broad research goal of this dissertation. In addition to assessing actual risk-taking behavior, Study I (Chapter 2) focuses on risk perceptions of risk-related events. By investigating this cognitive indicator of risk propensity, a more detailed analysis of the influence which subjective loss of control experiences exert is enabled. Study II (Chapter 3) pursues several other research questions in addition to the analysis of how externally attributed loss of control experiences influence risk-taking behavior. By proposing that spillover effects impact subsequent, objectively unrelated settings, the question of the linking pathways arises. To this end, Study II investigates the role of emotions, particularly anger, as a mediating mechanism in this relationship. Furthermore, the issue of cross-cultural generalizability of the proposed relationships is tackled by investigating and comparing samples from

two different cultural backgrounds.

In the final Chapter 4 the main results of both independent empirical studies are brought together, summarized and discussed. Furthermore, limitations as well as implications are presented and final conclusions are drawn.

2 Spillover Effects of Loss of Control on Risk Propensity

2.1 Summary

Decision making under risk is frequently required in our everyday lives and has been shown to be influenced by various factors, some of which are independent of the risk context. Based on these previous findings as well as theories about the central role of subjective perceptions of control (e.g., Theory of Learned Helplessness) and their impact on subsequent – even unrelated – settings, spillover effects of subjective loss of control on risk propensity are assumed. After developing and testing an innovative experimental paradigm for inducing loss of control in order to overcome methodological shortcomings of previous designs, the hypothesized effects of loss of control on risk propensity are investigated in this set of four experiments. Supporting the hypotheses, prior experiences of loss of control affected subsequent risk propensity, both when assessed by risk perceptions and actual risk-taking behavior. Results demonstrated increased levels of risk perceptions and decreased risk-taking behavior following the experimental manipulation of subjective loss of control. Thus, this study provides evidence for the spillover effects of prior loss of control experiences on risk propensity and additionally makes a methodological contribution by proposing a newly developed experimental paradigm facilitating further research on the effect of subjective loss of control.

2.2 Introduction

"To be alive at all involves some risk."

(Harold Macmillan, 1894-1986)[1]

Risky environments are a part of people's everyday lives. There are numerous situations we have to face daily whose outcomes and consequences cannot be predicted. These situations are characterized by uncertainty and thus bear the potential for either positive or negative outcomes, for example, traffic situations, exams, and health-related or financial issues. We are not only exposed to these risky contexts, but we are often required to make immediate decisions about how to respond to these hazards and about which risks to take. Some examples of everyday decisions characterized by some degree of risk include selection of a route and means of transportation in traffic situations, choice of learning strategies for exams, whether or not to take preventive health-related actions (e.g., inoculation), and deciding on insurance contracts or investment options regarding our financial concerns.

These decisions are widely regarded to result from complex deliberating processes, for example, considering objectively given and stable hazard-related characteristics, such as probability estimates. Still, in addition to an economic preference perspective, psychological approaches make valuable contributions for understanding risk-related decision making. Individually differing and thus subjective influences on estimations of the risk's extent are crucial. Preceding events as well as characteristics of the actual situation impact the decision-making processes, among which subjective perceptions of personal control play an important role (Renn, 1998).

Perceptions of control can be defined as an individual's belief about the extent to which he or she can predict or influence events (Bandura, 1989). They result from beliefs that there is a contingent connection between one's behaviors and outcomes and the belief that one is able to perform the required behavior successfully (Skinner, 1996). Living in modern communities which are characterized by ongoing technical and societal developments and changes in living and working conditions (e.g., Schober et al., 2007), differing experiences of subjective control are ubiquitous. Facing rapid changes,

[1] Macmillan (1959) as cited in Walter (1998).

increasing complexity and novel challenges in their everyday lives, people might frequently experience feelings of a lack or loss of control over their changing environment.

Thus, being able to deal with these objective – and consequently subjectively perceived – changes of control appropriately and to understand how they affect everyday decisions, such as choices made under risk conditions, carries practical pertinence. However, so far research on the relationship between control experiences and risk-related decision making is scarce. This may partly be due to the fact that suitable experimental paradigms to systematically examine the effects of perceived control are lacking. Thus, in this study we aimed to overcome this shortage by proposing a newly developed experimental paradigm for inducing subjective loss of control. From a "psychoeconomic" perspective, we aimed to investigate the effects of prior subjective loss of control experiences on subsequent risk propensity, specifically, on cognitive risk estimations and behavioral decision making in a risky setting.

2.2.1 Objective and Subjective Aspects of Risk-Related Decision Making

Risk behavior refers to actions whose consequences are characterized by uncertainty and therefore are – to some extent – associated with either positive or negative outcomes. Thus, risk contains two components, namely, probability and severity of (negative) outcomes (Renn, 1998). The objective extent of the risk involved in a given hazard may be defined by a combination of these two elements. However, there are notable differences in people's ways of dealing with risky situations, even when they face comparable hazards with analogous threat potential and probability, and therefore objectively identical risk conditions. This phenomenon might be due to the fact that "individuals respond according to their perception of risk and not according to an objective risk level or the scientific assessment of risk" (Renn, 1998, p. 60). Further, even if perceptions of risk are similar, risk behavior may differ depending on an individual's willingness to participate in risky behavior. When aiming to understand people's risk propensity, it is therefore reasonable to take "objective" risk conditions, individual's "subjective" risk perceptions (cognition) as well as the actual risk-taking decision (behavior) into account individually.

2.2.2 Spillover Effects on Risk-Related Decision Making

Additional factors impacting people's risk perceptions and behavior – above objectively given risk conditions – have to be considered. The phenomenon that people's experiences in one domain impact their cognitions, emotions and behavior in another – even objectively unrelated – context, is known as a "spillover effect" and has been widely accepted and investigated. In empirical studies on decision making characteristics of the current situation, the individual's present state, and prior experiences emerge as important predictors of choice. In line with the risk-as-feelings-approach (Loewenstein et al., 2001), current emotions and mood states arising from stimuli, even those unrelated to the risky decision ("incidental affect"; Lerner & Keltner, 2000), were proven to impact risk perception and risk behavior (for a review see Waters, 2008). In addition, people's risk-taking decisions are impacted by immediately preceding experiences. For example, the effects of losses and gains on future decision making under risk conditions are discussed in the economic literature (cf. Arkes & Blumer, 1985: "sunk cost effect"; Staw, 1976: "escalation of commitment"; Thaler & Johnson, 1990: "house-money effect"). In regard to the frequently illustrated spillover effects between completely unrelated contexts, it is reasonable to assume that prior experiences might influence people's ways of feeling, thinking and acting in a new setting to a greater extent if these experiences are related to an important aspect of the new setting as well.

2.2.3 Spillover Effects of Control Perceptions on Risk Propensity: Theoretical Foundations

Spillover effects on subsequent risk-related decision making may be especially important to consider in relation to subjective experiences of personal control. Their substantial role in the deliberation process for decisions and behavior in risky situations has been empirically proven (cf. Renn, 1998); and research on illusions of control has added evidence regarding the impact of control perceptions in chance situations (Langer, 1975; for a review see Thompson et al., 1998). An especially strong association has been identified between people's perceived control and their risk perceptions (cf. Lench & Levine, 2005; Peters & Slovic, 1996; Rivers, Arvai, & Slovic, 2010; Slovic, 1987).

Based on this prior line of research, we expect that the experience of subjective loss of control will affect subsequent risk-related cognitions and behavioral decision making due to spillover effects. This proposition is in line with three different well-

established theoretical models, which can be classified to either (a) emphasize the consequences of perceived control or (b) be concerned with the risk-related perception and decision-making process. Despite this difference in their focus, all three research lines address the assumed impact of control experiences on risk propensity:

The Theory of Learned Helplessness (Abramson et al., 1978; Seligman, 1975), a member of the former category, represents one of the most prominent frameworks dealing with spillover effects and is the first theoretical model considered. The Theory of Learned Helplessness explains the empirically well illustrated emotional, cognitive, motivational and behavioral impairments that follow perceived lack of control, even in unrelated subsequent contexts. Following from this model, our proposed effects on subsequent risk-related judgments and behavior can be regarded as one of the consequences of perceived of lack of personal control. Second, when turning to the latter category of models, assumed spillover effects can also be drawn from the risk-as-feeling-approach (Loewenstein et al., 2001). Consistent with this approach it is proposed that an individual's previous experiences may also impact the decision-making process. Third, changes in risk-taking behavior following subjective experiences of uncontrollability may be due to current impairments of risk perception. Tversky and Kahnemann (1973, 1974) suggested that deviations in subjective judgments of probability are caused by the mental availability of appropriate events (intuitive "availability bias").

2.2.4 Previous Research on Perceived Control and Risk Propensity

So far, there is little research on the supposed relationship between perceived control and subsequent risk-related cognitions and behavior. Using an experimental laboratory design, Rivers and Arvai (2007) investigated the effect of chronic losses on decision making under risk. This study provides valuable support for the hypothesized relationship as they found decreased risk-taking behavior following their experimental manipulation. However, the study faces a few methodological shortcomings. First, despite arguing on the basis of the Theory of Learned Helplessness, the subjectively perceived extent of control was not explicitly measured. Second, they used hypothetical money and installed deviant probabilities for winning in the manipulated conditions without the participants' knowledge and therefore produced "unnaturally" occurring losses or wins. Further, the experimental design applies methods which are not in line with proposed and widely accepted guidelines in experimental economics, namely,

avoiding deception of participants (cf. Davis & Holt, 1992). These criteria are also important outside the field of experimental economics due to reasons of credibility, reputation and ethics.

Previously used classical experimental designs (e.g., Hiroto, 1974; Rotter & Mulry, 1965) did not meet these requirements when inducing subjective loss of control either. Therefore, new experimental designs meeting the guidelines and ethical criteria of experimental economics are needed in order to investigate the risk-related effects of subjective loss of control.

2.2.5 Research Aims and Hypotheses

The objectives of our set of studies were twofold; first, to contribute to methodological approaches and to overcome the limitations of previous studies. Therefore the first step was to develop and pilot an appropriate experimental paradigm for inducing subjective loss of control (Pilot Experimental Studies 1 and 2). The second objective aimed at investigating the spillover effects of subjective loss of control on risk propensity (Main Experimental Studies 1 and 2) as assessed by two separate indicators: risk perception as a cognitive measure and risk taking as a behavioral measure. We expected both measures to be affected by prior experiences of subjective loss of control; specifically, we were interested in testing two hypotheses.

Hypothesis 1: Due to spillover effects, prior subjective loss of control experiences are assumed to result in increased estimations of risk in a subsequent risky situation (cf. Main Experimental Study 1).

Hypothesis 2: Due to spillover effects, prior subjective loss of control experiences are assumed to result in decreased risk-taking behavior in a subsequent risky setting (cf. Main Experimental Study 2).

2.3 Pilot Experimental Study 1

2.3.1 Aims

Facing a lack of appropriate designs, the aim of this study was to pretest several potential components and decide on their inclusion in a new experimental design developed to induce subjective loss of control. With "loss" implying a change in possession, the experimental design was intended to make the participants perceive a gradual alteration in the extent of control. To this end, a computer-based problem-solving task was chosen and task difficulty was manipulated to gradually increase in order to induce subjective loss of control. This first pilot study thus aimed at pretesting various aspects of the problem-solving task in terms of their objective and perceived difficulty in order to select the most appropriate components for the experimental design.

2.3.2 Method

Overview: Computer Game

The problem-solving task consisted of an incentive-related computer game in which the participants had to predict by mouse click where an object would be displayed on a circle by recognizing the systematic pattern underlying the previously displayed objects (e.g., clockwise or equidistant, for an example see *Figure 2.1*).

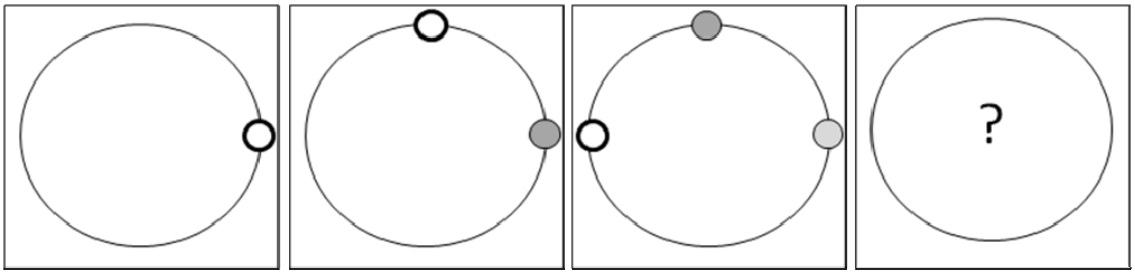

Figure 2.1: A sample schematic representation for a low difficulty pattern in the computer-based problem-solving task. Participants are asked to continuously indicate the assumed next position of the little white circle while its previous positions fade from dark grey to lighter shades of grey.

As the experimental paradigm being developed was supposed to consist of an experimental-control group pre-post-design with both conditions including four rounds of the game-based problem-solving task, this pilot study pretested 30 potential patterns. The goal was to select the most appropriate 12 patterns for inclusion in the subsequent experiments: eight patterns with low difficulty (experimental and control group baseline part as well as control group manipulation part) and four patterns with increasing difficulty (experimental group manipulation part). This computer-based paradigm was developed using the Zurich Toolbox for Readymade Economic Experiments (z-Tree; Fischbacher, 2007).

Participants and Data Collection

Sample. N = 34 students (74% female) with an average age of M = 22.29 years (SD = 5.23, range: 19 - 45) voluntarily participated in this study.

Procedure. In a one-factorial within-subjects design the participants played 30 rounds of the problem-solving task with each of them using a different underlying pattern. The patterns were determined by the angular distances of the subsequently displayed objects from the position of the object in the preceding display. Thus, the task of recognizing these sequences is similar to solving a continuing number series or pattern – a frequently used nonverbal reasoning task in common tests of intelligence (for example see K-ABC-II: Kaufman & Kaufman, 2004; CogAT6: Lohman & Hagen, 2001; CFT-20-R: Weiß, 2006). The 30 items were created specifically for this study and were tested in order to choose the 12 patterns most appropriate for inclusion in the experimental design in order to induce difficulty-related subjective loss of control. Thus, objective and subjective difficulty indicators, as well as their correspondence, served as criteria for choosing the 12 patterns ultimately selected for the experimental design. The order of the patterns was randomized between the participants.

Variables and Study Measures

Objective difficulty. The participants' performance was assessed by the measured angular deviation of the distance between the predicted position by the participant and the position where the object was actually displayed on the circle. Thus, theoretically, mean performance could range between 0° (perfect prediction) and 180° (worst prediction) for each participant and pattern. The average performance of all participants served as an indicator of objective difficulty of the pretested patterns.

Subjective difficulty. Following each of the 30 patterns the participants were asked to rate their experienced, thus subjective, perception of the difficulty level with respect to the previous round ("How difficult was the previous round for you?") on a seven-point rating scale ranging from 0 *extremely easy* to 6 *extremely difficult*. The subjective ratings of perceived difficulty were analyzed and compared with the participants' objective performance in order to select 12 (eight low difficulty and four increasing difficulty patterns) of the 30 pretested patterns for the experimental design.

2.3.3 Results

The average subjective difficulty of the 30 patterns was M = 2.25 (SD = 1.33, range: 0.09 - 5.12),[2] the average angular deviation as an indicator of objective difficulty was M = 27.55° (SD = 13.52°, range: 7.04° - 58.34°; theoretical range: 0° - 180°). The patterns' subjectively rated difficulty, objective difficulty and the correspondence between the two difficulty measures were used as the criteria for selection.

Descriptive statistics of the 12 selected patterns with respect to the subjective and objective difficulties and their Pearson correlations are displayed in *Table 2.1*. Patterns 1 to 8 were selected to represent low complexity. Although both the subjective and objective difficulty indicators of patterns 5 to 8 tended to be slightly higher, *t*-tests revealed no significant differences in the subjectively rated difficulty between each pair of subsequent patterns from 2 to 8, thus indicating no distinguishable increase in perceived difficulty. Both the subjective and objective difficulties of patterns 1 to 8 were below the average of all 30 pretested rounds.

In contrast, for patterns 9-12 both the subjective and objective difficulties were above average (subjective difficulty: M = [2.26, 5.12]; average angular deviation as a measure of objective difficulty: M = [30.33°, 53.08°]). Additionally, both the subjective and objective difficulty indicators significantly increased between each pair of subsequent patterns 9 to 12, indicating the proposed rise in difficulty.

With respect to all the 12 selected patterns the Pearson correlations between the subjective and objective difficulty measures ranged between r = .35, p = .044 (pattern 3), and r = .88, p < .001 (pattern 10), Mdn = .65, representing medium to high relationships

[2] This relatively low averaged subjective difficulty of the 30 pretested patterns can be explained by the fact that the pilot study aimed at selecting eight easy and only four relatively difficult patterns. Thus, the majority of the patterns for the pretest were created to have a rather low subjective difficulty level.

according to Cohen (1988).

Table 2.1: Descriptive Statistics and Correlations Between the Subjective and Objective Difficulties of the 12 Selected Patterns

Category of Difficulty	Selected Pattern	Subjective Difficulty		Objective Difficulty		*r* (Subjective – Objective Difficulty)
		M	*SD*	*M*	*SD*	
Low	1	1.18	0.94	20.00	8.48	.49 **
	2	1.47	1.11	16.77	6.83	.60 ***
	3	1.79	1.32	19.32	9.13	.35 *
	4	1.41	1.23	19.67	9.27	.69 ***
	5	1.91	1.42	31.27	12.02	.75 ***
	6	1.88	0.95	20.58	5.73	.54 **
	7	1.41	1.26	16.61	8.58	.42 *
	8	1.59	1.54	24.42	14.60	.87 ***
Increasing	9	2.26	1.52	30.33	11.93	.77 ***
	10	3.44	1.86	36.13	14.82	.88 ***
	11	4.29	1.19	52.56	9.59	.48 **
	12	5.12	0.88	53.08	10.45	.71 ***

Note. N = 34. Patterns 1-8 represent low difficulty patterns, whereas patterns 9-12 represent increasing difficulty patterns. *p < .05. **p < .01. ***p < .001.

2.3.4 Discussion

The results of the pretested patterns allowed for selection of 12 (eight low and four middle to high difficulty) patterns for inclusion in the experimental design. Patterns 1-4 were selected for the low difficulty baseline portion; similarly, patterns 5 to 8 were chosen for the control group's manipulation section for which the difficulty has to be kept at a relatively stable, low level. Finally, patterns 9-12 were chosen for the experimental group's manipulation section for which difficulty is intended to increase in order to induce subjective loss of control due to increasing task difficulty.

While the selection criteria were based on both subjective and objective difficulty indicators, a remarkable correspondence between the individuals' perception (subjective difficulty) and performance in these tasks (objective difficulty) was observed, especially for the more difficult patterns. Thus, despite the fact that this study

is mainly focusing on the effects of subjectively perceived extents of control, their correspondence with the objectively given conditions is very satisfying and the selection of patterns for the experimental design based on this pilot experimental study can be considered valid.

2.4 Pilot Experimental Study 2

2.4.1 Aims

The objective of Pilot Experimental Study 2 was to investigate whether the increase in objective task difficulty would impact participants' subjectively perceived extent of control. Therefore, the experimental design included the previously tested and selected patterns of varying difficulty. By assessing the participants' subjective control ratings, the question to be explored was whether the objectively produced decrease in control (due to increasing task difficulty) is subjectively perceived as a loss of control.

2.4.2 Method

Participants and Data Collection

Sample. *N* = 42 students (50% female) recruited using the online recruiting system ORSEE (Greiner, 2004) participated in Pilot Experimental Study 2 and had an average age of *M* = 22.00 years (*SD* = 2.45, range: 19 - 30). The subjects participated voluntarily and were compensated by a fixed participation fee plus payment according to their individual performance in the problem-solving game (maximum profit: 1 € per round). The participants were randomly assigned to the treatment conditions with *n* = 20 (50% female) in the experimental (EG) and *n* = 22 (50% female) in the control group (CG).

Procedure and experimental design. The experimental study consisted of a one-factor pre-post design with questionnaires following the baseline and manipulation sections (cf. *Figure 2.2*) to allow for both between- and within-subject comparisons.

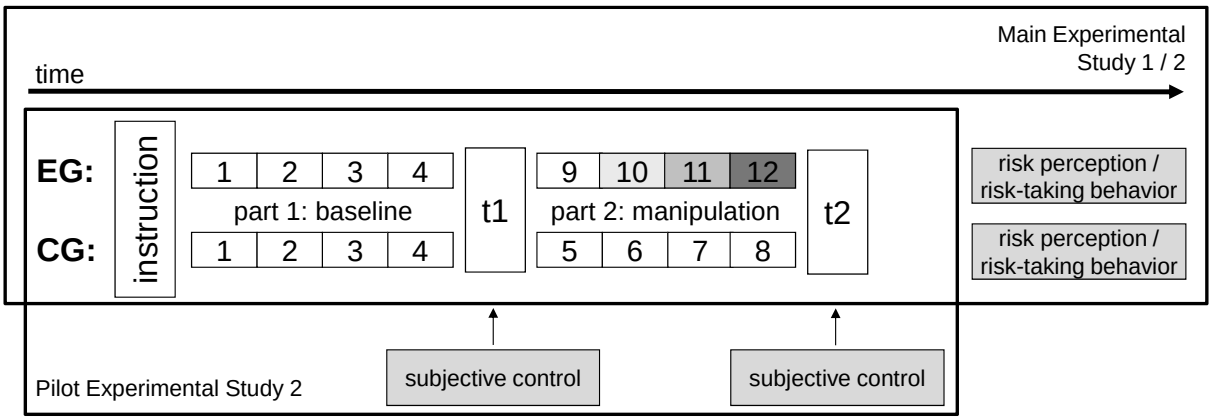

Figure 2.2: Design of Pilot Experimental Study 2 and Main Experimental Studies 1 and 2. Pilot Experimental Study 2 tested the experimental computer-based problem-solving paradigm that included 12 different task patterns for inducing difficulty-related loss of control. In a one-factor pre-post design an experimental (EG) and control group (CG) were compared using subjective control questionnaires following the baseline (t1) and manipulation (t2) parts of the experiment. Main Experimental Studies 1 and 2 applied the same computer-based problem-solving paradigm to investigate the effects of loss of control on risk perception and risk-taking behavior, respectively.

Following an instruction phase which included a comprehension test at the end to ensure appropriate understanding of the task, both the experimental and control group played eight rounds of the computer game-based problem-solving task. The first four rounds represented the baseline section in which both groups were presumed to experience subjective control (patterns 1-4), while the second four rounds constituted the manipulation section. In this manipulation section different patterns were used for the two groups. While the control group played patterns 5 to 8 whose difficulty remained relatively stable on a low level, the experimental group had to play patterns 9 to 12 which represented increasing task difficulty.

Between the two sections (t1) and at the end of the manipulation section (t2) the participants answered a questionnaire assessing their subjective perceptions of control. This served as a dependent variable in order to test whether the increase in task difficulty during the manipulation section of the EG was subjectively perceived as a loss of control. The participants were asked to answer these questionnaires concerning the previously played pattern, thus following pattern 4 for all participants and following patterns 12 or 8, respectively, depending on whether they received the experimental or control section. Socio-demographic and several potentially relevant trait variables were

assessed during a separate follow-up which each participant attended within about two weeks following the experimental part of the study.

Variables and Study Measures

Subjective control. Following the baseline (t1) and manipulation sections (t2), the participants were asked to indicate their subjective perceptions of control over their outcomes with respect to the previously played round. The items are based on the Academic Control Scale (Perry, Hladkyj, Pekrun, & Pelletier, 2001) and were adapted to the computer-game context (e.g., "I could completely determine my outcomes."). Using a seven-point rating scale ranging from 0 *completely disagree* to 6 *completely agree*, the two-item measure had an internal consistency of $\alpha = .62$ (t1) and $\alpha = .66$ (t2).

Manipulation check. The participants' performance during the manipulation section, as measured by the average angular distance between the participants' clicking position and the target location, served as a manipulation check to ensure that increasing difficulty impacted performance.

Trait variables. Two sets of potentially relevant traits and socio-demographic variables were assessed in a separate follow-up which the participants attended approximately within the two weeks following the experiment:

Measures of numeral and figural nonverbal reasoning. Three subtests ("number series", "figure selection" and "cubes"; 20 items each) of a prominent and widely used German intelligence structure test (I-S-T 2000-R; Liepmann, Beauducel, Brocke, & Amthauer, 2007; English version: Beauducel, Liepmann, Horn, & Brocke, 2010) were assessed as indicators of numeral and figural nonverbal reasoning.

Measures of internal versus external locus of control. A German version of Levenson's (1974) Internality, Powerful Others and Chance-Scales (IPC) was applied as a measure of internal versus external locus of control (Krampen, 1981). This measure consisted of the three eight-item subscales: internal control orientation (I; e.g., "I can pretty much determine what will happen in my life"), powerful other external control orientation (P; e.g., "I feel like what happens in my life is mostly determined by powerful others") and chance control orientation (C; e.g., "To a great extent, my life is controlled by accidental happenings"). Participants were asked to indicate their agreement with the 24 statements on a six-point rating scale ranging from -3 *strongly disagree* to +3 *strongly agree*. Due to reliability concerns we joined the subscales P and C to a compound 16-item external control orientation subscale and conducted the data

analyses accordingly.[3] Cronbach's alpha was α = .62 for subscale (I) and α = .69 for the 16-item external orientation subscale (P and C).

Socio-demographic variables. Participants' sex, age, as well as information on their chosen subject of study, mother language and subjective ratings of their experiences with computer games were assessed by a questionnaire.

2.4.3 Results

Trait Variables

T-tests for equivalence revealed no significant differences between the treatment groups with respect to nonverbal reasoning indicators and general control beliefs. However, the participants of the experimental group turned out to be significantly older than the members of the control group, EG: $M = 23.10$, $SD = 2.65$ versus CG: $M = 21.00$, $SD = 1.77$; $t(40) = 3.04$, $p = .004$; $d = 0.94$. Thus, age was treated as a covariate in subsequent ANCOVA analyses.

Manipulation Check

In accordance with our expectations, the participants' performance in the problem-solving task during the manipulation section (rounds 5-8) was significantly lower in the experimental group (averaged angular deviation $M = 63.35°$, $SD = 7.45°$) than in the control group ($M = 29.62°$, $SD = 13.71°$), $F(1, 39) = 76.07$, $p < .001$, $\eta_p^2 = 0.66$. Thus, the participants in the control group performed significantly better than the experimental group in the sense that they were able to predict the next objects' positions more precisely based on the previous pattern of displayed objects. The participants' age, which had been included into the ANCOVA, had no significant influence on the task performance.

Subjective Control

As expected, there were no significant differences in the subjective control evaluations between the treatment conditions following the baseline part at t1, EG: $M = 3.65$, $SD = 1.66$; CG: $M = 3.75$, $SD = 1.56$; $F(1, 39) = 0.35$, $p = .556$, $\eta_p^2 = 0.01$. Also

[3] Results are presented according to the data analyses using the compound 16-item external control orientation subscale. However, the same pattern of results occurs when using subscales P and C separately as compared to the compound subscale. Reliabilities of the separate eight-item subscales were α = .65 (P) and α = .60 (C).

in line with our expectations, following the experimental manipulation at t2, the experimental group rated their subjective control significantly lower than the control group, $F(1, 39) = 5.76$, $p = .021$, $\eta_p^2 = 0.13$; EG: $M = 3.13$, $SD = 1.52$ versus CG: $M = 4.11$, $SD = 1.58$ (see *Figure 2.3*). The participants' age, which had been treated as a covariate because of group differences between the EG and CG, showed no significant effect on the subjective control ratings, neither at t1 nor at t2.

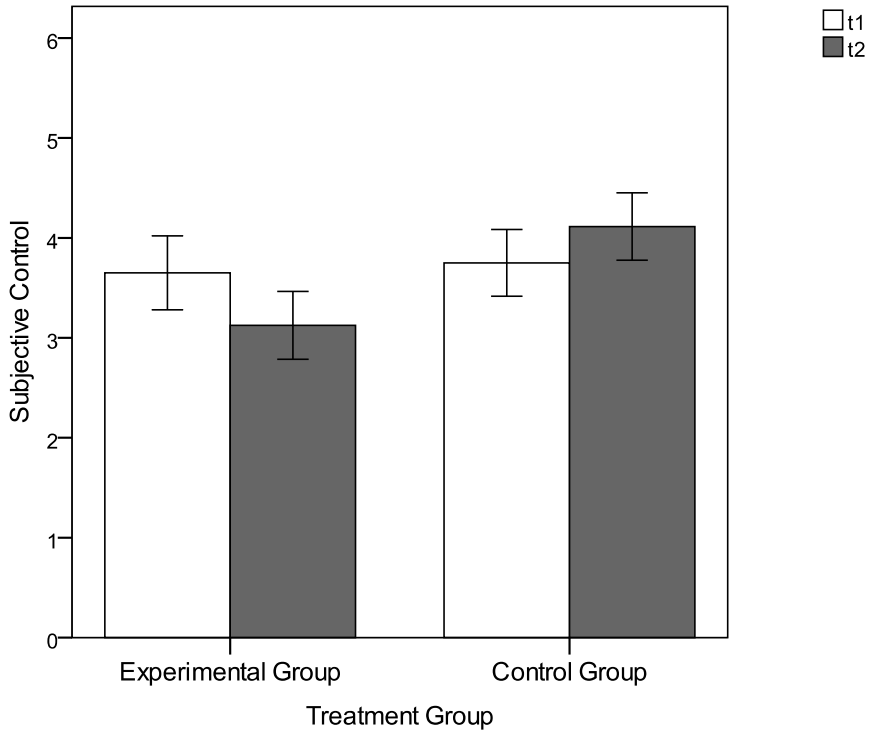

Figure 2.3: Subjective control ratings of the experimental and control group following the baseline (t1) and the manipulation (t2) sections of Pilot Experimental Study 2. Error bars represent standard errors of the mean (±1 SE).

2.4.4 Discussion

This study's results support the impact of increasing task difficulty within the computer-game paradigm, thus decreasing objective control, on the subjectively perceived extent of control in the expected manner. The manipulation check validated the patterns' expected difficulty and supports their inclusion into the experimental paradigm as a manipulation of objective control. Concerning the subjective control ratings, the hypothesized feeling of loss of control induced by the difficulty-related treatment within the problem-solving game was supported. Thus, the developed

experimental design based on different difficulty-level patterns of problem-solving tasks, and therefore changes in objective control, can be regarded as appropriate for inducing a subjective sense of loss of control in participants in the experimental group during the manipulation part compared to the baseline part and the control group.

2.5 Main Experimental Study 1

2.5.1 Aims

The objective of the first main experimental study was to investigate the impact of subjective loss of control on risk propensity. By applying the newly developed and tested experimental paradigm, this study aimed at exploring the hypothesized spillover effect on subjective risk perceptions as a cognitive indicator of risk propensity.

2.5.2 Method

Participants and Data Collection

Sample. The study was conducted using a student sample consisting of N = 50 (50% female) participants recruited via ORSEE (Greiner, 2004). Their average age was M = 23.30 years (SD = 2.12, range: 19 - 30). There was a random assignment to the EG (n = 25; 48% female) and the CG (n = 25; 52% female). Voluntary participation was compensated by a fixed participation fee supplemented by payment according to the subject's performance on the problem-solving task.

Procedure and experimental design. Main Experimental Study 1 consists of the same experimental computer-based problem-solving paradigm as Pilot Experimental Study 2, but instead of applying questionnaires on subjective control at t1 and t2 risk perception was measured using subjective estimations concerning a risky scenario following the manipulation section at t2 (cf. *Figure 2.2*). Socio-demographic and trait variables were assessed during a separate follow-up attended by each participant within about two weeks following the experimental part of the study.

Variables and Study Measures

Risk perception. In order to investigate the hypothesized effect of subjective loss of control on subjective risk-related estimations participants' risk perception was assessed by a case scenario of the computer-based variant of the "devil's task" (Slovic,

1966), a circle with 23 equal sectors consisting of 22 "secure" and one unknown "devil's" section, after completing the manipulation section of the experiment. In the "devil's task", choosing a secure sector results in a gain of 0.10 € per sector while choosing the "devil's" section, whose position is unknown, causes the loss of all money. This task reflects a typical risk situation with the number of fields chosen serving as the dependent variable. However, in this study participants' actual behavioral decision was not being investigated, but instead their risk perception was the variable of interest. Therefore, the participants were presented with a case vignette of the "devil's task", a picture of the circle in which seven of the 23 sectors had been selected (indicated by white color), and they were told to imagine that someone had made this choice in the "devil's task". Afterwards they were asked to indicate how risky they considered this choice using an eleven-point rating scale ranging from 0 *not at all risky* to 10 *extremely risky*.

Trait variables. In addition to socio-demographic variables three sets of potentially relevant traits were assessed in a separate follow-up attended by participants within about two weeks after the experiment:

Measures of numeral and figural nonverbal reasoning. Nonverbal reasoning was assessed by three subtests ("number series", "figure selection" and "cubes"; 20 items each) of a German intelligence structure test (I-S-T 2000-R; Liepmann et al., 2007; English version: Beauducel et al., 2010).

Measures of internal versus external locus of control. For measuring general control beliefs, the German version of the IPC locus of control scale (Levenson, 1974; German version: Krampen, 1981) was applied and subscales P and C were joined for a 16-item external control orientation subscale because of reliability concerns.[4] The internal consistency of the IPC-scale was satisfying for our purposes (internal control orientation subscale [I]: $\alpha = .70$; external control orientation subscale [P and C]: $\alpha = .60$).

Measures of trait-based risk-taking propensity. Participants' traits regarding risk attitudes and behavior were assessed by the "financial decisions" subscale (consisting of four items each on "investing" and "gambling") of the Domain-specific Risk-attitude

[4] The presented findings result from using the compound 16-item external control orientation subscale, with very similar patterns of results occurring when subscales P and C were used separately as compared to the compound subscale. Reliabilities for the separate eight-item subscales were $\alpha = .45$ (P) and $\alpha = .44$ (C).

scale (DOSPERT; Weber, Blais, & Betz, 2002; German version: Johnson, Wilke, & Weber, 2004). The eight items separately assessed both risk perception and risk behavior. Internal consistency was satisfying with α = .69 for the risk perception scale and α = .70 for the risk behavior scale.

Socio-demographic variables. The concluding socio-demographic questionnaire assessed participants' sex and age and included questions on the participants' subject of study, mother language and subjective ratings of their experiences with computer games.

2.5.3 Results

Trait Variables

T-tests for equivalence did not reveal any significant group differences regarding the socio-demographic variables, indicators of nonverbal reasoning, general control beliefs and trait-based risk-related variables. Thus, no socio-demographic or trait variables were included as covariates in the following analyses.

Risk Perception

A *t*-test revealed that – following the manipulation section – the members of the experimental group tended to estimate the riskiness of the presented scenario higher than the members of the control group (EG: M = 3.84, SD = 3.51 vs. CG: M = 2.52, SD = 2.57). This difference was marginally significant, $t(48) = 1.52$, $p = .068$ (one-tailed), $d = 0.43$ (cf. *Figure 2.4*).

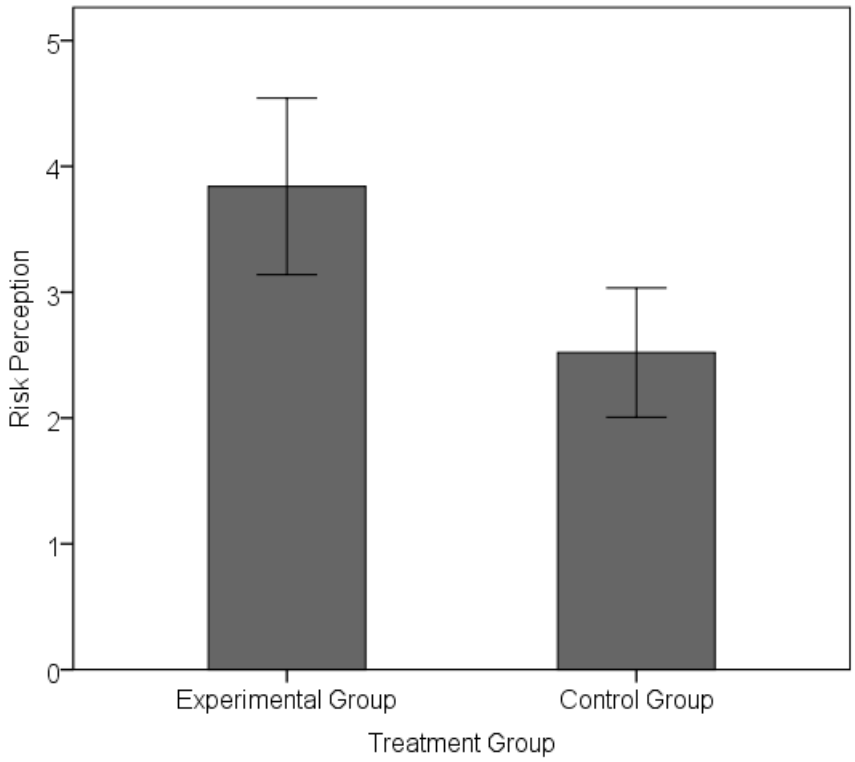

Figure 2.4: Risk perceptions of the experimental and control group with respect to the case scenario of the devil's task following the manipulation part (t2) of the Main Experimental Study 1. Error bars represent standard errors of the mean (±1 SE).

2.5.4 Discussion

The result of Main Experimental Study 1 tends to support Hypothesis 1, indicating increased perceptions of risk following the experimental manipulation of difficulty-related subjective loss of control. Although reaching only marginal significance, this result nevertheless is considered interpretable, as the effect size indicates a moderate effect according to Cohen (1988). Thus, preliminary evidence of the hypothesized effect of loss of control on risk propensity measured via perceptions of risk as a cognitive indicator is provided.

2.6 Main Experimental Study 2

2.6.1 Aims

In the second main experimental study we aimed to investigate the hypothesized spillover effect of subjective loss of control on risk propensity when using risk taking as a behavioral measure. Thus, the consequences of loss of control for subsequent risk-taking behavior in an objectively unrelated setting were at issue.

2.6.2 Method

Participants and Data Collection

Sample. The sample consisted of N = 47 (49% female) students with an average age of M = 23.30 years (SD = 2.85, range: 18 - 34). Again, the participants were recruited using the online recruiting system ORSEE (Greiner, 2004) and were randomly assigned to the EG (n = 24; 50% female) and the CG (n = 23; 48% female). The voluntary participation was again compensated by a fixed participation fee as well as additional payment according to the subject's performance in the problem-solving and risk game.

Procedure and experimental design. Main Experimental Study 2 applied the same experimental computer-based problem-solving paradigm as Main Experimental Study 1. However, following the experimental manipulation section at t2, behavioral effects in a risky situation were investigated (cf. *Figure 2.2*). Finally, again there was a separate follow-up for assessing socio-demographic and trait variables during an about two-week-interval after completing the experimental part of the study.

Variables and Study Measures

Risk-taking behavior. In order to assess the effects of subjective loss of control on risk behavior participants were presented a computer-based variant of the "devil's task" (Slovic, 1966) following the manipulation section of the problem-solving task. The participants' actual risk-related behavioral decision was investigated with the number of chosen fields serving as the dependent variable.

Trait variables. Potentially relevant control variables including a set of socio-demographic and trait variables were assessed during the follow-up. The participants' sex, age, subject of study, mother language and subjective experiences with computer

games were assessed via questionnaires. Trait variables included (a) measures of numeral and figural nonverbal reasoning (subtests "number series", "figure selection" and "cubes" with 20 items each of a German intelligence structure test: I-S-T 2000-R; Liepmann et al., 2007; English version: Beauducel et al., 2010), (b) measures of internal versus external locus of control (IPC locus of control scale: Levenson, 1974; German version: Krampen, 1981; internal consistencies: internal control orientation subscale [I]: α = .63; external control orientation subscale [P and C]: α = .71),[5] and (c) measures of trait-based risk-taking propensity (DOSPERT: Weber et al., 2002; German version: Johnson et al., 2004; subscale "financial decisions" consisting of "investing" and "gambling", both with respect to risk perception and risk behavior; internal consistencies: α = .63 for risk perception; α = .74 for risk behavior; additionally, the computer-based variant of the "devil's task" was applied again in order to assess the participants' trait-based risk behavior: Slovic, 1966).

2.6.3 Results

Trait Variables

No significant group differences occurred in tests for equivalence with respect to socio-demographic variables, indicators of nonverbal reasoning and general control beliefs. In addition, the experimental and control groups did not differ in trait-based risk-related variables, which included the DOSPERT self-report risk perception and risk behavior scales (Weber et al., 2002; German version: Johnson et al., 2004) nor in their risk-taking behavior in Slovic's (1966) "devil's task" at the follow-up investigation. Thus, trait and socio-demographic variables were not considered in the following analyses.

Risk-Taking Behavior

A *t*-test revealed that – following the manipulation section – the members of the experimental group chose significantly fewer sections in Slovic's (1966) "devil's task" than the members of the control group (EG: M = 9.62, SD = 3.80 vs. CG: M = 11.83, SD = 3.96) with $t(45) = -1.95$, $p = .029$ (one-tailed), $d = -0.57$ (cf. *Figure 2.5*).

[5] Due to reliability concerns the results of Main Experimental Study 2 are presented according to the data analyses using the compound 16-item external control orientation subscale. However, analyses showed similar patterns of results when using subscales P and C separately as compared to the compound subscale. Reliabilities for the separate eight-item subscales were α = .50 (P) and α = .58 (C).

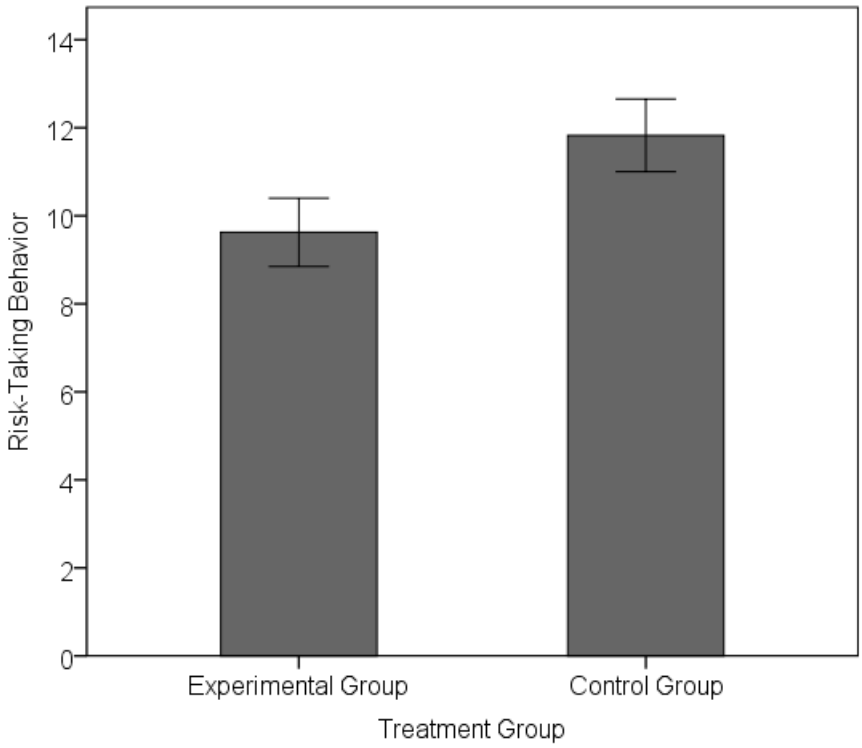

Figure 2.5: Risk-taking behavior of the experimental and control group represented by the mean of chosen sectors in the devil's task following the manipulation part (t2) of the Main Experimental Study 2. Error bars represent standard errors of the mean (±1 SE).

2.6.4 Discussion

The results of this experimental study support our Hypothesis 2 and indicate that participants engage in less risk-taking behavior following the experimental manipulation of subjective loss of control. Thus, the assumed spillover effect of experimentally induced subjective loss of control on risk propensity could be demonstrated when assessing the participants' real behavioral decisions in a concrete risk situation.

2.7 General Discussion

Aimed at investigating the effects of prior experiences of loss of control on risk propensity by applying a newly developed experimental paradigm, this set of four experiments provides empirical evidence for the importance of subjective control experiences when considering risk-related decision making. Additionally, the current set of studies makes an innovative methodological contribution. In two pilot studies the experimental paradigm using difficulty-based manipulations was designed and tested and its adequacy for inducing changes in subjectively perceived control was substantiated. Thus, we proposed a new experimental paradigm which overcomes some design-related problems of previous experimental settings and which is suitable for investigating the impact of experimentally manipulated subjective control experiences.

Applying this newly developed experimental paradigm, the effects of subjective loss of control were then investigated using risk perception and risk-taking behavior as two indicators of risk propensity. The results of our main experimental studies revealed that – as hypothesized – risk-related decision making was influenced by preceding experiences of personal control. Concrete risk propensity differed significantly between the groups of participants with differing experiences of control. Participants who had been exposed to manipulations of loss of control showed deviant judgments and behavior in the following risky context in comparison to those who were able to maintain their personal control. Across both operationalizations used in Main Experimental Studies 1 and 2, risk propensity turned out to be affected by prior experiences of subjective loss of control. The preceding experimental induction of subjective loss of control impacted subsequent risk propensity both when assessed via cognitive (risk perception) and behavioral (risk taking) measures. We found risk perception tended to increase (Main Experimental Study 1) and risk-taking behavior decreased (Main Experimental Study 2) following loss of control. Both of these observations can be interpreted to be complementary as they point to the same direction, namely representing decreased risk propensity. Following an experience of a loss of control, people seem to be more cautious and averse towards risky situations. These findings are in line with previous studies which have empirically demonstrated increased levels of risk aversion following chronic losses (e.g., Rivers & Arvai, 2007), as

well as biased risk estimations typically occurring in situations of increased threat (cf. van der Pligt, 1996) which we – given the relevance of personal control for human well-being – assume would also apply to perceptions of loss of control.

Moreover, with these effects even being transferred between objectively unrelated contexts, our study's results additionally demonstrate spillover effects of previous perceptions of control. In our design, the tasks of the manipulation and test phase were independent from one another, both with regard to content and method. Objectively, there was no relationship at all between experiences of failure in the problem-solving task and losses in the risk game. Experiences of failure and loss of control in the problem-solving task were due to escalating difficulty. As the tasks were in principle solvable, and thus controllable, failure depended on a lack of ability to solve the problem. In contrast, there was no possibility of controlling the outcome of the risk game as it totally depended on chance. Losses in the risk game therefore were not related to personal ability. Thus, these results not only give first evidence for the effect preceding experiences of control have on risk-related decision making, but even illustrate their relevance across contexts.

These spillover effects supported our hypotheses and are in line with the theoretical approaches on which we based our assumptions. From the perspectives of Learned Helplessness Theory, availability bias and the risk-as-feelings approach, the risk-related decision-making process is argued to be influenced by factors shaped by prior experiences or generally unrelated to the hazard, and thus, factors lying outside the actual concrete and objectively given decision-making criteria. In our study, with both the estimations of risk and the observed risk behavior, two manifest aspects of our participants' risk-related decision-making process were influenced by prior experiences of loss of personal control due to failure in the problem-solving task.

2.7.1 Limitations

This study provided evidence that prior experiences of loss of control impact risk propensity both when considered cognitively and behaviorally. Additionally, a newly developed experimental paradigm for inducing subjective loss of control was proposed. Despite these interesting findings, there are limitations to the current set of studies that must be taken into consideration.

We conducted our studies applying a highly standardized experimental

laboratory setting. As in other experimental studies, this procedure can be criticized and may be considered lacking in ecological validity. In fact, developing a paradigm for inducing subjective loss of control was one of our objectives because of the lack of existing methods for manipulating subjective control. With the payment in our studies largely depending on the individual's performance and the participants' behavior referring to a real financial decision, the ecological validity of our experimental design is justified. Nevertheless, despite these efforts in creating an experimental paradigm characterized by a highly ecologically valid setting, the transferability of our results needs to be further investigated.

In all our studies we used student samples which had been recruited by a university-intern database of students volunteering to participate in empirical studies. Thus, the generalizability of our paradigm and our findings might be questioned and, actually, should be examined in future research. However, the fact that our paradigm's adequacy could be confirmed within our student sample, argues for the applicability of the paradigm. Within our experimental manipulation, inducing a sense of loss of control was a matter of task difficulty in relation to cognitive problem-solving capabilities, and thus applying the paradigm to a student sample with average to high cognitive abilities (both assumed and confirmed by results in the nonverbal reasoning tasks) can be regarded as a statistically conservative test. Thus, it is reasonable to assume that this experimental design could be successfully applied to other (i.e., non-student) samples. Testing this might not only evaluate the actual generalizability of our results, but could also help to further validate this newly developed experimental design.

2.7.2 Implications

This study's results have both practical relevance as well as several implications for future research. By developing this paradigm we made an innovative methodological contribution which solves some of the design-related problems associated with previous experimental settings for investigating the effects of subjective control experiences. The paradigm is characterized by a stable and highly standardized setting, thus meeting objectivity requirements and enabling control of confounding individual and situational variables (e.g., traits, preexisting experiences with similar tasks, noise, time of day, etc.). Additionally, by meeting common guidelines and strict ethical requirements (e.g., avoiding deception, and thus ruling out participants' potential doubts and fostering

reliable decisions), this paradigm finally overcomes the previous lack of adequate paradigms. This newly developed paradigm[6] is able to facilitate further research on the effects of subjective loss of control which is of interest to a broad range of perspectives, such as various scientific disciplines (e.g., psychology, pedagogy or economics) and subsamples (e.g., students, clinical and nonclinical samples, economic decision makers).

In this study risk perception and risk-taking behavior were assessed as separate indicators of risk propensity. These two risk-related outcome variables might be regarded as interconnected. For example, the risk-as-feelings model proposes cognitive evaluations as preceding variables which – together with feelings – determine subsequent behavior, thus hypothesizing risk behavior to be mediated by perceptions of the hazard's riskiness. We also assume the two variables to be interrelated as both are considered to be indicators of people's risk propensity. But, although perceptions of risk are often found to be positively related to preventive behavior, for example, health-related behavior, empirical studies have not yet unambiguously clarified the relationship between these two variables (e.g., regarding health-related behavior: Weinstein, 1989; Weinstein, Rothman, & Nicolich, 1998).

Due to a lack of research on our proposed relation between prior subjective control experiences and risk propensity, we aimed at a first exploration of this association, thus assessing risk propensity separately within two samples by using one cognitive (risk judgment) and one behavioral (action in risky situation) indicator regardless of their relationship. Besides, assessing the two indicators within one study might raise the problem of mutual interference. Explicitly asking participants to indicate their estimations of riskiness might impact their following risk-taking behavior just as much as prior risk-taking behavior might be justified when assessing the risk perceptions afterwards. Thus, we investigated the effects on the two variables of risk propensity one by one within the two main experiments. Based on our findings, which separately confirmed effects of subjective loss of control on both cognitive evaluations of risk and behavioral decisions, future research concentrating on possible underlying mechanisms is necessary. Specifically, investigating risk perception as a possible mediator might clarify the observed impact of subjective loss of control on subsequent risk-taking behavior.

[6] More detailed information needed to apply the experimental paradigm for future research as well as the used items of the problem-solving task are provided upon request.

Besides investigating this relationship, further research might concentrate on two other possible indirect effects whose impact on the association between experiences of loss of control and risk propensity seems plausible. First, it is argued that prior experiences might affect subsequent risk estimations and decisions by lowered expectations of success, decreased illusionary control and vivid mental representations of losses (cf. availability bias or risk-as-feelings approach). Future empirical studies could include these variables in order to test the theoretical assumptions and to shed further light on the mechanism forming the basis of our findings. Second, a group of variables which has been proven both to be related to experiences of loss of control and to impact risk judgments and behavior are emotions (e.g., impact of state anxiety on risk perception: Bouyer, Bagdassarian, Chaabanne, & Mullet, 2001; differential impact of fear and anger: Lerner & Keltner, 2001). Affective states have also been explicitly included in theoretical models of risk-related decision making, such as in the risk-as-feelings-approach. Considering our results, emotions following from the experimentally induced subjective loss of control experiences might act as a link between the different settings and might be able to explain the observed spillover effects. In this sense, taking into account possible affective states following the experimental manipulation could potentially reveal mediating effects of emotions on the relationship of prior control experiences and risk propensity.

2.7.3 Conclusion

It is generally acknowledged that perceptions and experiences of control are a central aspect for human decision making. This study provides evidence that they impact risk propensity both when considered cognitively and behaviorally. Understanding the processes underlying risk-related decision making could contribute to support people in improving the way they deal with risky situations (North, 1998). Based on our results it seems reasonable to focus on people's preceding experiences, especially on their perceptions of control. Taking previous incidental control experiences into account may be either wise or not when making a decision, depending on the situation. Either way, for both researchers and advisors, considering people's previous control experiences may provide informative details which might enable researchers and advisors to reconstruct and understand the decision process, and thus might be helpful in order to support other people in their decision making. Improving

one's decision-making process, for example, by revealing an individual's train of thought and how they are influenced by prior experiences, bears wide practical relevance as risk-related decisions are both frequent in daily life and can have momentous consequences. However, future research should focus on the underlying processes in more detail. Knowledge of these underlying associations may make an important contribution to support people in dealing with critical events, such as experiences of loss of control, and allow them to master challenges, such as decision making in the face of risky situations.

3 "Losing control makes me angry, so I take the risk": On the Cross-Culturally Generalizable Effects of Subjective Loss of Control on Anger and Risk-Taking Behavior

3.1 Summary

In today's rapidly changing society, dealing with experiences of uncertainty and loss of subjectively perceived control is considered a key competence. The consequences of these experiences for subsequent behavior and decision making bear wide practical relevance for people when dealing with challenges in their daily life. Cognitive theories on emotions propose subjective perceptions of personal control as a central variable with respect to emerging emotions and resulting behavior. Based on this theoretical approach the following experimental studies examine the relationship between externally attributable loss of control experiences and risk-taking behavior, as well as the assumed mediation of this relationship by the emotion anger. For this purpose, an experimental paradigm for inducing externally attributed subjective loss of control was first newly developed and pretested in a Pilot Study. The cross-cultural universality of the proposed relationship between loss of control experiences, anger and risk-taking behavior was then investigated by using two separate student samples from Germany (N = 84, 54% female) and China (N = 125, 64% female). In line with our hypotheses, results showed anger mediated the link between subjective loss of control experiences and increasing risk-taking behavior. Multiple group comparisons revealing similar patterns in both samples affirmed the results' cross-cultural generalizability. These results include implications for individuals' processes of economic decision making.

3.2 Introduction

"Change is the only constant."

(Heraclitus of Ephesus, approx. 535-475 BC)

The world keeps changing around us. Ongoing rapid development and new technologies continue to change our environments as well as our living and working conditions. Although many of these advances are associated with huge reliefs such as time savings and a reduction in physical labor due to increased use of machines, these ongoing developments also bring increasing complexity (Schober et al., 2007) and people are facing new challenges every day as everyone has to quickly learn about the latest development, to newly orient, to adapt and get along with the new circumstances. People might find these experiences demanding and associate them with a loss of orientation and subjective feelings of uncertainty and loss of control.

The question of how externally caused experiences of uncertainty affect people's decision-making processes bears wide practical relevance. In this study, the effects of subjective loss of control experiences on risk-related decision making due to changes in external conditions are investigated. It seems plausible to assume that emotions might play a special role in this relationship due to the well-known impact of emotional experiences on decision-making processes. This study focuses on the role of anger as one central emotion and examines its influence on the relationship between loss of control experiences and risk-taking behavior. Additionally, the question arises as to whether the assumed functional associations are generalizable, especially across people from various cultures. Thus, cultural influences on these relationships are at issue and the cross-cultural generalization is explored with samples from Germany and China representing different cultural backgrounds.

3.2.1 Relation Between Subjective Control and Risk-Taking Behavior

There is a close association between perceptions of control and risk taking. Although Skinner (2007) considers risky situations to be "prototypical cases of uncontrollability" (p. 912), subjective perceptions of control are an important facet of the perceived riskiness of a hazard or situation. For example, illusions of control (Langer, 1975; for a review see Thompson et al., 1998) have been shown to play an

important role in chance situations and, thus, in the evaluation of and attitudes towards risks. Perceived controllability of a hazard was identified as essential to one of two factors ("dread") underlying people's risk perceptions (Peters & Slovic, 1996; Slovic, 1987). Thus, it is reasonable to assume that perceived control impacts risk perception and risk-related behavior (Renn, 1998).

Perceived control is understood as the extent to which one believes that he or she can predict or influence events (Bandura, 1989). Its importance for a broad range of psychological variables is acknowledged and widely investigated (e.g., see Skinner, 1996, for a review). Regarding behavioral outcomes, perceptions of control have been included as a central construct in several theories dealing with motivation and future behavior (Control Theory: Glasser, 1984; Valence-Instrumentality-Expectancy Theory: Vroom, 1964; Theory of Planned Behavior: Ajzen, 1991). With respect to subsequent behavior, prior experiences of subjective loss of control have been shown to be especially influential (e.g., see Theory of Learned Helplessness: Abramson et al., 1978; Seligman, 1975).

Risk-taking behavior is considered to be one specific facet of decision-making behavior with an especially strong relation to perceptions of control as outlined above. Thus, it seems plausible to assume that risk taking is influenced by prior experiences of personal control, the more so when keeping in mind the close relation of control and risk and the direct link between perceptions of control and risk perceptions.

However, evidence for direct effects of experiences of control on risk-taking behavior is scarce. The relationship has largely been investigated with a focus on the effects of chronic losses on future investment decisions (e.g., Rivers & Arvai, 2007). Initial evidence for causal effects of loss of control experiences on risk-taking behavior was provided in experimental studies in which experiences of internally attributable difficulty-related loss of control were found to influence risk propensity (Wimmer, Musu, Nett, Daschmann, Fischbacher, & Goetz, 2010). Besides these initial findings supporting a causal relationship between prior experiences of (internally attributed) loss of control and risk-taking behavior, research is largely lacking. In the current study, which focuses on this rather unattended association, we additionally assume that emotions might play a significant role in this relationship.

3.2.2 The Role of Emotions in the Relationship between Loss of Control and Risk Taking

It is well-known that emotions arise from personally relevant experiences of control, especially experiences with loss of control. Additionally, emotions powerfully influence – the often purely rationally considered – decision-making processes. For example, incidental (thus objectively irrelevant) emotions have been shown to impact decisions and thus can account for spillover effects between even objectively unrelated settings. Therefore, emotions might operate as a link between loss of control experiences and risk-taking behavior, more precisely, they may be worthwhile to examine as a potential mediator of this link.

The Relevance of Perceptions of Control for Emotions

Cognitive emotion theories (e.g., see Lazarus et al., 1970; Scherer et al., 2001) propose that emotions are not aroused by events per se, but by cognitive evaluations or appraisals of the events, and the resulting discrete emotions depend on this pattern of appraisals. Several dimensions underlying these appraisals have been discussed, among which control appraisals play a prominent role. In various appraisal theories of emotions the dimension of control is consistently identified as one of the central appraisal dimensions and thus is regarded as a central antecedent of emotions (e.g., Goetz, Frenzel, Stoeger, & Hall, 2010; Roseman et al., 1996; Scherer, 1982; Smith & Ellsworth, 1985).

Appraisal dimension of control and the valence of emotions. The control-value theory (Pekrun, 2000, 2006) focusing on the antecedents and development of emotions considers control to be one of the two most important appraisal dimensions in the emergence of emotions. Control-related cognitions are believed to essentially determine the valence of emotions (i.e., positive vs. negative) and appraisals of lack of control are associated with negative emotions (Pekrun, 2000). Thus, generally, experiences of loss of control due to changes in external conditions might be associated with a variety of negative emotions, such as fear, anger, or hopelessness. The concrete emotional quality arising from those experiences is influenced by additional factors, such as evaluation of the circumstances and attributions of causes (e.g., Weiner, 1985).

Externally caused subjective loss of control and its emotional consequences. This study is particularly concerned with the effects of experiences of loss of control

caused by changes in external conditions that handicap one's task performance, but that lack a personally threatening potential. Annoying technical difficulties with computer hard- or software might be the everyday counterpart of this experience. Given ongoing technological developments and our reliance on technology this kind of experience is assumed to be ubiquitous in most people's daily work. Thus, our study deals with one's subjective experiences of loss of control and consequently the lack of a possibility to fulfill one's task and to produce the desired performance.

The primary emotion arising under these circumstances is assumed to be anger. Anger is characterized as a retrospective emotion following negative developments and outcomes (Pekrun, 2006) which are explicitly externally, not internally, attributed. According to Weiner (1985), anger is a control-dependent emotion (more precisely: external control) implying an appraisal that one's personal goal attainment has been blocked (Kitayama, Mesquita, & Karasawa, 2006). In addition to these rather cognitive facets, anger is considered an activating emotion (Kleine, Goetz, Pekrun, & Hall, 2005; Pekrun, 1992; Shaver, Schwartz, Kirson, & O'Connor, 2001) which is especially interesting in regard to the context of the current study because it points towards subsequent behavior and decision making.

Emotions and Their Impact on Risk-Taking Behavior

Research has shown that risk-related decisions are not fully understandable when only purely objective ("rational") facts, such as probability and severity of possible outcomes are considered. Instead, subjective influences, such as incidental affective states (e.g., Waters, 2008), have emerged as important predictors of these decisions. Following a considerable amount of research focusing on the effects of positive and negative mood (e.g., work by Isen and colleagues; for a review see Isen, 2000) research has recently gone beyond this valence dimension of affect and instead turned towards the differential effects of specific discrete emotions, such as fear, anger, or happiness (e.g., Lerner & Keltner, 2001).

Appraisal Tendency Framework (ATF). The Appraisal Tendency Framework (ATF; Lerner & Keltner, 2000; 2001; see also Han, Lerner, & Keltner, 2007) proposed a general theoretical model describing emotion-specific effects on economic decision making. It allows a precise prediction of the differential impact of discrete emotions on particular decision-making processes and outcomes due to their link to emotion-specific appraisal tendencies. Based on the premise of appraisal theories that each emotion is

characterized by a unique appraisal pattern on central appraisal dimensions (such as pleasantness, certainty, control; see Smith & Ellsworth, 1985), the ATF assumes that "each emotion activates a cognitive predisposition to appraise future events in line with the central-appraisal dimensions that triggered the emotion" (Lerner & Keltner, p. 477). This cognitive predisposition for future appraisals is called appraisal tendency and underlies the carry-over effects by which emotions influence subsequent judgments and decision making. To exert strong influences, the emotion's central appraisal content must be thematically linked to the decision-making topic (Lerner & Keltner, 2001).

Appraisal Tendency Framework (ATF) and risk-related decisions. In the context of risk-related decision making, the appraisal dimensions certainty and control are thought to be particularly influential due to their close association with cognitive evaluations determining risk assessments. The emotion anger in particular is characterized by high appraisals of both certainty and control (Lerner & Keltner, 2000), and is therefore assumed to influence risk-related decisions. Thus, for our study's objective of investigating the consequences of subjective loss of control experiences on risk-taking behavior, the effects of anger are particularly interesting. Despite originally being elicited by loss of control experiences, the emotional experience of anger is subsequently assumed to be accompanied by high certainty and control appraisals. These accompanying appraisal tendencies are then expected to impact subsequent risky decision making. Drawing from both the ATF (due to high levels of certainty and control) and the notion of anger being an activating emotion characterized by features associated with approach motivation (Carver & Harmon-Jones, 2009; Lerner & Tiedens, 2006), anger is believed to increase people's risk-taking decisions. Therefore, because our experimental paradigm is designed to elicit externally attributed subjective loss of control and thus, anger, we assume anger will mediate the impact of loss of control experiences on risk-taking behavior.

3.2.3 Cultural Influences and Cross-Cultural Universality

We were also interested in exploring what existing research states about the cross-cultural generalizability of the proposed associations between control experiences, anger, risk taking and their underlying mechanisms, such as causal attributions and cognitive appraisals. The little research that has been conducted on the cultural influences of some of these aspects has had rather mixed results. Whereas

evidence on differences in behaviors, perceptions of, and attitudes towards risks is not unambiguous (Bontempo, Bottom, & Weber, 1997; Brumagim & Wu, 2005; Rohrmann & Chen, 1999; Weber & Hsee, 1998), cross-cultural variations seem to be particularly pertinent with respect to emotions and control perceptions, especially when comparing individualistic and collectivistic cultures (for a definition of cultural value dimensions see Hofstede, 2001; Triandis, 1994, 1995).

When considering control-related constructs, culture seems to influence levels and patterns of general control beliefs (e.g., internal vs. external locus of control, primary vs. secondary control). For example, people from Western European countries seem to habitually perceive higher levels of personal, thus internal, control than people from Eastern Asian countries (e.g., see Spector, Sanchez, Siu, Salgado, & Ma, 2004). In addition to the individual level, there might also be differences with respect to the extent of perceived power, control, and uncertainty at the country level (cf. cultural dimensions by Hofstede, 2001, such as power distance index or uncertainty avoidance index).[7] However, the personal need for being able to control one's environments is regarded as a fundamental motive (Heckhausen & Schulz, 1995; Skinner, 1996). Correspondingly, the consequences, either beneficial or detrimental, of experiencing gains in, maintenance of, or loss of control over personally relevant situations or outcomes is considered universal and generalizable across cultures.

Similarly, various facets of emotions have been shown to be culturally influenced, for example, emotional expressivity, norms for feeling and displaying emotions, and interpretations and interpersonal consequences of emotions (Eid & Diener, 2001; Markus & Kitayama, 1991; Matsumoto et al., 2008; Mesquita & Walker, 2003; van Hemert, Poortinga, & van de Vijver, 2007). These facets are – at least partly – able to explain cultural differences in the frequency and intensity of emotions. Without questioning potential differences in emotional intensities between cultures, basic relations between constructs are typically considered to be cross-culturally valid (also

[7] The power distance index (PDI) refers to the levels of power and control as perceived by the common people within a society as compared to its most powerful people. Comparing the two countries to be investigated in this study, China scores remarkably higher on this dimension than Germany, thus pointing towards generally lower levels of control of the common people. The uncertainty avoidance index (UAI) – on which China scores considerably lower than Germany – deals with the question of people's tolerance towards uncertainty, ambiguity, and unstructured situation, which thus seems to be more distinct in Chinese people.

see Frenzel, Thrash, Pekrun, & Goetz, 2007, for universality of constructional associations despite mean level differences). For example, "cognitive-affective linkages" between attributions and resulting emotions are not found to differ cross-culturally (Brown & Cai, 2010, p. 111). Pekrun (2006) also lends support for relative cross-cultural universality stating "general functional mechanisms of human emotions are bound to universal, species-specific characteristics of our mind" (p. 329).

Instead of focusing on absolute levels or the intensity of control and emotional experiences, in this study the effects of loss of control experiences on risk-taking behavior and the role of anger in this relationship are at issue. Thus, whether these relational and functional associations are generalizable, which we assume to be the case, will be explored cross-culturally.

3.2.4 Research Aims and Hypotheses

In summary, the objectives of this set of studies are as follows: First, the impact of subjective experiences of loss of control due to external changes in control conditions on subsequent risk-taking behavior will be examined. Second, the role of anger in this relationship will be investigated. Third, the cross-cultural generalizability of the proposed relationships between subjective loss of control, anger and risk-taking behavior will be explored.

Due to a lack of existing research, the first aim is to develop an appropriate experimental paradigm for inducing externally attributable subjective loss of control (Pilot Experimental Study) in order to allow for the investigation of the proposed hypotheses. Following the development of the experimental paradigm, the hypotheses concerning the effects of externally attributed loss of control on anger and risk-taking behavior are investigated (cf. Main Experimental Study 1) and the cross-cultural generalizability of the proposed relationship are explored with participants from different cultural (individualistic vs. collectivistic) backgrounds (cf. Main Experimental Study 2):

Hypothesis 1: Externally attributed subjective loss of control experiences are assumed to cause anger.

Hypothesis 2: Externally attributed subjective loss of control experiences are assumed to impact subsequent risk-taking behavior.

Hypothesis 3: The relationship between externally attributed subjective loss of control

experiences and increased risk-taking behavior is assumed to be mediated by anger.
Hypothesis 4: The mediating effect of anger on the relationship between subjective loss of control and risk-taking behavior is assumed to be cross-culturally generalizable.

3.3 Pilot Experimental Study

3.3.1 Aims

The objective of this Pilot Experimental Study was to test the effects of our newly developed experimental manipulation of objective control conditions which was designed to induce a sense of externally attributed subjective loss of control. This prestudy aimed to investigate the assumed effects as a manipulation check in order to ensure the paradigm's adequacy to explore the previously proposed hypotheses in the subsequent experiments.

3.3.2 Method

Participants and Data Collection

Sample. N = 44 German university students (50% female) with an average age of M = 21.52 years (SD = 1.98, range: 19-27) voluntarily participated in this study. The participants were recruited using the online recruiting system ORSEE (Greiner, 2004) and they were compensated by a fixed show-up fee plus payment according to their individual performance in the problem-solving game. The assignment to the treatment conditions was random with n = 22 (50% female) participants in the experimental (EG) and n = 22 (50% female) participants in the control group (CG).

Procedure and experimental design. The experimental study consisted of a one-factor pre-post design with questionnaires following the baseline and manipulation sections (cf. *Figure 3.1*).

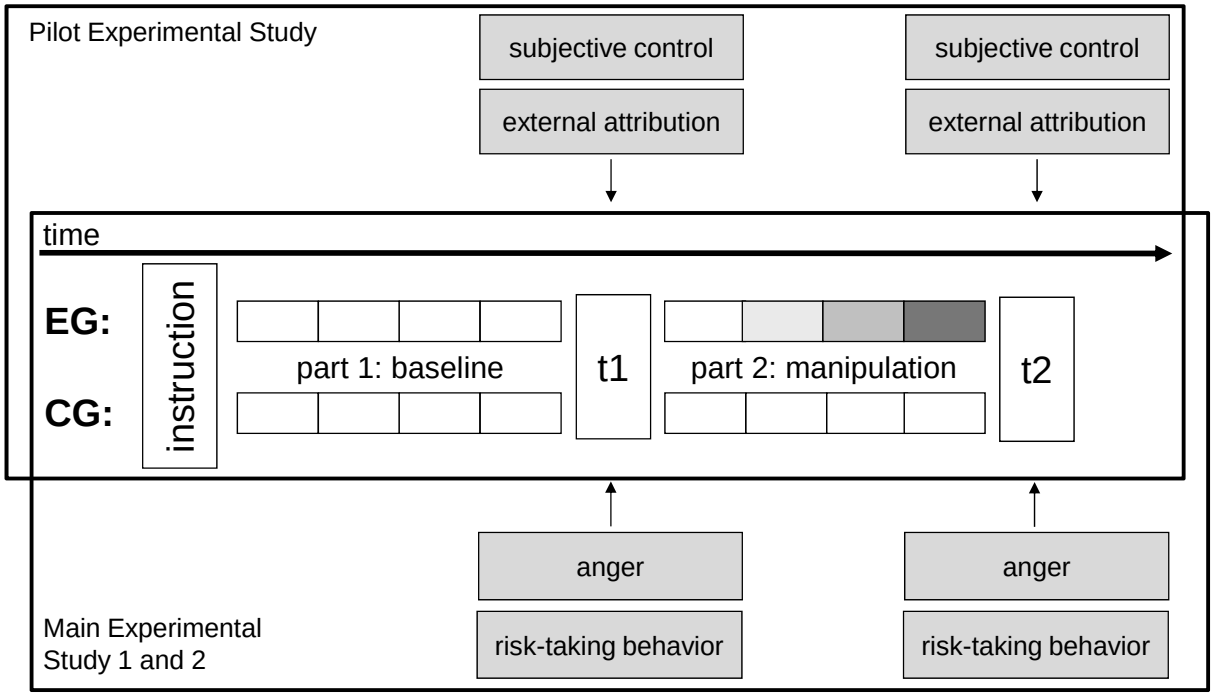

Figure 3.1: One-factor pre-post design of the Pilot Experimental Study and Main Experimental Studies 1 and 2. The Pilot Experimental Study tested the experimental paradigm's adequacy for inducing externally attributed subjective loss of control. By decreasing the accuracy with which the participants' prediction was implemented into the computer game, the experimental group's objectively given control was increasingly reduced during the four rounds of the manipulation section (represented by the darkening grey color). In a one-factor pre-post design the experimental (EG) and control (CG) group's subjective control ratings and external attributions following the baseline (t1) and manipulation (t2) sections of the experiment were compared. Main Experimental Studies 1 and 2 applied the same experimental paradigm to investigate the effects of loss of control on anger and risk-taking behavior in Germany and China, respectively.

Following an instruction phase that included a comprehension test, both the experimental and control group played eight rounds of an incentive related computer-based problem-solving task (maximum profit: 1 € per round) in which the participants had to predict by mouse click where an object would be displayed on a circle by recognizing the systematic pattern underlying the previously displayed objects (for an example see *Figure 2.1*). The patterns were determined based on the angular distances of the subsequently displayed objects. This is similar to a continuing number series or patterns task which is frequently used to test nonverbal reasoning in common tests of intelligence (for example see K-ABC-II: Kaufman & Kaufman, 2004; CogAT6: Lohman &

Hagen, 2001; CFT-20-R: Weiß, 2006).

In order to avoid deception the written instruction before the start of the experiment informed participants that unexpected events may occur. The first four rounds represented the baseline section in which both the control and experimental group were supposed to experience subjective control; this section did not differ between the groups. The second four rounds belonged to the manipulation section and the objectively given control was continuously reduced for the participants in the experimental group. This induced loss of control was obtained by decreasing the accuracy with which the participants' prediction of the object's next position is implemented into the computer game. Instead of displaying the participant's clicking position accurately, it is displayed randomly within an interval including the chosen position. The range of the interval increased gradually from ±3.5° in round 5, to ±10° (round 6), then ±30° (round 7) and finally to ±90° in round 8 (cf. *Figure 3.2*). This computer-based paradigm was designed using the Zurich Toolbox for Readymade Economic Experiments (z-Tree; Fischbacher, 2007) as experimental software.

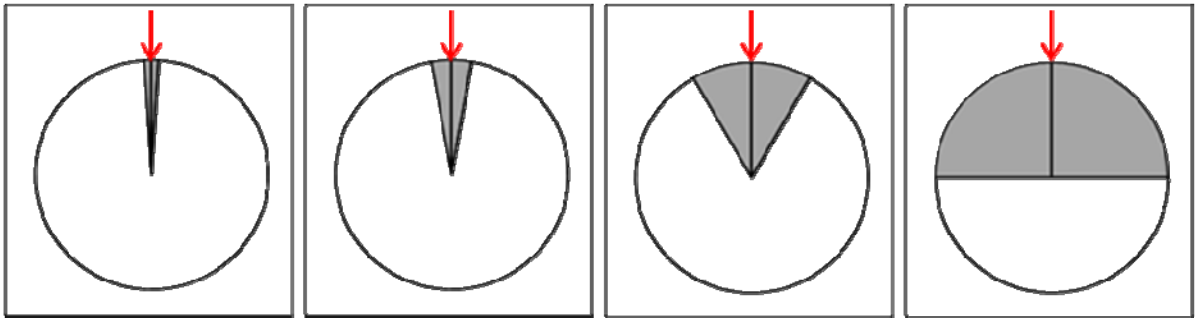

Figure 3.2: A sample schematic representation of the experimental decreasing accuracy manipulation of displaying the participants' prediction of the next position. The range of the intervals in which the clicking position was displayed was ±3.5° centered around the actual chosen position (red arrow) in round 5, ±10° in round 6, ±30° in round 7 and ±90° in round 8.

Between the baseline and manipulation section (t1) as well as at the end of the manipulation section (t2) the participants answered a questionnaire on their subjective perceptions of control and on their attributions for the perceived control. Furthermore, in order to ensure general comparability between the experimental and control group, during a separate follow-up attended by each participant within about two weeks following the experimental part of the study, socio-demographic and several potentially

relevant trait variables (nonverbal reasoning, locus of control) were assessed.[8]

Variables and Study Measures

Subjective control. The participants' subjective perceptions of control over their outcomes with respect to the previously played round was assessed twice, following both the baseline (t1) and manipulation section (t2). The items, based on the Academic Control Scale (Perry et al., 2001), were adapted to the experimental context (e.g., "I could completely determine my outcomes") and rated on a seven-point rating scale ranging from 0 *completely disagree* to 6 *completely agree*. Cronbach's alpha of the two-item measure was α = .58 (t1) and α = .88 (t2).

External attribution. Following the baseline and manipulation section, the participants indicated to what extent they attributed their perceived control to external causes (e.g., "My outcomes depended on influences lying outside myself.") on a seven-point rating scale ranging from 0 *completely disagree* to 6 *completely agree*. The two-item scale had an internal consistency of α = .72 (t1) and α = .96 (t2).

3.3.3 Results

Subjective Control

Following the baseline part at t1 there were no significant group differences in the subjective control evaluations between the treatment conditions, EG: M = 3.84, SD = 1.35 versus CG: M = 3.75, SD = 1.56; $t(42) = 0.21$, $p = .837$, $d = 0.06$. However, in line with our expectations, the experimental group rated their subjective control significantly lower than the control group following the experimental manipulation at t2, $t(42) = -8.14$, $p < .001$, $d = -2.46$ (EG: M = 0.84, SD = 1.03; CG: M = 4.11, SD = 1.58), see *Figure 3.3*.

[8] Besides socio-demographic variables (sex, age, subject of study, mother language, pre-experiences with computer games) the trait assessment included measures of numeral and figural nonverbal reasoning (subtests from widely used German intelligence test I-S-T 2000-R; Liepmann et al., 2007; English version: Beauducel et al., 2010) and measures of trait locus of control (Internality, Powerful Others and Chance-Scales, IPC by Levenson, 1974; German version: Krampen, 1981). There were no significant differences (all $ps > .05$) between the treatment groups with respect to the socio-demographic variables, nonverbal reasoning indicators and general control beliefs, thus supporting the treatment groups' equivalence.

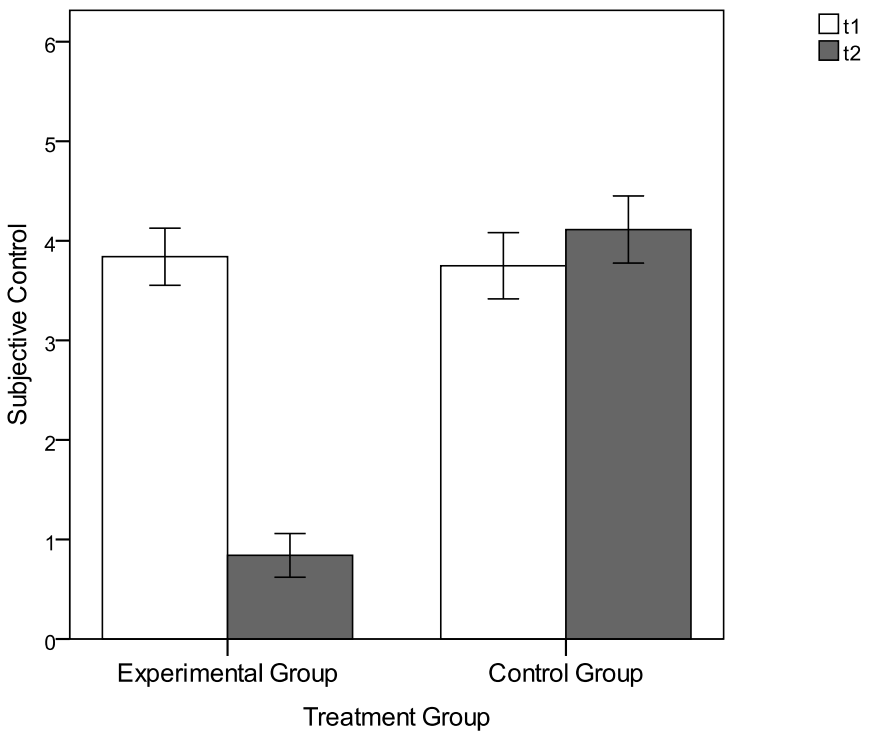

Figure 3.3: Subjective control ratings of the experimental and control group following the baseline (t1) and the manipulation (t2) part of the Pilot Experimental Study. Error bars represent standard errors of the mean (±1 SE).

External Attribution

The analyses of the attribution ratings showed that before the experimental manipulation at t1 there was no significant mean group difference in the extent of external attributions, EG: M = 1.23, SD = 0.95 versus CG: M = 1.09, SD = 1.06; $t(42) = 0.45$, $p = .656$, $d = 0.14$. However, following the experimental manipulation at t2, the participants in the experimental group attributed the perceived control to be significantly more external than the participants in the control group: EG: M = 5.09, SD = 1.28 versus CG: M = 1.32, SD = 1.48; $t(42) = 9.06$, $p < .001$, $d = 2.73$ (see *Figure 3.4*).

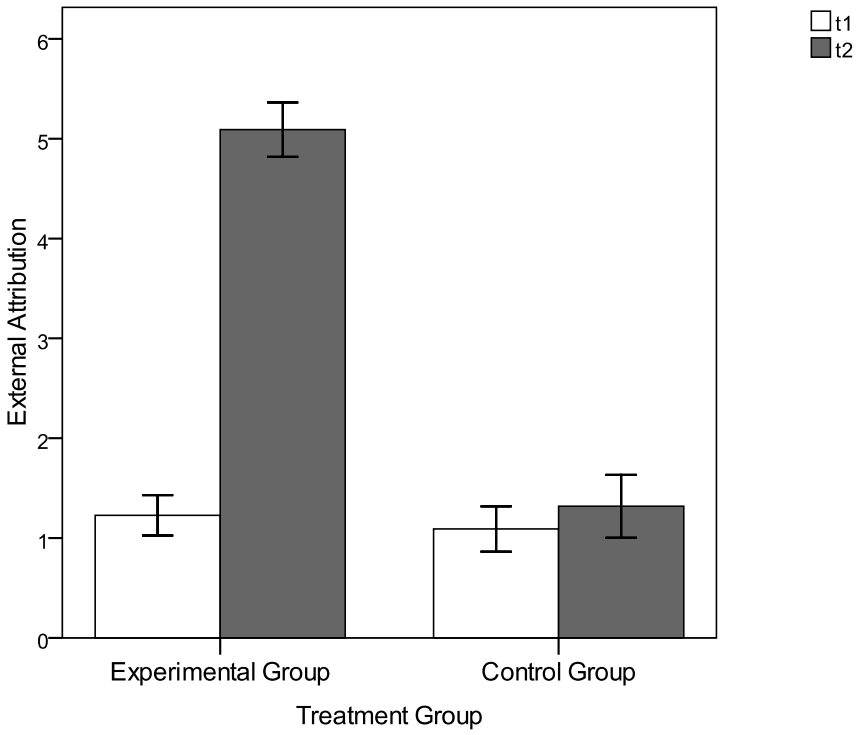

Figure 3.4: External attributions of the experimental and control group following the baseline (t1) and the manipulation (t2) part of the Pilot Experimental Study. Error bars represent standard errors of the mean (±1 SE).

3.3.4 Discussion

In this study the expected impact of the experimental manipulation of objectively given control on attributions and the subjectively perceived extent of control was supported. For the participants of the experimental group, the manipulation applying decreasingly accurate displays of the participant's clicking position within the computer game led to a sense of subjective loss of control compared to the baseline section and the control group. Furthermore, the external attributions of perceived control significantly increased following the experimental manipulation. Thus, this study's results provide evidence for the expected impact of decreasing objective control on subjective control ratings and provide support for the paradigms' adequacy to induce externally attributed subjective loss of control.

3.4 Main Experimental Study 1

3.4.1 Aims

Main Experimental Study 1 aimed at investigating the impact of externally attributed subjective loss of control on anger and risk-taking behavior (Hypotheses 1-3) by applying the newly developed and tested experimental paradigm inducing externally attributed loss of control by decreasing the implementation accuracy during the computer-based problem-solving task.

3.4.2 Method

Participants and Data Collection

Sample. The study was conducted at a German university using a student sample consisting of N = 84 (54% female) participants recruited via the online recruiting system ORSEE (Greiner, 2004). The participants had an average age of M = 21.93 years (SD = 1.93, range: 19-27) and they were randomly assigned to the EG (n = 44; 57% female) and the CG (n = 40; 50% female). Their voluntary participation was compensated by a fixed show-up fee as well as additional payment according to the subject's performance during the problem-solving task and risk game.

Procedure and experimental design. Main Experimental Study 1 used the same newly developed experimental computer-based game paradigm that had been pretested in the Pilot Experimental Study. However, instead of measuring the participants' perceived control and attributions, following the baseline (t1) and manipulation section (t2) their anger was assessed by a questionnaire. Additionally, the participants' behavior in a risky situation was investigated (cf. *Figure 3.1*). Finally, a separate follow-up during an about two-week-interval after the experimental part of the study was used to assess the socio-demographic and trait variables.[9]

[9] The follow-up included measures of socio-demographic variables, nonverbal reasoning and trait locus of control again (cf. footnote 8). Additionally, in this Main Experimental Study 1, the participants' trait-based risk-taking propensity regarding risk attitudes and behavior was assessed using the "financial decisions" subscale of the Domain-specific Risk-attitude scale (DOSPERT; Weber et al., 2002; German version: Johnson et al., 2004). T-tests for equivalence did not reveal any significant group differences with respect to the socio-demographic and trait variables (all ps > .05).

Variables and Study Measures

Risk-taking behavior. The participants' risk-taking behavior was assessed by computer-based variants of the "devil's task" (Slovic, 1966) consisting of a circle with a given number of equal sectors. All – except one or two – of those sectors represent "secure" sectors, whereas the remaining one or two sectors are the "devil's" sectors. The positions of both the secure and devil's sectors are unknown to the participants. While choosing a secure sector results in a gain of 0.10 € per sector, choosing a devil's sector causes the loss of all money. This task reflects a typical risk situation with the number of chosen fields serving as the dependent variable. The participants were presented one version of this game at t1 (31 sectors, one devil's sector) and three immediately succeeding versions at t2 (game 1: 23 sectors, one devil's sector; game 2: 31 sectors, two devil's sectors; game 3: 23 sectors, two devil's sectors). In order to avoid any effects on the subsequent versions of the devil's task, the participants did not receive any immediate feedback on their results between the rounds, but only at the end of the experiment. The internal consistency of the three versions of the devil's task at t2 was $\alpha = .86$.

Anger. Applying the subscale of the Differential Emotions Scale (DES; Izard, Dougherty, Bloxom, & Kotsch, 1974; as cited in Izard, 1977; German version: Merten & Krause, 1993) consisting of three adjective items ("enraged", "angry", "mad"), the participants' anger was assessed by their ratings on a five-point intensity rating scale ranging from 0 *not at all* to 4 *very strong*. The three-adjective-subscale had an internal consistency of $\alpha = .84$ at t1 and $\alpha = .94$ at t2.

3.4.3 Results

Anger

In line with our assumptions there were no significant group differences before the manipulation at t1 (CG: $M = 0.66$, $SD = 0.87$, EG: $M = 0.69$, $SD = 0.89$, $t(82) = -0.16$, $p = .872$, $d = -0.04$). In contrast, and supporting Hypothesis 1, the members of the experimental group showed significantly higher levels of anger following the externally attributable subjective loss of control manipulation ($M = 2.23$, $SD = 1.22$) than the participants in the control group ($M = 0.80$, $SD = 0.97$), $t(82) = -5.90$, $p < .001$, $d = -1.29$ (see *Figure 3.5)*.

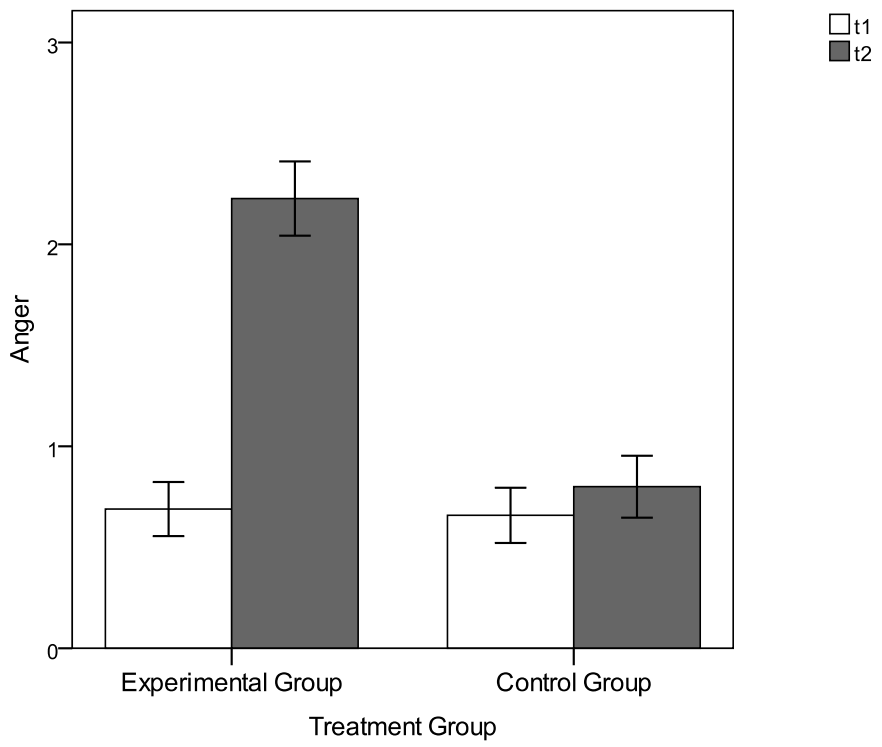

Figure 3.5: Anger ratings of the experimental and control group following the baseline (t1) and the manipulation (t2) part of the Main Experimental Study 1. Error bars represent standard errors of the mean (±1 SE).

Risk-Taking Behavior

Similarly, there was no group difference with respect to the risk-taking behavior in the baseline section (average proportion of chosen sections in the devil's task) at t1: CG: M = 0.42, SD = 0.15, EG: M = 0.42, SD = 0.17, $t(82)$ = 0.01, p = .990, d = 0.002. Following the experimental manipulation, the experimental group took significantly more risks compared to the control group (see *Figure 3.6*). During the three rounds of the devil's task the experimental group's proportion of chosen sections on average was M = 0.44 (SD = 0.11), while the control group's was M = 0.40 (SD = 0.10). This group difference was marginally significant, $t(82)$ = -1.64, p = .053, with d = -0.36 representing a moderate effect size (Cohen, 1988) and providing support for Hypothesis 2.

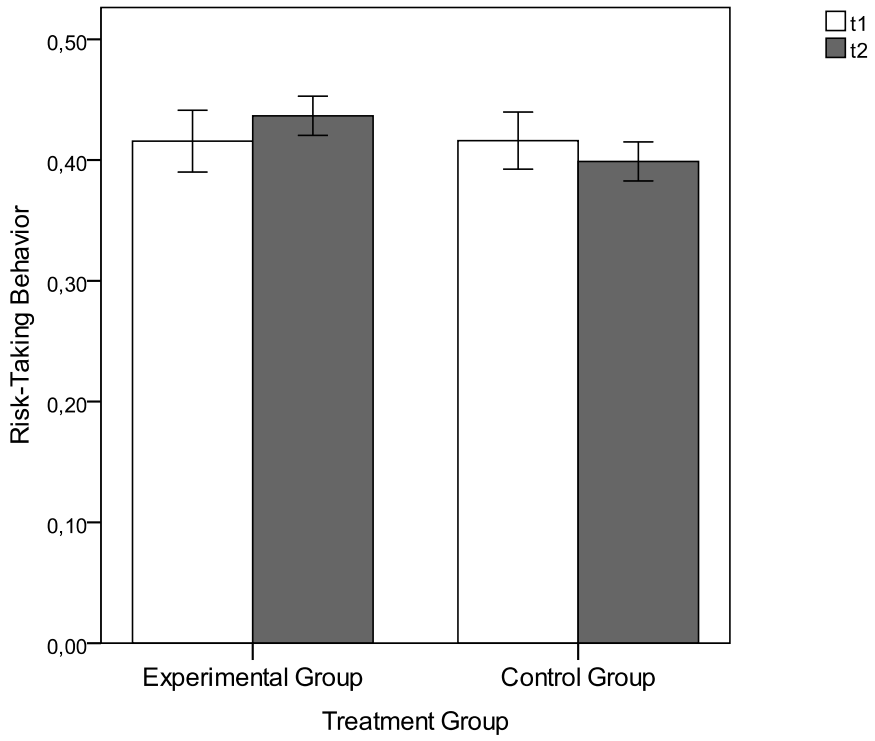

Figure 3.6: Risk-taking behavior of the experimental and control group represented by the mean proportion of chosen sectors during the devil's task following the baseline (t1) and the manipulation (t2) part of the Main Experimental Study 1. Error bars represent standard errors of the mean (±1 SE).

Anger as a Mediator of the Relationship between Subjective Loss of Control and Risk-Taking Behavior

In order to examine the mediating effect of anger on the relationship between the subjective loss of control-manipulation and subsequent risk-taking behavior as postulated in Hypothesis 3 we applied structural equation modeling (SEM) techniques (see Byrne, 2010; Kline, 2010) which provide excellent methods for testing indirect effects. The proposed mediation was modeled with anger and risk-taking behavior as latent variables (cf. *Figure 3.7*). The three items of the anger subscale of the DES were modeled as manifest indicators of the latent variable anger. Similarly, the mean proportion of chosen sectors in the three devil's task rounds following the experimental manipulation section at t2 served as manifest indicators of the latent variable risk-taking behavior. The proposed mediating effect was modeled by the three unidirectional paths leading from the manifest variable subjective loss of control-manipulation (independent variable) towards the latent variables anger and risk-taking behavior as

well as from the latent variable anger (mediator) towards the latent variable risk-taking behavior (dependent variable).

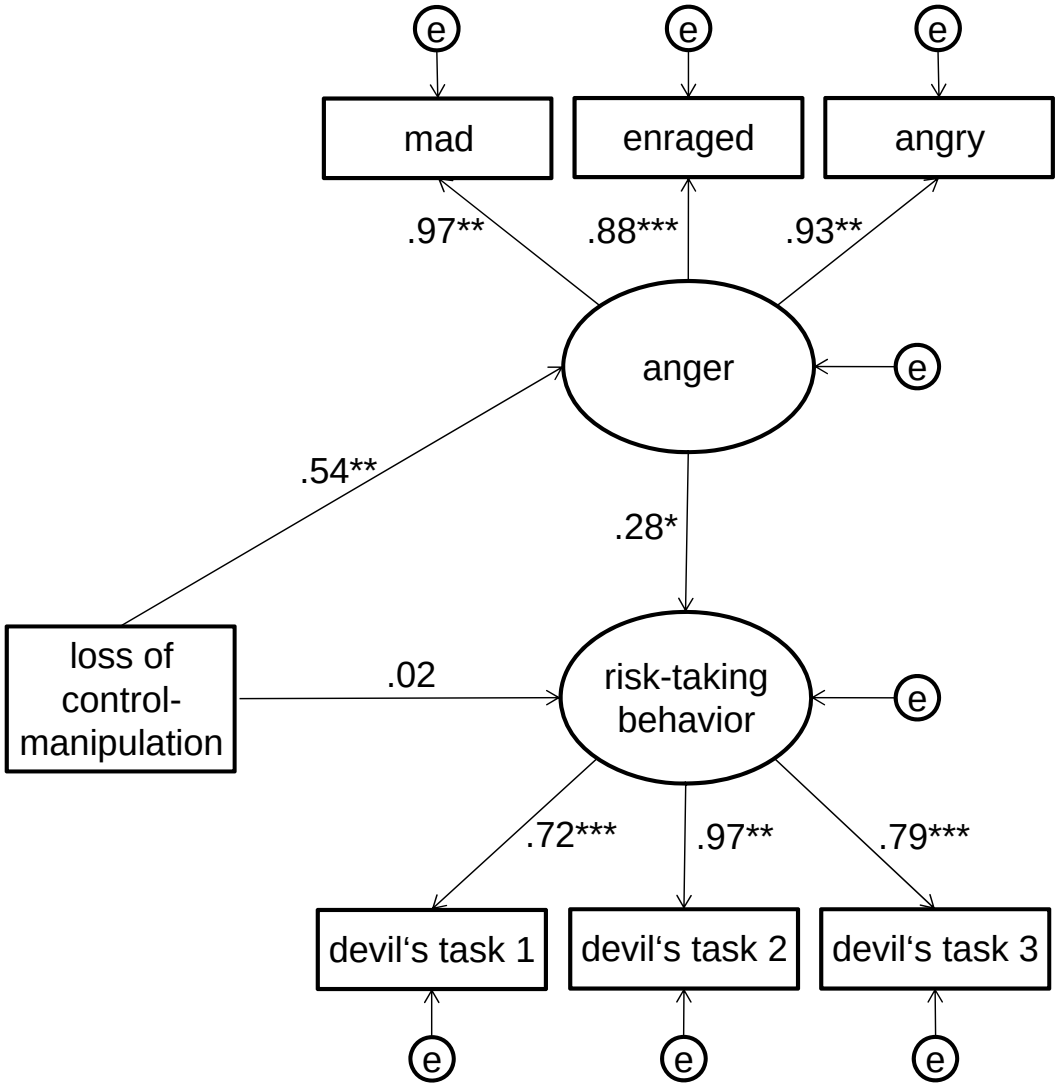

*Figure 3.7: Structural equation model for testing the indirect effect (Hypothesis 3) of Main Experimental Study 1 on a latent variable level. The coefficients represent standardized factor loadings and standardized regression paths in the German sample (N = 84). * p < .05. ** p < .01. *** p < .001.*

The results of the CFA showed that the proposed model was not rejected in the test of significance ($\chi^2 = 17.21$, $df = 12$, $p = .142$) and showed very satisfactory model fit indexes (CFI = .987; RMSEA = .072; SRMR = .0455) which are in line with the recommended cutoff criteria for acceptable model fit (Hu & Bentler, 1999). The standardized indirect effect of the subjective loss of control-manipulation on risk-taking behavior via anger in this model was 0.15, $p = .013$. The Sobel test for the latent regression path coefficients was significant with $z = 2.03$, $p = 0.042$.[10]

Thus, the analyses of indirect effects supported the mediating effect of anger proposed in Hypothesis 3. Furthermore, the confirmatory factor analysis added evidence for a very satisfactory general fit of the proposed model.

3.4.4 Discussion

This study provided evidence for the assumed effects of externally attributed subjective loss of control on anger and risk-taking behavior. As expected, following the externally attributable experimental manipulation of objective control, the participants reported increased levels of anger and tended to act more riskily in a subsequent decision-making setting. However, the group difference with respect to the risk-taking behavior was only marginally significant which could be a result of the sample size, which is commonly known to influence detection of effects (e.g., see Cohen, 1992). Considering the effect size of the mean difference which – according to Cohen's (1988) guidelines – is regarded as a moderate effect, the difference in risk-taking behavior between the two groups of participants might still suggest a practically significant effect. Furthermore, the empirical data supported the assumed mediating role of anger in the relationship between subjective loss of control and risk-taking behavior. In conclusion, the results of Main Experimental Study 1 were in line with our expectations and provided supporting evidence for Hypotheses 1-3.

[10] Manifest regression-based mediation analyses (Baron & Kenny, 1986) revealed that the original direct effect path c ($B = .04$, $SE_B = .02$, $\beta = 0.178$; $p = .053$) was substantially reduced and lost its statistical significance (path c': $B = .01$, $SE_B = .03$, $\beta = 0.03$; $p = .408$) when the mediating variable anger was included in the model (Sobel $z = 2.06$, $p = 0.039$). Bootstrap procedures (cf. Preacher & Hayes, 2008) based on 5000 bootstrap samples also provided support for the mediating influence of anger with the point estimate of the indirect effect *ab* paths = 0.03, $SE = 0.02$, $Z = 2.04$, $p = .021$.

3.5 Main Experimental Study 2

3.5.1 Aims

The objective of Main Experimental Study 2 was to test Hypothesis 4 which proposes the assumed mediating mechanism of anger on the relationship between subjective loss of control and risk-taking behavior will be generalizable cross-culturally. For this reason the Main Experimental Study 1 was replicated within a Chinese sample to allow for cross-cultural comparisons.[11]

3.5.2 Method

Participants and Data Collection

Sample. N = 125 (64% female) Chinese students participated in the replication study. The average age was M = 20.44 years (SD = 1.78, range: 17-28). The participants were randomly assigned to the EG (n = 61; 61% female) and the CG (n = 64; 67% female)

[11] Before replicating the Main Experimental Study, a totally comparable pretest applying the procedure from the previously reported Pilot Experimental Study was conducted in order to test the design's adequacy to induce externally attributed subjective loss of control in Chinese participants. The sample consisted of N = 63 (68% female) participants (average age: M = 21.10 years, SD = 1.84, range: 18-26) with random assignment of n = 32 (69% female) participants to the experimental and n = 31 (68% female) participants to the control group. T-Tests for equivalence showed no significant group differences (all ps > .05) between the EG and CG with respect to socio-demographic and trait variables (locus of control: IPC by Levenson, 1974, German version by Krampen, 1981; risk propensity: DOSPERT by Weber et al., 2002, German version by Johnson et al., 2004; Chinese items for both measures had been developed during this study based on the German versions).

In line with the expectations, at t1 there were no significant group differences in the ratings of subjective control (CG: M = 3.90, SD = 1.14; EG: M = 3.72, SD = 1.28; $t(61)$ = -0.61, p = .547, d = -0.15) and external attributions (CG: M = 1.39, SD = 1.14, EG: M = 1.81, SD = 1.05; $t(61)$ = 1.54, p = .129, d = 0.39). However, following the experimental manipulation at t2, the experimental group rated their perceived control significantly lower (M = 1.14, SD = 1.12) than the control group (M = 4.08, SD = 1.12; $t(61)$ = -10.44, p < .001, d = -2.63) and showed significantly higher external attributions (M = 4.02, SD = 1.88) than the control group (M = 1.65, SD = 1.22; $t(61)$ = 7.82, p < .001, d = 1.97). These results were comparable to those of the German sample and provided evidence for the applicability of the experimental design to Chinese participants which we considered a prerequisite for conducting Main Experimental Study 2.

and compensated by a fixed show-up fee with additional payment given according to their performance in the problem-solving and risk game.

Procedure, variables, and experimental design. Main Experimental Study 2 applied the same procedures, measures, and experimental design in the Chinese sample as Main Experimental Study 1 in the German sample (cf. *Figure 3.1*). Thus, following the baseline (t1) and the manipulation part (t2) of the experimental design, anger as well as risk-taking behavior were assessed. To create a Chinese version of the anger subscale of the Differential Emotions Scale (DES; Izard et al., 1974; as cited in Izard, 1977), the German version (Merten & Krause, 1993) was subjected to a multiple stage translation process[12] consisting of independent forth- and back-translations by two professional translators, as well as comparisons, revisions and a pretest with Chinese students. The internal consistency of the translated three-item anger subscale was $\alpha = .84$ at t1 and $\alpha = .90$ at t2. Identical to the Main Experimental Study 1, the participants' risk-taking behavior was assessed by one or three rounds of the devil's task (Slovic, 1966) at t1 and t2, respectively. The internal consistency of the three versions of the devil's task at t2 was $\alpha = .91$. In accordance with the Chinese currency, choosing one secure sector resulted in a gain of 0.45 RMB and the maximum profit in the computer-based problem-solving game was 4.50 RMB per round. Socio-demographic and trait variables were assessed later the same day during a separate part following the experimental section of the study in order to allow for trait-based comparability between the experimental and control group.[13]

3.5.3 Results

Applying the multiple group comparison procedure we specified a sequence of three models with nested structures and increasing constraints of equality in order to

[12] The reported translation procedure was also applied to the instruction process and all measures of both the experimental design and the pretest in the Chinese sample (cf. footnote 11).

[13] The separate study part assessed participants' socio-demographic variables (sex, age, subject of study, pre-experiences with computer-games), trait-based locus of control (Internality, Powerful Others and Chance-Scales, IPC by Levenson, 1974; Chinese items were developed based on the German version by Krampen, 1981) and risk propensity (DOSPERT; Weber et al., 2002; Chinese items were developed based on the German version by Johnson et al., 2004). No significant differences between the EG and CG were found during *t*-tests for equivalence regarding the socio-demographic and trait variables (all *p*s > .05).

test the invariance of the proposed models between the two samples in Germany and China. Model 1 (baseline model, identical to the model testing the mediation effect on a latent variable level in Main Experiment 1) tested for the invariance of the model form without any constraints. Model 2 included constrained factor loadings assuming that the measurement weights of the latent variables anger and risk-taking behavior on their manifest indicators operate equivalently across the two samples. Model 3 additionally tested for the invariance of the regression paths between the independent variable, mediating variable and dependent variable proposing the relationships to be comparable in both samples. In order to evaluate the adequacy of the models and their included invariance assumptions, the absolute as well as relative model fit (changes in model fit due to additionally imposed constraints) were considered (e.g., Byrne, 2010; Little, 1997). Goodness-of-fit statistics and indexes of the three models are displayed in *Table 3.1*.

Table 3.1: Model Fit Statistics and Indexes of the Three Nested Models of Multiple Group Analysis with the German and Chinese Sample

	Model fit				
	χ^2	*df*	*p*	CFI	RMSEA
Model 1 Invariance of model form	30.70	24	0.163	0.993	0.037
Model 2 Invariance of factor loadings	39.82	28	0.069	0.988	0.045
Model 3 Invariance of regression paths	46.14	31	0.039	0.984	0.049

Note. N(Germany) = 84, N(China) = 125. All p-values refer to one-tailed tests.

Additionally, within the proposed models the indirect effects of the subjective loss of control-manipulation on risk-taking behavior via anger were analyzed and tested for significance based on bootstrapping procedures. The results of the indirect effect analyses for all models and both samples are presented in *Table 3.2*.

Table 3.2: Tests of Standardized Indirect Effects within the Three Nested Models of Multiple Group Analysis in the German and Chinese Sample

	Germany		China	
	Indirect effect	*p*	Indirect effect	*p*
Model 1 Invariance of model form	0.15	0.009	0.06	0.039
Model 2 Invariance of factor loadings	0.15	0.009	0.06	0.036
Model 3 Invariance of regression paths	0.10	0.003	0.06	0.003

Note. N(Germany) = 84, N(China) = 125. All p-values refer to one-tailed tests. The tests of significance of the standardized indirect effects (ab paths) were performed based on 5000 bootstrap samples and bias-corrected 95% confidence intervals.

The results revealed a good overall fit for the baseline Model 1 ($\chi^2(24) = 30.70$, $p = .163$; CFI = .993; RMSEA = .037) and the indirect effects reached significance both in the German (standardized indirect effect: 0.15, $p = .009$, one-tailed) and Chinese sample (standardized indirect effect: 0.06, $p = .039$, one-tailed). Thus, the assumed mediating effect was supported and the invariance of the model form was confirmed in both samples. The Chinese sample's standardized coefficients of the model are presented in *Figure 3.8*.

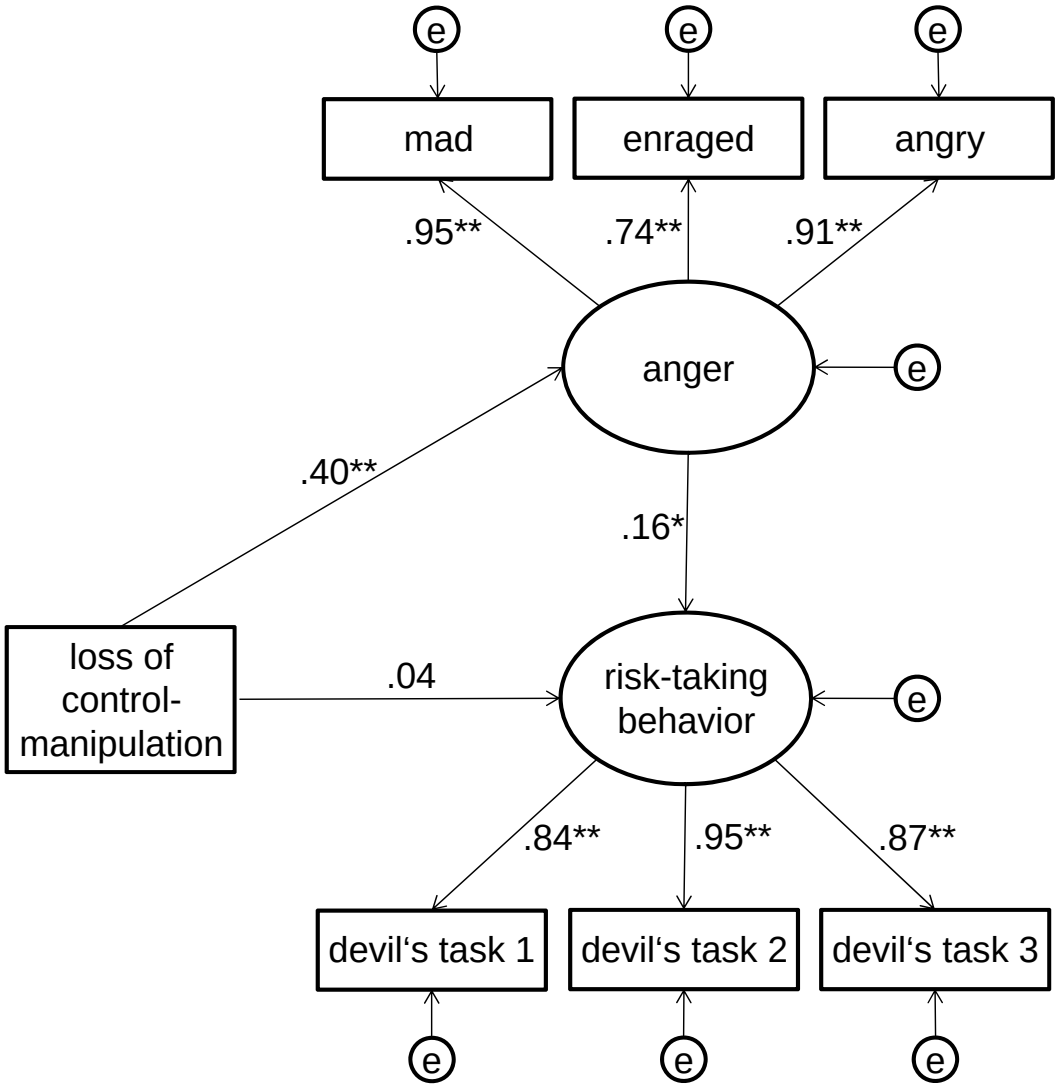

*Figure 3.8: Structural equation model for testing the indirect effect on a latent variable level in Main Experimental Study 2. This model also served as baseline model (Model 1) for testing the cross-cultural generalizability Hypothesis 4. The coefficients represent standardized factor loadings and regression paths of the baseline model 1 in the Chinese sample (N = 125). * p < .05. ** p < .01.*

Constraining the factor loadings to be invariant in Germany and China caused a marginal, but not significant loss of model fit (Likelihood-ratio-test: $\Delta\chi^2(4) = 9.12$, $p = .058$). The ΔCFI = .005 was smaller than the recommended .01 cutoff criterion (Cheung & Rensvold, 2002), thus representing negligible loss of fit and supporting the invariance of the factor loadings between the two samples.

Imposing additional constraints referring to the equality of the regression paths in Model 3 again resulted in a small, but insignificant loss of model fit ($\Delta\chi^2(3) = 6.32$, $p = .097$) with the ΔCFI = .004 again not exceeding the cutoff criterion for nested model comparisons. Model 3 showed very satisfying model fit indexes (CFI = .984; RMSEA = .049) and, despite the imposed constraints, the indirect effect of subjective loss of control on risk-taking behavior via anger was also significant in this model (standardized indirect effects: Germany: 0.10, China: 0.06, both *p*s = .003, one-tailed). With the invariance of both the factor loadings and regression paths between the German and Chinese sample and the significant indirect effects, these results provide evidence for the cross-cultural generalizability Hypothesis 4.

3.5.4 Discussion

Based on the results showing the experimental design's applicability for inducing externally attributed subjective loss of control in China, and thus in a sample with a different cultural background, this study demonstrates the cross-cultural generalizability of the results found in Main Experimental Study 1. Based on excellent model fits for the mediation path model and the significant indirect effect of anger, the effects of externally attributed subjective loss of control on increased risk taking due to the elicitation of anger were replicated in the Chinese sample. Furthermore, multiple group analyses indicated invariance of both the structural and measurement model between the German and Chinese samples. Thus, by comparing the results gained in the Western European and the East Asian sample, this study provides evidence for the hypothesized cross-cultural generalizability of the proposed relationships and the mediating effect of anger.

3.6 General Discussion

The questions investigated examined how loss of control experiences due to changes in our external environment impact subsequent risk-taking behavior, as well as the role that anger plays in this relationship and the cross-cultural generalizability of the functional mechanisms. In line with the assumptions, loss of control experiences considerably influenced both emotional experiences and subsequent behavior and their impact was demonstrated cross-culturally. Strong support for the hypothesized effect of

subjective loss of control experiences on subsequent risk-taking behavior was provided in this set of studies. Subjective control due to changes in external conditions – and thus externally attributable – was shown to arouse anger.[14] Furthermore, anger was shown to mediate the relationship between control experiences and risky decision making. These functional relationships and their underlying mechanism were detected in both samples from Western Europe and East Asia and therefore provide support for cross-cultural generalizability. Thus, all of the studies' results were in line with our hypotheses and contribute to a deeper understanding of how immediately preceding experiences of control impact risk-related decision making in a subsequent, objectively unrelated setting.

As expected, and regarding their close association, the relevance of control experiences for decision making under risk conditions was demonstrated. The decisions of participants exposed to changes in objective control conditions designed to induce subjective loss of control differed significantly from the decisions of participants who were able to maintain their personal control. More precisely, people who had experienced a gradual loss of control over their outcomes acted significantly more riskily in the subsequent decision-making context. This finding might appear rather surprising as prior experiences of loss of control might be assumed to elicit cautious behavior and efforts to regain control instead of giving rise to even more uncertainty. Thus, at first glance, careful and risk-averse behavior might appear to be more plausible and reasonable. However, when reviewing previous research on the effects of chronic losses support for both decreasing and increasing investment can be found (cf. "house-money effect": Thaler & Johnson, 1990, versus "sunk cost effect": Arkes & Blumer, 1985, and "escalation of commitment": Staw, 1976). The specific effects of prior loss of control experiences depend on the evaluation of these experiences, for example, the appraisals and attributions of the causes. As supported in the Pilot Experimental Study, the loss of control experience in this study was characterized by an external causation and blockage of one's goal attainment, but without personally threatening potential. Thus, the emotion of anger aroused by these experiences and its behavioral consequences was the critical aspect predicting subsequent risk taking. As expected, the mediating role of

[14] During the Pilot Experimental Study an appropriate experimental paradigm for inducing externally attributed subjective loss of control was successfully developed and tested. Further details on this experimental paradigm needed for its application in future research will be provided upon request.

anger was most influential with respect to the increasing risk-taking behavior following the loss of control experiences.

Our results were in line with both theoretical models explaining how emotions impact decision-making processes in general and previous research on the effects of anger in particular. This study added empirical evidence on the powerful effect of anger on decision making in risky settings. Anger following from the externally attributed loss of control experiences caused increased risk-taking behavior. This observation is compatible with the notion of anger making people feel more confident and encouraging them to actively approach a situation (e.g., see Lerner & Tiedens, 2006).

According to the Appraisal Tendency Framework (Lerner & Keltner, 2000, 2001) the risk-related influence of anger can be explained by high levels of certainty and control appraisals. This aspect is especially interesting in the context of our study in which anger emerged as a powerful mediator of the relationship between loss of control experiences and risk-taking behavior. On the one hand, it provides a feasible explanation for the observed increase in risk-taking behavior. On the other hand, these feelings of high certainty and control seem to stand in contrast to the subjective loss of control experiences intended to be induced by the experimental manipulation. However, the findings of the Pilot Experimental Study can rule out any doubts that the experimental manipulation to decrease objectively given control may have failed to induce the intended sense of loss of control. In both samples the experimental group members rated their personal control significantly lower following the experimental manipulation as compared to the control group (and the baseline part). Instead, the apparent "regain" of a sense of certainty and control should be due to the cognitive evaluations of the loss of control experiences, which were shown to be characterized by external attributions and increasing anger as previously proposed. The emotional experience of anger thus appears to be the crucial underlying mechanism linking the loss of control experiences with the increased risk-taking behavior in the subsequent, objectively unrelated decision-making context. Although elicited by subjective loss of control experiences, anger might have led to a sense of regained certainty due to its accompanying appraisal tendencies and thus has been demonstrated to play a vital role in the context of control and risk. Therefore, the experimental manipulation did not only induce subjective loss of control, but – via attribution processes – elicited anger which in turn (via high certainty and control appraisals) impacted the subsequent risk-taking behavior by opposing

excessive risk aversion.

Therefore, this study again provides support for the influence of emotions as a rather subjective variable on the assumingly rather rational and "objective" decision-making process. However, in this study concrete behavior, namely actual risk taking, has been demonstrated to differ remarkably depending on prior control and emotional experiences. This is in contrast to much other previous research examining possible impacts on decision making, which has focused on perceptions or cognitive estimations of risk instead of actual behavior. It can be informative to look at precursors of decisions, such as cognitive evaluations of different alternatives, while researching decision making, but it is not sufficient. In the end, the actual choice, the behavior, represents the final outcome of the decision-making process. Thus, by supporting the hypotheses our results both add evidence for the theoretical assumptions and go beyond existing findings by demonstrating behavioral effects.

Furthermore, by exploring the cross-cultural generalizability this study contributed to understanding cultural issues in the relation between control experiences, anger and risk-taking behavior. Through the comparison of the results of both our samples from Germany, representing Western Europe, and China, representing an East Asian cultural background, the cross-cultural applicability of the proposed relations between the variables was supported. In both Germany and China participants reported significantly higher levels of anger following the externally attributed loss of control and made riskier decisions with this behavioral effect being mediated by anger. In regard to possible cultural influences on our included variables, our findings are remarkably interesting. When focusing on the levels of anger participants reported, one of the variables especially informed by culture, there in fact seem to be differences between the two samples, with the Chinese anger ratings generally being lower than the German ratings. This is in line with previous findings showing that individualistic and collectivistic cultures generally differ in intensities of reported emotions with China showing particularly low norms and intensity scores (Eid & Diener, 2001). For negative emotions that might threaten the desired interdependence between individuals in collectivistic cultures (Markus & Kitayama, 1991), such as anger, this might be especially true.

It is also worthwhile to have a closer look at the direct effects of the experimental manipulation of personal control and their cross-cultural influences. Despite some

evidence for the fact that people from various cultures might differ in their habitually perceived locus of control – with Western European countries tending to perceive higher levels of personal, thus internal, control than Eastern Asian countries – the effects of experiences of loss of control was assumed to be cross-culturally generalizable. In fact, the Pilot Experimental Studies showed the effects of the experimental loss of control manipulation on control ratings were exactly as intended in the German and the Chinese sample. Both the patterns of control ratings and attributions demonstrated the paradigm's adequacy to induce externally attributed subjective loss of control in the Chinese sample as well. These findings counter the argument that the experimental manipulation might have had weaker effects in the Chinese sample since they may be used to lower levels of personal control due to a habitually more external locus of control (see also Scherer & Brosch, 2009, on the relationship of attributions and perceived control) and instead speaks for the cross-cultural applicability of the experimental paradigm. Furthermore, the relevance of experiences and appraisals of personal control for emotions and behavior has been confirmed cross-culturally. The effects of loss of control experiences on risk-taking behavior via anger were also demonstrated in both samples. Additionally, this study supports the applicability of the emotions-behavior link as proposed by the Appraisal Tendency Framework which had previously been questioned for people from collectivistic cultures (Lerner & Keltner, 2001). The influence of anger on risk-related decisions was also found within the Chinese sample and did not to differ from the effect in the German sample. In conclusion, despite (possibly habitual) differences in anger ratings and external attributions, the functional relationships between the variables following the loss of control experiences were shown to be generalizable across cultures as hypothesized.

3.6.1 Limitations

Although support for all hypothesized functional relationships between subjective loss of control, anger, and risk-taking behavior was provided with evidence for cross-cultural applicability and a newly developed experimental paradigm was introduced, there are some limitations that should be taken into account.

This study deals with the cross-cultural generalizability of the proposed functional mechanisms. For this purpose, the study was conducted with participants from two countries representing different cultural backgrounds: A sample of German

participants representing the Western Europe culture and a sample of Chinese participants representing the Eastern Asian culture. These cultures are known to differ on a variety of dimensions, among which the differentiation between individualism and collectivism is probably most prominent (e.g., see Hofstede, 2001; Triandis, 1994, 1995). A great deal of research on cultural effects and cross-cultural comparability has been made on the basis of this dimension. Thus, comparing samples differing on this dimension in order to explore cultural influences might be reasonable. Still, one has to keep in mind that drawing final conclusions about cross-cultural universality is – for several reasons – not possible by investigating samples from only two countries. First, the two countries do not exclusively define the cultural background they are meant to represent. With a number of other countries also belonging to the Western Europe and Eastern Asian cultural area, the representativeness of the chosen countries with respect to their cultural area has to be considered. For example, China's individualism score is remarkably lower than the average score[15] of Eastern Asian countries (Hofstede, 2001). From this perspective, the results of this study might even be underestimated, as the difference between China and Germany might be even bigger than between Germany and East Asian countries on average. This deliberation argues for the generalizability between the two cultures, but only further research can clarify this assumption.

Additionally, there are many other aspects on which cultures differ besides the individualism-collectivism dimension, and there are many more than just these two cultural backgrounds, such as African, Eastern European, and Arabic culture which were not included in the current study; thus a degree of caution in the interpretation is warranted. By comparing a German and a Chinese sample, which can be considered to represent the opposite poles of the often-investigated individualism-collectivism dimension, a first step towards interpreting a cross-cultural generalizability has been made. However, until several further replications have been conducted the results of this first step should be handled with care.

When considering the effects of externally attributed loss of control experiences on anger and risk taking as demonstrated in this study, one should keep in mind the specific context and setting of these findings. The experimental manipulation of changes in objectively given control due to external circumstances was specifically intended to induce a sense of loss of control that was attributed externally, lacked a personal threat

[15] The averaged score for Asia includes China, Hong Kong, Japan, South Korea and Taiwan.

and aroused anger. Through this experimental manipulation, a rather moderate intensity of anger with mean anger ratings around (Germany) or even below (China) the center of the five-point rating scale was aroused. However, several similar, but not identical scenarios of loss of control experiences are imaginable. For example, slightly different conditions might elicit much stronger intensities of anger that would probably be associated with different consequences for risky decision making. Furthermore, instead of a continuous change in objective control as applied in our experimental paradigm by decreasing the objectively given control over the course of four rounds of the computer game, the loss of control experiences might have occurred more abruptly and might have aroused surprise rather than anger. Additionally, the changes might have been associated with a feeling of personal threat and thus elicited fear. Therefore, although these alternatives also deal with externally attributable subjective loss of control experiences and would require only small changes in the experimental manipulation that can easily be implemented in our experimental paradigm (e.g., by reducing the number of rounds in the manipulation section or changing financial incentives), their effects on emotions and subsequent risk-taking behavior are presumed to differ fundamentally. When interpreting our findings it is important to keep the special circumstances of our study in mind, that is, with risk-related behavior impacted by loss of control experiences arousing moderate levels of anger.

3.6.2 Implications

The results of this study on the hypothesized effect of subjective loss of control on anger and risk-taking behavior suggest several theoretical, methodological and practical implications as well as raise some questions for future research.

Anger was demonstrated to mediate the relationship between loss of control experiences and increased risk-taking behavior. As proposed by the ATF (Lerner & Keltner, 2000, 2001) the risk-related influence of anger is due to high certainty and control appraisals, which generally accompany and typically characterize this emotion. In our context, aimed at investigating the consequences of subjective loss of control, this contrasting effect appears to be especially interesting. Although in the present study certainty evaluations with respect to the risk-related decision have not been explicitly measured, this aspect certainly deserves more attention and should be addressed in future research. The question arises as to whether experiencing anger could show a way

of attenuating the often reported negative effects following subjective loss of control experiences and partly compensate for these consequences, at least in the face of risky decision making. Our study's results seem to suggest this interpretation, as anger appeared to prevent overly risk-averse behavior and encouraged participants to act more confidently, but still not in a way that would be considered risk loving. This might be due to the only moderate intensity of anger aroused in our study. Furthermore, one might suppose this encouraging effect of anger on increasing risk-taking behavior to be especially beneficial when following loss of control experiences since these experiences may hinder bold behavior. Thus, though opposite in nature, the combination of anger and loss of control experiences may contribute to a nearly ideal risk-taking decision, as long as the anger is not in excess. But before being able to make more detailed statements, a deeper understanding of the relationship between the obviously contrasting effects of loss of control experiences and certainty experiences due to anger is required. Conditions and limitations of this relationship need to be further investigated, in order to – for example – provide practical implications, such as giving advice for adaptive coping strategies after perceived lack of control.

Related to the aspect of how of loss of control experiences can exert spillover effects to subsequent objectively unrelated settings via emotions is the question about the limits of this mechanism. For example, can purposively elicited or suppressed anger account for adaptive responses either following subjective loss of control or in the face of risk-related decisions? As suggested by Lerner and Keltner (2001), awareness is one of the boundary conditions since "becoming aware of one's own judgment and choice process should deactivate appraisal tendencies, even if the emotion itself persists" (p. 156). In our experimental design, emotions were assessed via self-report immediately before the decision process. Thus, in both our German and Chinese sample reflecting on one's own emotions did not seem to impair the effect of anger on risk-taking behavior. Considering the proposition by Lerner and Keltner (2001), a possible explanation might imply that although the emotion has been assessed via self-report – and thus it is assumed that one is aware of it – it is not cognitively associated with the subsequent decision-making process. In this case it can exert carry over effects between unrelated settings despite being aware of one's feeling, which is an interesting and possibly influential assumption certainly worthy of further investigation.

Finally, further research is encouraged as a consequence of the methodological

contribution of this study. During the Pilot Experimental Study, an experimental paradigm for inducing externally attributable subjective loss of control (and consequently anger) was developed. Its adequacy was successfully proved in both the German and the Chinese sample, thus additionally suggesting its cross-cultural applicability. This methodological innovation facilitates further research on the effects of loss of control experiences due to external causes, an issue that up to now largely lacked proper methods for investigation. Considering people's everyday experiences of externally caused uncertainty due to the continuing rapid developments, the newly developed and herein introduced experimental paradigm provides easy access to this highly relevant research topic.

3.6.3 Conclusion

Perceiving oneself to be a competent person and in control of personally relevant outcomes has generally been proposed to be a fundamental human need (Heckhausen & Schulz, 1995; Skinner, 1996). Therefore, the importance of control perceptions for emotions and behavior has already been a focus of research for quite a time, often with a concentration on the detrimental consequences of lack of control experiences. However, in the face of ongoing technological and societal developments that may make feelings of lacking control and uncertainty an everyday experience, this issue has not lost its relevance. Instead, questions of how to adaptively cope with experiences of lack of control and uncertainty, how to encounter their consequences, and the mechanisms of their impact on subsequent decision-making processes are quite timely. By applying a cross-cultural perspective, the understanding of fundamental general functional relationships as well as cultural influences on our everyday coping mechanisms in response to universal challenges is fostered. This study's results point out that – across cultures – emotions, more precisely, anger might bridge the gap between prior, externally attributed loss of control experiences and the subsequent decision-making setting, and thus can account for prior proven spillover effects. Furthermore, despite the often rather negative evaluation of anger as a socially undesirable and unpleasant emotion, our findings may give reason to cast a more positive light on it; anger can also be associated with cognitions of power, control and certainty. It seems to be able to compensate for the discouraging effects of lack of control experiences by counteracting overly cautious behavior and contributing to more confident, optimistic and risk-taking

decision making. Intensified efforts aimed at getting to the bottom of the underlying mechanisms might shed further light on the theoretical and practical chances and constraints of these seemingly promising effects of anger, which appear to have the potential to support people in coping with experiences of lacking personal control and uncertainty.

4 General Discussion

Given today's ongoing, rapid developments causing frequent experiences of uncertainty and uncontrollability for people in their everyday personal and professional lives, the present dissertation aimed at investigating the effects of subjective loss of control experiences on subsequent decision making. Because facing situations in which we have to choose between different alternatives with often unpredictable outcomes is a frequent and central aspect in both personal and professional daily life, the impact of loss of control experiences on risk-related decisions in particular was at issue in this dissertation. To this end, two experimental studies consisting of a set of pilot and main experiments were conducted. Each of the experimental sets focused on the consequences of subjective loss of control experiences due to one specific aspect of control beliefs based on the theoretical model of Skinner, Chapman and Baltes (1988). This model proposes that control beliefs are determined by both the conviction that one's behaviors and outcomes are connected in a contingent way (means-ends beliefs), and that one possesses the required means (agent-means or agency beliefs) to effect the outcome. Thus, Study I focused on experiences of uncontrollability referring to the relation between the task and one's capability to fulfill it (agent-means relation) and, to this end, the task difficulty was gradually increased. In contrast, Study II investigated loss of control experiences due to changes in the relation between one's behavior and their consequences (means-ends relation). For this purpose, the accuracy with which the participant's behavior was implemented into the computer game was manipulated and thus influenced the way behavior contributed to the individual performance-related payment. The main results of these two sets of experimental studies are summarized and discussed in this final chapter. Additionally, limiting aspects, as well as particular strengths and implications of this dissertation will be presented and final conclusions will be drawn.

4.1 Synopsis

Study I dealt with the consequences of subjectively perceived loss of control on risk-related decisions due to intrusion in the agent-means relations because of increasing task difficulty. In accordance with the expectations, results showed evidence for the proposed effects on risk propensity assessed by both a cognitive and behavioral indicator. People who had experienced a loss of personal control by being confronted with problem-solving tasks of escalating difficulty acted significantly more risk averse in the subsequent decision-making setting. These participants showed increased levels of risk perception with respect to the given case vignette and decreased risk-taking behavior in the actual risky setting. Thus, both outcomes demonstrated complementary effects pointing towards decreased risk propensity following subjective loss of control experiences. These findings are in line with previous studies which found increased risk aversion resulting from chronic losses (e.g., Rivers & Arvai, 2007). Cautious estimations and behavior as well as efforts to reestablish or maintain one's personal control appear to be plausible and adaptive reactions to prior experiences of uncontrollability, thus supporting the proposed theoretical underpinnings of these results. In summary, Study I provided evidence for the importance of considering prior subjective control experiences when examining risk-related decision making.

Study II investigated the issue of how subjective loss of control experiences due to externally caused distortions in the relation between one's behavior and outcomes (means-ends relations) impact subsequent risk-taking behavior. Additionally, it especially focused the role of anger as a possible linking mechanism between the two objectively unrelated settings, and furthermore addressed cross-cultural generalizability concerns. The externally attributed subjective loss of control was shown to considerably impact subsequent risk-taking behavior in the sense that people who had experienced a gradual loss of control over their outcomes took significantly more risks. In line with the hypotheses, this effect was explained by the mediating role of anger. The anger that was elicited by the externally attributed loss of control experiences caused increased risk-taking behavior and thus acted as a linking variable suitable for explaining the spillover effects to the new, objectively unrelated risky decision-making setting. This finding both met the expectations and was in line with theoretical models and evidence from

research that shows anger influences risk-taking decisions (Lerner & Keltner, 2000; Lerner & Tiedens, 2006). According to the Appraisal Tendency Framework (Lerner & Keltner, 2000, 2001) the encouraging effect of anger in the face of risky decision-making contexts is due to its accompanying high levels of certainty and control. Therefore, although anger was originally aroused by subjective loss of control experiences due to changes in external circumstances, it is likely the subsequent association of anger with appraisals of high certainty and control which in turn can account for the increased risk-taking behavior of angry people. Thus, experimentally manipulating the means-ends relation did not only induce subjective loss of control, but also aroused anger which in turn let people act riskier in the subsequent decision-making setting. Both the impact of subjective loss of control on anger and risk-taking behavior and the mediating role of anger in this relationship was demonstrated in both samples with participants from Germany and China. Taking into account that two of the included variables, namely control perceptions and emotions, are known to be particularly susceptible to cultural influences and previous evidence has not permitted definite conclusions, this finding is especially interesting and strongly argues for the cross-cultural generalizability of the present effects.

Thus both studies, although concerned with different aspects of control beliefs due to objectively differing experimental manipulations focusing either on the agent-means relation (Study I) or means-ends relation (Study II), provided empirical evidence for the importance of subjective control experiences when considering risk-related decision making. As such, the assumed relevance of personal control perceptions for risky decisions was strongly supported. Risk-related cognitions and behavior were strongly impacted by preceding experiences of personal control.

Upon having a more detailed look at the findings from Study I and Study II, at first glance, the contrast between the results seems to be striking. While Study I reported a decrease in risk propensity following subjective loss of control experiences, the participants of Study II demonstrated increased risk-taking behavior consistently across the samples in both Germany and China. Although these results seem to be contradictory initially, it is necessary to revisit the experimental circumstances. Even though both manipulations intended to elicit subjective loss of control experiences, they affected differing aspects of the relations, namely the agent-means relations (Study I) versus means-ends relations (Study), and thus differing facets of the objectively given control.

Further, the effectiveness of inducing subjective loss of control experiences had been shown in pilot studies for both manipulation methods. Still the question arises as to whether the effects of subjective loss of control – once experienced – should differ across settings, the more so as feeling in control is regarded as a basic human need (Heckhausen & Schulz, 1995; Skinner, 1996). The common notion of placing great importance on subjective perceptions and cognitive evaluations rather than on seemingly similar objective circumstances has already been put forth by ancient Greek philosophers (e.g., "Men are disturbed not by the things which happen, but by their opinions about the things" by Epictetus; Long, 1991, p. 14) and is also accounted for in cognitive appraisal theories. However, above this notion of subjective perceptions and evaluations, one has to keep in mind, that in the present dissertation, even the objective loss of control-eliciting events differed between the Study I and Study II. Although both experimental manipulations aimed to impair perceptions of personal control, this impairment was intended to be due to two completely independent aspects of that control. Thus, the subsequent effects should be related to the perceived causes of the loss of control experiences. The (objective) causes were in fact the only facet in the methodology of the experimental design that differed between Study I and Study II and they therefore represent the aspect (including its consequences, such as anger in Study II) to which the observed differing consequences for risk-related decisions should be ascribed. Of course, differing perceived causes of uncontrollability should in turn shape the consequences as they are highly relevant for the way to counter and – if possible – avoid these situations in the future. Loss of control experiences aroused by external circumstances that cannot be personally influenced should elicit different consequences than those which are perceived to be due to causes that can be personally affected. Thus, the fact that the participants behaved in a seemingly contrasting way in the risk-related decision setting between Study I and Study II not only appears reasonable when considering the concrete setting, but also confirms that the causes of uncontrollability had in fact been perceived differently between the two experimental designs as was intended.

From a more applied perspective, one might ask whether perceiving the causes of uncontrollability in one way or the other contributed to more adaptive or ideal decisions under risk. For example, with respect to the goodness of risk-related decisions, is it advantageous to ascribe subjective loss of control experiences to one's own control or to

uncontrollable external circumstances which in turn cause anger? And, should a recommendation be given to practitioners and coaches to advise their clients to attribute their loss of control experiences in a certain way to account for optimal risk-related decisions on the basis of reattributional methods (Försterling, 1985)? Based on the findings of the two sets of studies in the present dissertation, this question is hardly answerable since both groups of participants showed deviant risk propensity, though in opposing ways; whereas the participants in Study I reacted in a rather risk averse way, increased risk-taking behavior was observed in Study II. However, the combination of loss of control experiences and moderate anger as investigated in Study II seemed to account for decisions that were quite reasonable in the face of risk, neither causing too cautious nor too bold behavior. Still, this notion has to be handled with great care as the intensity of anger seems to be crucial because the participants showed only a moderate intensity of anger following the externally attributed loss of control experiences. Further research should clarify the effects of higher levels of anger on risk taking in the context of experiences of uncontrollability, and should also examine whether there is some kind of "turning point" at which the advantage of the encouraging effect of anger switches to overbold behavior. Therefore, the most important aspect for reasonable decision making following subjective loss of control – besides the fact that perceptions and attributions should in principal be linked to objectively given circumstances in order to allow for realistic expectations – might be to inform people about the influence that attributed causes can exert on risk-related decisions. More precisely, it should be taken into account that anger can increase one's risk propensity while overly cautious estimations and behavior might follow from prior experiences of uncontrollability that are ascribed to oneself. Whether one of the two effects is more advisable cannot be easily answered without knowing the potential outcomes and their consequences within the specific decision-making context. Thus, at this point, making people aware of possible effects on their decision-making process appears most promising, as overall both sets of studies provided evidence for the importance of prior experiences of uncontrollability and their perceived causes with respect to subsequent risk-related decision making.

4.2 Strengths, Limitations, and Implications

Overall, this dissertation provides many beneficial findings and suggestions, but some limiting aspects should also be taken into account. In the following sections, some major strengths as well as limitations and resulting implications for future research are presented.

4.2.1 Strengths

Methodological advances and the broad research approach used throughout the several studies contained in this dissertation reflect the major benefits of this work. One main strength pertains to the experimental design for inducing subjective loss of control experiences which was newly developed in the course of this dissertation and used in both Study I and Study II. Despite ensuring a standardized setting and allowing the studies to control for undesired influences and potential confounding variables, the experimental setting was intended to be as close to real life experiences as possible to account for external validity issues. Thus, the computer-game setting relates to people's everyday experiences while working or spending their free time on the computer. Furthermore, the risk-related behavioral decisions were made with respect to real money which the participants earned both for their attendance and based on their performance. Most importantly, both Study I and Study II used an identical, basic experimental paradigm which in principal differed in only one aspect that was purposely manipulated in order to investigate loss of control experiences due to the two different relations according to the model of control beliefs by Skinner, Chapman and Baltes (1988). While Study I induced subjective loss of control by affecting the agent-means relations, the experimental manipulation of Study II focused on the means-ends relations. Applying largely identical paradigms allows for comparison between the studies. Furthermore, both experimental paradigms were intensively pretested in several pilot studies supporting their adequacy. The experimental induction of subjective loss of control due to distortions in the means-end relations (cf. Study II) was also investigated from a cross-cultural perspective, arguing for its universal applicability.

By developing this new experimental paradigm enabling the manipulation of

different aspects of control beliefs, this dissertation provides a valuable methodological contribution and facilitates future research in this area, within which appropriate manipulation methods have largely been lacking. Using this paradigm, further research questions naturally arise and are efficiently testable. For example, direct comparisons between the consequences of both control manipulations are possible. Although the results of Study I already counter arguments that loss of control experiences are mainly due to external attributions (e.g., see Scherer & Brosch, 2009), the effect sizes of loss of control experiences caused by the manipulation of means-ends relations in Study II in fact appear to be stronger. While direct comparisons (as well as comparisons within samples) have not yet been made, this question can certainly be tackled with the methodological opportunities that exist as a consequence of this dissertation. Additionally, the joint exploration of both control aspects seems worthwhile and can be easily investigated. As proposed by the underlying model by Skinner, Chapman and Baltes (1988) arguing that control beliefs result from the combination of agent-means beliefs and means-ends beliefs, one would expect the effects of manipulations that include both aspects to exert even stronger effects as both relations would be perceived to be impaired. However, it may be that when both agent-means and means-ends beliefs are manipulated one of them could outweigh the other one, and there might be an interaction effect between the two aspects. For example, if one does not believe he or she possesses the required means to perform the task, weaker effects might be observed if one is simultaneously experiencing that the means-ends relations are distorted anyway. The newly developed basic experimental paradigms for inducing subjective loss of control experiences allow for the investigation of these kinds of questions rather effortlessly as they are easily modifiable. Similar objectives can also be examined by, for example, adapting the task difficulty, the incentives, or the abruptness of loss of control experiences (and thus probably impacting perceptions, attributions, and aroused emotions). Furthermore, extending the focus from the impact of subjective loss of control to control experiences more generally, the paradigm is also suitable for exploring the effects of perceived gains in control. This could be implemented by reversing the order of the underlying patterns in Study I, thus starting with high difficulty patterns and gradually decreasing the difficulty level, or by gradually increasing the accuracy with which the participants' mouse click positions are displayed on the computer screen (Study II). Thus, the development of an experimental paradigm

for investigating effects of subjective loss of control experiences that is also suitable to be adapted to closely related objectives makes a methodological contribution which helps remedy the previous methodological deficiencies and also facilitates future research on this highly relevant and timely topic.

Furthermore, this dissertation intended to contribute to a broader understanding of the consequences of subjective loss of control with respect to risk-taking decision making. To this end, it aimed to take a broader perspective using several approaches. For example, the focus was not just on one specific facet of subjective loss of control, but instead investigated two different kinds of loss of control experiences due to differing causes based on an integrative theoretical model. By using both cognitive and behavioral indicators as outcome variables, different facets of risk propensity were taken into account which might also provide valuable hints regarding the underlying decision-making process. In order to get closer to the mechanisms of spillover effects, the emotional experience of anger as a connecting variable between the two objectively unrelated settings was explored. Finally, this dissertation also aimed to explore the findings' generalizability which – when examining a topic in the field of "general psychology" – is almost automatically questioned and still often neglected. In the present dissertation, this issue was investigated from a cross-cultural perspective as some of the variables of interest are known to be potentially susceptible to cultural influences (especially control beliefs and emotions). Although Study II focused on this investigation, which was already an initially insightful and worthwhile effort, some further steps remain to be taken in order to go further explore this highly relevant issue. By taking different approaches and focusing on diverse aspects, altogether the studies of this dissertation already managed to draw a clearer picture of the various facets of the main research objective.

4.2.2 Limitations and Implications

There are several aspects of this dissertation which should be taken into account as potential limiting factors and starting points for future research. Some of these shortcomings and their implications are presented in the following section.

One of the additional aims of this dissertation was to look for the underlying mechanisms of the spillover effects and potential linking variables suitable for bridging the gap between the two settings. To this end, Study II investigated the role of anger as a

possible mediating variable; anger in fact turned out to be a central variable for explaining increased risk-taking behavior following loss of control experiences. Study I, in contrast, did not explicitly search for underlying mechanisms, but by assessing both risk perceptions and risk-taking behavior, two facets of the risk-related decision-making process were investigated. Considering actual risk-taking behavior as the final outcome of the decision-making process, as argued in Study II, the increased risk perceptions in Study I might also give cautiously interpretable hints about the cognitive pathways during the decision-making process. However, as the relation between risk perceptions and risk-taking behavior was not explicitly explored in this study and previous findings are not unambiguous (e.g., Weinstein, 1989; Weinstein et al., 1998), this issue still remains unanswered for Study I and deserves further investigation.

Furthermore, considering the strong evidence of anger as a mediator in Study II, a more detailed look at the role of emotions in the experimental setting of Study I also appears worthwhile. Perceiving oneself as gradually losing control because of one's inability to fulfill the increasingly difficult tasks may be associated with emotions such as shame or hopelessness. These emotions and their consequences might in turn account for the reported decrease in risk propensity. For example, shame is regarded as an emotion characterized by the "desire to hide or disappear" (Schmader & Lickel, 2006, p. 44) instead of actively engaging in a situation; additionally, shame is often associated with avoidance motivation. Furthermore, with respect to the Appraisal Tendency Framework (Lerner & Keltner, 2000, 2001), shame may also be accompanied by cognitions of possessing rather low power. In summary, both these arguments point towards shame leading to rather cautious risk-related decisions, and similar considerations might apply for hopelessness which is commonly regarded as a deactivating emotion (Kleine et al., 2005). Thus, the investigation of emotions in the relation between subjective loss of control experiences and risk-related decisions deserves more attention with respect to the experimental paradigm of Study I and the inclusion of emotions might deepen the understanding of the underlying mechanisms.

Given the important role of emotions, which Study II provided evidence for, additional questions for further research arise. For example, it appears reasonable to assume that subjective loss of control experiences not only elicit negative emotions, such as anger, but might also be associated with a decrease in positive emotions. People might experience less enjoyment, pride, or hope when they find themselves unable to

perform the required behavior, and thus experience a loss of control over their outcomes. This decline in positive emotions might also be very influential with respect to future behavior and decisions.

Moreover, methodological concerns with respect to the assessment of emotions and their impact – in combination with the issue of "awareness" as discussed in Study II – on subsequent risk-taking behavior appear interesting. Indeed, assessing anger via self-report did not seem to impair its effect on risk-taking behavior in Study II, although awareness is proposed to be one of the boundary conditions of the effects which are elicited by emotions according to the Appraisal Tendency Framework by Lerner and Keltner (2000, 2001). Still, future research could either avoid or shed further light on this issue by using more objective measures and indirect indicators of emotional experiences rather than self-report questionnaires. Some examples include physiological assessments of arousal or facial expressions (see Coan & Allen, 2007, for issues of emotion assessment). However, because these measures are also often critized for not being emotion-specific (rather mood-specific), sensitive, or reliable enough, a combination of indirect emotional assessments and the more direct assessments used in the already completed studies appears most promising. Applying a multimethodological approach to additionally include less awareness-related assessment methods might also contribute to a consolidation of the findings, as well as allowing future research to learn more about the nature of the boundary conditions and thereby providing additional insights for practical implications.

From a more applied perspective, the question arises as to what influence emotion regulation strategies (e.g., Gross, 1998, 2002) would exert in the risk-related decision-making context. The spillover effects of loss of control experiences on risk-taking behavior in Study II have been shown to rely largely on the mediating mechanism of anger. Considering both the possibly positive and negative effects of emotions in terms of inciting appropriate risk-taking behavior following loss of control experiences – for example, through their accompanying power and control appraisals that might counter the discouraging effect of experiences of uncontrollability – the investigation of emotion regulation effects in this context might be examined from two different perspectives. First, it could focus on the effects of purposively arousing a certain emotion which might contribute to an adequate risky-decision response. Second, it could focus on the extent to which the regulation of naturally occurring emotions following

subjective loss of control interferes with the reported effects on risk-related decision making. These issues appear especially relevant from a more applied perspective as they might provide valuable insights for practitioners, such as coaches or advisers of decision-making processes.

To further strengthen the possible benefits for practice of these results, future research might also look beyond the highly standardized experimental setting in which the current studies have been conducted with only student participants. Efforts to get a step closer to reflecting real life could possibly address the sample, experimental setting, and application of related methods. For example, non-student samples could be taken into account. In terms of the setting, the study design could be embedded into a more applied, everday situation, such as using a driving simulator within an experimental setting, which could offer both a manipulation of control aspects and assessment of risk taking. Further, a combination of other research methods could be considered, such as quasi-experiments which provide a chance to investigate the effects of naturally occurring experiences of loss of control. For instance, school students who change from a lower to a higher ability reference group have been found to show a considerable decrease in academic-self concept ("big fish-little pond effect": Marsh, 1987), a variable which is considered to indicate perceived personal control. This detrimental effect can for example be found following the transition from a non-ability-grouped primary school into a high ability secondary school, or after changing from regular to special ability-grouped classes for gifted students (Preckel, Goetz, & Frenzel, 2010). Taking advantage of naturally occurring conditions like those listed above offer the opportunity to investigate the impact of loss of control experiences in quasi-experimental designs with a strong reference to real life settings. Together with fully controllable experiments, and also taking different samples into account, these efforts could provide important evidence on the generalizability and transferability of the findings from the laboratory into real daily life.

4.3 Conclusion

The role that perceptions of control play in the emergence of emotions and as an antecedent of behavior has already been acknowledged for a long time in the research literature. This dissertation extends this research by putting a spotlight on the consequences of perceptions of control and emotions for subsequent decision making under risk conditions. Remaining capable of making appropriate decisions is even more challenging if potential outcomes are largely unpredictable or depend on chance. However, both feelings of lack of control and the necessity of making risk-related decisions are an integral part of today's modern society characterized by high complexity and rapid developments (Schober et al., 2007). In this dissertation both sets of studies consistently found evidence for the impact of prior loss of control experiences on subsequent risk-related decision making, a result which counters the notion of a purely objective and rational decision-making process. In contrast, the relevance of individuals' subjective experiences and evaluations, and the central role of control perceptions are emphasized. Loss of control experiences, which are considered a frequent part of our daily lives, spill over beyond contexts and can impact psychological functioning in the face of risk-related decisions. By demonstrating these effects consistently as elicited across different contexts, and with samples from two cultural backgrounds, the studies of this dissertation provide a strong empirical basis for the reported results. In addition to arguing for making people aware of possible effects of loss of control experiences and their ascribed causes on risk propensity, these findings offer a valuable starting point for future research. These future directions look promising for being able to provide support for decision-makers, advisers and common people in dealing with their everyday affairs, in which they will for sure encounter both experiences of subjective loss of control and face risky decisions.

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