Induced emotions and economic behavior:
An experimental approach

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"Experimentalist: If I understand the opening question correctly, we are here to discuss human economic behavior, not the behavior of a mythical hero called 'rational man', a mythical hero whose powers of computation and cogitation are unlimited. For this mythical hero it is easy to form consistent probability and preference judgments, but not for ordinary people like you and me."

Reinhard Selten, talk delivered at the J.L. Kellogg Graduate School of Management, Northwestern University in 1989 (printed version Selten, R., 1991. *Games and Economic Behavior*, 3, 3-24, p. 4)

Abstract

Do specific emotions influence economic decisions? Can emotions be of strategic value in market entry decisions? This dissertation takes an interdisciplinary and experimentalist's approach to address these questions. Relevant literature and models from standard psychology, neuroscience, and economics are synthesized and discussed. Two incentive compatible experiments conducted with entrepreneurs and students examine whether induced happiness and fear (i) influence risk taking behavior and (ii) market entry decisions. Happiness and fear are induced with film clips validated in an extensive laboratory test. We can conclude that although risk preferences are not systematically influenced by induced emotions; there is strategic value of emotions. Specifically, the findings indicate that people use the information about others' emotional states to coordinate. Limitations and implications are discussed.

Zusammenfassung

Beeinflussen Emotionen ökonomische Entscheidungen? Können Emotionen einen strategischen Wert in Markteintrittsentscheidungen haben? Die vorliegende Doktorarbeit verfolgt einen interdisziplinären und experimentellen Ansatz um diese Fragen zu adressieren. Relevante Literatur und theoretische Modelle aus den Bereichen der Psychologie, den Neurowissenschaften und der Ökonomie werden dargestellt und diskutiert. Zwei anreizkompatible Experimente mit Unternehmern und Studenten wurden durchgeführt mit dem Ziel zu untersuchen, inwiefern induzierte Freude sowie Angst (i) individuelle Risikopräferenzen und (ii) Markteintrittsentscheidungen beeinflussen. Freude und Angst wurden mit Hilfe von ausführlich validierten Videoclips im Labor induziert. Während kein systematischer Einfluss von induzierten Emotionen auf Risikopräferenzen festgestellt werden kann, wird ein strategischer Wert von Emotionen sichtbar. Die Ergebnisse legen nahe, dass Menschen Informationen über die Emotionen von anderen Personen zur Koordination nutzen. Schließlich werden Implikationen und Limitationen diskutiert.

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Abbreviations

AER	American Economic Review
AIM	Affect Infusion Model
ATF	Appraisal Tendency Framework
BART	Balloon Analogue Risk Task
CPT	Cumulative Prospect Theory
DES	Differential Emotions Scale
EDA	Electrodermal Activity
EEG	Electroencephalography
E&G	Eckel and Grossman
ET&P	Entrepreneurship Theory and Practice
EIC model	Emotion-inbued Choice Model
EUT	Expected Utility Theory
fMRI	Functional Magnetic Resonance Imaging
H&L	Holt and Laury
HR	Heart Rate
IAPS	International Affective Picture System
JPE	Journal of Political Economy
K&T	Kahneman and Tversky
ME	Market Entry
MMH	Mood Maintenance Hypothesis
PANAS	Positive and Negative Affect Schedule
QJE	Quarterly Journal of Economics
SMH	Somatic Marker Hypothesis
SOEP	Socioeconomic Panel
SWLS	Satisfaction with Life Scale
US	United States
WHO	World Health Organization
WTP	Willingness to Pay

I Emotions in management and economics

I.1 Introduction

Behavioral economics is often described as a mixture of economics and psychology, insights about human decision making from psychology and other social sciences are applied to explain economic decision making (Thaler 2016). Central themes within the discussion between behavioral economists and neoclassical economic theorists are the boundedly rational agent and heuristics (Savage 1954, Simon 1957, Kahneman and Tversky 1974, Gigerenzer and Selten 1991). Researchers came to question the dominant model of the idealized homo oeconomicus as normative *and* descriptive model. The homo oeconomicus is defined by having well defined preferences, unbiased expectations, and self-interests. This person optimizes his decisions based on these premises. Hence, he must be "a mythical hero whose powers of computation and cogitation are unlimited" as Nobel Laureate Reinhard Selten (1991) puts it in a speech at the University of Chicago:

> *"Experimentalist:* If I understand the opening question correctly, we are here to discuss human economic behavior, not the behavior of a mythical hero called 'rational man', a mythical hero whose powers of computation and cogitation are unlimited. For this mythical hero it is easy to form consistent probability and preference judgments, but not for ordinary people like you and me." (Selten 1991, p. 4)

Here, the German Nobel Laureate in economics Reinhard Selten stresses the importance of better understanding how 'ordinary' people like him actually come to decisions, as compared to the model of the homo oeconomicus.

Over the past decades, a range of 'cognitive biases' has been identified that systematically violates rational behavior. In a series of smart experiments Kahneman and Tversky (1979, 1992) show that peoples' judgments (or expectations) systematically deviate from normative benchmark models, which led to the establishment of prospect theory as dominant descriptive decision theory. On the other hand, Gigerenzer and colleagues (1991, 2008) study cognitive heuristics in their research program and show that using heuristics rather than maximizing, i.e., using less time, information, and computation, can actually improve accuracy – depending on the environment.

Interestingly, for decades decision researchers and economists have modeled and experimentally tested normative and descriptive decision theories mostly without considering the influence of emotions. On the other hand, (social) psychologists have a long tradition in studying emotions and their importance for human behavior (James 1888, Watson 1919). Only over the past two decades, the role of emotions on judgment and decision making has received substantial attention not only by decision scientists but also economists (e.g., Loewenstein 2000, Loewenstein, Weber, Hsee and Welch 2001, Rottenstreich and Hsee 2001, 2004, Loewenstein and Lerner 2003, Koszegi 2006, Ifcher and Zarghamee 2011, Schade, Koellinger, and Kunreuther 2012).

Research has shown that (even incidental) emotions (or mild affective states) can have a significant influence on for instance work effort, creativity, and helpfulness (Isen 2008), time preferences (Ifcher and Zarghamee 2011), willingness to pay (Schade et al. 2012, Lerner et al. 2003), likelihood judgments (Lerner and Keltner 2000, 2001), or ambiguity attitudes (Baillon, Koellinger, and Treffers 2016). Research on the influence of discrete emotions on *economic decisions and preferences* is still rather fragmented. For instance, Lerner, Small, and Loewenstein (2004) investigate how inducing sadness and disgust in a laboratory experiment affect the famous 'endowment effect' and find that the phenomenon reverses (sad condition) or even disappears (disgust) compared to a control group. Schade, Koellinger and Kunreuther (2012) find that in a large-scale incentive compatible economic experiment on the decision to buy insurance protecting against fire or theft, worry drives peoples' willingness to pay and not probabilities. Ifcher and Zaghamee (2011) find that in a laboratory setting positive affect systematically influences time preferences. Surprisingly, only a handful of (empirical) papers have so far looked at the influence of emotions on entrepreneurial decision making.

In real life, economic decisions are mostly made within social context, i.e., they include one or more partners. Herbert Simon (1967) highlights: "In human behavior, situations involving interaction with other human beings are characteristically more heavily laden with emotions than are other situations." (p.37). Hence, in order to fully understand the role emotions play in economic decision making we need to include interactive scenarios to account for the reciprocal influence of emotions (Liu, Chai, and Yu 2016, Winter 2014). Research on strategic emotions is still fragmented but received growing attention recently. One stream of research investigates the influence

of induced emotions in the laboratory in strategic games such as ultimatum or dictator games (e.g., Kirchsteiger, Rigotti, and Rustichini 2006, Harlé and Sanfey 2007, Andrade and Ariely 2009, Kugler, Neeman, and Vulkan 2014). Here, scholars find systematic influences of emotions on behavior of agents such as altered offers and acceptance rates. This stream of research is very exciting since understanding emotions in interactive decisions is especially relevant for the field. Winter (2014) argues and shows that especially in such types of decisions emotions can be very rational and serve us.

In this thesis, I take an experimentalists' approach to studying emotions and behavioral decision making. Economic experiments provide an excellent tool to establish causal relationships and allow testing normative theories of decision making – such as the homo oeconomicus. Especially for emotion research using experiments is well established, simply because field experiments are not only methodologically but also practically and ethically problematic to implement. Moreover, laboratory experiments allow for studying induced emotions and economic behavior.

The present dissertation consists of five parts. Part I introduces the topic of emotions in economics and management. It further provides important definitions and clarifies what type of emotions are covered and discussed. Part II discusses relevant models and provides an overview of the relevant literature in an interdisciplinary fashion. Starting with traditional authors from emotion psychology, more modern approaches to emotions are covered, such as dual-process models and studies from neuroscience. Building up on this, I present specific models for emotions from economics, psychology, and decision sciences as base for the empirical part. Chapter II.5 presents important work from the field of strategic games. The second part finishes with an overview of emotions in the literature on entrepreneurial decision making as important application.

Part III provides methodological foundations. I will discuss experiments as research method and discuss advantages and disadvantages. The second sub-chapter discusses the important question of how to induce emotions in the laboratory. For this purpose, our own pretest is conducted. We identify four film clips for each of the target emotions happiness and fear as well as four neutral clips to reliably induce these emotional states.

In part IV, two experimental studies are presented. The first study analyses the direct effect of emotions on risk preferences. A thorough understanding of emotions and risk preferences is crucial for decision making in an uncertain world. This is especially relevant regarding communication and presentation of information about risky choices for instance in medical and financial decision making. We conduct a laboratory experiment investigating the effect of happiness and fear on two tasks eliciting risk preferences, the Balloon Analogue Risk Task (Lejuez et al. 2002) and a simple lottery choice task by Eckel and Grossman (2008). We do not find treatment effects of happiness and fear on risk preferences. Potential reasons for this are discussed.

The second experiment is a coordination game and allows determining the strategic value of emotions. Coordination has been studied extensively in the economic and psychological literature and has important real world applications in all kind of markets and business decisions. We hypothesized that emotions such as happiness and fear could help people to coordinate in market entry decisions. We conduct a large experiment with students and entrepreneurs and find that people indeed use emotions for coordination. Part V discusses, gives limitations, and theoretical as well as managerial implications. The dissertation closes with concluding remarks.

I.2 What are emotions?

"There is a large degree of consensus in the scholarly literature on what emotions there are, and quite good agreement on what emotions are." (*Jon Elster 1998, p.48)*

"Defining ''emotion'' is a notorious problem."

(Scherer 2005, p. 695).

Scherer (2005) starts his comprehensive essay aiming to clarify the definition of emotions with the sentence: "Defining 'emotion' is a notorious problem." (Scherer 2005, p. 695). I absolutely agree. The field of emotion research does not benefit from the non-existence of a unique definition of emotions. Research and folk concepts of emotions oftentimes vary; the concepts of emotions, feelings, mood, and affect are used interchangeably; measuring emotions is rather difficult; across cultures and languages people have a different understanding of specific emotions.[1] However, as Jon Elster notes, there is also a "quite good agreement on what emotions are." (Elster 1998, p. 48). In the following I will provide a working definition.

Elster (1998) defines emotions by six features: cognitive antecedents, intentional objects, physiological arousal, physiological expressions, valence, and action tendencies. For Elster, the difference of emotions compared to for instance addiction or visceral factors is that they are triggered by beliefs and that they have an intentional object (e.g., someone is angry about a certain person). Further, emotions are characterized by physiological arousal (e.g., hormonal change) and physiological expressions (e.g., tears, blushing). Emotions have a negative or positive valence but Elster additionally explicitly mentions the importance of action tendencies in this respect (e.g., the action tendency of love is to approach, of anger to hurt, etc.). These in turn interact with social norms. For instance, social norms could either intensify or inhibit the tendency to hurt in the case of anger depending on the social norm. For Ekman (1994) emotions are products of our evolution and every emotion has at least

[1] For instance in Chinese, several different terms for 'happiness' exist and each term has a different meaning: *xingfu* means a good life, *you yiyi* stands for meaning and *kuaile* for a good mood. For fascinating research on how this influencing happiness research in general, please see the current work of Becky Hsu and Levisen (2016).

seven characteristics whereas some of them are similar to Elster's approach: distinctive physiology, automatic appraisal, commonalities in antecedent events, presence in other primates, quick onset, brief duration, and unbidden occurrence. These seven features can be found in the following emotions and are the basis of many scales measuring emotions such as the PANAS-X (Watson and Clark 1994): amusement, anger, awe, contempt, contentment, disgust, embarrassment, excitement, fear, guilt, interest, pride, relief, sadness, satisfaction, pleasure, shame. However, only some of these emotions share the characteristic of having a distinct universal signal. Interestingly, Ekman (1994) stresses that each emotion is different from each other leading him to the proposal it may not be reasonable or possible to establish a comprehensive theory of emotions. Rather one should aim for separate theories of each emotion (p.19). Shweder (1994) adds another layer to the discussion by questioning the existence of basic emotions at all in the sense that each culture and society experiences different emotions.

In general, there are certain aspects on which I would say almost all emotion researchers agree. First, it is important to distinguish between *state emotions* and *trait emotions* (e.g., Lazarus 1994, Isen 1999, Baron 2008). State emotions are immediate, current changes in feelings mostly caused by external events (Baron 2008). Trait emotions on the other hand are rather stable personality tendencies (Isen 2008). In this work, I will focus on state emotions. Moreover, I follow Ekman's approach (1992) and focus on *discrete emotions*. Those are anger, fear, happiness, sadness, disgust, and surprise. Further, I will not pursue a valence-based approach, i.e., distinguishing only according to negative or positive emotions but rather also build up on the *appraisal tendency framework* (Ellsworth and Smith 1988, Lerner and Keltner 2000). Economists mostly follow a valence-based approach, i.e., contrasting the influence of positive and negative emotional states when analyzing the influence of emotions on economic decisions. Recent studies however have shown that this approach can be problematic (Lerner and Keltner 2000, Tiedens and Linton 2001). For instance, two emotions of the same valence such as anger and fear can have opposite effects on an outcome such as risk taking behavior.

Loewenstein and Lerner (2003) (amongst others) develop models differentiating between different kind of emotions in the decision making process: *expected* and *immediate emotions*. In this thesis, I will discuss and experimentally investigate

immediate emotions. Loewenstein and Lerner (2003) entangle immediate emotions in having direct and indirect influences. By their understanding, indirect immediate emotions are mediated by peoples' expectations of the emotions they will feel in the future and by their information processing. Direct emotions on the other hand are not mediated by cognitive processes or expected emotions. Finally, *incidental emotions* are encompassing emotions that affect decisions unrelated to that emotion (Lerner et al. 2015).

Often, the words emotions and *mood* are used interchangeably. Both concepts can be distinguished by endurance, i.e., while emotions are rather brief and last at most several minutes, moods can last for hours or days (Davidson 1994, Ekman 1992). Moreover, moods are more diffuse than emotions (Gross 1998). Further, common distinctions between emotions and moods include distinctive facial expressions of emotions as compared to moods and emotions evolving from recognizable antecedent events. Davidson (1994) further proposes the difference between mood and emotion lies in their primary functions: emotions influence action whereas moods influence cognition. Further, the word affect is oftentimes used in emotion research as term including both emotions and mood (Baron 2008).

Something closely related to emotions are visceral factors. One could describe visceral factors as an extreme form of emotions. According to Loewenstein (1996) visceral factors always have a "direct hedonic impact (which is usually negative), and second, an effect on the relative desirability of different goods and actions" (p. 272). Visceral factors include drive states (e.g., hunger, thirst, or sexual desire), physical pain (e.g., craving for a drug), and emotions (predominantly fear and anger). For instance, hunger increases the desirability to eat, up to a point where it becomes impossible for someone to concentrate on anything else but the feeling of hunger. Note that changes in visceral factors are typically not permanent and change rapidly as compared to for instance taste. Visceral factors have been examined theoretically (Loewenstein 1996) and also empirically (e.g., Ariely and Loewenstein 2006, Loewenstein et al. 1994) and provide important insights as in how these extreme feelings influence behavior. I will discuss relevant studies in part II.4.

Further, one exciting field of research regarding the influence of *expected emotions* on decision behavior is regret theory (Loomes and Sudgen 1982, Bell 1982, Fishburn 1982). Regret theory integrates the phenomenon that people experience

negative emotions (*regret*) when having made bad decisions (i.e., learning that an alternative action would have generated a more desirable outcome) or positive emotions (*rejoice*) when observing they made a good choice. Loomes and Sudgen (1982) argue that individuals' anticipation of such experiences of regret or pleasure influence their choices. They integrate the effect of regret in a theory of decision making under uncertainty. Related, Mellers (2000) amongst others, models both pleasure and pain in a utility framework. One very interesting approach including strategic components of emotions is Koszegi (2006) who models interaction of agents' where information has emotional implications. This stream of research is very important, however, outside the scope of this doctoral thesis.

Oftentimes used interchangeably are the terms positive emotions and *wellbeing*. Studies aiming to better understand individual's wellbeing are usually classified within the field of emotion research. In this thesis, I will briefly talk about studies examining wellbeing in the entrepreneurship domain. However, my understanding and definition of emotions as studied in this thesis does not include the broad and complex concept of wellbeing. This is also related to Bentham's (1789) utility concept and experienced utility (Kahneman et al. 1997). I will refer to those concepts in chapter II.4.2.

Finally, there is an ongoing discussion about whether emotions might be positive or negative in their nature of influencing choices, i.e., whether they bias or rather guide choices. Emotions have been shown to be essential for making good decisions (e.g., Damasio 1994, Isen 1993). On the other hand, emotions have been considered a source for biased judgments (e.g., Averill 1983). I do not aim or claim to answer this question, but will discuss this further in the following chapters and primarily in the concluding discussion.

In the present thesis, I focus on two discrete state emotions, fear and happiness, for the following reasons. First, these two emotions have been shown to influence relevant economic variables such as risk preferences or time preferences according to previous literature (Ifcher and Zarghamee 2011, Lerner and Keltner 2000, 2001). Second, a better understanding of these two emotions is especially relevant in economic decision making and for policy implications. Happiness and fear are emotions we encounter regularly in our everyday decision making so that they potentially influence our daily choices. But also many important life decisions such as retirement savings or choosing to move may be driven by happiness or fear. On a

macro level, understanding whether fear or happiness systematically influence individuals' choices can have consequences for policy implications, see for instance the recent discussion about fear from terrorism and consequences in Germany (e.g., Gigerenzer 2016). Last, fear and happiness are among the emotions one can reliable induced using film clips in experimental laboratories whereas for instance sadness or anger are rather difficult to induce (Kreibig et al. 2007, Rottenberg et al. 2007).

II Theory – models and relevant literature

II.1 Goal and structure of this part

Part II provides the theoretical foundation of this thesis. This part is structured in an interdisciplinary approach in order to account for the important findings from different fields of research. The goal of this part is to provide a theoretical base for the experimental studies in chapter IV. This is important, as recently, more and more empirical studies have been published showing how emotions influence and shape our decision making. However, a clear theoretical frame is oftentimes lacking (see also Vohs and Hertwig (2016) for a discussion).

Chapter 2 introduces important scholars from the field of standard *emotion psychology* as one of the oldest fields of research in psychology. Here I provide an overview of general theories and models on how emotions influence behavior. This includes cognitive theories and attributional theories of emotions (e.g., Weiner 1985) as well as evolutionary approaches (e.g., Cosmides and Tooby 2000).

Chapter 3 discusses rather 'modern' approaches to emotions. I provide a short overview of dual-process models and findings from neurophysiology including Damasio's (1994) somatic marker hypothesis, and important experimental findings by for example Bechara and colleagues.

Chapter 4 further examines important *specific models* of the role of emotions in judgment and decision making. I will cover important theories of decision making under risk and uncertainty, economics, and management, and discuss how scholars modeled emotions within these frameworks. I evaluate the main features of those models discussed that are important for my research questions.

Chapter 5 further summarizes and discusses important contributions from the *literature on strategic games* as base for part IV.2. Intuitively plausible and previous literature shows that emotions oftentimes play an important role in interactive decisions. Behavioral game theory provides a suitable tool to study emotions and strategic decisions (see Winter 2014).

Chapter 6 finally provides important theoretical frameworks and empirical evidence from *entrepreneurial decision making* that incorporate emotions. Previous literature shows that entrepreneurs oftentimes differ in their decision making and proneness to cognitive biases from non-entrepreneurs (e.g., Busenitz and Barney 1997,

Schade and Burmeister 2005). The role of emotions in entrepreneurial decision making has not been studied (especially empirically) much yet and is an exciting and new avenue of research in the domain.

II.2 Emotions in standard psychology

One of the most important and oldest streams of literature in psychology research is the study of emotions. Questions such as what are emotions, what is the function of emotions, can we control our emotions, or what is the relation between emotions and memory (see Ekman and Davidson 1994) have been studied ever since psychology evolved as an own discipline in the late 19th century. Research on emotions was very popular in the late 19th century until the 1920s amongst researchers such as John B. Watson (1919), William James (1884), or Wilhelm Wundt (1986) who – by the way – studied emotions as one of the first psychologists' using experimental methods[2] (Wallach 2005). During the mid 20th century psychology focused more on behavioral approaches and not much progress was made within the field of emotion study until the 1970's. Over the past 40-50 years the topic became of more importance again in psychology and decision making research and remains an important stream of research to date – and recently became more prominent in other disciplines such as economics or management.

II.2.1 Behavioral theories

For John Watson (1919) an emotion: "is a hereditary pattern-reaction involving profound changes of the bodily mechanism as a whole, but particularly of the visceral and glandular systems." (p.165). For him, emotions are merely inherited, physical reactions to certain stimuli. Watson was very interested in the conditioning of emotions and reports on a range of experiments with babies and children trying to further clarify how emotions such as fear, rage, and love evolve. In his experiments, he presented a range of stimuli (mostly animals) to babies in a hospital and observed at first no reaction of fear to any of the stimuli presented. He finds that babies only reacted when loosing physical support and hearing sudden noises. Watson concludes that children

[2] In 1879, Wundt founded the first laboratory for psychology research in Leipzig (Wallach 2005).

are not inherited with but learn about fear provoking stimuli such as being afraid of dogs or darkness.

His experiments are obviously largely criticized and discussed nowadays. One experiment, oftentimes called the 'Little Albert experiment' is especially provoking and from today's point of view extremely unethical. Watson and his student Rosalie Rayner carried out conditioning experiments with a nine-month-old boy called Albert (Watson and Rayner 1920). They exposed the toddler to furry objects including a white rat and observed that he greatly enjoyed playing with the rat. Subsequently, Watson made loud noises whenever the child was in contact with the rat. They continued to 'condition' the child over several sessions. Then, they continued showing the rat without making loud noises and observed that the boy did not enjoy playing with the rat anymore but rather was afraid of the rat. Hence, the two researchers claim to successfully condition the child to experiencing fear triggered by furry objects. They never de-conditioned the boy.[3]

Even though Watson is largely criticized for his conditioning experiments, he inspired subsequent researchers to a great extent by providing groundbreaking work in the field of emotion research especially in the experimental field.

II.2.2 Cognitive-physiological theories

Maybe most popular nowadays is the work by William James (1884) asking the questions 'What is an emotion?'. Being one of his most cited quotes, James explains his view of emotions with the following example: it is not that we "meet a bear, are frightened and run" (p. 190) but rather we meet a bear, run away, and consequently are frightened. Hence, the bodily changes arise from the perception of the object (bear) and our feeling of this change is the emotion. This view of James has lead to a long debate on the so-called 'feeling theory of emotions' and is discussed to date. In his

[3] The identity of 'Albert' remains unclear to date and probably adds to the popularity of the experiment. According to Beck, Levinson and Irons (2009), 'Albert' was the son of one of the nurses at Johns Hopkins hospital at the time called Douglas Meritte and sadly died at the age of 6. Powell, Digdon, Harris, and Smithson (2014) however claim that Albert's real name was William Barger and he did at age 87 having antipathies towards dogs. Please refer to both articles for further details of this detective story.

work, James (1884, 1890) emphasizes the physiological aspects of emotions and hence implies potential for empirical research of emotions. He proposes each emotion is physiologically distinct so that through detailed experimental study it becomes possible to categorize and better understand emotions. By this approach, he heavily influenced experimental psychologists of the field.

In the 1920's, Cannon and Bard (1927) propose somewhat opposing theories to James' theory of emotions. Already at that time, the two researchers highlight the role of studying the brain for understanding arousal and experiencing emotional states. Mainly, they state that arousal and emotional states are co-existing implying that emotional states do not necessarily need to evolve from physiological arousal. Schachter und Singer (1962) contribute to the discussion with their two-factor theory of emotion. They propose that emotional states are a function of both physiological arousal and cognition suitable to the respective state of arousal. Imagine some stimulus physiologically arouses an individual. If the individual does not have an explanation for this arousal he labels this state he or she is in and in turn experiences an emotional state. It is important to note that the same physiological arousal may result in different emotional states depending on the cognitive labeling process. If the individual has an immediate and satisfying explanation, no cognitive evaluation process happens and the emotional state does not alter. Moreover, emotional reactions or feeling states always and only happen as reaction to physiological arousal. Note however that in this model cognitive evaluations are necessary to label discrete emotions such as joy or fear. Schachter and Singer (1962) find empirical support testing these propositions in two experiments. Their experiments are oftentimes criticized and replications were unsuccessful (Marshall and Zimbardo 1979, Maslach 1979). However, they foster lots of research in the domain of cognitive emotion theories. In general, cognitive emotion theories were very popular in the 1960s-1980s and are still today but oftentimes lack empirical backup.

II.2.3 Appraisal and attributional theories

Appraisal and attributional theories of emotions stress the role of appraisals or attributions for experiencing emotional states. In contrast to previous theories, Bernard

Weiner's (1985) attributional theory of emotions does not concern itself very much with physiological reactions. Rather, he stresses the importance of causal attributions. Discrete emotions (such as anger, pride, or joy) are evaluated according to three causal attributions: locus, stability, and control. Locus refers to whether I perceive the cause for the emotion as internal, such as experiencing joy from own abilities, or as rather external, such as anger over bad exam results from difficult tasks. The dimension stability further determines whether I perceive such a cause as temporary or permanent. For instance, experiencing joy from solving quizzes due to my math abilities is permanent. Having received difficult question in an exam by chance is rather temporary. Last, causes are evaluated as controllable or not. I can control how much effort I put into solving math riddles and experience joy but not whether I have the ability to solve the difficult exam questions and experience anger. This dimension is important for experiencing emotional states caused by other individuals. For instance, if I observe that an entrepreneur fails with his business due to uncontrollable factors I will experience pity. If he however fails because of causes he could have controlled better I am angry about his failure and burning money (see also Weiner 1985, Michl et al. 2009 for examples and elaboration). Weiner's theory captures the different dimensions nicely but is also relatively complex. Moreover, it cannot explain all emotions (such as disgust).

Lazarus' (1991) appraisal theory of emotions posits in a similar manner to Weiner (1985) that appraisals precede cognitive evaluations and then lead to physiological arousal and emotional responses simultaneously. This contrasts with cognitive theories stating that emotional responses are an outcome from cognitive evaluations and physiological arousal. The appraisal tendency framework (ATF) (Han et al. 2007, Lerner and Keltner 2000, 2001, Smith and Ellsworth 1985) provides a useful theory of emotion-specific influences on individuals' judgments and choices. The ATF relies on three basic assumptions. First, the model assumes that a discrete set of cognitive dimensions actually leads to distinguished emotional experiences. Second, emotions trigger individuals' responses and reactions. Third, emotions have motivational properties and initiate adaptive responses (Frijda 1986, Levenson 1994). Rather than following a valence approach the ATF focuses on appraisal dimensions. Smith and Ellsworth (1985) specify six cognitive dimensions that are defining appraisal patterns underlying different emotions: certainty, pleasantness, attentional activity, control,

anticipated effort, and responsibility. The dimensions allow distinguishing between discrete emotions as compared to only comparing good and bad valences. Note that pleasantness actually accounts for 20-25 percent of the variance when distinguishing between 15 discrete emotions (Smith and Ellsworth 1985). The dimension certainty refers to how much uncertainty is involved in a respective situation. Attentional activity means how much somebody in an emotional state wants to further attend this state or shut it down. Control of an emotional situation could be either associated with high own control, or rather situational or others' control. Further, anticipated effort simply refers to how much mental or physical effort someone felt the respective emotion requires. Last, responsibility could refer either to one's own or to others' responsibility. For all scales and descriptions, please see Smith and Ellsworth (1985), p. 822. For example, anger and fear are both of negative valence but differ on the dimensions certainty and control: anger can be associated with certainty of the cause and individual control whereas fear is linked with uncertainty and little control (Han et al. 2007). These considerations are especially important when looking at the assessment of risk and monetary values. Lerner and Keltner (2000, 2001) show for instance, that the negative emotions fear and anger have an opposite effect on risk perception. Further, Lerner et al. (2004) find that the both negative emotions of sadness and disgust influence peoples' willingness to pay reversely.

II.2.4 Evolutionary psychology of emotions

Turning to the question of the function of emotions directly leads to the study of evolution and emotions. Dating back to the 19th century, Darwin (1872) studied emotion expressions in his book 'The Expression of the Emotions in Man and Animals' aiming to support his theory of evolution. Other prominent scholars from the early to mid-20th century are McDougall (1908) and Plutchik (1958). Recently, taking an evolutionary approach to the study of emotions has gained new momentum. Scholars around the group of Tooby and Cosmides study the adaptive behavior of our ancestors during their evolution in order to better understand the function of emotions, instincts, and motivations (e.g., Cosmides and Tooby 2000). From an evolutionary approach to the role of emotions in decision making we are able to experience emotions since they enhance our abilities and fitness in our physical and social

environment (already Darwin 2013/1872, Fessler et al. 2004, Frank 1988, Frey et al. 2014). Hence, the physiological, psychological, and behavioral characteristics of emotions serve to enable individuals to deal with threats and opportunities in our environment. From this standpoint, emotions are useful and shaped by natural selection (Nesse 1990). The function of emotions is closely related to the role of instincts. McDougall (1908) discusses the role of instincts and associated primary emotions with action tendencies and biological functions. For instance, the instinct of flight is characterized by the emotion fear and leads to the tendencies to run away and hide away. McDougall (1908) illustrates this by describing a kid's behavior of running away from the source of fear and hiding beyond a blanket – a tendency still well pronounced with adults. In its biological function this pattern serves to avoid harm or death. Elation on the other hand relates to a dominance instinct and leads individuals' to leading others or asserting oneself. Biological roots are to avoid fights by showing others' dominant behavior. Hence, each primary emotion relates to instincts and serves adaptive purposes. Later, Plutchik (1980) takes a similar view as McDougall (1908). He considers eight primary emotions (anger, fear, sadness, disgust, surprise, anticipation, trust, and joy) that serve distinct adaptive functions. In Plutchik's work, the cognitive part within the evolutionary approach plays a large role. For instance, a situation of threat is evaluated as dangerous and leads to fear. Fear results in flight behavior in order to serve a biological function of protection. More modern evolutionary approaches to emotions focus more on the adaptive function of emotion rather than on the evolutionary history.

Note that from an evolutionary standpoint it is not reasonable that all emotions of the same valence have the same influence on for instance risk taking. In their adaptive functions, fear as a response to threat motivates escape whereas anger rather encourages involvement (Fessler et al. 2004). Even though most psychologists probably share this view of an adaptive function of emotions through history and still in our modern world and environment, many scholars (starting with Watson 1919) stress that emotions do not always and only serve as useful tool (e.g., Frijda 1994). I will further discuss this in later chapters.

II.2.5 Concluding: Lewin's field theory as alternative?

Table II.1 below summarizes the theories discussed above. The table compares stimulus, reaction, and behavior for each of the theories discussed above. As already pointed out some scholars argue emotions to cause physiological reactions whereas other propose the reverse and some suggest simultaneous processes.

For this thesis and as foundation for the experiments in chapter IV, I am not particularly interested in whether emotions evoke physiological arousal or vice versa. The questions I am asking are whether specific induced emotions influence individuals' risk preferences and strategic behavior. What is important to learn from standard psychology for such questions is that certain stimuli evoke emotions and those in turn have been shown to influence behavior. Concluding, this is what all of the above theories from emotion psychology since the 19th century agree on, as summarized below.

Table II-1: Overview of emotion theories in psychology

THEORY	Stimulus	Reaction			Behavior
Watson (1919)	Perception of stimulus	Emotion (joy)	→ Bodily changes (smile)		Influence on behavior
James (1884) (James and Lange)		Bodily changes (smile)	→ Emotion (joy)		
Cannon and Bard (1927)		Physiological arousal (smile) + Emotion (joy)			
Schachter and Singer (1962)		Physiological arousal (smile) + cognitive evaluation (I am happy)	→ Emotion (joy)		
Weiner (1985)		attribution evaluation (locus, stability, control)	→ Emotion (joy)		
Lazarus (1991)		appraisal	→ Emotion (joy) + Bodily changes (smile)		
Evolutionary approaches		Emotion (joy)	→ Bodily changes (smile)	→ biological fct. (survival)	

An alternative approach to model emotions in behavioral decision making that has not been considered much in emotion research yet could be Kurt Lewin's field theory. From my point of view, his theory provides a useful formula to study emotions and behavior. Ranked 18th of the 100 most eminent psychologists of the 20th century by the *Review of General Psychology* (Haggbloom et al. 2002), Kurt Lewin is without doubt one of the most influential psychologists of the last century. Especially well-known is his field theory developed in the 1940's. Lewin's field theory provides a very useful holistic theory of behavior in the sense that it includes not only the individual but the environment as well (Lewin 1939/1982[4]).

According to Lewin, field theory assumes any behavior to depend on a range of different factors constituting the psychological 'field' (Lewin 1939 / Graumann 1982). This field includes factors such as goals and motivations, perception of the past and future events, or the group an individual belongs to. At each point in time each individual acts in a different field including the person and the environment as perceived by the individual. Lewin provides a neat and rather heuristic formula:

$$B = f(P, E)$$

Behavior *(B)* is a function of the person *(P)* and the environment *(E)*. This implies that P and E cannot be independent, hence *P = f (E)* and *E = f (P)* (Graumann 1982).

Within this model, one could consider that emotions enter the formula – the field – and influence behavior *B*. In this framework, it is not important whether emotional reactions, cognitive appraisals, or bodily changes cause each other as explained in previous chapters of standard psychology models of emotions or not but rather that emotions ultimately influence behavior.

Concluding, I view evolutionary approaches to emotions and decision-making as most promising in general and specifically for experimental research. Such approaches, like Lewin, take the environment of the decision maker into account so

[4] Note that Lewin only started in his last years to explicitly label his work 'field theory' so that it remains difficult to provide a clear cut definition (see also Graumann 1982, pp. 24 ff.)

that an evaluation of the influence of emotions goes beyond a pure ‘good versus bad’. Moreover, rather than looking at positive and negative emotions only, specific emotions are studied. From my point of view, this is crucial given the empirical evidence (e.g., Lerner and Keltner 2001).

I believe drawing on adaptive functions of emotions (fear triggers flight, anger triggers attack) to be very reasonable. This is also related to the adaptive function of heuristics (Gigerenzer et al. 1999). I will further discuss this in part II.4. In this thesis, we are interested in the emotional states happiness and fear and specifically study their influence on economic and strategic choices. The experimental studies in part IV of this thesis build up to a large extend on evolution theories of emotions.

II.3 Modern approaches from psychology and neurophysiology

II.3.1 Dual-process models

'Yet another dual-process model' is some economists' common reaction to articles and presentations proposing variations of dual-process models for modeling individuals' behavior. However, being far from realistic the notion of a rather simple distinction between two different systems of thinking apparently allows people to better understand our decision making and how our brains might work. The success of Daniel Kahneman's book 'Thinking fast and slow' (Kahneman 2011) discussing the central theme of two modes of thought, a 'fast' System 1 (quickly and automatically) and a 'slow' System 2 (deliberate and complex computation), illustrates this fashion. It has been awarded the 'best book award 2011' by *The Economist*, *The Wall Street Journal* and has been a bestseller on the lists of the *New York Times* and the *Spiegel* for weeks. Kahneman himself of course makes clear that this interpretation of two modes is to be understood *only conceptually*: "I describe mental life by the metaphor of two agents, called System 1 and System 2, (…)" (Kahneman 2011, p.13).

Historically, dual-process models are a popular approach for modeling decision making in psychology (partly also in also economics) (e.g., Epstein 1994, Figner et al. 2009, Kahneman 2011, Slovic et al. 2002). Dual-process theories distinguish between two separate decision systems whereas one system is typically referred to as fast, unconscious, hot, or *emotional*. The other system is described as slow, deliberate, cold, and *cognitive.* Choices then rely either on system A, or system B. Table II-2 below is adapted from Epstein (1994) and Slovic et al. (2004) and summarizes key features of the 'two systems' literature.

Table II-2: Illustrative characterization of dual-process models, adapted from Epstein (1994) and Slovic et al. (2004)

'Experiential system'	**'Analytical system'**
Holistic	*Analytical*
Intuitive	*Deliberative*
Emotional	*Cognitive*
Impulsive	*Controlled*
Fast	*Slow*
Hot	*Cold*
Automatic	*Logical*

In psychology, authors often refer to one 'hot' and one 'cold' system (Figner et al. 2009). Here, the hot system explicitly represents the emotional and the cold system stands for the cognitive part. Figner et al. (2009) similarly describe the hot system to work spontaneous and automatic and hence choices driven by the hot system happen by affective impulses. The cold system functions by "the rules of logic" (p. 710) and control, and can block affective impulses from the hot system.

Loewenstein, O'Donoghue and Bhatia (2015) recently propose a novel dual-process framework. They model choice behavior rather than judgment and distinguish two different motivational processes: a deliberative process and an affective process. The authors provide a formal dual-process model in which behavior can be described by a deliberative system (consequentialist fashion) and by an affective system (encompasses emotions). A person's deliberate system evaluates opportunities in a consequentialist way whereas in the affective system emotions and emotional states (visceral states) are evaluated. Therewith they respond to the interest in emotions by for instance economics in recent years and present one of the few formal models. Interestingly, the authors define the term affect in line with evolutionary psychologists such as Cosmides and Tooby (2000) as being adaptive and carrying action tendencies (Frijda 1986). For instance, fear motivates flight and anger motivates attack.

Loewenstein et al. (2015) acknowledge that many deliberate processes are probably influenced by affective factors and vice versa. They explicitly stress that they "use the labels deliberation and affect primarily as labels to help organize two different types of motivations" (p. 57). Formally, they assume the two processes work as two

objective functions: one motivational function *M* and one deliberate function *U*. When choosing option *x* out of choice set *X,* the affective influences on behavior are captured by *M(x,a),* where a is a factor of intensity. The more deliberate factors can be described with *U(x).* If only one of the two systems where to decide what to do it would simply maximize the respective function. However, both systems interactively influence behavior. Further, the authors assume that the deliberative system makes the ultimate choice what comes with the cost of cognitive effort. This cost is captured by $h(W,\sigma)$ and depends on strength of willpower W and competing cognitive demands σ (e.g., cognitive load). Summarized by one function it looks as follows:

$$V(x) \equiv U(x) + h(W, \sigma) * M(x, a)$$

When making a choice the individual chooses *x* somewhere in between the optimum of the deliberative function and the optimum of the affective function, depending on how costly it is for the deliberative system to engage in willpower (Loewenstein et al. 2015). The authors apply their model to three domains: intertemporal choice, risky decisions, and social preferences. For a thorough discussion of specific assumptions and predictions please refer to Loewenstein et al. (2015), pp. 61ff. With their approach, the authors provide an interesting framework on how to formally model affect and deliberation as distinct processes in one function. Hence, they contribute to the increasing interest in affect amongst psychologists and economists with this theoretical model that allows empirical testing.

The understanding of emotion and cognition being two separate systems evolved (or is in line) with brain research starting with findings regarding the limbic system from the 1950's. The limbic system was labeled as the emotional center of the brain whereas cognitive functions were associated with the neocortex (Phelps et al. 2014). However, advances in neuroscience research in the past 20 years showed that this strict distinction is not correct. For instance, Damasio (2005) shows that the orbifrontal cortex is essential for emotions. Research by Squire (2004) indicates the hippocampus (i.e., part of the limbic system) plays an important role for the process of memory. Most authors conclude that there is no ground for distinguishing two distinct regions in the brain being responsible for emotion and cognition. LeDoux (2012) and others thus argue that it is crucial to work on a better understanding and illustration of the complex structure how emotions function in the brain. Moreover, Phelps et al. (2014)

in a recent review claim that since neuroscientists already concluded it is not correct to follow a notion of two distinct systems we need to rethink the predominance of dual-process models in the decision sciences for modeling emotions in decision making.

II.3.2 Findings from neuroscience

Neuroscience has a long tradition in studying the role of emotions for decision making. The first studies noting that the human amygdala plays a central role in emotional behavior date back to the 19th century. Brown and Schaefer (1888) observed that after temporal lobes lesions including the amygdala, monkeys showed large behavioral changes. Later, Kluever and Bucy (1939) found in lesion experiments with rhesus monkeys that after removing both temporal lobes the monkeys showed profound emotional changes. For instance, after surgery the monkeys did not fear certain objects or subjects that they would not have approached before surgery. This so-called 'psychic blindness' – Seelenblindheit in German – is nowadays known as the Kluever-Buce syndrome. Further research by Weiskrantz (1956) extended these observations and demonstrated the central role of the amygdala. In humans, it remained difficult to further elaborate on the role of the amygdala simply because patients exhibiting selective bilateral damage restricted to the amygdala or hippocampus where difficult to identify and hard to find. Bechara et al. (1994) were one of the first scholars who studied humans with distinct brain lesions. They carried out conditioning experiments with three patients having brain lesions and conclude that the amygdala is crucial for emotional conditioning and moreover for processing information concerning somatic states.

Neuroscientist Antonio Damasio presents a remarkable and very popular theory of the role of affect in decision making in his famous book *'Descartes error'* (Damasio 1994). He describes how he realized from observations and experimental studies that reason and emotion simply cannot be two separate neural systems and how he became convinced that certain aspects of emotions are indeed necessary for rational behavior:

> "He had had an entirely healthy mind until a neurological disease ravaged a specific sector of his brain and, from one day to the next, caused this profound defect in decision making. The instruments usually considered necessary and sufficient for rational behavior were intact in him. He had the requisite knowledge, attention, and memory; his language was flawless; he could perform calculations; he could tackle the logic of an abstract problem. There was only one significant accompaniment to his decision-making failure: a marked alteration of the ability

to experience feelings. Flawed reason and impaired feelings stood out together as the consequences of a specific brain lesion, and this correlation suggested to me that feeling was an integral component of the machinery of reason. Two decades of clinical and experimental work with a large number of neurological patients have allowed me to replicate this observation many times, and to turn a clue into a testable hypothesis." (pp. xi-xii)

Damasio provides with the well-known *somatic marker hypothesis (SMH)* a theory and neuroanatomical foundation of how emotions are involved in the decision making process. In the 1990s, he conducted decision making experiments together with and building up on research of his wife and co-author Hanna Damasio. Several studies by Antoine Bechara, Antonio Damasio, Hanna Damasio, Daniel Tranel and colleagues (see e.g., Bechara 2004, Bechara et al. 2002, Damasio et al 2000, Reimann and Bechara 2010) study the decision making of individuals with lesions in the orbitofrontal sector of the prefrontal cortex. The authors aim to understand better and provide an explanation for the fact that those neurological patients with damaged parts in the region of the prefrontal cortex start developing difficulties in their daily life and decision making. They mostly use the so-called gambling task framework. The gambling task is designed as follows: subjects have to choose between four decks of cards and can switch as often as they want. The card deck is designed in a way that two decks yield high immediate returns but large future losses hence long term losses, and the other two decks yield rather low immediate returns but also low future losses resulting in a long term gain. The participants do not know this and are asked to maximize profits. Usually, in the task the pattern evolves that participants without brain damage after a few rounds tend to avoid the disadvantageous decks and choose cards from the two beneficial decks. By contrast, participants with damage in the ventromedial region (that includes the orbifrontal area) did not avoid the bad desks (Bechara et al. 1994, 1995, 1997, 1999, Manes et al. 2002, Fellows and Farah 2005). These impairments in decision making have been interpreted as evidence for the fact that emotions guide decisions as the patients showed a normal intellect (average IQ of 100).

Damasio explains the above observations and findings with his theory of somatic markers. When making decisions a person has to access all options that are available

and consider costs and benefits associated with them. Oftentimes such choices are complex, or conflicting, or are made under time pressure. According to Damasio (1994), before applying any reasoning a specific 'emotional' process happens. From experience, bad outcomes from particular responses are associated with unpleasant feelings. For instance, a falling object evokes a negative gut feeling and motivates a person to move to the side. He calls this 'feeling' a *somatic* (because soma is the Greek word for body) *marker* (because they mark images). Somatic markers draw attention to specific options and hence guide our decision making in the sense that they preselect or erase certain options. Before we evaluate all options of a choice process, somatic markers already mark particular options.

Before some individual starts reasoning how to react as soon as she or he realizes a moving object above her or him, the somatic marker already erases a range of possible options (such as stay still or duck down) and the decision maker only must choose between several options how to move away from the threat. This is why somatic markers improve individual's decision making. They are not involved in subsequent reasoning but provide a more accurate choice set to choose from. In this way somatic markers are actually adaptive and related to the argument that emotions can function like a heuristic as proposed by (Gigerenzer et al. 1999). I will discuss this in chapter II.4.7. Hence, Damasio shows that emotions influence our decision making in a more complex way than differentiating between reason and emotion. This is what he implies with the title 'Descartes error': the assumption of a dualism between body and mind is not correct (Damasio 1994).

Building up on this, Shiv, Loewenstein, and Bechara (2005) experimentally study investment decisions with participants who had stable focal lesions in brain regions that are related to emotion and healthy participants (control). The authors are interested whether having lesions in brain regions that are essential for experiencing emotions can also be beneficial, as compared to most prior experimental findings by Damasio and colleagues. This idea is motivated by an observation of Damasio (1994, p.192-193): He writes about one of his patients with brain lesions who reports on his drive to the laboratory on a cold day. Instead of hitting the brakes when driving on icy surface as most people did in front of him and had accidents, he simply drove steadily. His lack of fear served him in this case as he arrived safely at the laboratory.

In the experiment, each respondent received USD 20 and was asked to invest or keep one dollar over twenty rounds. If they decide not to invest they would just keep the dollar. If they decide to invest they would receive USD 0 with 50 percent or USD 2.50 with 50 percent. This task is designed in a way that everybody should invest in every round as the expected value of investing (US 1.25) is higher than keeping the dollar. Shiv et al. (2015) find that people with lesions in brain regions related to emotions invested more (around 80 percent as compared to the control group investing 50 percent) and gained more money overall. The authors suggest this behavior pattern evolves because the control group is more affected by past experiences than respondents with lesions.

Overall, the authors interpret their findings as follows. Control group respondents' emotional reactions to outcomes let them adapt their strategies in subsequent rounds to less risk-taking strategies. Hence, the authors provide empirical support for emotions playing an important role in individuals' risk taking behavior. Their findings are very interesting as they highlight a potential negative influence of emotions on risky decisions. It would be interesting to study different types of risky decisions as the above experimental paradigm depicts clear risks as compared to ambiguity or uncertainty. I would presume that the findings would not hold in more experimental tasks studying ambiguity or uncertain environments. In general, the authors agree with Damasio and co-authors in that they find that emotions to play a central role in decision making and cannot be viewed as opposing rationality.

The SMH has many critics such as Maia and McClelland (2004, 2005) or Dunn et al. (2006). Critics argue that the difference in decision making does not necessarily mean decisions are guided by emotions but also deficits in memory or learning processes can lead to impairments (Maia and McClelland 2004, 2005). However, currently there is no other neurological theory or model providing an alternative to the SMH so that it in any way remains a helpful guidance. More, it remains that it is questionable to motivate dual-system models with findings from neuroscience.

Over the past years, the field of neuroeconomics underwent a huge popularity. Scholars from different disciplines make use of methods from neuroscience for instance measuring brain activity like functional magnetic resonance imaging (fMRI), heart rates (HR), or electro dermal activity (EDA). This avenue is very exciting and promising since it provides novel insights to behavioral questions, especially when it

comes to emotions. However, one has to be careful of interpreting the results and whether physiological measures are helpful answering all research questions or are rather suitable only for certain problems. For an extensive discussion see Harrison (2008) or McCabe (2008). From my point of view, all interdisciplinary approaches and insights from novel methodologies are beneficial to the study of emotions in behavioral decision making as the field is inherently multidisciplinary. When discussing findings as causal relations however, one needs to be careful when interpreting empirical data from methods commonly used in neuroscience.

II.4 Specific models for emotions in behavioral economics and decision making

So far, I have covered important theories from standard psychology and neurosciences. Psychologists largely agree that emotions have strong influences on behavior and have proposed different general models. This chapter looks at specific models for emotion in the decision sciences including economists' approaches. I will provide a brief overview of normative and descriptive models of decision making under risk and uncertainty. Then I will discuss different approaches of how emotions are modeled within those standard frameworks. Therefore, I draw on literature from the decision sciences, behavioral economics, consumer decision making, and economic psychology. I will further discuss research on heuristics and emotions. The chapter closes with concluding remarks.

II.4.1 Decision making under risk and uncertainty

> *Hence, in order to have anything like a complete theory of human rationality, we have to understand what role emotion plays in it.*
>
> (Herbert Simon, 1983, p. 29)

In his seminal work, Herbert Simon already stressed the importance of integrating emotions in normative and descriptive theories of decision making. Simon (1957, 1983) is well known for his theory of *bounded rationality*. As opposed to mainstream economic theory, for Simon, decision making can be described as "search process guided by aspiration levels" (Selten 1999, p. 2). Put simply, once the satisficing value of an aspiration level is reached the alternative in this process is taken. This idea is central to bounded rationality theory. Decision makers' rationality is limited by the information and time available to make a decision, and the cognitive ability of their minds, to process this information. Hence, individuals are not necessarily maximizers as dictated by standard economic theory but oftentimes satisfice. Little attempts have been made to incorporate emotions within this framework (Frey et al. 2014, Gigerenzer et al. 1999, Muramatsu and Hanoch 2005). Gigerenzer and the ABC

research group (Gigerenzer et al. 1999) who focus on *cognitive heuristics* note that emotions can also function as heuristics for instance as stopping rule in information search (see p. 31). Surprisingly, the role of emotions is – to my knowledge – covered very little by their research program, and neither included in Kahneman and Tversky's study of 'irrationality' and heuristics in the 1970' and 80's.

Kahneman however concerned himself a great deal with happiness (Kahneman et al. 1997, Kahneman 2000, 2003) in the sense of *objective happiness* or *experienced utility* following the utility concept of Bentham (1789). Bentham (1789) describes utility as referring to experiencing pleasure and pain, he states:

> "Nature has placed mankind under the governance of two sovereign masters, pain and pleasure. It is for them alone to point out what we ought to do, as well as to determine what we should do." (p.ii, chapter II).

Bentham defines the principle of utility as the impact any action has on a person's (or any entities') happiness.[5] Pleasure evolves from positive utility and pain is given by negative utility. Hence, the goal of anybody's actions is to maximize utility, i.e., maximize pleasure. Over the course of the last two centuries this interpretation was changed to utility of outcomes and decision weights in order to explain choices resulting in our 'modern' understanding of utility theory (see Kahneman et al. 1997). This development basically resulted in a neglect of emotions in most major normative as well as descriptive theories of decision making from the 20th century (see also Volz and Hertwig 2016). Table II-4 below provides an overview of the most important models of decision making under risk that I will further elaborate in the following.

[5] Note that this notion of happiness or pleasure is entirely different to the kind of emotion (e.g., happiness) this thesis is concerned with.

Table II-3: Overview of decision making theories

Theory	*Scholars*	*Model*	*Specifications*
Utiliarism	Bentham 1789		
Expected-value theory		$EV=\Sigma\, p_i\, x_i$	where p_i objective probability, x_i value of objective (monetary) outcome
Expected-utility theory	Bernoulli 1789, N&M 1944	$EU=\Sigma\, p_i\, u(x)_i$	where p_i objective probability, $u(x_i)$ monotonically increasing fct over x
Subjective Expected-utility theory	Savage 1954, Edwards 1954	$SEU=\Sigma\, p_i\, u(x)_i$	where p_i subjective probability, and $u(x_i)$ monotonically increasing fct over x
(Cumulative) Prospect Theory	K&T 1979, T&K 1992	$V(A)=\Sigma\, \pi(p)_i\, v(x)_i$	where $\pi(p_i)$ weighting fct, and $v(x_i)$ value function (independent)
'Affective' prospect theory	Rottenstreich & Hsee 2001	$V(A)=\Sigma\, \pi(p)_i\, v(x)_i$	where $\pi(p_i)$ weighting fct, and $v(x_i)$ value function (dependent)

II.4.2 Normative models and emotions

In economics, the normative benchmark model for decision making under risk has always been the expected utility (EU) model (Bernoulli 1738/1954, von Neumann and Morgenstern 1944). Traditionally, decision makers facing risky decisions are assumed to choose between alternatives by evaluating possible outcomes (or utilities) and respective probabilities of occurrence. They then choose the option with the highest expected value and hence maximize outcomes (payouts). This basic model has been advanced over time. For an overview of the different consequentialist models, please refer to Table II.3 above.

As a starting point, expected-value theory simply assumes the decision maker to choose the option with the highest expected value from objective outcomes and objective probabilities. Mathematician Daniel Bernoulli (1789) already in the early

18th century proposed to replace expected values by expected utility in order to account for quite obvious contradictions to real life observations like diminishing sensitivity. Hence, expected-utility theory replaces expected-value theory's objective outcome with subjective utilities (Bernoulli 1738/1954, von Neumann and Morgenstern 1944). What Edward (1954) calls the modern period, starts with von Neumann and Morgenstern's (1944) *Theory of Games and Economic Behavior* and until today postulates a comprehensive and most prominent normative theory of decision making under risk. About a decade later, subjective expected-utility theory (Savage 1954/1972, Edwards 1954) replaces objective with subjective probabilities resulting in a personal probability function. None of these models integrate any form of discrete emotions. Kahneman in the late 1990's / early 2000's re-introduces the utility concept of Bentham (1789) with his concept of *objective happiness* or *experienced utility* (Kahneman et al. 1997, Kahneman 2000, 2003). This however is not what this thesis is concerned with.

One important approach to model emotions within the EUT model framework comes from Loewenstein (2000) who develops a utility model that includes emotions or more precise visceral factors. He considers only negative emotions in order to maintain a reasonable complexity. He defines a range of visceral factors that are negative emotions (such as fear), drive states (such as hunger), and feeling states (such as pain). These visceral factors are assumed to systematically influence peoples' behavior and regulate the trade-offs they make. Loewenstein (2000) models visceral factors as instance of state-dependent preferences. Let $u(c, s)$ be a utility function of a vector *c* (consumption) and a vector *s* of an individual's visceral state. Either, visceral factors motivate people or they extremely dissatisfy. For instance, a wine tastes better when one is thirsty resulting in the motivation to drink. This can be represented by $\frac{\partial^2 u(c_i,s_j)}{\partial c_i \partial s_j} \geq 0$, with *i* and *j* being specific pairs of consumption and visceral states. The marginal utility of drinking wine and thirst motivates as long as it is ≥ 0. Whenever the visceral states cannot be satisfied however, the person feels worse with increasing visceral factor, hence: $\frac{\partial u(c^0,s)}{\partial s} < 0$, with c^0 representing a null level of the respective consumption.

Naturally, incorporating visceral factors in utility-type models does not come without problems. This is for instance when in a certain visceral state people do not

behave in their own self-interest anymore. Moreover, people usually underestimate the impact on current as well as future behavior. Economists left visceral factors out of their models claiming the influence is not strong enough or unpredictable. Loewenstein's model (2000) quite convincingly incorporates negative emotional states in an economic model of choice. I believe this model represents a good approach to incorporate visceral states of the nature of drive states, i.e., hunger, thirst, arousal. One problem however might be the valence-based approach when it comes to other emotional states. Research has shown, that fear and anger being of the same negative valence do have completely different influences on behavior (Lerner and Keltner 2000, 2001). It would also be interesting to extend the model for positive emotions.

II.4.3 Descriptive models and emotions

Looking at peoples' actual behavior empirically mostly contradicts the EU predictions. Anecdotal evidence shows that people when facing important choices, typically do not weight each possible outcome and decide based on a consequentialist's approach. Moreover, people find it hard to understand and objectively evaluate probabilities. For instance, for surfers, the probability of dying from a shark attack is very low compared to other potential threats but still almost every surfer perceives this probability to be very high. Further, people oftentimes act according to reference points rather than final states. Imagine your soccer team (Hertha BSC) to finish 2:2 against the leading team of the league (Bayern Munich). In scenario one, this result after having scored 2:0 in the first halftime would be perceived as a rather negative outcome. Whereas your team making up a 0:2 from the first halftime would feel like a success and a good outcome. Indeed, empirical evidence shows that people systematically violate the EU model predictions. For instance, Allais (1953) and Ellsberg (1961) show and mathematically proof that the majority of people violates the axioms of EUT.

As a reaction to observations from experimental research in the 1970's, Kahneman and Tversky (1979) propose prospect theory (PT) as descriptive model of decision making under risk. They introduce a value function replacing the utility function that is assigned to gains and losses rather than final states. The value function is concave

for gains, convex for losses and steeper for losses than for gains (hence incorporating loss aversion). Further, they replace the probability weighting function by a weighting function that overweights small probabilities and underweights medium and large probabilities. Cumulative prospect theory (CPT) (Tversky and Kahneman 1992) proposes an inverse s-shaped weighting function and moreover gets rid of the independence between values and weights (so called probability outcome independence in EUT models). Weights directly depend on values (outcomes) whereas largest values have the highest weights and impact. This feature of diminishing sensitivity implies that changes in probability diminish and have less impact at both ends of the function (0 = impossible and 1 = certainty). Ample studies investigating the shape and parameters of the weighting function find similar patterns (e.g., Gonzalez and Wu 1999, Prelec 1998).

Being the first who bring affect into the picture, Rottenstreich and Hsee (2001) propose an affective weighting function within the CPT framework. They suggest the large jumps at both ends of the weighting function can be explained by different types of outcomes a decision maker faces: a rather neutral choice (monetary outcomes) or affect laden outcomes (both positive such as a potential kiss of movie star or negative like a potential electrical shock). Positive affective outcomes that evoke hope would explain the curve's steepness of the left-hand side, negative outcomes evoking fear explain the weighting curve's shape on the right-hand side. Hence, the shape and predictions of the weighting function do not differ a great deal from K&T's version but they explicitly account for what type of outcome the decision maker is facing in the weighting function. If affective outcomes indeed influence the weighting function this will result in larger deviations or a more pronounced s-shape of the function since the hope or fear respectively of getting an affective outcome (or not) will be higher than for monetary outcomes.

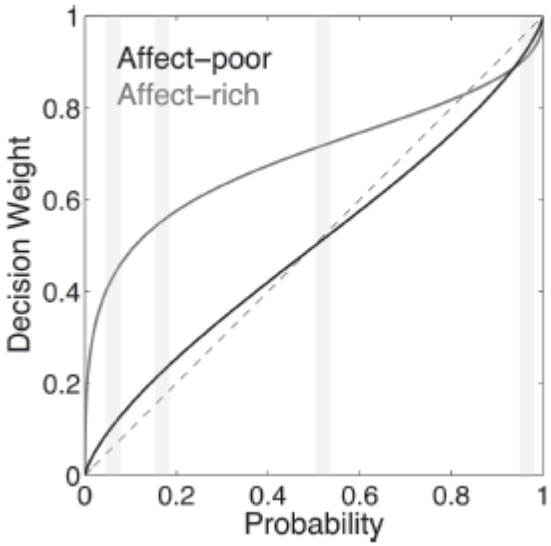
Rottenstreich and Hsee (2001) experimentally test their proposition in three studies with $N = 40$, $N = 138$ and $N = 156$ students and observe behavior supporting their predictions. The findings are in line with Camerer's (1992) observation of decision makers putting larger weights on large monetary outcomes and smaller weight on small monetary outcomes (hence, dependence of probabilities and outcomes). Rottenstreich and Hsee (2001) presume and interpret this finding as large cash amounts evoking larger emotional reactions than small amounts. In another study,

Hsee and Rottenstreich (2004) study whether the magnitude of stimuli and their subjective value differ when contrasting valuations by feeling and valuation by calculus. They find that relying on feelings, peoples' value function is nearly a step function whereas when people rely on calculus it is rather linear.

Suter et al. (2015) and Pachur et al. (2013) pursue similar approaches and compare choices in rather affect-poor monetary lottery problems with choices in affect-rich medical decision problems (decision whether to take a drug that causes side effects such as fatigue, insomnia, depression, and memory problems). Before the choice task, the N=23 participants were first ask to rank the four side effects (pleasant to unpleasant) and then state their willingness to pay (WTP) to avoid the side effects. Then lotteries were shown to participants based on their respective WTP and a range of probabilities. In the end, the participants evaluated how upset they would be losing a certain amount of money and also experiencing a side effect.

In line with the findings by Rottenstreich and Hsee (2001), Suter et al. (2015) find that affect-rich choices resulted in a stronger curvature of the probability weighting function of CPT, see figure below. The authors also acquired FMRI data and examined brain activation. They compared regions in the brain showing significant activation during affect-rich and affect-poor choices in order to understand whether certain areas that are usually associated with affective processing show a different engagement in both trials. The authors find that affect-rich choices were associated with brain regions that are associated with processing emotions whereas affect-poor choices rather involved those regions involved in cognitive processing (please refer to p.13 for brain maps).

Figure II-1: Expected value function by Suter et al. (2015), p. 9, in line with figure of Rottenstreich and Hsee (2001)



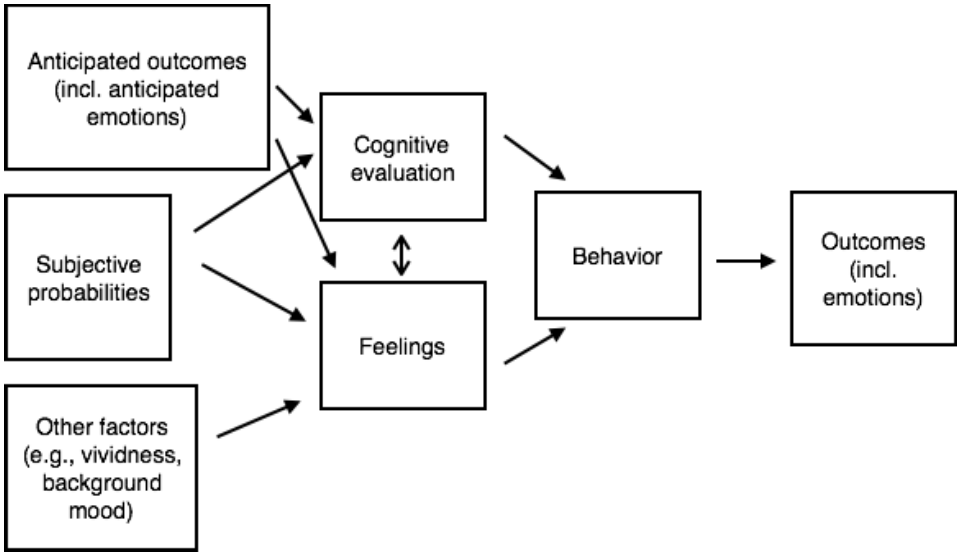
The above findings are important since contrary to most experimental studies using purely monetary gambles as decision problems, in our everyday life we oftentimes have to make decisions in affect-rich environments. Examples are decisions from medical decision making concerning our health like whether to undergo surgery or not, or to take some drug that might cause side effects. This is also relevant for doctors' decision making in the hospital, who face very affect-rich choices everyday (assuming that they remain affect-rich for doctors who routinely face such type of choices). More examples may concern our love life (the risk of moving in together with your new partner or not), or job-related decisions (choosing a career after graduation). This field is very exciting and more empirical studies in other environments or with other frames in the laboratory are desirable.

II.4.4 Feeling-based approaches

Over the past twenty years the study of emotions and how they interact with cognitive processes has massively increased, for excellent reviews, see Lench et al. (2011), Vohs et al. (2007), or Lerner et al. (2015). Lerner et al. (2015) provide with their work 'Emotion and decision making' a comprehensive overview of the impact of emotions on decision making. They organize and analyze studies from approximately 1970 until today. The authors conclude that across different domains emotions do have a powerful and predictable impact and even call the recent findings to have "the potential to create a paradigm shift in decision theories" (p. 33).

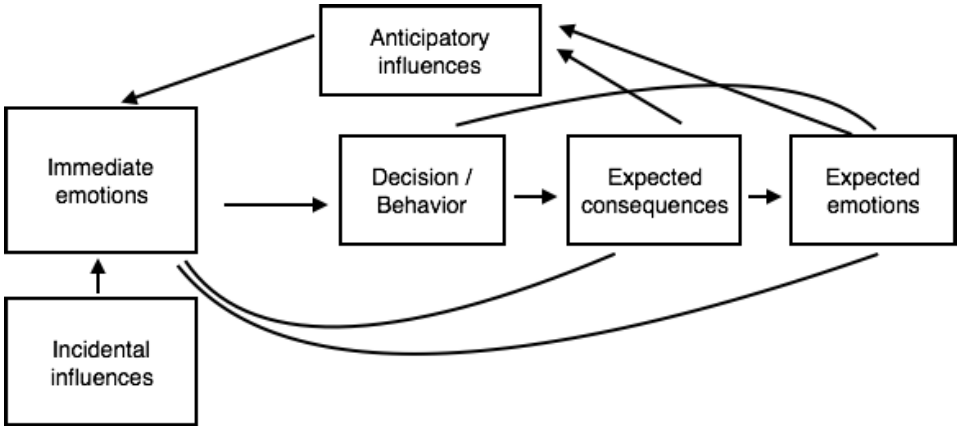
As opposed to existing consequentialist's and purely cognitive approaches to decision making under risk and uncertainty (that is assuming people to make a decision via assessing probabilities and outcomes of events and expectation-based functions), Loewenstein, Weber, Hsee, and Welch (2001) propose the *risk-as-feelings hypothesis*. The authors emphasize the role of emotions the decision maker experiences at the moment he makes the decision. They hence explicitly account for the role of immediate emotions in the decision making process. In contrast to the affect heuristic emotions do not only serve as 'bias', guideline, or additional information but in fact alter the decision outcome completely. One example would be to refuse boarding an airplane due to being afraid of flying (Loewenstein et al. 2001). Figure II-3 below illustrates the model. Rather than only mediating cognitive evaluations emotions can have a direct influence on behavior. Anticipated outcomes, subjective probabilities, and other factors such as the environment influence emotions and ultimately behavior. Behavior results in outcomes (including emotions). The model also captures the influences of emotions on cognitive factors and vice versa. Loewenstein et al. (2001) discuss empirical studies supporting their model and conclude on the advice to also collect emotional reactions whenever researchers are studying risky decisions.

Figure II-2: Risk-as-feelings hypothesis (Loewenstein et al. 2001, p. 270)



Related, Loewenstein and Lerner (2003) develop a framework in order to better understand how emotions influence decision making. The 2003 model also identifies two different ways how emotions influence decisions / behavior but it differs a great deal in that they do not explicitly include cognitive evaluations, see Figure II-3. From my point of view, the 2003 model describes the influence of emotions more precise as it does not predict as many influences as the 2001 model. I will discuss further differences and relate both models to the newest EIC framework (Lerner et al. 2015) at the end of this subchapter.

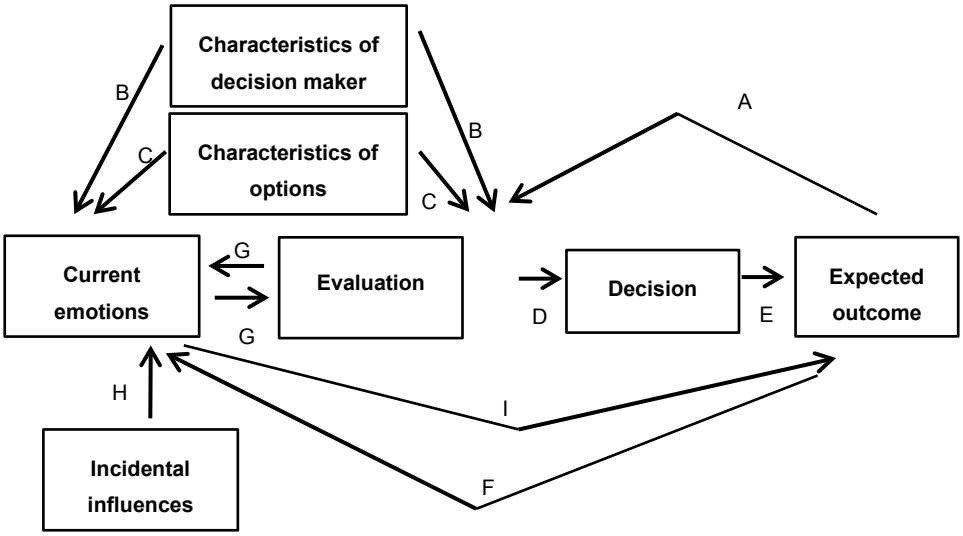
Figure II-3: Loewenstein and Lerner (2003) - Determinants and consequences of immediate and expected emotions (p.621)



Loewenstein and Lerner (2003) differentiate immediate emotions in having direct and indirect influence. First, emotions can have a direct influence on someone's decision making without functioning as mediator of perception of probabilities and outcomes. Then, the effect depends on the intensity of the emotion. Either, low or moderately intense emotions serve as extra information. According to Clore (1992) and Schwarz (1990) and their affect-as-information hypothesis people use their feelings in order to form judgments. On the other hand, the higher an emotion the higher will also be the impact on behavior. More, at very intense levels emotions may override cognitive processing. For instance, somebody experiencing intense fear from fire would rather freeze than act deliberately and run away. Second, emotions also have an indirect impact on decision making since they influence the judgment of expected probabilities and outcomes. Johnson and Tversky (1983) for example find that people who are in a happy situation judge risky situations more optimistically than those who experienced sadness. Immediate emotions are further determined by anticipatory and incidental influences according to Loewenstein and Lerner (2003). Anticipatory influences arise from someone's thinking about future consequences of a decision. Emotional responses to probabilities are not very sensitive in contrast to e.g. emotional reactions to the intensity of an outcome (except when zero probability occurs). Loewenstein and Lerner (2003) hypothesize that this is because mental images of outcomes drive anticipatory emotions (in line with Damasio 1994).

Lerner et al. (2015) further discuss a valence approach opposed to the appraisal tendency framework and discuss different factors how emotions shape our decisions. They finally propose a general model of affective influences building up on earlier models (Loewenstein et al. 2001, Loewenstein and Lerner 2003), see Figure II.4. Their emotion-inbued choice (EIC) model builds up on traditional rational choice models. In the model, a decision maker evaluates an option by the utility of the respective outcome. This evaluation phase is influenced by characteristics of the options (e.g. probability or time delay) (C) and characteristics of the decision maker (e.g. risk attitude) (B). The overall evaluation results in choosing the best option (decision takes place (D)). Emotions come into the picture first in the evaluation phase as influencing factor resulting from predicted emotions from the final outcome. Second, unlike traditional rational choice models, current emotions felt at the time of the decision directly and indirectly influence the decision making. Current emotions influence the evaluation of outcomes (e.g. via altering probabilities (Rottenstreich and Hsee 2001)), changing the weight a person puts on different dimensions (Lerner and Keltner 2000, 2001). The current emotion itself may be influenced by incidental emotions (H), characteristics of the decision maker (i.e., trait emotions) (B') or characteristics of the option (e.g., ambiguity rather than probability) (C'). Moreover, by changing the expected utility for possible outcomes current emotions also indirectly influence the decision making (I).

Figure II-4: EIC model (Lerner et al. 2015, p.3317)



Concluding, all the models discussed above provide a theoretical framework of how to capture emotion's potential influence on judgment and choices and emotion's interrelation with cognitive evaluations. Moreover, immediate and anticipatory emotions, their relation to each other, and on outcomes are well described. Incidental factors that might influence the decision process are captured as well. All three models take similar approaches but differ quite significantly in how emotions / feelings and cognitive evaluations interact and influence outcomes.

However, it is very hard to empirically test and establish such causal relationships. Empirical evidence for some sub aspects of the model exists of course[6]. For instance, it is rather easy to measure how a certain investment decision and outcome influences an individuals' emotional outcome. I am not sure however if it is possible at all to empirically verify all causal relationships the models propose, i.e., manipulate and measure all variables in one experiment. Moreover, empirical work shows that emotions can have a direct influence on outcome variables such as WTP (e.g., Schade

[6] One interesting empirical study by Loewenstein, Nagin, and Paternoster (1997) studies the influence of the visceral state of arousal. They find that a group of men who have been shown sexually arousing materials answered to behave more sexually aggressive in a hypothetical dating scenario (for instance urge the scenario woman to remove her clothes) as compared to a neutral control group.

et al. 2012) hence contradicting the risk-as-feelings arguments. Within the EIC model framework however the findings by Schade et al. (2012) are not contradicting. Emotions such as worry influence the evaluation phase (G) and hence the decision (D) and outcome (E). It would be interesting to test the findings by Schade et al. (2012) within the EIC framework (Lerner et al. 2015). In general, more experimental research would be desirable aiming at clarifying the relations in such type of models.

From my point of view, such type of models are very appealing for intuitively and conceptually understanding the role of emotions and choices. They are very valuable for depicting potential interrelations of influencing factors and also illustrating the relation between immediate and anticipatory emotions. In this, especially Lerner and Lowenstein (2003) provide a simple yet convincing process model. Empirical testing of the above models might be very challenging as it is hard to measure and capture all variables depicted accurately. However, given there are very little theoretical models in emotions research especially when it comes to experimental testing the authors provide important frameworks for the field.

II.4.5 Marketing and consumer research

Marketing science and consumer decision making has a long tradition in considering emotions' influence on judgment and choices. Emotions have been studied in the context of advertising processes (Batra and Ray 1986, Burke and Edell 1989), consumer satisfaction (Alford and Sherrel 1996, Westbrook and Oliver 1991), or consumer choices in general (Muro and Murray 2012, Norton and Andrade 2012). One interesting recent empirical paper (N > 14,000) by John et al. (2016) studies the implications of 'liking' brands on Facebook. The authors find that 'liking' does not alter attitudes or increase the willingness to purchase but rather expresses someone's preexisting affection of the brand. In another study, Cryder, Lerner, Gross, and Dahl (2008) find sadness induced by a short film clip in the laboratory to increase WTP for a sporty water bottle. For excellent overviews of emotions in marketing science see for instance Cohen et al. (2008) or Bagozzi et al. (1999).

Further, insurance behavior and the role of emotions has been studied extensively in order to better understand how people evaluate probabilities in low probability-high stake negative events by a range of authors (e.g., Johnson et al. 1995, Kunreuther et al. 2001, Wakker et al. 1997). One important stream of literature specifically looks at willingness to pay (WTP) for insurance to evaluate whether such a seemingly purely monetary decision is influenced by affective factors (Hogarth and Kunreuther 1995, Hsee and Kunreuther 2000, Schade and Kuneuther 2002, Schade et al. 2012). Hsee and Kunreuther (2000) find using a range of hypothetical decision scenarios that both willingness to purchase a certain object and willingness to claim compensation for lost objects increases the more affection people have for the respective object. Related, Peters, Kunreuther, Sagara, Slovic, and Schley (2012) investigate the influence of affect and time on peoples' willingness of buying protective measures and find that in affect-rich situations time is neglected. Baron, Hershey, and Kunreuther (2000) find in a large questionnaire study that the desire to take action (personal and government) for risk reduction is largely explained by worry.

Schade et al. (2012) put the findings of Baron et al. (2000) to the hard scrutiny of an incentivized experiment with high monetary stakes. They study WTP for insurance in a large incentivized economic experiment (N = 263) and given or ambiguous probabilities. Moreover, the levels of state worry as well as trait worry (worry domain questionnaire by Tallis, Eysenck, and Mathews 1992 in the end of the experiment)

were elicited. The authors find that a large group of people is willing to pay a high premium for insurance and most strikingly that worry rather than probabilities drive individuals' WTP. Or put differently, judgments of probabilities do not explain the high WTP for insurance but the amount of one's worry does.

These findings have important implications for industry, policy and future research. If emotions such as worry drive peoples' WTP for premiums of insurances more research is needed on what causes worry (Schade et al. 2012). Further, it would be interesting to study different scenarios of how for instance worry can be reduced while making a buying decision. Further, for pro-consumer insurance companies these findings are of special interest, as they show that many insurance companies most likely use techniques that worry customers so to increase premiums and it would be desirable to increase transparency in order to gain consumers' trust.[7] More empirical work would be desirable to further elaborate such relations in other industries and environments.

[7] Recently, fin-tech and insurance-tech start-ups like Lemonade (www.lemonade.com) started by making use of insights from behavioral decision making to design business models that provide more transparency and information to consumers and ultimately aim to transform the industry to being more consumer friendly.

II.4.6 Behavioral economics

Emotions are a neglected topic, and the neglect of economists is second to none. I find this surprising. I take it that economics is concerned with the best ways of promoting human satisfaction in a world of scarce resources. With one exception, all human satisfaction comes in form of emotional experiences."

(Jon Elster 1996, p.1386)

In his articles on 'Emotions and Economic Behavior' (1998) and 'Rationality and the emotions' (1996), Jon Elster describes the two fields of economic theory and emotions "to exist in near complete isolation from each other" (p. 47). Not only do economists whose main goal lies in explaining human behavior ignore emotions in their theory and models but also emotion researcher never reference economic theory. Economic models that incorporate emotions are very rare. Standard economics does not consider emotions to have systematic influences neither as independent nor dependent variable in models or experimental papers. This is surprising looking at the increase of studies and strong findings from neuroscience and psychology. Over the past 15 years a change happened though. Rather than solely looking at cognitive processes, economists (scarcely) now investigate emotions to better understand and predict behavior of economic agents. To my best knowledge two studies exist dealing with emotions in a way I am concerned with emotions in the present thesis that have been published in the American Economic Review (AER). Ifcher and Zarghamee (2011) study induced emotions (film clips) and time preferences and find significant influences of positive mood. Capra (2014) investigates emotions in strategic games (I will discuss this in chapter II.5).

In economics, studying anticipatory emotions has a relatively long tradition compared to immediate emotions. Sudgens and Loomes (1982) and Bell (1982) develop regret theory accounting for the strong effects of anticipated regret influencing behavior at the time of making decisions. Further, one important stream of research models the influence of anticipatory emotions in agency theory (Koszegi 2006). Here, an agent must decide whether to convey information of emotional consequences for the principal or not (imagine situations such as the government informing the population about current challenges). Agents face the dilemma of anticipating that

principals act according to the accurate news or rather giving them good news that are emotionally beneficial. This model approach provides important insights to how emotions can influence interactive decisions. For the present thesis however, I will focus on the role of immediate emotions and economic decision making. Chapter II.5 provides empirical evidence from the field of strategic games and behavioral game theory. In the following I will first turn to emotions and heuristics.

II.4.7 Emotions and heuristics

The theory of the *affect heuristic* states that feelings can function like a heuristic (Finucane et al. 2000, Slovic et al. 2007), people use their positive and negative feelings as guide to evaluating risk and rewards. The group around Paul Slovic became interested in further exploring feelings and risks after having discovered that people judge a situation they like as high reward low risk situation whereas whenever we dislike something we evaluate rewards to be low and risks to be high (Alhakami and Slovic 1944, Finucane et al. 2000). This observation contradicts the common notion of positive correlations of risks and rewards. Further, they observe that in certain situations such as under time pressure or high uncertainty affective reactions can be more efficient than evaluating all information available.

More precise, people have images of objects or incidents that are tagged with positive or negative feelings. When making decisions they refer to this pool of labels consciously or unconsciously. For instance, I have been stung by a jellyfish years ago resulting in a very painful experience. Whenever I see a jellyfish (whether he is harmful or not) I tend to run away or turn away of fear whereas many people explicitly look at pictures of jellyfish experiencing joy from the beauty of the creatures. (Those people have obviously never encountered a sting of a jellyfish). In this way, similar to availability or representativeness, affect works as a heuristic cue. It is important to note that the authors define affect as ”the specific quality of "goodness" or "badness" (1) experienced as a feeling state (with or without consciousness) and (2) demarcating a positive or negative quality of a stimulus.” (Slovic et al. 2002, p. 397). The idea of associated images traces back to Zajonc (1980) who already proposed that affective responses to stimuli guide our judgment. For Zajonc perception is almost always related to affect so that we never just see some object but rather a beautiful object, or

ugly object. Moreover, oftentimes we decide based on affective evaluation and justify our behavior later by weighting pro and contras. Hence, we oftentimes buy the car or house we *like* and later deliberately justify our decisions (Zajonc 1980). I believe almost everybody can relate to this argument when making small and also important buying decisions, or when deciding on personal questions. It remains if this holds true for economic decisions however. More empirical evidence is needed in order to further explore this phenomenon.

Finucane et al. (2000) study judgments of risks and benefits and the affect heuristic in two experimental settings. The authors present N=54 students with several activities or facilities such as smoking, or chemical plants and were to rate the benefits and risks of these. One half of the group was assigned to a time-pressure condition with the aim to enhance heuristic thinking. The authors find an inverse relationship between risks and benefits whereas the negative correlation being higher in the time pressure treatment (r = - .80 as compared to r = - .75). In another experiment, the authors provide four different descriptions of nuclear technology with varying information of whether the perceived benefit and risk is high or low respectively.

Further, a few studies incorporate the role of emotions into Simon's (1957) concept of bounded rationality. Kaufman (1999) argues that agents are not only boundedly rational because of cognitive limitations but also because of emotional influences. Going back to institutional economist Commons (1934) by whom Simon was largely influenced, Kaufman highlights Commons arguments abut the human nature. Commons argues that human behavior is influenced by stupidity, ignorance and passion (Commons 1934). Whereas Simon (1982) acknowledges stupidity (cognitive limitations), ignorance (limited availability of information), he does not account for passion in his important theory. Kaufman basically concludes that emotions as one factor that interfere with rational decision making leads to biases when making choices.

Related but with a different tone, Hanoch (2002) and Muramatsua and Hanoch (2005) discuss ways in which emotions may enter bounded rationality in the thinking of the adaptive toolbox as proposed by Gigerenzer and Selten (1999) and Gigerenzer, Todd, and the ABC Research Group (1999). This implies that emotions (as with heuristics in general) do not oppose rationality but are rather rational depending on the environment. Muramatsua and Hanoch (2005) take an evolutionary perspective and

stress the important function of emotions in guiding cognition and making decisions. They basically highlight the role of emotions when searching for information (following Simon's (1983) thoughts) and when to stop searching (Ketelaar and Todd 2001). Emotions guide decisions with restricting the range of options and by letting the agent focus on specific parameters. They conclude that in certain situations emotions are rational, as for instance disgust signals danger in case of harmful food ultimately leading to survival from an evolutionary point of view. Further, Simon (1983) states that a fundamental role of emotions is to help us prioritize and direct our attention. For instance, hunger is a signal for the need of immediate attention. In this sense emotions are perfectly rational and even lead to optimal behavior whereas in other circumstances emotions can lead to irrational behavior. With this discussion, the authors contribute to the fact that humans function incredibly well even though they have cognitive limits and time constraints. I find it surprising that so little studies look at what is a field I view as very promising. For instance, to the best of my knowledge no study draws a connection to emotions and satisficing, see chapter 10.3 for a further discussion of potential research avenues.

Concluding, approaching the role of emotions and decision making using a similar framework as the study of heuristics could increase our understanding of how emotions influence people's choice. From my understanding emotions are not the same as heuristics, neither are emotions one type of heuristic. I believe emotions are much more complicated in their functions as discussed in chapter II.2. But drawing an analogy and studying emotions in their adaptive function just like the study of heuristics in an uncertain world (Todd, Gigerenzer, & The ABC Research Group 2012) seems to be very promising. Such an approach does not aim to answer whether emotion's influence on choices is rational or irrational in general but rather whether and when emotions are ecologically rational (see also Volz and Hertwig 2016). Hence, whether emotions have a positive or negative influence on outcomes depends on the environment a person makes decisions. Such an approach can also be related to Lewin's field theory as proposed in chapter II.2. Behavior is a function of the person, including emotions, and the environment. It is only possible to observe and maybe even predict the role of emotions on decisions when we include the environment in the equation.

II.4.8 Conclusion

Chapter II.4 summarizes and reviews existing models from decision science and economics that model emotions and (economic) choices. Starting with general thoughts on emotions in the decision sciences by for instance Herbert Simon and Jeremy Bentham, I reviewed normative models such as EUT-type models (Loewenstein 1996, 2000). Normatively, these models are quite convincing for modeling specific types of emotions such as visceral states. However, for modeling discrete emotional states especially positive emotions it will probably be difficult to incorporate these in utility-type models. Moreover, scholars incorporate emotions within descriptive-model frameworks such as prospect theory (Rottenstreich and Hsee 2001, Suter et al. 2015) and find that whenever outcomes evoke affective reactions the probability weighting function of prospect theory is changed. Affect leads to an even more non-linear weighting function. For instance, they find that a small probability of receiving a kiss is weighted higher than a small probability of getting cash. Suter et al. (2015) find a similar pattern studying negative affective choices (medical side effects). This research avenue explains and incorporates affective factors into prospect theory models very nicely. More empirical work looking at different emotions and also different domains (e.g., fear in financial decisions, or joy in consumption choices) would be desirable.

As a next approach to the role of emotions I reviewed feeling-based models such as the risk-as-feelings hypothesis (Loewenstein et al. 2001). These models became quite popular over the past 20 years and are intuitively appealing since they nicely establish relationships between immediate and anticipatory emotions and judgment and choices. However, empirically those models are hard to challenge and their predictive power remains unclear. Moreover, the 'original' risk-as-feelings model (Loewenstein et al. 2001) and the most recently proposed EIC model (Lerner et al. 2015) differ to a great extent. Research somehow contradicting the risk-as-feelings model as for instance studies finding direct influences of emotions on economic variables (e.g., Schade et al. 2001) could be incorporated into the EIC framework as opposed to the risk-as-feelings model. Hence, empirical testing of the EIC model would be helpful.

Chapters II.4.5 - 6 draw attention to studies and models from marketing and behavioral economics highlighting the important role emotions such as worry or joy

play in economic choices. This field of research has been growing over the past years and emotions have been incorporated increasingly to better understand choices. Decisions such as buying a car or insurance are oftentimes especially exposed to emotional influences, either naturally or amplified by marketing strategies. Hence, I believe this stream of applied behavioral research is especially important and may reveal relevant insights on how emotions influence people's buying choices and how to potentially educate or even guide consumer's choices.

The last sub-chapter of this part of the thesis draws attention on how to incorporate emotions into bounded rationality and how to possibly approach emotions in a similar way as heuristics. The basic tenant here is that emotions do not contradict rationality but are rather ecologically rational. Hence, depending on the environment emotions can lead to optimal choices or not (see also Volz and Hertwig 2016). Slovic and colleagues argue in line with this reasoning with their affect heuristic. As Slovic states (2007, p. 339): "*Under the right conditions, the perception and integration of affective feelings, within the experiential system, appears close to the sophisticated maximization process postulated by economic theories since the days of Jeremy Bentham."* I find this argument and empirical support very convincing. I do not equate emotions with heuristics. I believe emotions are very different from heuristics but can be studied more successful in their adaptive function within their environment. From my point of view, approaching emotions like heuristics in an adaptive framework highlighting ecological rationality is a very promising stream of research that is in need of further especially empirical research.

This also relates back to the emotion theories from evolutionary psychology discussed in chapter II.2.4. According to evolutionary psychology emotions have adaptive functions. For instance, the negative emotion of fear has the adaptive function to avoid danger and leads to flight behavior. From this point of research, it does not make sense to pursue a valence based approach but it is important to consider discrete emotions. Being able to distinguish discrete emotional states is also important for part IV of this thesis where I experimentally study and induce the emotions happiness and fear.

Concluding, all of the specific models discussed above and empirical evidence shows that emotions play an important role for judgment and decision making. Scholars work in different paradigms, different disciplines, and take different

approaches to the study of emotions. However, they all find that emotions play an important role in our decision making and influence choices. More empirical evidence and theoretical progress will help to better understand this relatively young but growing field. This thesis aims to contribute to the field by first providing a thorough review of different theories (chapter II) to identify testable hypotheses. Moreover, we experimentally study induced happiness and fear in two important economic paradigms. Experiment 1 deals with individual risk preferences and experiment 2 with strategic choices. The next chapter will provide insights to emotions in the literature on strategic games.

II.5 Emotions in the literature on strategic games

So far, I have discussed different theoretical and empirical approaches from decision theory. However, economic decision making and studying emotions most of the time includes interactive decisions. Herbert Simon (1967) states that in order to be satisfactory, a theory of emotional behavior has to analyze emotions within social interaction (p.37). Further, Winter (2014) stresses the importance of game theory for understanding emotions: "The game theoretic approach enables us to understand the roles that emotions and other behavioral characteristics have within a context of social interaction." (p. xii). Hence, I turn to emotions in the literature on strategic games in the following. The following literature review provides the theoretical base for the experimental study in part IV.2 of this thesis where we investigate the role of induced happiness and fear in market entry decisions, i.e., two discrete emotions in strategic games. In the following, I will review and synthesize all to my best knowledge existing experimental papers studying emotions in strategic games.

Albeit fragmented, over the last ten to 15 years research on emotions in strategic behavior has experienced more and more attention by experimental economists and psychologists. One important stream of research empirically studies the role of induced emotions on decisions in strategic games such as dictator, ultimatum, and trust games (Kirchsteiger 1994, Sanfey et al. 2003, Capra 2004, Harlé and Sanfey 2007, Andrade and Ho 2007, 2009, Andrade and Ariely 2009, Kausel and Connoly 2014), prisoner's dilemma (Nelissen et al. 2007), gift-exchange games (Kirchsteiger et al. 2006), and a two-person market entry games (Kugler et al. 2014). No academic study exists looking at emotions in repeated market entry games. Four of the studies include a 'strategic component' of emotions in the sense that emotions of other players in the experiment are communicated and become relevant for individual decisions (Andrade and Ho 2007, Gneezy and Imas 2014, Kausel and Connoly 2014, Kugler et al. 2014). I will proceed chronologically in the following.

Sanfey et al. (2003) were one of the first to study emotions in games using tools from the fields of neuroscience. The authors use functional magnetic resonance imaging (fMRI) to study neural and behavioral reactions of the responders in the *ultimatum game* (e.g., Güth et al. 1982). The authors do not induce emotions but rather study emotional reactions to behavior in the ultimatum game. However, as one of the

very first studies in the field I report their findings for completeness in the following. In the ultimatum game, player A receives some amount of money and proposes how to split the sum. Player B responds by accepting or rejecting the respective offer. Previous studies find that rather than accepting all offers as the standard economist predicts, the responder would oftentimes reject offers that appear unfair to them. One explanation for this 'anomaly' (as the standard economist would call it) in the responders behavior could be that the rejection results from being angry (Sanfey et al. 2003). Sanfey et al. (2003) test the ultimatum game (USD 10) with half fair (USD 5 / USD 5) and half unfair offers over 30 rounds with N=19 participants whereas part of the offers were made by human partners and part by a computer. The authors find that responders would reject unfair offers of USD2 and USD1, and they would reject unfair offers by humans significantly more often compared to offers by computers. Further, the fMRI shows greater activation for unfair offers compared to fair offers, and for unfair offers by humans compared to a computer, in the areas of the bilateral anterior insula, dorsolateral prefrontal cortex, and anterior cingulate cortex. Hence, apparently, respondents reacted to unfair offers stronger when it was proposed by a human as compared to computers. The bilateral anterior insula has been associated with negative emotional states such as pain or hunger. Participants with high activation levels of the bilateral anterior insula rejected unfair offers significantly more often than others. Sanfey et al. (2003) interpret these results as direct empirical support for the influence of emotional factors on economic choice. Results from fMRI studies have to be treated with caution regarding their implications. However, the findings of this remarkable study definitely serve as very good starting point and motivation for further studies evaluating how emotions influence choices in economic games and how people expect choices in economic games to impact their emotions.

Capra (2004) explicitly induces emotions in the laboratory as one of the first authors in the field of economics (study published in *AER*). She investigates the influence of mood on behavior in *dictator, ultimatum, and binary trust games* in the laboratory. She induces positive and negative mood using (1) experience of success or failure from answering an easy or hard set of trivia questions and (2) memory elicitation tasks. The $N = 72$ subjects first complete the easy or hard set of questions (three good mood and three bad mood sessions) and a self-report on how they felt. They then play a dictator game: A has the role of the proposer ('dictator') who can

choose to propose either a fair (USD 5 and USD 5) or unfair (USD 6 and USD 2 or USD 6 and USD 1) outcome to B who passively accepts that amount. Thereafter, subjects were again randomly assigned role A and B and played an ultimatum game (USD 10). Then, the memory elicitation task was completed and finally all subjects played a binary trust game (similar to McCabe et al. 2003). Capra (2004) finds that in the dictator game 92 percent of subjects in the good mood treatment offer fair splits compared to 62 percent in the negative mood group. In the ultimatum game, only small differences are found (bad mood treatment players offered slightly higher amounts). All responders accepted the offer. In the trust game, 59 percent made trusting choices (i.e., offered the outcome to B) in the bad mood compared to 42 percent in the good mood treatment and 70 percent reacted trustworthy in the bad mood compared to 62 percent in the good mood. These findings are in line with prior findings of people reacting trusting and trustworthy (McCabe et al. 2003). The differences between the mood treatments are not significant. The study by Capra (2004) has a very interesting approach and is especially being one of the first studies including mood in an economic game very important. However, the author uses a pure valence approach. Thus, it is not clear whether the bad mood induction resulted in an experience of sadness or anger for the subjects. Further, the first 'mood induction' may not actually have the result of people being in a good or bad mood. Also, as Capra (2004) herself notes, the different tasks might have affected subsequent tasks. The weak influence of emotions in the ultimatum may be the case because in between the mood inducement and the ultimatum game, players already played the dictator game. Hence, there might be testing effects at hand and the results must be treated with caution. Interestingly all responders accepted the offer. This is in line with standard economic predictions however not with the strong findings of other studies (e.g., Güth et al. 1982). So maybe, playing a dictator game directly before an ultimatum influenced responders to not show as strong reactions in the ultimatum game.

Related, Harlé and Sanfey (2007) study the impact of amusement and sadness (versus a neutral control group) induced with short film clips in the *ultimatum game*. They find that whereas amusement did not have any influence, sadness let to lower acceptance rates of offers that were unfair. Mussel, Göritz, and Hewig (2013) find in a large online experiment with N = 1,326 that in the ultimatum game offers from proposers with smiling faces are accepted more often than neutral proposers, and offers

from proposers with angry faces were accepted less often. Moretti and di Pellegrino (2010) find that induced disgust as compared to sadness and neutral groups results in a higher acceptance of unfair rejection rates in the ultimatum game but only if the partner is a human being. In computer interaction, this effect disappears. Bonini, Hadjichristidis, Mazzocco, Demattè, Zampini, Sbarbati, and Magon (2011) find similar patterns of accepting more unfair offers in ultimatum games with one group of subjects being in a room with a disgusting smell as compared to a neutral room. These findings stress the importance of studying specific emotions and not only good or bad mood.

Andrade and Ho (2007) experimentally study the effect of incidental emotions on strategic behavior. Specifically, they propose that people believe that incidental emotions have an influence on others' behavior, and that they can strategically benefit from this as long as the other does not realize it. The N=122 subjects either watched film clips eliciting a happy or angry emotional state (and describing a story related to that feeling) or a neutral film clip. They then played a modified version of the *ultimatum game*. Subjects assigned the role of the receiver were watching the happiness or anger film clip. Proposers were watching the neutral clip and were told about the emotional state of the receiver. More, in one treatment the proposer was told the receiver does not know that he knows how he feels, and in the other treatment the proposer was told the other knew. The authors find that proposers offered unfair amounts more often if they knew the receiver had watched a funny film clip (as compared to the angry video). As soon as they were told that the other knew that they knew about his prior emotional experience this effect disappeared. Andrade and Ho (2007) thus conclude that subjects being in the role of the proposer acted strategically and expected a happy receiver to be more cooperative than the angry one (as long as he does not know that the proposer may behave strategically). This finding is especially striking relating to our study on strategic emotions.

In another *ultimatum game* experiment, Kopelman et al. (2006) find that receivers more often accept offers from proposers displaying positive emotions as compared to neutral and negative emotions. The authors were interested in negotiation strategies similar to van Kleef et al. (2006), Sinaceur and Tiedens (2006) and Pietroni et al. (2010). Pietroni et al. (2010) are interested in the role emotions (happiness and anger) play in negotiations. This is important because emotions are intuitively central in such

settings but have not been considered very much in research on negotiations and strategies of negotiators. They find in ultimatum game experiments that the influence depends on the desired outcome: positive emotions result in higher offers of negotiators whenever the others' exit strategy was highlighted.

Further, Andrade and Ariely (2009) suggest that the effect of incidental emotions on decision making lasts longer than the emotion itself. In their experiment, emotions are manipulated by letting a group of subjects watch film clips inducing happiness and anger. These subjects were assigned the role of the receiver in the *ultimatum game* in the next step. Proposers watched a documentary (neutral state) instead. Then, participants played the ultimatum game. "Study 3" contained a filler task about pictures and memory (20 minutes) attempting to neutralize subjects' positive and negative emotions. Thereafter, subjects played the reversed role in the ultimatum game and finally, they played a dictator game. The emotion manipulation check happened directly after watching the clip and again after completing the filler task (question of feeling happy or angry was embedded in a range of questions). The authors find that subjects were feeling angrier or happier after watching the film clips and that the feeling faded away after completing the filler task. More, in the first ultimatum game only 40 percent of the subjects in the happy condition rejected the unfair offer whereas 73 percent of the angry subjects rejected the unfair offer. In the second ultimatum game with reversed roles and neutral states, the once angry receivers now proposed a fairer amount (less to themselves) to the receivers than the once happy receivers. Similarly, in the dictator game the once angry receivers offered an outcome with a smaller share to themselves as the once happy subjects. Andrade and Ariely (2009) interpret this result as incidental emotion having an indirect and long-lasting effect on behavior, i.e., those subjects who were once angry made a fairer offer to their opponents than the once happy ones – even in the dictator game where receivers had to accept any amount.

Related, Kirchsteiger et al. (2006) investigate the impact of mood on behavior in a *gift-exchange game*, i.e., two players decide sequentially whereas the first mover allocates some amount of an endowment to another player who then chooses an effort level. Effort is costly meaning it decreases the second mover's payoff but increases the first mover's payoff. In the laboratory with N=130 students they manipulate the second mover's mood by letting subjects watch a sad or a funny movie before playing the game. The authors observe that the mood induction has an effect on behavior.

Comparing behavior in the good to the bad mood treatment, both transfer and effort is larger in the bad mood treatment (higher reciprocity). Players in a good mood on the other hand are more generous.

Nelissen and Dijker (2007) study the influence of fear and guilt on behavior in simultaneous *one-shot dilemma games*. In their experiment with *N*=277 undergraduate students they induce the emotions fear, guilt, and neutral states using autobiographical recall procedure. The authors find fear to reduce and guilt to increase levels of cooperation. Interestingly, this relation depends on individual's value orientation: fear reduces cooperation only for individuals with pro-social value orientation whereas guilt only increases cooperation of people with pro-self value orientation.

Furthermore, Kausel and Connoly (2014) investigate individuals' expectations about trustworthiness and study the impact of incidental emotions on behavior in *trust games*. Specifically, the authors study the impact of three incidental emotions (anger, guilt, and gratitude) on players' expectations of trustworthiness in a series of three experiments. In study 1, subjects (*N*=112) answered a package of questionnaires (in the laboratory and beginning of an MBA class) inquiring their beliefs about the impact each of the emotion (anger, gratitude, and guilt) may have on acting trustworthy, altruistic and fair. Kausel and Connoly (2014) find that participants believe that gratitude leads to a more trustworthy behavior. Anger and guilt however negatively impact others' trustworthiness whereas anger has a higher mean impact, i.e., the results show different findings for the same valence. Study 2 was a laboratory experiment. Participants were randomly assigned a role player A or B. Participants' assigned to role B were to write down a scenario of their life where they have been especially angry, guilty, or grateful. A neutral control group and players A wrote about a recent classroom experience. Subsequently, all players played a trust game with the crucial manipulation of giving them 'emotional knowledge' about their opponents, i.e., Players A were told whether Player B has written about a situation that made them feel angry, guilty, grateful or neutral, and they would now as a result experience anger, guilt, gratitude or be in a neutral state. In the trust game, players A could decide about sending a share of their endowment (USD 20) to players B, the amount was then tripled, and players B could send back any amount they wanted. The amount sent by A is interpreted as measure of trust in the literature. Moreover, players A were asked about their expectations of what B would send back. Mean expectations show that

players A expected angry Bs return less than neutral Bs (M = 12.06 vs. M = 20.59, p < .05). Further, As expected guilty Bs return more than angry Bs (M = 21.25 and M = 12.06, p < .05). Expectations about returns from grateful Bs as compared to neutral Bs did not significantly differ. Regarding As' behavior, they sent a smaller amount facing an angry B (M=8.71) than facing a neutral B (M=13.53, p < .05). More, As sending money to guilty Bs gave more (M=14.75) compared to facing angry Bs (M = 8.71, p < .05). The authors find no significant differences comparing the amount sent by As to grateful or neutral Bs. Overall, the findings show that information about others' emotions influence expectations, and more, actual behaviors.

Kugler et al. (2014) measure anxiousness and aggressiveness of two players in entry decisions. The authors conduct an online experiment (N=106) with a within-subjects design (5 dimensions). Subjects' anxiousness (Leary 1983) and aggressiveness (Bryant and Smith 2001) were measured using self-report questionnaires. Both measures showed reasonable reliability (Cronbach's α of .90 and .81 respectively). Interestingly the correlation of both scales was significant and quite high (.29, p<.01). Participants then played a simple 2-player simultaneous market entry game for 45 rounds. They were matched with an opponent randomly and were informed about his personality characteristic. The matching was done so that each player played against each personality type for nine rounds (anxious, non-anxious, aggressive, non-aggressive, random). They found that subjects' personality influenced their behavior in the market entry game and that players adjusted their behavior according to another players' personality. More precise, they found that aggressive subjects entered more and anxious subjects entered less. Subjects were more likely to enter against anxious players and less likely to enter against aggressive players. The authors presume that the players adjusted the beliefs about their opponents.

On a related note, Gneezy and Imas (2014) pursue a novel approach for studying emotions in strategic situations. They allow people in the laboratory to explicitly anger their opponents and find that people use anger strategically in different interactive games. Depending on the environment angering people results in less effective (simple strength games) or more effective (more cognitive demanding games) behavior. Moreover, and most strikingly, the authors find that people anticipate this effect and when given the chance use angering their opponents whenever it is strategically advantageous. The authors hence conclude that people understand how emotions affect

behavior and moreover make use of this knowledge in strategic settings. These findings motivate our experimental study greatly and more empirical research is in demand.

Summarizing, there is a relatively good understanding about the role of specific emotions in some games such as the ultimatum game. Fear, disgust, and anger have been studied quite well. Here, it would be interesting to further study discrete positive emotions and their influence on behavior of proposers and responders. The dictator game however has not received as much attention as one would have presumed even though Capra (2004) finds a strong influence of positive mood on dictators' offers. Hence, it would be desirable to further study the impact of positive and especially of negative discrete emotions on peoples' behavior in dictator games.

Further, people's expectations about opponents' emotions and potential adjustments in behavior have received some attention in the literature. Andrade and Ho (2007), Kausel and Conolly (2014), and Kugler et al. (2014) find that player expect other players in experimental studies to react to induced emotions and they adjust their strategies accordingly. These findings are important and we build our hypotheses directly on this empirical evidence.

One new and very interesting study explicitly allows people to use emotions strategically by giving participants in the laboratory the opportunity to explicitly anger opponents. Those findings demonstrate that people apparently understand a strategic value of emotions. More research with different emotions would be desirable.

Concluding, in this chapter, I provided a thorough over view of what has been done in the field of emotions in strategic situations in order to synthesize the current state of the field. We are directly building our hypotheses on such findings. Whereas some paradigms such as the ultimatum games have been studied extensively, some other games have received little to no attention. Amongst those is the classic market entry game, an important framework for studying people's coordination behavior. We are interested in how induced fear and happiness influence behavior in this game.

II.6 Emotions in entrepreneurship research

Emotions and entrepreneurial activity are a relatively under researched field. This is surprising as anecdotal evidence from talking to entrepreneurs nearly always involves emotional facets.

Only recently, a strong interest in the topic of affect in entrepreneurship research evolved. In a foreword of a special issue on 'emotions in entrepreneurship research' in the journal *Entrepreneurship Theory and Practice* (ET&P), Cardon et al. (2012) highlight the importance of studying emotions. They coined the term 'entrepreneurial emotions' referring "to the affect, emotions, moods, and/or feelings-of individuals or a collective-that are antecedent to, concurrent with, and/or a consequence of, the entrepreneurial process, meaning the recognition/creation, evaluation, reformulation, and/or the exploitation of a possible opportunity." (Cardon et al. 2012, p.3). The recent handbook of entrepreneurial cognition (Mitchell et al. 2014) devotes three out of 14 chapters to the topic of affect and entrepreneurial thinking. However, concrete and especially empirical research on immediate emotions in the entrepreneurial domain is still rare. A handful of studies explore the relation of state and trait emotions on opportunity evaluation and exploitation (e.g., Grichnik et al. 2010, Welpe et al. 2012) or on entrepreneurial risk propensity and perception (e.g., Foo 2011). Incentive compatible experiments are to my best knowledge nonexistent with one exception. Burmeister-Lamp et al. (2012) experimentally explore the influence of one's regulatory focus, i.e., emotional tendencies, on part-time entrepreneurs' time allocation. They indeed find that entrepreneurs can be better described by a rather emotional concept than by normative utility theory. Hence, there is need for more theoretical and empirical research in the entrepreneurial domain to better understand how emotions influence entrepreneurs' decision making. Just recently, Schade (2016) provides an overview of existing studies in the field asking the question of the role of emotions in entrepreneurial decision making.

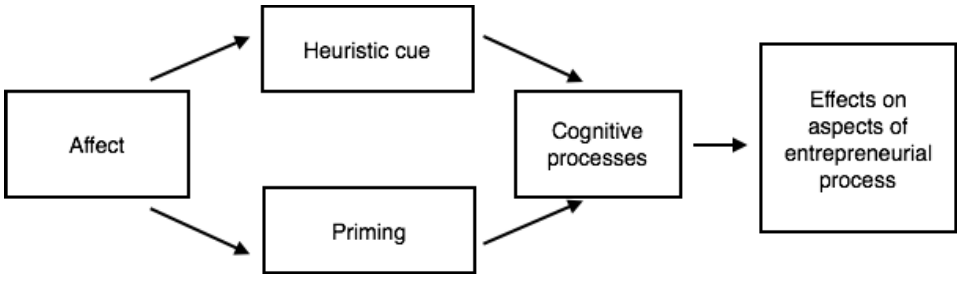
This chapter provides an overview of theoretical frameworks incorporating emotions in entrepreneurial decision making. Building on this, I discuss empirical

evidence. A brief overview of emotional outcomes from entrepreneurial activity is provided. Finally, studies looking at immediate emotions are discussed and evaluated.

II.6.1 Theoretical frameworks

The field of emotion research in entrepreneurship and entrepreneurial decision making is rather young. Robert Baron (2008) highlights the importance of the role of affect in all stages of the entrepreneurial process. He develops one of the first and very comprehensive theoretical frameworks. It is important to note that throughout his review, he refers with the term affect to both state affect, i.e., generated by specific events, and trait affect, that is stable tendencies being experienced across many situations. Baron motivates his thoughts of why affect is especially relevant to entrepreneurship for two major reasons: (i) entrepreneurs act in a highly uncertain and changing environment, and (ii) entrepreneurs have to perform tasks that have shown to be influenced by affect in prior research from psychology. For instance, important domains are creativity (Isen et al. 1987), negotiation (Baron 1990), and of course decision making under risk and uncertainty in general (Lerner und Keltner 2001). Baron models the influence of affect in the entrepreneurial process as follows: both, incidental and event generated affect influence different domains of the entrepreneur's tasks via cognitive processes. Affect functions as heuristic cue or results in priming of relevant connotations and thereby alters perception or judgments and ultimately influences processes such as opportunity recognition.

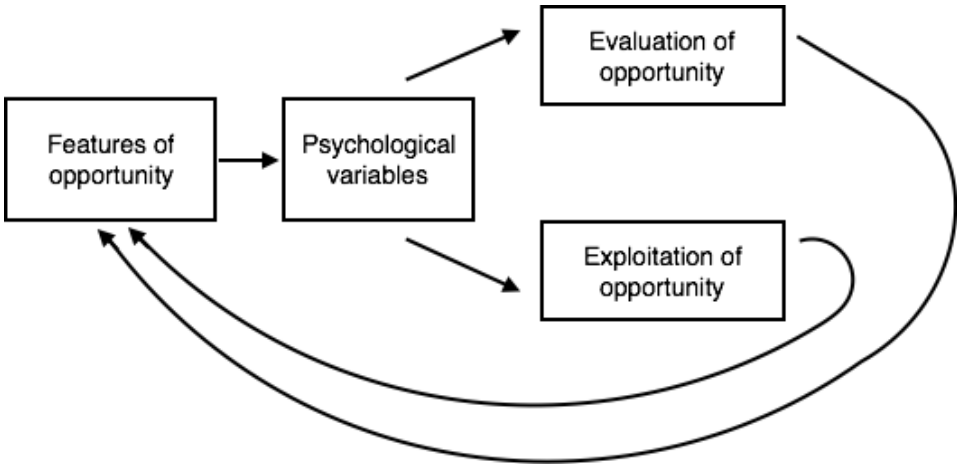
Figure II-5: Baron's theoretical model of the role of affect in entrepreneurship (2008, p. 335)



Baron (2008) proposes a model that argues in the line of Loewenstein et al. (2001): affect influences cognitive thinking and hence alters individuals' (entrepreneurs') choices. Note that this is in contrast to findings by scholars from the decision sciences who find in incentive compatible experiments that emotions influence choices directly (Schade et al. 2012). Besides, though an important and interesting approach, the model lacks clear specifications on how affect influences processes (e.g., valence or appraisal tendencies). Such kind of model is moreover relatively difficult to empirically challenge in order to make causal inferences.

In a similar approach, Michl et al. (2009) present a model based on the stimulus-organism-response model (S-O-R) to examine emotions and cognitions in the entrepreneurial context, following Shaver and Scott (1991) who first applied the S-O-R model to the entrepreneurship domain. In their model (Michl et al. 2009), the stimulus is represented by some feature of an opportunity such as probability of success or time to profit, and the organism consists of psychological variables, i.e., emotions, cognitions, perceptions, motivations. The organism is naturally never fully observable but must be inferred (Shaver and Scott 1991, Michel et al. 2009). Driven by stimuli and organism the response can be either the evaluation or exploitation (resulting directly or mediated by the evaluation) of the opportunity. The response then again influences the stimulus.

Figure II-6: S-O-R model (Michl. et al. 2009, p. 180)



The model of Michl et al. (2009) is less conceptual from my point of view and mimics the underlying psychological process well. Moreover, the authors experimentally tested their proposed model and find quite convincing evidence, see below. Interestingly, in the above model the psychological variables do not influence the features of an opportunity, i.e. emotions do not influence probabilities directly but certain features do evoke emotions. This is different from the other consequentialist models reported in this and previous chapters.

Concluding, a handful of theoretical models building mostly on Baron (2008) exist. Most of the models consider opportunity evaluation and exploitation as dependent variables. There is urgent need for further theoretical and empirical research on how emotions influence the entrepreneurial process and vice versa (see also Cardon et al. 2012, Shepherd 2015). In the following sub-chapter, I will discuss empirical papers in the entrepreneurship literature that examine emotions and entrepreneurial decision making.

II.6.2 Empirical evidence

II.6.2.1 Emotional outcomes from entrepreneurial activity

Only a handful of empirical papers explicitly study the influence of basic emotions (as independent variable) on entrepreneurial choices such as opportunity recognition or exploitation (Grichnik et al. 2010, Foo 2011, Welpe et al. 2012). A somewhat larger stream of literature investigates *emotional outcomes* from entrepreneurial activity, i.e., emotions as dependent variable: *emotion = f(x)*. Especially regarding positive emotions several studies examine the influence of entrepreneurial activity on for instance passion, wellbeing, and excitement. Already in the 1980s being self-employed instead of being a wage employee has been linked to higher job satisfaction and wellbeing (Blanchflower et al. 2001, Bradley and Roberts 2004, Thompson et al. 1992, Van Praag and Versloot 2007). Further, Gielnik et al. (2015) find using experimental and longitudinal data of US entrepreneurs that effort influences entrepreneurial passion. This view somewhat contradicts studies by Cardon and colleagues (Cardon et al. 2005, 2009) claiming the reverse effect that passion influences entrepreneurial effort (see next subchapter). Chen et al. (2009) investigate the influence of entrepreneurial passion on venture capitalists' investment decisions.

They find in one laboratory and one field experiment (business plan evaluations and a business plan competition respectively) that preparedness of the entrepreneurs is more important when it comes to funding decisions. Note however, that in these two settings no further interaction between VC and entrepreneur and therewith demonstration of being passionate was possible. It would be interesting to further explore this topic. Further, Schindehuette et al. (2006) pursue a very interesting approach and relate entrepreneurship to the concepts of peak performance, peak experience, and flow. Conducting interviews with *N*=140 entrepreneurs the authors find that challenges and experiences from entrepreneurial activity lead to peak experiences and further experiencing a state of flow. Given rather high stress levels of entrepreneurial careers other studies look at entrepreneurs' coping strategies and influence on wellbeing (Drnovšek et al. 2010).

A related stream of literature looks at negative emotions and entrepreneurial activity such as firm failure (Jenkins and Brundin 2009, Shepherd 2003, 2009). Shepherd (2003, 2009) studies the important topic of negative emotional responses to business failure. He suggests that entrepreneurs experience grief after losing a business and that those entrepreneurs experiencing high levels of grief learn less from the process of business failure (Shepherd 2003). He further provides a theory of grief recovery time after losing a family business and highlights the importance to further explore the phenomenon (Shepherd 2009). Building up on these propositions, Jenkins and Brundin (2014) empirically investigate entrepreneurs' emotions from firm failure. The authors use the appraisal tendency framework to hypothesize how individuals respond to firm failure. The authors measure grief using a 9-item scale and also appraisal tendencies. A firm's bankruptcy was used as operationalization of failure. They conducted *N*= 284 telephone interviews with owner–managers who recently experienced bankruptcy and received *N*=120 questionnaires of those managers. They find that entrepreneurs' feelings after firm failure vary depending on appraisal tendencies. On a related note, Biniary (2012) explores the role of envy within corporate venturing processes in an interesting approach. Patzelt and Shepherd (2011) study entrepreneurs' negative experienced emotions in general and find drawing on a large US survey dataset (*N* = 2700) that self-employed individuals experience fewer negative emotions (depending on regulatory coping behavior). This stream of research

is important to get a better understanding of the emotional consequences of entrepreneurial decision making and further empirical studies are desirable.

Concluding, this field of research is very important and provides exciting future research opportunities. For instance, studies frequently find that entrepreneurs have a higher job satisfaction even though they earn less than wage employees. Further exploring this relation using survey or experimental methods would be interesting. In this thesis however I focus on immediate emotions in decision making. Hence, the next chapter will discuss empirical evidence on how emotions influence entrepreneurial decisions.

II.6.2.1.1 Emotional drivers of entrepreneurial activity

To my best knowledge five papers exist that study the role of emotions as driver of entrepreneurial activity in an experimental fashion (Michl 2009, Grichnik et al. 2010, Foo 2011, Podoynitsyna et al. 2012, Welpe et al. 2012). First, Grichnik, Smeja and Welpe (2010) investigate the impact of emotions on distinct phases of the entrepreneurial process. Precisely, they analyze the influence of joy and fear on entrepreneurial evaluation and exploitation in an online experiment with start-up employees. The authors develop their hypotheses based on the emotion-as-information theory stating that emotions influence the way someone processes information (emotions as heuristic cues) and on the concept-priming theory suggesting that emotions prime people's memories (Bower and Forgas 2001). Building on the emotion-as-information theory Grichnik at al. (2010) presume someone in a positive emotional state will use the emotion as extra information, evaluate the situation as less risky and evaluate the opportunity more positive. For the negative state the opposite holds. Regarding the exploitation tendency, the authors build up on the emotion-maintenance theory by Carver (2003). Here, people thrive to reduce discrepancies between actual and desired states. In a positive state, the discrepancy is rather small and increases aversion to actions that involve risks (Grichnik et al. 2010). Negative emotion though increases someone’s effort to achieve a goal (Schwarz 2001). Thus, the authors predict that positive emotions would influence opportunity evaluation positively and exploitation negatively, and negative emotional states would impact evaluation negatively and exploitation positively.

Participants of the experimental study were 146 employees from 40 entrepreneurial firms. Originally 541 firms have been identified as young entrepreneurial firms and have been contacted, 40 firms volunteered to participate. Of the 410 firms, at least three people were asked to participate (CEOs, co-founders, employees). The subjects were rather young ($M = 31$, $SD = 6.69$), mostly male (70%), and 30% owned a significant share of the firm. Experimental instructions and the survey link were send out via email, they were asked to provide enough time for the survey and have an advice available to play a video clip. Before any manipulation, participants were asked questions regarding their current emotional states and sensibility. Unfortunately, the authors do not explain the exact questions they use. Then, people were assigned to one of the three conditions: watching a video clip that induced a joyful emotional state, a fearful emotional state, or no film. Immediately after watching the short movies (seven minutes), the participants (in the two video groups) filled out the PANAS-X scale by Watson and Clark (1994). Next, participants received a short (less than one page) case study introducing a product innovation that has been validated by experts as appropriate. After reading the case, subjects were to judge how promising they would evaluate the innovation and on whether they would judge it to be an opportunity on 5-point rating scales. The mean of these questions determines the variable opportunity evaluation. Three more questions were asked in order to determine the opportunity exploitation tendency of participants: the subjects had to state their willingness to invest a certain percentage (0-100%) from their own savings or from a loan in the product innovation (11-point rating scale), and what percentage of their free time they would devote. Finally, participants provided demographic information (Grichnik et al. 2010).

The authors find that positive emotion influences opportunity evaluation positively and subjects in a positive emotional state are less willing to exploit the opportunity. Subjects in the fear condition evaluated the situation less positive than the control group and fear negatively influences exploitation. Especially the last finding of a negative influence of fear on exploitation is not in line with their hypotheses. They draw the line to findings of negative emotions influencing creativity (Davis 2009). Comparing the results by Grichnik et al. (2010) with the experimental papers by Welpe et al. (2012) and Foo (2011) the negative relationship of fear and exploitation tendencies makes a lot of sense.

Related, Foo (2011) studies the influence of the state emotions anger, happiness, fear and hope on risk perception (study 1 with $N = 187$ students) and the trait emotions anger and happiness on entrepreneurs' risk propensity (study 2 with $N = 66$ entrepreneurs). He builds up on the appraisal tendency framework (Smith and Ellsworth 1985) in order to examine emotions' influence on risk perceptions and risk preferences (or differently put opportunity evaluation). In study 1, Foo (2011) finds that those individuals induced to emotions with appraisal tendencies of certainty and control, i.e. anger and happiness, estimated the risk for a new venture to be lower whereas participants that have been induced to fear and hope, i.e. emotions characterized by appraisal tendencies of uncertainty and lack of control, stated higher risk estimates. Study 2 concludes that the entrepreneurs' who had higher scores on trait anger and happiness scales preferred to invest in a venture with higher but also uncertain outcome. Foo's (2011) findings are very interesting and certainly contribute to the literature on how emotions influence entrepreneurs' decision making. However, at some parts it is difficult to understand the exact experimental design and both studies where not incentive compatible so that replicating Foo's study yields caveats. Foo (2011) already discussed the limitation of the student sample in study 1 for making general statements about entrepreneurial decision making from this part of the study. His findings from study 1 are very interesting regarding the question whether one should pursue a valence approach or not. Fear and anger being of same valence result in exact opposite risk evaluations, hence a pure valence approach is not suitable when studying emotions influence in the domain of decision making under risk and uncertainty. This is in line with findings from Lerner and Keltner (2000, 2001).

Welpe et al. (2012) study the influence of state emotions on opportunity recognition and exploitation. In two studies, students were asked to imagine a specific entrepreneurial situation associated with either high or low profits and high or low probability of success (3x2 design with high, low, and uncertain probabilities and high and low profits). Subsequently, the subjects answered to the PANAS-X emotion questionnaires (Watson & Clark, 1994) for joy (seven items) and fear (six items in study 1, and joy, fear and anger (three items) in study 2. Building up on the affect-as-information hypothesis (Schwarz and Clore 2007) they expect fear to negatively impact a person's tendency to exploit an entrepreneurial situation and both happiness and anger to positively impact exploitation tendencies. Surveying 138 MBA and

entrepreneurship students (1) and 178 students (2) they find that both evaluation and emotions influence exploitation tendencies. Joy and anger increase exploitation whereas fear decreases it. Further, emotions influence the impact of evaluation on exploitation with joy and anger increasing and fear decreasing the impact. These findings are in line with the findings by Grichnik et al. (2010).

These findings are consistent with Baron's (2008) model who predicts anger and joy to have an approach oriented function whereas fear is an avoidance oriented emotion. This is also in line with the study by Foo (2011) and Lerner and Keltner (2000, 2001). Besides not being an incentive compatible economic experiment the above study provides a very rigor experimental design and contributes largely to the empirical research on entrepreneurial emotions. Building up on Welpe et al. (2012) findings it would be interesting to run the questionnaire experiment with real entrepreneurs and moreover to actually manipulate the emotions fear, anger, and joy using for instance relived emotions or film clips as in Grichnik et al. (2010).

One interesting approach to mixed emotions is the study by Podoynitsyna, Van der Bij, and Song (2012) who investigate the role of mixed emotions on entrepreneurial risk perception. Drawing on a sample of N=253 venture owners (mailing through the VentureOne list) the authors present hypothetical scenarios describing a strategic situation involving high risk. They ask the participants to evaluate the situation by the extent to which 16 emotion adjectives that are described made them feel. Podoynitsyna et al. (2012) find mixed emotions to influence risk perception. Moreover, after controlling for basic emotions conflicting emotions seem to be a predictor of a more cautious behavior.

Closely related to the above studies, Burmeister-Lamp et al. (2012) investigate the important question of how hybrid entrepreneurs allocate their time, i.e., how much time individuals who start a business while still being employed devote to their new business and how much they spend working for their employer. The authors experimentally test two predictions: a rational approach on a utility framework and one rather emotional approach based on a person's promotion and prevention focus. They measure risk preferences and also individuals' prevention focus (someone's tendency to focus on avoiding negative events) and promotion focus (someone's focus on potential gains from a decision). In an incentivized economic experiment with both

students and entrepreneurs Burmeister-Lamp et al (2012) find that entrepreneurs' behavior is better described by their promotion and prevention focus rather than by the rational standard economic model predictions. Students on the other hand can be well described by the rational model. The authors can conclude that entrepreneurs appear to decide more emotional than students when facing time allocation problems. This is to my knowledge the only incentive compatible experiment in the field.

Concluding, a hand full of interesting studies investigating emotions and entrepreneurs' decision making have been published over the past five years. Scholars moreover call for more research on emotions in entrepreneurship research (Shepherd 2015, Cardon et al. 2012). Building up on existing theories from psychology and economics it is important to empirically investigate whether entrepreneurs are special regarding their decision process and emotional influences. Since most of the studies discussed in this chapter have been conducted with students rather than with real entrepreneurs and the experimental designs are not incentive compatible (important exception: Burmeister-Lamp et al. 2012) it is important to provide data that overcomes this issue. We hope to contribute to this gap with our study in part IV.

III Methodological part

III.1 Methodological foundations

Homo oeconomicus, *noun, masculine*
- never seen in nature
(Discussion on rationality in 'The European')

III.1.1 Experiments as research paradigm

In the 1960s, philosopher Karl Popper coined the term 'Critical rationalism' as a theoretical framework that combines both induction and deduction (Popper 1959). Scholars develop testable hypotheses from theory that in turn are empirically tested. From Popper's (1959) point of view, scientific theory should be subject to rational criticism and empirical testing in order to falsify hypotheses. One excellent empirical approach to testing theory-backed hypotheses is experimental research. Using experiments as a research method has the advantages of being able to control variables, explicitly test hypotheses, and establish causal relationships (Campbell and Stanley 1963, Schade and Burmeister-Lamp 2009, p.91 ff.). Moreover, experiments are an excellent tool for challenging and empirically testing the assumption of the homo oeconomicus model. Controlled experiments allow explicit testing of predictions from theory and studying behavior. This is also important for policy questions since experiments allow testing for instance interventions or implementation of markets such as matching markets (Kagel and Roth 2000).

An ongoing methodological debate exists about the use of laboratory experiments in the social sciences (see e.g., Levitt and List 2007, Falk and Heckman 2009, List, 2009, Henrich et al. 2010, Bardsley et al. 2009). Henrich et al. (2010) complain that "behavioral scientists routinely publish broad claims about human psychology and behavior in the world's top journals based on samples drawn entirely from Western, Educated, Industrialized, Rich, and Democratic (WEIRD) societies." (p. 61). They may well have a point saying that some experimental studies might claim generalizability that is not justified and it is necessary for advancement of this field of research to conduct more replications of empirical studies. However, I believe the statement by Henrich et al. (2010) to be fairly exaggerated. In 2010, the Journal of Experimental Psychology published a special issue on 'Issues in the Methodology of

Experimental Economics' (edited by Rosser & Eckel 2010). Authors including Vernon Smith, Werner Güth, and Elinor Ostrom discuss important critics and relevance. This discussion is important to guarantee good practice of experimentalists so that results remain reliable (see Bardsley et al. 2009 for an interesting overview). One point that is oftentimes criticized is using students as subjects. Inviting students has naturally certain benefits such as being easily available, or having a steep learning curve. On the other hand, this means that the empirical foundation of many domains in economic decision making is largely based on laboratory experiments with self-selected student participants (Falk et al. 2011, Friedman and Sunder 1994). Potential problems arise if students who participate in laboratory experiment differ systematically from non-students and also from students who do not sign up for experiments. Falk et al. (2011) find using a large dataset (N=16,666) of donation choices that for social preferences self-selected students do not differ from other students. Moreover, they find that students and non-students behave very similar in other to the participant pool similar trust experiments. Hence, the choice of subjects very much depends on your research question (see also Gaechter 2010).

Experiments are further especially suited for research in a very dynamic environment such as *entrepreneurial decision making*. High dynamics threaten the reliability of relationships so that using experimentation allows controlling for certain factors or noise (Schade 2005). Moreover, using experiments as empirical method is especially suited for *emotion research*. First, alternatives are rather limited. Simply, very little data sets on peoples' emotions exist. One exception is panel studies measuring individuals' wellbeing or life satisfaction in data sets such as the SOEP, the WHO, or the World Valued Survey. Note however that such studies deal with the broader concepts of wellbeing or satisfaction and not with induced emotional states, i.e., with what this thesis is concerned with. Second, using questionnaire surveys as a method would be an option however imposes several limitations. A major drawback of survey methods is that they cannot be incentivized. Inducing emotions in field experiments implies potential ethical problems. In the next section, I will introduce the special characteristics of economic experiments and methodological challenges.

III.1.2 Economic experiments

The use of laboratory experiments has a long history in economics and received growing acceptance in the economic community over the past years. For instance, Hamermesh (2013) analyzes 748 refereed articles in the American Economic Review (AER), Journal of Political Economy (JPE), and Quarterly Journal of Economics (QJE), for one year in each decade from 1960-2010. He discovers that the percentage of experimental papers increased from 3.7 percent in 1993 and 2003 to 8.2 percent in 2011 (p. 168). Nobel prize winner Al Roth points out that the first economic experiments date back to the 1930s and received increasing attention around the time of von Neumann and Morgenstern publishing their 'Theory of Games and Economic Behavior' in 1944 (Kagel and Roth 1995). In the 1960s and 1970s, the field grew increasingly and was dominated by experimentalists in Germany (Heinz Sauermann, Reinhard Selten, and Reinhard Tietz) and the US (Charles Plott and Vernon Smith). For an overview of the history of experimental economics, please refer to Kagel and Roth (1995).

Within the framework of economic experiments, participants are rewarded with real monetary outcomes and preferences are elicited via incentive compatible mechanisms (Campbell and Stanley 1963). This is in line with *induced-value theory* (Smith 1976) in order to gain experimental control over participants' characteristics. Smith (1976) identifies three sufficient conditions: First, participants must prefer more reward to less without becoming satiated (*monotonicity*). Second, the reward has to be dependent on the agent's choices (and potentially the choices of other players in the experiment) (*salience*). Third, agents' utility changes only according to the reward, other influences are neglect able (*dominance*) (see Friedman and Sunder 1994 for further discussion and examples).

The strength of economic experiments as introduced by Nobel Prize winners Vernon Smith (2002) and Reinhard Selten (1994)[8] is that they are *incentive compatible* and hence elicit the decision makers' real preferences (Smith 1976, Selten 1993, Friedman and Sunder 1994, Kagel and Roth 1995, Schade 2005). A further important

[8] Note that Reinhard Selten was awarded the Nobelprize for his theoretical work on the analysis of equilibria in non-cooperative games and not for his brilliant early work on economic laboratory experiments.

criterion is randomization to ensure that the differences between and within groups are not systematic (Friedman and Sunder 1994, Kagel and Roth 1995). Well-designed experiments ideally are *internally* and *externally valid*, whereas validity means the extent of a test measuring what it claims to measure. Internal validity raises the question of causality of variables, asking: Did the experimental treatment make a behavioral difference so that we can rule out alternative explanations? External validity is also called generalizability, asking the question whether the observed effect can be generalized to different populations, settings, or variables (Campbell and Stanley 1963, Friedman and Sunder 1994). Typically, laboratory experiments have a very high internal validity as compared to other methods and a comparably less strong external validity. Any empirical researcher faces a tricky trade-off between both types of validity. Using laboratory experiments in an artificial set up enables testing a direct and causal relationship between independent and dependent variables that may be less externally valid. Large field studies provide very externally valid results however oftentimes lack internal validity in the sense that you cannot ensure that the observed effect steams from your treatment. Hence, it always depends on the degree of dynamics, relevance of personality or experience, and relevance of incentives when deciding what empirical method to use (for an extensive discussion see Schade 2005).

Several factors are potentially problematic for internal and external validity and ideally need to be controlled for in laboratory experiments (for a comprehensive discussion see Campbell and Stanley 1963). First, certain events between several measurements may be problematic for causality (*history* effects). For instance, if the different experimental sessions are carried out over several weeks some event that happened during that time may alter the response. Further, one needs to be aware of possible *maturation* effects, for instance individuals growing hungrier during the day (one can control for this with conducting experimental sessions in the morning, mid-day and evening). Moreover, potential *testing* effects may occur, e.g., effects resulting from testing risk attitudes on subsequent measurements. An easy way to control for this is to randomize the order of tasks. *Instrumentation* in the sense of altering for example the observers can also change findings so that it is important to not change the experimental conditions during the data collection. The possibility of respondents dropping out of experiments (*experimental mortality*) especially in repeated designs has obviously to be accounted for. Further, *selection biases* when assigning

participants to treatment ad control groups need to be controlled for with randomizing the selection process (e.g., assigning random seat numbers to people entering a laboratory). One statistical phenomenon potentially troubling internal validity is *regression to the mean*. It occurs when your sample or groups are drawn nonrandom from a population, an extreme group is selected and if then measured again, the mean will be closer to the mean for all subjects than the first. Finally, experimentalists need to be careful when interpreting results and ruling out the possibility of phenomena such as *selection-maturation interaction*. Regarding external validity, one needs to be careful about participants' *responsiveness* to experimental tests as prior tests such as pretests influence respondents' behavior as compared to untested participants. Recruiting systems such as ORSEE (Greiner 2015) make it possible for the experimenter to invite exactly the sample one desires (e.g., only music students that have never before participated in an experiment). Moreover, *selection biases* can be problematic for the interpretation of the observed effect. By nature, certain variables may have a different effect in experiments than they would have to persons in non-experimental settings (*reactive effects* in experimental settings). Last, whenever multiple treatments on the same person are used one needs to be aware of the influence of first treatments on later ones (*multiple-treatment interference*) (Campbell and Stanley 1963). Generalizability of results is most often problematic whenever experiments are carried out with small samples or very specific samples, in one geographical location, or in very idiosyncratic environments generally. Good experimental designs are strong in both regards, internal and external validity, however, some factors can never be fully overcome (Campbell and Stanley 1963).

In general and concluding, conducting both laboratory and field experiments, analyzing survey data and using standard econometric methods in combination should be the greatest benefit for the social sciences whereas arguments about what method is superior may rather hinder progress (see also List and Heckman 2009). In the present thesis, we pursue an experimental approach as for our research questions this is most suitable. Part V discusses alternative methodological approaches and compares.

III.2 Inducing emotions in the laboratory – Developing a database of film clips

A crucial aspect when conducting research on emotions is how to reliably induce them. This is not a trivial endeavor. Consider the following example: In the context of the recent discussion about a 'replication crisis' of laboratory experiments[9], Camerer et al. (2016) replicated all of the 18 experimental studies published in the American Economic Review (AER) and the Quarterly Journal of Economics (QJE) from 2011-2014. Amongst the replicated experiments is the only experimental study on emotions and economic choices published in the AER so far – a study by Ifcher and Zarghamee (2011) showing that positive mood influences time preferences. Interestingly, Camerer et al. (2016) were not able to replicate the results of Ifcher and Zarghamee. The question is why. As Camerer et al. (2016) state: "Mood induction is the key in this experiment. It had the intended effect on affect in the original article (…). In the replication study, mood inducement did not have the intended effect on affect." (p.4, additional materials[10]). For mood induction, Ifcher and Zarghamee (2011) used a short clip of stand-up comedian Robin Williams (positive mood) as compared to a (seemingly) neutral scene (a documentary about the Denali Wildlife). However, the main character of the film clip expected to induce happiness in the original study, Robin Williams, died tragically in 2014 – before the replication study took place – by committing suicide. Camerer at al. (2016) observed that 11 out of 86 respondents felt sadder after watching the Robin Williams clip and 90% of subjects in the happiness treatment knew that Robin Williams had previously died. Further, I believe the images of the Denali Wild Park may not be perceived as neutral but rather positive to some audiences[11].

The present discussion about the replicability of experimental studies demonstrates the importance of choosing the right methods and materials to induce

[9] for a discussion see e.g., Maxwell et al. 2015

[10] Additional material, replication reports, and all data 18 of studies that were replicated by Camerer et al. (2016) can be found here: https://experimentaleconreplications.com/

[11] You may refer to Appendix A, for an image of the Denali National Park and build your own opinion whether you perceive the scenery as neutral or rather positive.

emotions. The current study carefully tests material and methods to induce emotions in order to develop a database of appropriate film clips for a German audience.

III.2.2.1 Emotion elicitation

Scholars interested in emotion research have used different methods to elicit emotions in the laboratory. One can distinguish between eight domains of emotion elicitation tools according to the 'Handbook of emotion elicitation' (Coan and Allen 2007): static photos (Lang 1979) and facial expressions (Ekman, Levenson and Friesen 1983), relived emotions (Levenson 2007, Rottenberg, Ray, and Gross 2007, Foo, 2011), interaction with trained people (Ax 1953), music and singing (Sutherland, Newman and Rachman 1982), acoustic startle reflex (Lang, Bradley, and Cuthbert 1990), startle eye blink modulation (Levenson 2007), directed facial action tasks (Ekman 2007), and film clips (Gross and Levenson 1995, Rottenberg, Ray and Gross 2007). Each of the elicitation methods imposes certain advantages and disadvantages that I will discuss in the following.

Static photos either in form of pictures used from a large database such as the International Affective Picture System (IAPS) or pictures of emotional faces work quite well for positive, negative and neutral emotions. However, only a limited range of emotions can be elicited. Thus, for our approach of eliciting specific emotions (such as fear and happiness) using static photos is less favorable. Next, relived emotions have been used both with autobiographical memories (e.g., Foo 2011) as well as with shared memories, like recalling a memory that made the participant especially angry. This has been applied in most studies from the entrepreneurship literature, see for example Foo (2011). Recalling memories results in good ecological validity, is engaging and personally salient. However it also has the disadvantage that it is idiographic, i.e., varies from participant to participant and cannot be standardized (Coan and Allen 2007). Dyadic interactions mean that in laboratory or field settings a trained person interviews the participant and aims to provoke a certain emotion. This method is very naturalistic but also very idiosyncratic. More, music has been used in order to elicit emotions in a range of studies (Clark 1983). Researchers highlight that even though music effectively induces emotions individual differences plus differential responding to music oftentimes pose problems (Västfall 2002). Further,

using the acoustic startle reflex method you record a reaction to a certain stimulus (Lang et al. 1990). A large eye blink implies a negative emotion whereas a small eye blink implies a positive emotion. Here again one can only distinguish the valence of an emotion. Other, directed facial action tasks can also elicit emotions. Here, you ask the participants to put their facial muscles in the configuration associated with an emotion (e.g. corner of lips up or down) what signals the respective emotion to the brain (Ekman 2007). Given the advantages and disadvantages of the previous elicitation methods we chose to use film clips as means of emotion induction in the following experimental studies.

Films as method for inducing emotions in the laboratory have already been used in the 1960s and 70s in order to evoke different levels of intensity of emotional states and stress (e.g., Lazarus et al. 1972, Notarius and Levenson 1972). Moreover, scholars interested in eliciting discrete emotions like anger (Brown et al. 1977) or fear (Mewborn and Rogers, 1979) have used films as method as well. Using film clips has the desirable property of being dynamic rather than static and being readily standardized. However, one limitation is the question of which set of stimuli to use. In the next chapters I will give an overview of and discuss studies that have identified film clips for inducing emotions in the laboratory in the past. Further, an own database of film clips is developed.

III.2.2.2 Existing film sets to elicit basic emotions

Ample scholars from psychology have addressed the question which film clips to use in a laboratory to elicit emotions. In the following, I will summarize the findings of these studies and as a basis for an own database identify relevant movie clips for our target emotions happiness, fear, and for neutral scenes.

Lazarus, Speisman, Mordkoff, and Davidson (1962) were one of the first scholars to introduce motion picture film into the laboratory in order to induce – in their study – *psychological stress*. McHugo, Smith, and Lanzetta (1982) pioneered in showing participants various film clips and let them rate their feelings on a modified Differential Emotions Scale (DES) and identified three *clusters*: fearful-anxious, disgusted-scornful, and amused-warmhearted. Further, Tomarken, Davidson and Henriques (1990) used short film clips to elicit *positive and negative affect.* They used

baseline electroencephalographic (EEG) measures in order to assess whether resting EEG asymmetry predicts affective responses. *N*=32 female subjects watched five (cohort 1) or eight (cohort 2) films clips (duration 45-120 seconds) in color. All clips were silent. The first cohort watched first a video targeting a neutral state (unfortunately Tomarken et al. (1990) do not provide further explanation on the stimulus), then two positive clips (a puppy playing with flowers and monkey playing and taking a bath), and two negative clips (depicting an amputation of a leg and a burn victim, scenes taken from training videos for nurses). Cohort 2 watched two positive stimuli and six negative stimuli, whereas two clips were designed to target each of the discrete emotions sadness, anger, and disgust. Here, clips were taken from commercially available films selected from a pool of originally 40 clips that were rated by *N*=122 undergraduates in groups of 10 to 15 (9 point rating scale). The study does not provide the film names (only stating e.g. The Godfather, see p. 794). However, Hewig et al. (2005) reported to have used all clips from the set developed by Tomarken et al (1990): On Golden Pond, An Officer and a gentleman, for positive valence, and Ghandi, Witness, The Godfather, Mari's Lover, An Officer and a gentleman, The Killing Fields (see Hewig et al. 2005, p.1098-99). Clips were shown in random order and each clip preceded a short synopsis. EEG was recorded in both cohorts. For a further discussion of frontal asymmetry results please refer to Tomarken et al. (1990).

Gross and Levenson (1995) identified a set of films eliciting eight discrete emotions (amusement, anger, contentment, disgust, fear, neutral, sadness, surprise). They considered a pool of 250 movies that had been nominated by a group of film critics, video store employees and film fans. This procedure resulted in 78 films that were then shown to 494 undergraduate students at an US university in group film viewing sessions (31 groups). Each subject watched ten films. After each film they had to complete a questionnaire asking about their emotional states and how much they felt each of the following emotions on a 9-point scale. In each group there were no two films shown that would target the same emotion and maximum three films targeting the same valence were shown in a row. Each group session started with a film that was known to arouse relatively low levels of contentment. Gross and Levenson (1995) evaluated the films according to their intensity, being the mean level at which the emotion was rated (note that they already targeted each film with a concrete emotion that was found to be the case in 74 out of 78 films). Discreteness was

measured by a hit rate index, i.e., the percentage of subjects who said that they had had experienced the target emotion more intensely than the other emotions. These two scores combined represent the success index and lead two the following recommendations for eliciting eight discrete emotions in the lab. For amusement the films are: *When Harry met Sally* (*M*=5.54) and *Robin Williams live* (*M*=5.86). Fear was best evoked with scenes from *The Shining* (*M*=4.08) and *Silence of the Lambs* (*M*=4.24). Two videos depicting abstract shapes and color bars have been identified as neutral (mean emotion ratings of smaller than 2 points on each emotion dimension). Please see Gross and Levenson (1995), p. 94, table 1 for an overview of all clips.

Interestingly, the authors find that women and people who had seen the respective movie before showed greater levels of intensity of target emotions. Amongst the eight emotions there are considerable differences concerning the intensity and discreteness of responses, ranging from rates larger than 80 percent for amusement, disgust, and sadness to considerably lower rates for the films eliciting anger (22 / 42 percent). Moreover, the different states differ in levels of intensity with disgust, amusement, anger, and sadness being elicited more intensely than surprise, fear and contentment. Thus, it seems that anger, contentment and especially fear are more difficult to elicit. This might be the case because for instance when being asked for their emotions one would rather circle happiness than contentment, or simply the films did not work well in eliciting the targeted emotions. In conclusion, even though one has to be careful when using videos to elicit emotions, the work by Gross and Levenson (1995) provides a reliable and carefully tested set of films. Unfortunately, they 'only' provide two clips per emotion and their subject pool are US college students. Hence, we cannot use these recommendations immediately but the findings serve as excellent base for an own dataset.

More recently, Hewig et al. (2005) revised existing film sets (Gross and Levenson 1995 and Tomarken et al. 1990) for inducing basic emotions, and explicitly included neutral clips that are more comparable to the clips targeting discrete emotions. Rather than using abstract forms, they include clips from commercially available films targeting neutral states. Overall, 20 clips (four neutral, four clips targeting anger, and each three clips targeting disgust, fear, amusement and sadness) were first selected and then shown to *N*=38 subjects. The films were shown in *German* language in four group viewings. The participants watched 20 film clips on a television whereas each session

started with a (supposedly) neutral clip and no clips of the same target emotion were shown in a row. After watching the clips participants answered an inventory consisting of 21 emotion-related items (happiness, pleasure, amusement, hope, affection, desire, sympathy, relief, boredom, frustration, anger, rage, sadness, fear, disgust, shame, guilt) on a 10-point scale. Hewig et al. (2005) identified at least two clips to elicit the specific target emotion whereas they always included those items that corresponded most closely to the target emotion, i.e., for the anger clips rage and anger and for the happiness clips amusement, pleasure and happiness were included. The film clips *When Harry met Sally* and *An Officer and a Gentleman* yielded the highest rating for the happiness/amusement stimuli. The fear stimuli *Halloween* and *Silence of the lambs* yielded the highest ratings. For all four neutral stimuli (*All the presidents' men, Hanna and her sisters, Crimes and misdemeanors*, and *The Last Emperor*) the highest mean was below 2.5. This provides a very useful base for our study. However, we need two and four clips respectively for each emotion for the experimental studies in chapter IV so that we need to validate new clips.

Furthermore, some studies exist that develop databases in other speaking languages than English and German. Philippot (1993) conducted a validation study with *N*=60 students (35 female, 25 male) in Belgium. Twelve movie excerpts aimed to elicit six specific emotions (joy, anger, fear, sadness, disgust, and neutral state). The movies were shown with French subtitles whenever the original version was not French. The movies targeting happiness, fear, and neutral state were two clips from *Le magnifique* (French comedy parody); *Psycho* and *Halloween*, and two *documentaries*, respectively. Schaefer, Nils, Sanchez, and Philippot (2010) developed a new and comprehensive set of film clips. They chose ten film scenes (identified out of 824 film excerpts rated by 50 film rental store managers) for the target emotions fear, anger, sadness, disgust, amusement, tenderness, and neutral scenes. *N*=364 French speaking students viewed the clips in individual sessions in the laboratory in French language. The authors proceeded in the same way as described above (neutral scene first, no two scenes of one valence in a row) and for each person ten clips were shown in row. Each clip was preceded by a 2.5 minutes relaxation procedure. After each clip, participants completed questionnaires about their emotional states (DES (Izard et al. 1974) and PANAS (Watson et al. 1988)) on a 7 point scale.. The authors report the following scenes ranked highest on the target emotion amusement*: Les trois frères, The Dinner*

Game, La cite de la peur and *The visitors.* Scenes evoking fear were *The Blair Witch Project* and *The Shining* (mean 2.93 and 2.77 respectively).

Fernandez Megias, Mateos, Ribaudi, and Fernandez-Abascal (2011) validated a Spanish version of a dataset of films to induce differentiated basic emotions. 57 scenes of Spanish dubbed films targeting seven emotions (anger, fear, sadness, disgust, amusement, tenderness and neutral scenes) were tested with *N*=127 subjects. The authors identified *When Harry met Sally* and *Here comes Mary* as highest ranked on amusement (diversion in Spanish), *Scream 2, The Blair Witch Project* and *The Exorcist* had highest ratings on the target emotion fear, and four neutral scenes depicting Sticks and documentary scenes (see Table 1 in Fernandez Megia et al. (2011) in Spanish for further clips). This battery of clips was afterwards employed by Fernandez, Pascual, Soler, Elices, Portella, and Abascal (2012) in order to elicit physiological responses.

Moreover, Carvalho, Leite, Galdo-Alvarez, and Goncalves (2012) aimed to develop a database of film clips without auditory content. They selected 52 clips and showed them to *N*=113 people. They also measured the heart rate and skin conductance level of *N*=32 volunteers. The authors showed excerpts of horror movies and erotic scenes to participants and measured the dimensions valence, arousal, and dominance rather than discrete emotions. Gamboa, Silva, and Fred (2013) just recently designed a database (called HiMotion) that provides cognitive tasks and a video set for affective elicitation. They aim to provide a more homogenous database for video clips (comparable picture and audio stimuli, such as the IAPS or IADS). They collected 14 videos targeting the six emotional states amusement / happiness (clips are *When Harry met Sally*, and *Officer*), anger, disgust, fear (clips are *Lambs* and *Shining*), sadness, surprise, and neutral states. The experimental procedure followed Hewig et al. (2005) and Rottenberg et al. (2007).

In 2007, Rottenberg, Ray and Gross wrote a chapter on emotion elicitation using films in 'The Handbook of emotion elicitation and assessment' (Coan and Allen 2007). The authors identify Philippot (1993) and Gross and Levenson (1995) as the two notable databases for film clips eliciting emotional states. They give recommendations on how to elicit emotions in the laboratory using films. In our own study, we follow their guidelines. Moreover they recommend a set of films to use, based on Gross and Levenson (1995). For the target emotion happiness, Rottenberg et al. (2007) advice to

use *When Harry met Sally, Robin Williams live, Bill Cosby,* and *Whose line Is It, Anyway?*. For fear, they recommend scenes from *The Shining* and *Silence of the lambs*. Clips targeting neutral states were again a documentary on the *Denali National Park* and *Abstract Shapes*. It is important that Rottenberg et al. (2007) differentiate between plain neutral (Sticks) and pleasant neutral (Denali), i.e., clips that elicit low levels of contentment. With plain neutral scenes, there is the threat that participants get bored or frustrated so that the authors favor pleasant neutral clips as baseline.

Concluding, based on the above discussion short film clips serve as a promising tool to elicit discrete emotions in the laboratory. However, some remarks to the existing tools remain for various reasons. First, Gross and Levenson and Philippot (1993) as well as Schaefer et al. (2007) use English and French clips and target an US American and French audience respectively. The German participant would presumably be not as amused by watching US standup comedians or French comedies as the US or French student. Moreover, we need to identify two and four clips respectively for each of our target emotion in chapter IV.1 and IV.2. Hence, we need to develop our own set of film clips targeting the emotions happiness, fear, and neutral state. Table III.1 below summarizes film clips targeting our emotions that have been used in prior studies.

Table III-1: Summary - recommendations for film clips

Target emotion	Film clip	Paper
happiness/ amusement	When Harry met Sally	*Gross and Levenson 1995, Hewig et al. 2005, Rottenberg et al. 2007, Fernandez Megias et al. 2012, Carvalho et al. 2013*
	On Golden Pond	*Tomarken et al. 1990, Hewig et al. 2005*
	An Officer and a Gentleman	*Tomarken et al. 1990, Hewig et al. 2005, Carvalho et al. 2013*
	Robin Williams live	*Gross and Levenson 1995, Rottenberg et al. 2007*
	Bill Cosby	*Rottenberg et al. 2007*
	Whose line Is It?	*Rottenberg et al. 2007*
	Le magnifique	*Philippot 1993*
	Les trois frères	*Schaefer et al. 2010*
	The Dinner Game	*Schaefer et al. 2010*
	Here comes Mary	*Fernandez Megias et al. 2012*
fear	The Shining	*Gross and Levenson 1995, Rottenberg et al. 2007, Schaefer et al. 2010, Carvalho et al. 2013*
	Silence of the Lambs	*Gross and Levenson 1995, Rottenberg et al. 2007, Schaefer et al. 2010, Carvalho et al. 2013*
	Psycho	*Philippot 1993*
	Halloween	*Philippot 1993, Hewig et al. 2005*
	The Blair Witch Project	*Schaefer et al. 2010, Fernandez Megias et al. 2012*
	Scream 2	*Fernandez Megias et al. 2012*
neutral	Abstract shapes	*Gross and Levenson 1995, Rottenberg et al. 2007*
	Color bars	*Gross and Levenson 1995*
	Denali National Park	*Rottenberg et al. 2007*
	All the presidents' men	*Hewig et al. 2005*
	Hanna and her sisters	*Hewig et al. 2005*
	Crimes and misdem.	*Hewig et al. 2005*
	The Last Emperor	*Hewig et al. 2005*

III.2.3 Validating an own set of film clips

We run two rounds of laboratory sessions in order to identify four film clips for each target emotion (happiness, fear, and neutral control). All sessions were conducted in the laboratory at Humboldt-Universitaet zu Berlin in July and September 2014. In the first round we were successful in identifying four clips targeting fear and happiness each. However, all clips that we chose based on older studies that would presumably evoke a neutral state were rather perceived as very happy, joyful, and amusing (up to point 6 on a scale from 0 to 8). In the following, I will first describe the sample and material of both rounds of experimental sessions. Further I will report and discuss the results and finally present our set of clips.

III.2.3.1 Material

The first film set included 32 film clips with each 8 clips targeting the emotions happiness and fear as well as 8 clips aiming to elicit neutral states. The choice of clips was based on the results by Gross and Levenson (1995), Rottenberg et al. (2007), as well as Hewig et al. (2005). The length of all movies varied between 62 and 188 seconds. All clips were presented in German language. For a full description of the scenes, length and sources please see tables III.2-4.

We picked eight scenes targeting happiness based on past studies. Amongst these, the clip that has been used most often in past studies is the famous 'breakfast scene' from the movie *When Harry met Sally*. We added two scenes from very successful German movies since the target group would be a German audience: *Pappa ante portas* (Loriot) and *Der Schuh des Manitu* (Bully Herbig). More, we added two scenes from the popular comedy show Big Bang Theory: the opening scene from the episode *'Fun with flags'* and a scene depicting the characters Sheldon and Penny in the hospital *'The Adhesive Duck Deficiency'*. Further, we included the 'wakeup' scene from the very successful movie *Hangover*, and two scenes from rather classic comical movies, Woody Allen's *Hanna and her sisters* and *The Naked Gun*, see table below for an overview.

Table III-2: Video clips for target emotion happiness

Target emotion: happiness		
No.	*Clip title*	*Length*
17	When Harry met Sally (breakfast scene)	02:16
18	The Hangover (waking up / tiger in bathroom)	03:08
19	Manitou's Shoe (Bully Herbig)	01:50
20	Big Bang Theory (Penny and Sheldon hospital)	02:07
21	Big Bang Theory (Fun with flags)	01:13
22	Naked gun (Sex Frank?)	02:12
23	Woody Allen (Conversation)	02:38
24	Loriot (Pappa ante portas)	01:44

Furthermore, for the target emotion fear we chose eight scenes from psycho thrillers and horror movies. We opted for scenes creating a tense and frightening atmosphere rather than scenes depicting killings or lots of blood for ethical reasons. We used scenes from *The Shining* and *Silence of the lambs* following Gross and Levenson (1995), Rottenberg et al. (2007), and Hewig et al. (2005). Moreover, we used two classic Hitchcock movie scenes (*The Birds* and *Psycho*), scenes from *The Blair Witch Project* (following Feinstein et al. (2011)), *Mirrors*, *Insidious*, and one scene from *Lord of the Rings*, for an overview see table below:

Table III-3: Video clips for target emotion fear

Target emotion: anxiety		
No.	*Clip title*	*Length*
9	Shining	00:47
10	Silence of lambs	01:39
11	The Blairwitch Project	00:48
12	Insidious	01:59
13	Mirrors	01:48
14	Hitchcock, Psycho	01:47
15	Hitchcock, Birds	01:19
16	Lord of the rings	01:35

For the neutral clips, we carried out two rounds of eights clips as we could not successfully identify four clips from our first dataset. In study 1, we chose a court scene from *'All the presidents' men'* following Hewig et al. (2005), and several scenes out of documentaries about the ocean, desert, or the forest, amongst others. This choice was based on the clips used in studies published in A+ journals such as Loewenstein et al. (2003) and Ifcher and Zhargamee (2011) who used clips about the *Great Barrier Reef* or the *Denali National Park* respectively for eliciting neutral states.

Table III-4: Video clips neutral scenes I

Target emotion: neutral		
No.	*Clip title*	*Length*
1	Adria	01:12
2	All the presidents' men	01:02
3	Birds' travels	01:47
4	Our blue planet	01:12
5	Mythos wood	01:44
6	Waterfalls	01:22
7	The desert	01:24
8	Kaukasus	01:21

Since the only movie that resulted in a neutral perception (i.e., mean values smaller than 2) was the scene *'All the presidents' men'* we decided to replicate the pretest with a new set of clips targeting neutral scenes. This time, we did not use documentaries about beautiful landscapes, naturally, but scenes from movies that could be identified as neutral (scenes from '*All the Presidents' men', 'The last emperor', 'The Network', 'Jane Eyre',* and *'North by Northwest'*). We also tested some documentaries about rather 'boring' topics (about fishing, a large cargo ship, and a locomotive). For a summary see table below:

Table III-5: Video clips neutral scenes II

Target emotion: neutral 2.0		
No.	*Clip title*	*Length*
1	All the presidents' men	01:02
2	The Last Emperor	01:20
3	North by Northwest	01:05
4	The Network	00:55
5	Locomotive	01:14
6	Fishing documentary	01:10
7	Jane Eyre	00:57
8	Freighter	01:03

Each participant answered a post film questionnaire after each clip. Following Rottenberg et al. (2007), we asked first to indicate how the participant felt while watching the film on a 9 point scale ranging from *not at all* to *very much* for the emotions: amusement, anger, anxiety, confusion, contempt, disgust, embarrassment, fear, guilt, happiness, interest, joy, love, pride, sadness, shame, surprise, unhappiness. Moreover, we asked what they thought which emotion the average of people might have felt, how pleasant they experienced watching the movie in general, whether they had seen the movie before, and whether they closed their eyes. Finally, each person answered demographic questions.

III.2.3.2 Procedure

In round 1, seven sessions were conducted with each three to nine subjects that lasted 30-45 minutes. All subjects were recruited via the recruitment system ORSEE (Greiner 2015) and the experiment was programmed using z-Tree (Fischbacher 2007). All participants watched the videos in separated booths using circumaural earphones. The light was dimmed so that they could fully concentrate on watching the videos. Participants were told that they would be shown film clips and were asked to watch carefully. However, they were told that they could close their eyes or look away whenever they would find a film as to distressing. Participants were assured that their

data would remain anonymous. They received Euro 6 as compensation for participating in our study. Contact between the experimenter and the subjects was minimized in order to avoid demand effects. Moreover, we videotaped each session in order to being able to control for possible noises in the laboratory such as loud laughter or screaming.

Each participant watched twelve clips out of the final set of 24 clips, four clips of each target emotion. The clips were shown in a random order. The first film shown was always a neutral clip in order to accustom the participants (see Hewig et al. 2005). Moreover, two clips targeting the same emotion were not shown in a row and we ended each session with a clip targeting happiness.

We proceeded in the same manner for round 2 of the pretest. For happiness and fear we used the successfully validated clips from round two (four each). For our neutral target scenes we used eight new clips as described above. Nine sessions were carried out with each three to nine subjects.

III.2.3.3 Results

In this section, I will proceed as follows: First, I report our findings from pretest study 1 for all 24 clips. Then, I will report the results from study 2 for the eight neutral scenes, and the four joyful and four fearful clips that have been pre-selected from study 1.

III.2.3.4 Sample

In study one, 27 male and 25 female persons (N=52) participated. The age range was 19-69 with an average age of 31 (SD=9.76). Eighty-five percent were students steaming from a range of different fields. In the second experiment, N=48 subject participated. Thirty-eight percent were male and the mean age was 25 (SD=6.57).

III.2.3.5 Emotion ratings

In study 1, for the target emotion happiness all film clips scored highest on the dimensions happiness and amusement as expected. Measured on a 9-point scale with 8 being the highest rating, all clips yielded mean values of larger than four and medians of 5 and higher. The highest ranked clips on the dimension happiness all have median

values of 6 or 7 (*M* – mean, *Mdn* – median): Harry (*M*=6.52; *Mdn*=7), BBT I (*M*=5.47; *Mdn*=6), Hangover (*M*=5.14; *Mdn*=6), and Naked (*M*=5.0; *Mdn*=6). On the dimension amusement means and medians are: Harry (*M*=7.11; *Mdn*=7), Hangover (*M*=5.96; *Mdn*=6), BBT I (*M*=5.95; *Mdn*=6), and Naked (*M*=5.5; *Mdn*=6). On all other dimensions, the clips yield mean values smaller than 3. We can conclude that four clips targeting the emotion happiness have been identified successfully. See table below for all means (SD) and mediums. Graphical representations can be found in Appendix A.

Next, the clips targeting fear elicited the expected emotion as well. Both Hitchcock movies, and the scene from Lord of the rings only yielded means of slightly above fear but more importantly also scored relatively high on the dimension amusement. Four of the eight clips however had high mean and median values on the dimensions fear: Lambs (*M*=6.0; *Mdn*=7), Insidious (*M*=5.30; *Mdn*=5), BWP (*M*=5.1; *Mdn*=5), and Shining (*M*=4.5; *Mdn*=5). For anxiety we see find a similar pattern: Lambs (*M*=5.0; *Mdn*=5), Insidious (*M*=5.50 / *Mdn*=6), BWP (*M*=3.9; *Mdn*=5), and Shining (*M*=4.4 / *Mdn*=4). We chose these four clips for our final battery of film clips since those have been perceived highest on the dimensions fear and anxiety and had very low ratings on all other dimensions. We excluded the clip Mirrors (*M*=6.11; *Mdn*=7) as the perceived fear when watching the clip was very high, and we did not want to disturb our subjects in experimental sessions. Moreover, regarding this clip male and female participants perceived the scene quite differently.

Then, all neutral clips but *Presidents* yielded very high mean and median values on the happiness and amusement dimension. The documentary about the forest even resulted in *M*=5.79 for amusement, *M*=6.0 for happiness, and *M*=3.24 for love. This means, we cannot use the clips as neutral scenes. Interestingly, many published studies in emotion research use documentaries about topics such as the Great Barrier Reef as induction for neutral states. This is potentially problematic. Maybe our findings are special for the German audience, i.e., Germans having a different perception of nature scenes than US Americans (see also discussion on p.80).

Table III-6: Descriptive statistics film clips (round I)

Target emotion			MEDIANS																
	film clip	*N*	*amus*	*ange*	*anxi*	*conf*	*cont*	*disg*	*emba*	*fear*	*guil*	*happ*	*inte*	*joy*	*love*	*prid*	*sadn*	*sham*	*surp*	*unha*
	neutral																			
1	**Adria**	23	**4**	0	0	0	0	0	0	0	0	3	6	2	0	0	0	0	0	0
2	**Pres**	20	**4**	0	0	1	0	0	0	0	0	2	5	0	0	0	0	0	2	0
3	**Birds**	20	**5**	0	0	0	0	0	0	0	0	5	6	5	1	0	0	0	0	0
4	**GBR**	25	**5**	0	0	0	0	0	0	0	0	5	7	4	0	0	0	0	0	0
5	**Wald**	24	**7**	0	0	0	0	0	0	0	0	7	6	7	4	1	0	0	0	0
6	**Waterfall**	20	**5**	0	0	0	0	0	0	0	0	6	7	5	3	1	0	0	2	0
7	**Desert**	25	**5**	0	0	0	0	0	0	0	0	4	7	3	0	0	0	0	0	0
8	**Kaukasus**	28	**3**	0	0	1	0	0	0	0	0	2	6	0	0	0	0	0	0	0
	Fear																			
9	**Shining**	25	2	0	4	2	0	0	0	**5**	0	0	2	0	0	0	0	0	1	2
10	**Lambs**	22	2	0	5	3	1	1	0	**7**	0	0	4	0	0	0	0	0	3	1
11	**BWP**	22	0	0	5	5	0	2	0	**5**	0	0	2	0	0	0	0	0	2	3
12	**Insidious**	22	1	0	6	5	0	3	0	**5**	0	1	3	0	0	0	0	0	4	2
13	**Mirrors**	24	1	0	5	5	1	3	0	**7**	0	0	2	0	0	0	0	0	4	4
14	**H, Psycho**	23	3	0	2	0	0	0	0	**5**	0	1	4	0	0	0	0	0	0	0
15	**H, Birds**	23	2	0	3	2	0	0	0	**4**	0	0	4	0	0	0	0	0	4	1
16	**Lord**	24	5	0	4	0	0	1	0	**6**	0	2	5	0	0	0	0	0	2	1
	happiness																			
17	**Harry**	25	7	0	0	0	0	0	1	0	0	**7**	5	5	0	0	0	2	1	0
18	**Hangover**	22	6	0	0	2	0	2	0	1	0	**6**	4	1	0	0	0	0	5	0
19	**Manitu**	21	6	0	0	0	0	0	0	0	0	**6**	3	3	0	0	0	0	0	0
20	**BBT - KKH**	21	6	0	0	0	0	0	0	0	0	**6**	4	3	0	0	0	0	0	0
21	**BBT - FFF**	24	6	0	0	0	0	0	0	0	0	**6**	4	4	1	0	0	0	0	0
22	**Naked**	23	6	0	0	1	0	0	0	0	0	**6**	5	3	0	0	0	0	2	0
23	**Woody**	24	6	0	0	1	0	0	0	0	0	**5**	5	1	1	0	0	0	2	0
24	**Loriot**	23	5	0	0	0	0	0	0	0	0	**5**	4	3	0	0	0	0	0	0

Given the results of round 1, we ran a follow up pretest using the four clips for happiness and the four clips for fear plus eight new neutral scenes as described above. The table below depicts mean and median emotion ratings. As in the first pretest study, the clips targeting happiness score high on the dimensions happiness: Harry (*M*=4.3; *Mdn*=4), BBT I (*M*=5.2; *Mdn*=6), Hangover (*M*=4.5; *Mdn*=5), and Naked (*M*=4.0; *Mdn*=4), and amusement Harry (*M*=5.8; *Mdn*=6), BBT I (*M*=5.8; *Mdn*=7), Hangover (*M*=5.8; *Mdn*=6), and Naked (*M*=4.8; *Mdn*=5). Median values on other dimensions are very low (0-2).

The same pattern applies to the fearful clips. All four clips have high ratings on the dimensions fear: Lambs (*M*=5.1; *Mdn*=6), Insidious (*M*=5.0; *Mdn*=6), BWP (*M*=5.2; *Mdn*=6), and Shining (*M*=4.3; *Mdn*=4), and anxiety: Lambs (*M*=3.6; *Mdn*=4), Insidious (*M*=5.20; *Mdn*=6), BWP (*M*=4.4; *Mdn*=5), and Shining (*M*=3.5; *Mdn*=4). On other emotion dimensions ratings of 0-2 can be found.

Further, this time the neutral scenes have apparently been perceived as neutral. Only one clip hat a rating of 4 on the amusement dimension and all clips seem to have caught interest (ratings of 3-6). This is important because we do not want to bore participants and create negative feelings such as annoyance. Six out of eight clips have been evaluated as very neutral (mean values of smaller than 1 or 2 on all dimensions): Presidents', Fishing, Network, Jane, North and Freighter. Out of these the four clips depicting scenes from motion movies have been selected in order to achieve a homogenous set of films.

Table III-7: Descriptive statistics film clips (round II)

Target emotion			**MEDIANS**																	
film clip		***N***	***amus***	***ange***	***anxi***	***conf***	***cont***	***disg***	***emba***	***fear***	***guil***	***happ***	***inte***	***joy***	***love***	***prid***	***sadn***	***sham***	***surp***	***unha***
	neutral																			
1	**All the pres**	21	**2**	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0	1	0
2	**Last emperor**	20	**3**	0	0	0	0	0	0	0	0	2	6	1	0	0	0	0	0	0
3	**Fishing**	21	**1**	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
4	**Network**	20	**1**	0	0	4	0	0	0	0	0	0	3	0	0	0	0	0	1	0
5	**Jane**	27	**2**	0	0	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0
6	**Post**	28	**4**	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0
7	**Freighter**	28	**1**	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
8	**North**	28	**2**	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0
	fear																			
9	**Shining**	48	1	0	4	3	0	0	0	**4**	0	0	3	0	0	0	0	0	2	1
10	**Lambs**	48	1	0	4	1	0	0	0	**6**	0	0	2	0	0	0	0	0	3	2
11	**BWP**	48	0	0	5	4	0	1	0	**6**	0	0	2	0	0	0	0	0	1	3
12	**Insidious**	48	1	0	6	4	0	1	0	**6**	0	0	2	0	0	0	0	0	3	2
	happiness																			
13	**Harry**	48	6	0	0	0	0	0	2	0	0	**4**	3	1	0	0	0	1	1	0
14	**Hangover**	48	6	0	0	0	0	1	0	0	0	**5**	4	1	0	0	0	0	2	0
15	**BBT**	48	7	0	0	0	0	0	0	0	0	**6**	5	3	0	0	0	0	0	0
16	**Naked**	48	5	0	0	1	0	0	0	0	0	**4**	3	1	0	0	0	0	1	0

Concluding, in line with prior studies (e.g., Hewig et al. 2005) we chose out of the eight clips those four who (i) had low ratings on the emotion dimensions and (ii) were scenes from motion pictures, as our film clips for positive and negative emotions also stemmed from motion pictures. Concluding, our final film battery consists of the following clips:

Table III-8: Final set of film clips

Neutral clips		**Fearful clips**		**Happy clips**	
N1	All the presidents' men	F1	The Shining	H1	Harry met Sally
N2	The network	F2	Silence of the lambs	H2	The Hangover
N3	Jane Eyre	F3	Blair Witch Project	H3	Big Bang Theory
N4	North by Northwest	F4	Insidious	H4	The naked gun

III.2.3.6 Discussion

In two rounds of experimental sessions with overall *N*=100 participants a reliable set of film clips with four clips for three discrete emotions could be validated. It appeared that neutral states are most difficult to evoke and apparently need to be chosen extra careful depending on the audience. Hence, the present set of clips is suitable for a German audience.

Using film clips certainly has some limitations of generality. First, we rely on *self-reported data* to assess emotional responses. Using self-reported data for emotion research in the present case serves as very good foundation. Have physiological measures as well would be a nice addition to identifying discrete emotions. *Demand effects* may also be of concern in this pretest. We asked participants to watch film clips and afterwards evaluate what emotional state they were in. Naturally, the participants could probably guess the purpose of our research. This might have partly contributed to the relatively high ratings in the first round of sessions regarding the neutral scenes. However, we explicitly asked participants to carefully think about what they have felt and did not encourage them to state one out of all emotions. Given our clear results in the sense of discreteness I do not believe demand effects to play out largely here but I can of course not rule out influences.

Further, as Hewig et al. (2005) already noted, participants sit passively when watching clips in a laboratory rather than being active as in real life situations. This raises the question of ecological rationality. Moreover, eliciting emotions via clips might be rather specific for western cultures, i.e., the interpretation of those film clips is partly owed to western culture and conventions. This is important to keep in mind however of no concern for our further experimental studies with German participants.

IV Experimental studies

IV.1 Emotions and risk preferences

IV.1.1 Introduction

Emotion and decision research demonstrates that emotions influence people's judgment and choices (e.g., Lerner et al. 2015). Understanding the relevance of emotions for risk and ambiguity preferences is critical for understanding decision making in an uncertain world. It has important implications for communicating and presenting information about risky choices, for instance in medical and financial decision making. Two emotions that are especially relevant for risk decision making are happiness and fear. Both happiness and fear are prevalent emotions in decision makers' daily lives and hence potentially relevant influencing factors on risky choices. In this chapter, I study the influence of induced happiness and fear on risk taking behavior in an experimental setting.

Risk taking behavior has been researched extensively and interdisciplinary by economists (e.g., Arrow 1965, Holt and Laury 2002, Falk et al. 2015), psychologists (e.g., Slovic 1962, Kahneman and Tversky 1979, 1992), neuroeconomists (e.g., Camerer et al. 2005, Glimcher and Fehr 2013), and entrepreneurship scholars (e.g., Brockhaus 1980, Forlani and Mullins 2000). A thorough understanding of individuals' risk preferences is crucial for research, applications in real life, and policy implications. Hence, scholars have studied risk taking in the laboratory and in the field, explored risk preferences over a range of different agents (e.g., students, entrepreneurs, rural fishermen in Indonesia), and animals such as honeybees (Shafir et al. 2008).

Moreover, risk taking behavior and emotions (affect, or mood) have been studied especially in psychology for decades. Researchers around Alice Isen in the 1980s find significant influences of positive affect on risky choices in laboratory studies (e.g., Isen and Patrick 1983, Arres, Herren and Isen 1988). Further, one important stream of research focuses on how affect influences risk perception (Lerner et al. 2003, Rakow et al. 2015). Johnson and Tversky (1983) for instance find strong influences of a person's affective state and perception of risky situations on risk estimates. Understanding this relationship is not only important for economic and cognitive modeling but also, or especially, for risk communication and policy implications.

In economic theory, risk propensity is usually assumed a stable preference or personality trait. This implies that individuals take similar risks across situations. According to standard economic theory, individuals have different risk attitudes. An individual can be risk averse, risk neutral, or risk prone. One can further distinguish and measure risk aversion as increasing or decreasing and relative or absolute. Recent studies from the field of economic psychology and behavioral economics question this assumption of context independency. Figner and Weber (2011) review definitions of risk attitudes across situations and structure factors influencing risk taking behavior. This includes approaches on understanding how emotions influence risk taking. Scholars find systematic influences of emotions in economic experiments on for instance time preferences (Ifcher and Zaghamee 2011), or risk taking behavior measured via WTP for insurances (Schade et al. 2012). One interesting question that arises in this context is whether induced happiness and fear systematically influence risk preferences in economic laboratory experiments.

Risk taking behavior as a personality trait is considered to be one of the key drivers of entrepreneurial choices and success. Hence, in entrepreneurial decision making, risk propensity is discussed and researched heavily (Brockhaus 1982, Ahmed 1985, Palich and Bagby 1995, Carland et al. 1995, Forlani and Mullins 2000, Mullins and Forlani 2001). This tradition goes back to Knight (1921) who defines the entrepreneur as *the* decision maker under uncertainty. Scholars propose that entrepreneurs accept higher risks than non-entrepreneurs and therefore are associated with having a higher risk taking propensity. One other argumentation is that entrepreneurs in fact only perceive risks differently than others. For instance, Brockhaus (1982) finds when controlling for perceptual variables that entrepreneurs and managers do not differ too much in their willingness to take risks. Studies on emotions and entrepreneurs' risk preferences are rare (Foo 2011).

In this chapter, we study the influence of two specific emotions, happiness and fear, on risk preferences in the laboratory. Happiness and fear are especially interesting when studying risk preferences as these two emotions are encountered frequently in both, daily tasks that include risks such as crossing a street, and high-stake decisions such as buying a house or founding a company. Happiness and fear are induced using film clips. We measure risk taking behavior with two different measures: the balloon analogue risk task (BART) by Lejuez et al. (2002) as sequential measure of risk and

the lottery comparison task by Eckel und Grossman (E&G) (2008). Both methods are incentive compatible, easy to understand for participants and especially suited for research of individual differences in risk taking (Charness et al. 2013). I will explain both tasks in the following chapters. We find that people are moderately risk taking in the lottery comparison task and in the BART. To our surprise and unexpected, we find no significant influence of induced fear and happiness on individual risk preferences. Potential reasons and implications will be discussed in part IV.1.5. Moreover, we do not find significant gender differences in risk taking behavior.

This paper makes the following contributions. Motivated by the amount of experimental literature providing mixed evidence about the influence (and if so direction) of emotions on risk taking behavior, we provide a random-assigned, incentivized laboratory experiment aiming to clarify the relation of emotions and risk preferences. Contrary to many not incentive compatible psychological experiments that find significant effects of emotions in hypothetical risk situations we observe no significant treatment effects of emotions. This indicates that economic experiments may reveal preferences more reliably than non-incentive compatible experiments and induced emotions do not play a big role when it comes to straight forward and incentivized risk evaluations. This finding is relevant for theory building as previous literature argues about competing theories and directions of the influence of emotions. Further, we provide a comprehensive, condensed, and explicit overview of the experimental literature studying the influence of emotions on risk taking behavior. We summarize and synthesize relevant studies by respective methods of emotion induction and measures for risk preference highlighting the contradicting empirical findings. Moreover, regarding our findings in the subsequent chapter on the strategic value of emotions this is very interesting. Contrary to the present study, we find that induced happiness and fear have a significant influence in market entry decisions. I will further discuss these findings and implications in chapter IV.1.5.

The remainder of this chapter is organized as follows. The next chapter reviews and synthesizes the relevant literature, provides theory, and develops the hypotheses. Subsequent sections provide the experimental design, analyses, discussions, as well as limitations, implications and future research opportunities. This chapter closes with concluding remarks.

IV.1.2 Theory and hypotheses

IV.1.2.1 Eliciting risk preferences

Empirically, one of the biggest challenges when studying risk taking behavior is how to measure and elicit risk preferences. Paul Slovic concludes already in his 1962 paper where he studies the convergent validity of several instruments that measure risk-taking behavior (questionnaires and gambling tasks) and finds no to little correlations:

> "(…) (a) none or only few of the variables analyzed actually measure the trait; or (b) willingness to take risks may not be a general trait at all but rather one which varies from situation to situation within the same individual." (Slovic 1962, p.70).

Measures have since then become more advanced (e.g., lottery comparison tasks such as the popular task by Holt and Laury 2002), and designed as context dependent instruments (e.g., Domain-Specific Risk-Taking scale by Weber et al. 2002). Moreover, the importance of real incentives when eliciting risk preferences has been stressed and demonstrated (Holt and Laury 2002, Treffers et al. 2012). However, the debate on what measure to use in which context is still ongoing. Scholars oftentimes argue that different measures really measure different phenomena. For instance, in a large study with 1,000 subjects Frey et al. (2016) collect a battery of risk attitude measures including self-reports and behavioral measures. The authors find only weak correlation between self-reports (such as the sensation seeking scale by Zuckerman 1974) and behavioral measures (such as lottery comparisons).

In economics and psychology ample methods for eliciting risk preferences exist. According to Charness et al. (2013) choosing the relevant measure mostly depends on the characteristics of the sample and the research question at hand. The authors discuss relevant methods for eliciting risk preferences and classify them according to complexity and suitability. They argue that very complex methods are usually used when estimating parameters and these methods demand mathematical sophistication of the participants in order to ensure the task is thoroughly understood. Simpler methods on the other hand that are easier to understand are most suitable when the research question is to identify treatment effects or differences in individual risk preferences. Hence, based on this argument we opt for two rather simple methods that are easily understood but are incentive compatible: the lottery comparison task by E&G (2008) and the BART by Lejuez et al. (2002).

IV.1.2.2 Relevant literature on emotions and risk preferences

Starting in the 1980s, ample experimental studies empirically investigate the influence of emotions, affect, or mood on risk preferences or perceptions. Table IV.1 below summarizes all studies (to my best knowledge) that aim to study emotions (mood, affect) as independent variable and risk preferences as dependent variable (for completeness I also included studies looking at risk perceptions) that have been published in the economic and psychology literature over the past three decades. These studies show very mixed findings and relations. Some studies find positive affect leading to less risk prone behavior (e.g., Isen and Patrick 1983, Isen and Geva 1987) and some papers find the opposite (e.g., Deldin & Levin 1986, Foo 2011). The table is organized as follows. After providing the year of publishing, authors, and academic journal, the type of experiment is listed. For each study, the independent variable *x* (if applicable in the sense that emotions are manipulated) and respective measurement as well as the dependent variable *y* and respective measurement is given. Further main findings, sample, and incentives are briefly summarized.

Table IV-1: Overview of experimental studies investigating the effect of emotions on risk taking behavior

#	*Authors*	*Year*	*Journal*	*Method*	*X*	*Measurement*	*Y*	*Measurement*	*Finding*	*Sample*	*Incentive*
1	Isen & Patrick	1983	*OBHP*	Lab exp	Positive affect	Delivery of unexpected McDonald's gift certificate ($.50)	Risk taking	Poker game & hypothetical dilemmas	Positive affect subjects bet more on low-risk bet, but less on high-risk bet	*N*=108 under-grad. students	None
2	Johnson & Tversky	1983	*JPSP*	Lab exp	Affect	Brief newspaper report of a tragic event	Risk percep-tion	Estimates of frequency of risks & other undesirable events	Increase in risk estimates	Several studies, students	None
3	Deldin & Levin	1986	*Bulletin of Psycho-nomic Soc.*	Lab exp	Positive, negative, or neutral mood	Velten mood induction procedure (VMIP): subjects read series of 60 statements	Risk	Evaluation of five hypothetical risk-taking scenarios	Positive state (negative) increased (least) willingness to take risk in some hypothetical risky scenarios	*N*=36	None
4	Isen & Geva	1987	*OBHDP*	Lab exp	Positive affect	Receipt of a small bag of candy	Risk prefe-rence	Prob. level of riskiest bet subjects were willing to make in a game of roulette (low, medium, high stake)	Positive affect less risk taking with moderate to high stakes, more risk taking with low stakes	*N*=71 under-grad. students	Course require-ment & treatment candy for N/2

5	Pietromo-naco & Rook	1987	*JPSP*	Lab exp	Depression	Beck Depression Inventory (RDi-SF; Beck & Bcamcsderfer, 1974)	Risk	Set of 10 hypothetical decision scenarios and a corresponding list of potential risks and benefits	Depressed participants assigned greater weight to risks than nondepressed	*N*=306 college students	None
6	Arkes, Herren, & Isen	1988	*OBHDP*	Lab exp	Positive affect	Bag of candy	Risk taking	(1) WTP for lottery tickets, (2) WTP to insure against losses	Positive-affect in risk situation with emphasis on potential -> risk aversion, when potential loss minimized -> risk proneness	*N*=108 (1), *N*=51 (2), *N*=84 (3) under-grad. students.	Course credits / mood induction gifts
7	Wright & Bower	1992	*OBHDP*	Lab exp	Happiness and sadness	Subjects were to recall and elaborate on past happy or sad circumstances they experienced, with the help of hypnosis	Probabi-lity judgment	24 events, requiring subjective probability judgment	Happy (sad) people optimistic (pessimistic), report higher (lower) prob. for positive & lower (higher) prob. for negative events	*N*=51 under-grad students	Flat sum ($3.50)
8	Leith & Baumeis-ter	1996	*JPSP*	Lab exp	Bad mood, embarrass-ment (6 studies)	Autobiographical narrative method	Risk	Lotteries	Bad moods increased risk-taking behavior	*N*=129 & *N*=48 students	Course participa-tion
9	Nygren, Isen, Taylor, & Dulin	1996	*OBHDP*	Lab exp	Positive or no affect	Bag of candy (1) and unexpected gift: high-quality Maxell audiocassette tape (2)	Risk	Betting task (11 three-outcome gambles) & Probability estimation	Positive affect less willingness to bet & optimism about the likelihoods associated with outcomes	*N*=109 (1)*N*=168 (2) under-grad. students	Course credits / mood induction gifts

10	Mittal & Ross	1998	*OBHDP*	Lab exp	Positive or negative affect	Read a short (about half a page) story (adapted from Johnson & Tversky, 1983)	Risk taking	Hypothetical situation: a manager was WTP in strategic risk situation	People in negative state willing to spend higher amount of money than those in positive state	*N*=63 under-grad. & MBA students	Course credits
11	Raghu-nathon & Pham	1999	*OBHDP*	Lab exp	Sadness, anxiety and neutral	Reading and projecting themselves into a hypothetical situation (written format)	Risky gambles	Two gambles of equal expected return: low-risk/low-reward and low prob.– higher payoff gamble	Sad individuals in favor of high-risk/high-reward options, anxious individuals favor of low-risk/low-reward options	*N*=83 under-grad. students	Course credits
12	Gasper & Clore	2000	*PSPB*	Lab exp	Positive and negative emotion	Autobiographical narrative method (writing)	Risk	Risk estimation questions	Mood influences judgments of people with high attention on emotion (not low)	*N*=102 students	Course credits
13	Lerner & Keltner	2000	*Cogn Emot.*	Lab exp	dispositional fear and anger	2 fear & 2 trait anger scales	Risk percep-tion	Johnson & Tversky scale (1983)	Fear predicts higher, anger lower risk assessment	*N*=97 under-grad. students	Course credits
14	Hockey, Maule, Clough, & Bdzola	2000	*Cogn Emot.*	Lab exp	State anxiety, depression, and fatigue	Mood diary (3x a day for 14 days (1), 28 days (2)), planning exercises designed to increase fatigue (3)	Risk	Personal Risk Inventory (hypothetical everyday choice scenarios)	(1)-(3) riskiness affected by state fatigue, not by anxiety and depression	*N*=34, *N*= 58 students (1-2), *N*=55 trainees (3)	None

15	Lerner & Keltner (1)	2001	*JPSP*	Class-room	Trait fear and anger	2 fear & 2 trait anger scales	Risk percep-tion	Asian disease problem	Fearful people express risk averse, angry people risk taking choices	*N*=75 under-grad. students	Course credits
15	Lerner & Keltner (2)	2001	*JPSP*	Take home question-naires	Trait fear, anger, and happiness	Respective scales	Risk percep-tion	Optimism scale (Weinstein)	Fearful people express pessimistic risk estimates, angry and happy people optimistic risk estimates	*N*=601 under-grad. students	Course credits
16	Kliger & Levy	2003	*JEBO*	Data	Weather	National Climatic Data Center (NCDC), SCSS, 'sky coverage from sunrise to sunset'	Capital market risk	S&P call options	Good (bad) mood associated with investors being less (more) willing to tolerate risks	na	na
17	Lerner, Gonzalez, Small, & Fischhoff	2003	*Psy Sc.*	Natural field experiment	Fear and anger	Text description stressing either anger or fear	Risk percep-tion	3 scales: probability of happening of risky events	Fear increases, anger decreases risk estimates	*N*=973 US Ameri-cans	None
18	Sunstein	2003	*J Risk and Unc*	Lab exp	Emotions	Vivid negative description of outcome variable	WTP for no arsenic in water	Question	Emotional description results in higher WTP	*N*=84 students	None

19	Yuen & Lee	2003	*J Affect Disord*	Lab exp	Happiness, sadness, neutrality	Film clips	Risk taking tendency'	Willingness to participate in hypothetical tasks based on 'Choice Dilemmas Questionnaire	People in sad group less risk taking compared to neutral, no difference between neutral and happy	*N*=54 under-grad. students (China)	None
20	Williams	2004	*Research and Practice in HR Mgmt*	Question-naire	Positive and negative mood	Q: How do you feel right now?	Risk	Q: 'How would you rate your own willingness to undertake risky business propo-sitions as com-pared to other managers in your firm?'	Managers reporting positive affective states more willing to take risks	*N*=149 managers	None
21	Fessler, Pillsworth, & Flemson	2004	*OBHDP*	Lab exp	Anger & disgust	Relived emotions	Risk taking	Risky gambles & questionnaire asking for risky behavior	Anger increases men's, disgust decreases women's risk taking	*N*=120 under-grad. students	$5 + gamble
22	Chou, Lee, & Ho	2007	*Psychology and Aging*	Group/lab experiment	Happiness, sadness, neutrality	Film clips	Risk taking tendency'	Willingness to participate in hypothetical tasks ('Choice Dilemmas Questionnaire')	Risk taking tendency greater in happy mood than sad mood, (more pronounced with older people)	*N*=188 (90 older, 98 younger people)	None
23	Cheung & Mikels	2007	*Emotion*	Lab experiment	Emotion	3 strategy groups: none (control), making decisions using emotions (emotion-focused) /	Risk seeking behavior	Gambling task, choosing between a sure option & risky gamble option	Positive relation between emotion reliance & risk seeking	*N*=65 under-grad. students	$5 or course credit

						wo. using emotions (emotion-regulation)		framed as losses or gains			
24	Grable & Rosz-kowski	2008	*J of Risk Research*	Mailing (question-naire)	Positive mood	Self-rating into one of three categories: happy, neutral and gloomy	Financial risk tolerance	13-item risk-tolerance scale (Grable and Lytton 1999)	Happy mood positively associated with having a higher level of financial risk tolerance	*N*=460 mid-western emplo-yees	None
25	Fehr-Duda, Epper, Bruhin, & Schubert	2011	*JEBO*	Lab exp	Good mood	Self-reported measure: "How has your day been going?"	Risk preferenc e	Certainty equivalents for 50 two-outcome lotteries	Women in good mood more optimistic; men less susceptible to mood states	*N*=107 students	Monetary
26	Hogarth, Portell, Cuxart & Kolev	2011	*BDM*	ESM via text msg	Emotions	Self-assessment manikins (SAMs)	Risk percep-tion	Evaluation of everyday situations: "At this moment, what risk for your well-being do you associate with ACT?	Mood states explain variations in risk perception	*N*=94 students	EUR 35
27	Foo (1)	2011	*ETP*	Lab exp	State happiness, hope, fear and anger	Relived emotions	Risk perceptio ns	Perceived risk in business opportunity	Participants in angry and happy group perceived less risk than those in hopeful and fearful group	*N*=187 students (1)	Course credits

27	Foo (2)	2011	*ETP*	Quasi-field	Trait anger and trait happiness	10 item scale for anger (adaption of L&K), 6-item happiness scale (Underwood& Froming 1980)	Risk preferenc e	Two investment decisions (Forlani& Mullins 2005)	Trait anger and happiness increase risk preference	*N*=66 entrepre-neurs (2)	None
28	Schlösser, Dunning, & Fech-tenhauer	2011	*JBDM*	Lab	Immediate and anticipated emotions	"Consider choosing the lottery, how do you feel about it?"	Risky choice	$5 for sure, or $10 w. 50% prob.	Emotions have direct influence on decision (wo. Correlation to subj. prob)	*N*=130 students	Course credit
29	Treffers, Koellinger & Picot	2012	*WP*	Lab exp	Joy, fear, sadness	Film clips	Risk preferenc e	Holt and Laury lottery	Sadness influences risk preferences when stakes are low, no other influences	*N*=253 students	Low, and high stakes (money)
30	Demaree & Burns	2012	*Emotion*	Lab exp	Affect	Q: "How do you feel right now?" after feedback about outcome in slot task	Risk taking	Forced choice repeated gambling task (slot tasks) w chance of winning 13%, 50%, or 87%	Reduced risk taking in a positive affective state (on the p=13% game)	*N*=144 under-grad. students	Partial course credits
31	Podoynit-syna, Van der Bij, & Song	2012	*ETP*	Survey	Mixed emotions	Extent to which 16 emotion adjectives described feeling about strategic issue	Entrepre-neurial risk perceptio n	Q: characterize whether a hypothetical strategic issue perceived as opportunity or threat	Mixed and after controlling for basic emotions conflicting emotions predict risk perception (more cautious)	*N*=253 venture owners (Venture One list)	None

32	Haiko & Kaustia	2012	*PLOS one*	Lab exp	Favorite, disliked and neutral music	Own favorite pieces of music	Risk prefe-rence	Willingness to take risk	Favorite music increases risk taking, and disliked music suppresses risk-taking	*N*=25 teenagers (aged 12–17)	Monetary incentives
33	Stanton, Reeck, Huettel, & LaBar	2014	*JDM*	Lab exp	Happiness, sadness, neutrality	Film clips	Risk prefe-rences	Monetary gambles	Happy mood induction increased gambling	*N*=91	Money, incentive compatible

Comparing the different studies yields some caveats. Often, neither the independent nor dependent variables are clearly defined. Approaches to measure risk preferences and perceptions vary from non-incentivized psychological scales to very abstract economic task. Especially some studies from the psychology literature are not accessing risk preferences as in an economic definition. For instance, Wang (2006) asks students while studying 'risk taking behavior' to decide either emotionally or rationally when facing hypothetical conflicting situations. Treffers et al. (2012) on the other hand use incentivized monetary gambles (the Holt and Laury lottery). Pietromonaco and Rook (1987) use hypothetical decision scenarios and Fehr-Duda et al. (2011) present certainty equivalents. Furthermore, many studies often cited for measuring risk preferences rather access related, but different aspects, such as selling decisions (Lee and Andrade 2011), or stock market behavior in general (Hirshleifer and Shumway 2003).

Moreover, some of the laboratory studies use (monetary) incentives, some give course credits, and some have no incentives at all. Furthermore, emotions are defined, measured, and induced in a variety of different ways ranging from film clips to providing candy bars. For instance, Grable and Roszkowski (2008) ask participants to self-rate own mood into one of three categories happy, neutral, or gloomy. This alone seems to be a rather difficult task and poses some challenges when comparing the findings to studies inducing emotions with film clips (e.g., Treffers et al. 2012) or to relived emotions in the laboratory (Fessler et al. 2004). The respective studies are also conceptualized quite differently. Some studies differentiate good and bad mood as compared to some studies building their hypotheses on appraisal approaches and focusing on discrete emotions.

Given all the above reasons it is not surprising that there is no to little agreement in the discussion about the influence of distinct emotions on risk preferences. By providing a rigorous and incentivized economic experiment studying induced fear and happiness and individuals' risk preferences we aim to provide new insights to the discussion.

IV.1.2.3 Competing theories

Building up on the studies reviewed above, several theories have been proposed of how emotions, affect, or moods influence risk-taking behavior. Amongst the most

prominent are two competing theories: the *Affect Infusion Model (AIM)* and the *Mood-Maintenance Hypothesis (MMH). The AIM* states that positive emotions lead to risk taking behavior whereas negative emotions lead to risk averse behavior (Forgas 1995). The AIM builds on the affect-as-information theory (Clore et al. 2001, Schwarz, 1990, 2001) proposing that emotions provide additional information when making choices and hence influence a person's response towards a situation or object. This implies that people being in a positive mood will evaluate their environment more positive (Bower 1981) and react more proactive. The MMH on the other hand states that individuals in a good mood want to maintain their current state and hence act less risk taking whereas negative moods lead to rather risk seeking behavior (Isen and Patrick 1983).

Reasons why previous studies find support for both concepts that go into opposite directions may stem from different implementations and induction of emotions in experimental studies and also from conceptual differences backing both theories. First, emotions or mood in experimental studies in the laboratory are induced in a range of different ways as discussed above. Induction methods range from film clips to little presents in the beginning of sessions. Often, in contrast, emotions are not induced but respondents simply report their current emotional states. Moreover, studies looking at naturally induced moods, for instance using weather data, are directly compared to studies looking at induced emotions in the laboratory. Second, affect and mood especially in the positive valence domain may not be taken alike. Mood is a rather mild state and hence might lead to the wish to maintain a respective mood. Affect on the other hand is a strong feeling and may lead to active behavior as discussed in previous chapters.

Further, both competing models only distinguish between positive and negative valence. As previously discussed (see chapter II), emotions of the same valence oftentimes lead to different outcomes especially regarding risk taking behavior. For instance, Lerner and Keltner (2000, 2001) find opposite effects of fear and anger on risk preferences. Both of the theories above do not account for such findings. Hence, our hypotheses are not based on either of the above theories but rather on arguments from evolutionary psychology discussed part two and the appraisal tendency framework (Han et al. 2007, Lerner and Keltner 2000, 2001).

IV.1.2.4 Appraisal tendency framework

The appraisal tendency framework (ATF) introduced in chapter I.2 provides one useful structure to systematically link appraisal processes associated with discrete emotions to judgment and choice outcomes such as those from risky decisions. The ATF has received increasing attention as theoretical base for experimental studies examining the influence of emotions on risk taking behavior over the past years (Lerner and Keltner 2001, Han et al. 2007). One advantage to other theories is that it distinguishes discrete emotions as compared to the MMH or AIM. Within the ATF happiness can be described as a very pleasant emotion with high levels of certainty and own control, little effort and strong attentional activity. Fear on the other hand is described as very unpleasant and having very high levels of uncertainty. Further, fear is associated with high situational control and others' responsibility. High levels of effort and medium attentional activity are anticipated. As a consequence of these attributes, the ATF classifies fear as an emotion leading to risk averse behavior and happiness as emotion leading to risk taking behavior. Table IV-2 below summarizes:

Table IV-2: Illustration of appraisal dimensions for fear and happiness, adapted from Lerner et al. 2015, p. 806

Appraisal dimension	**FEAR**	**HAPPINESS**
Certainty	Low	High
Pleasantness	Low	High
Attentional activity	Medium	High
Anticipated effort	High	Low
Individual control	Low	High
Other's responsibility	Medium	Low
Appraisal tendency	Perception of negative events as unpredictable, under situational control	Perception of positive events as predictable, under human control
Influence on risk preference	**Risk averse**	**Risk taking**

This argumentation is consistent with empirical findings by Lerner and Keltner (2001), Foo 2009, Han et al. 2007). Also intuitively one would expect fear to lead to more risk avoiding behavior and happiness to increased risk taking behavior.

Especially when studying induced emotions, the whole process of appraisal theories may be questioned as specific emotions are induced and do not arise from the individual's interpretation of an event. I believe the ATF provides a solid framework for developing testable hypotheses in emotion research in general as experimental studies testing the framework show (e.g., Foo 2011, Lerner and Keltner 2001). For induced emotions however, we additionally build our hypotheses on arguments from evolutional psychology and approach and avoidance orientation as discussed in chapter II.

Further, Frederickson and Branigan (2000) find that people in a joyful condition (induced via short film clips) produced a broader thought-action repertoire, i.e., participants would come up with more things they would like to do than when been exposed to a neutral or negative situation. Moreover, Aspinwall and MacNamara (2005) find that positive emotion decreases defensiveness and increases effective coping. All of the above leads to our first hypothesis:

Hypothesis 1: *Induced happiness leads to higher risk-taking behavior than induced fear.*

IV.1.2.5 Gender differences in risk preferences

Ample studies find women to behave more risk averse than men (Byrnes et al. 1999, Croson and Gneezy 2009, Dohmen et al. 2011, Eckel and Grossman 2002, Fehr-Duda et al. 2006, Finucane et al. 2000, Jianakoplos and Bernasek 1998). For instance, Croson and Gneezy (2009) review literature on gender differences in risk preferences, competitiveness, and other-regarding preferences in economic experiments and find robust gender differences. They conclude one explanation for the differences might be due to different emotional reactions to risky situations. If women experience a risky option more emotional this can influence the utility. Specifically, experiencing the option as negative emotion would lead to a lower utility. Furthermore, Fehr-Duda et al. (2006) find that women and men differ in their probability weighting when eliciting certainty equivalents. Women underestimate large probabilities of gains compared to men. This is related to the research by Rottenstreich and Hsee (2001) on probability weights for high-affect and low-affect gambles. Moreover, Fehr-Duda et al. (2011) find women tend to weight probabilities more optimistically when being in a good mood (compared to normal mood) whereas men are not influenced by their mood. Hence, we expect hypothesis 1 to be more pronounced with women than with men, and we expect different emotional reactions to risky situations to be one explanation for gender differences in risk taking.

Hypothesis 2a*: Female participants will behave less risk taking than male participants.*

Hypothesis 2b: *Fear induced female respondents will exhibit more risk averse behavior than male respondents. Happiness-induced female players will behave more risk taking than happiness-induced male respondents.*

IV.1.3 Experiment

IV.1.3.1 Experimental design

Table IV.3 below depicts the experimental design. Risk preferences are measured using the Eckel and Grossmann (2008) lottery task and the BART (Lejuez et al. 2002). Happiness and fear are induced with each two well-validated film clips. Each participant watches either two film clips inducing happiness or two clips inducing fear. The two emotions and the order of film clip and risk task are the between-subjects treatments (2x4), see Table IV.4. We randomly allocate participants and randomize (R) the order of tasks (participants either get the Bart task first and the E&G task second or vice versa) and video clips (i.e., happiness-inducing clip 1 or 2, and fear-inducing clip 1 or 2) shown within-subjects.

Table IV-3: Experimental design

1	Welcome & introduction
2	Film clip 1 (R)
3	Risk task 1 (R)
4	Film clip 2 (R)
5	Risk task 2 (R)
6	Questionnaire
7	Payout (anonymously)

Table IV-4: Between-subjects factors

Group	*Clip 1*	*Task 1*	*Clip 2*	*Task 2*
1	H1*	Balloon	H2	E&G
2	H2	Balloon	H1	E&G
3	F1	Balloon	F2	E&G
4	F2	Balloon	F1	E&G
5	H1	E&G	H2	Balloon
6	H2	E&G	H1	Balloon
7	F1	E&G	F2	Balloon
8	F2	E&G	F1	Balloon

**H1: Harry & Sally, H2: Hangover, F1: BWP, H2: Insidious*

The computerized experiment was conducted at the laboratory of Humboldt-Universitaet zu Berlin and programmed in z-Tree (Fischbacher 2007). Student participants were recruited via ORSEE (Greiner 2015). Each participant signed a consent form before entering the laboratory. After welcoming the participants to the laboratory and randomly assigning seats, the different phases of the experiment were explained to the participants on screen and instructions were read out loud by the experimenter. Both the lottery choice and BART task were explained by the instructor in the beginning of the experiment to make sure that everybody understood the tasks. Then, either a happy or anxious video clip was shown to the participants (between-subjects variable *emotion*) using circumaural headphones. Thereafter, either the BART task or the lottery choice (between-subjects variable *order*) appeared. After completing the first task, another video clip of the same type (happy or anxious) was watched and the second risk task completed. Finally, all participants answered demographic questions. Payments were made anonymously before leaving the lab. The experiment was carried out in German (see instructions in Appendix B).

IV.1.3.2 Emotion induction

Inducing emotions with film clips is very common in laboratory experiments and has many advantages as compared to other methods (Loewenstein et al. 2014, Ifcher and Zharaghmee 2011). As extensively discussed in chapter III.2, we conducted an extensive pretest, identifying four clips each targeting the emotions happiness and fear

of which we need two clips for this experiment, please see the appendix for an overview. For happiness, short scenes of the movies *"When Harry met Sally"* and *"The Hangover"* is used. Fear is introduced with scenes from the movies *"The Blair Witch Project"* and *"Insidious"*.

IV.1.3.3 Risk elicitation

In this experiment, we elicit risk preferences using two tasks: the gamble choice task by Eckel and Grossman (2008) and the BART (Lejuez et al. 2002). Both tasks are fairly easy to understand but allow differentiated analyses. The gamble choice is a one shot decision whereas the BART is implemented over ten rounds.

Eckel and Grossman (2008) developed a *choice task* for measuring risk attitudes as simple as possible in order to reduce errors from comprehension but with sufficient heterogeneity in choices (see appendix B). Each participant is shown five gambles and has to choose the one he or she wants to play. For all gambles the events A and B have an occurrence of 50 percent each. One of the five gambles is a sure thing (in our case EUR 3.20). The other gambles are linearly increasing in expected payoffs and also standard deviation, i.e., risk. The advantage of this design (in comparison to more complicated lottery choice tasks) is that with using only 50/50 gambles the task can be easily understood. The variance associated with the increasing expected values is considerably large resulting in relatively high heterogeneity in participants' choices (see Eckel and Grossman 2008). We adapted the Eckel and Grossman (2008) task using a different scaling of payoffs, see table below.

Table IV-5: Gamble selection sheet, adapted from Eckel and Grossman (2008)

Gamble	Event	Payoff	Probabilities	Your selection
1	A	EUR 3.20	50%	
	B	EUR 3.20	50%	
2	A	EUR 4.80	50%	
	B	EUR 2.40	50%	
3	A	EUR 6.40	50%	
	B	EUR 1.60	50%	
4	A	EUR 8.00	50%	
	B	EUR 0.80	50%	
5	A	EUR 9.60	50%	
	B	EUR 0.00	50%	

In their original study, Eckel and Grossman (2008) use a 'no loss' frame and one frame with losses. In order to not run into confounds with loss aversion and more importantly in order to remain comparable to the BART we opted for the 'no loss' frame. Hence, the worst-case scenario for respondents would be to end up with zero Euros. One advantage using the 'loss treatment' (i.e., option gamble 4 and 5 resulting with 50% probability in minus x Euros) would have been to presumably observe larger effects on risk taking behavior after having been induced to a fearful clip. This would be interesting to study in subsequent experimental studies. Moreover, using loss frames would imply endowing participants with an amount of money in order to prevent them from losing money over the time of the experiment. We were concerned to create confounding effects here again when endowing people in the beginning of the experiment so that the 'no loss' frame turns out to be the cleaner and more desirable design.

In the *BART task* (Lejuez et al. 2002, Wallsten et al. 2005), participants see a series of k balloons on a computer screen. They can earn money by clicking a button pumping air into the balloon. With each pump participants earn x Cents that are added up over all rounds r_i as long as the balloon does not explode. The balloon inflates until a randomly determined threshold where the balloon explodes. Hence, each pump offers the possibility to earn money (reward) but also the risk of explosion and earning zero Euro in this round increases with each pump. The participant can stop at any point and collect the money. Participants do not know the probability structure of the explosion

point of the balloon. They are informed as follows: “Balloons explode if you pump them up too much. You can decide on each trial how much air to pump into the balloon. Balloons differ. You do not know what type of balloon you are facing and on each trial the type of balloon might be different. Some balloons may explode after the first pump and some only after they fill the whole screen.”

The computer is in fact programmed in a way that it allows a maximum number of *n* pumps and to explode. This explosion point is predetermined and the explosion happens random point with probability *1/n* (see also Lejuez et al. 2002, Wallsten et al. 2005). Balloons have different explosion points determined by a randomly drawn number from a uniform distribution for each subject. This implies that the ‘conditional probability’ of explosion increases with each successful pump. In round 1, the probability of explosion is $p_1 = 1/n$. In round 2, $p_2 = 1 / (n-1)$ given that the balloon did not explode in round 1. In round 3, $p_3 = 1 / (n-2)$ in case the balloon did not explode in round 1 or 2, and so on. Hence, the probability of the balloon exploding on pump i given the balloon did not explode in round *n-i* is:

$$p_i = \frac{1}{(n-i+1)}.$$

This implies that on each pump decision the participant faces two options from his decision: the option to lose the accumulated amount with p_i or earn x cents with $1-p_i$. Hence, normatively speaking the decision maker should stop pumping as soon as the payout from both options is equal.

In the original version of the BART by Lejuez et al. (2002) participants earn USD .05 for each pump and see *k=3x30* balloons with different explosion points drawn from a uniform distribution. In the present study, participants play ten trials of the BART task. On each trial, the computer allows 1 to 32 pumps before the balloon would explode. In each round they can earn 4 cents with each pump (inflation sound is played). The number of clicks, the profit from current round, and cumulated profits are displayed to the subjects. In case the balloon pops before they collect the money, an exploded balloon is shown and an explosion sound displayed (screenshots can be found in appendix B.1).

The validity of the BART has been shown via the association to real world risk taking behavior (Hunt et al. 2005). For instance, high risk taking in the BART relates to drug and alcohol use, smoking (Lejuez et al. 2003a), gambling, theft, and aggression (Aklin et al. 2005, Lejuez et al. 2002). Moreover, the BART is significantly related to sensation seeking and impulsiveness (Aklin et al. 2005, Lejuez 2003b), measured by the Sensation Seeking Scale (Zuckerman et al. 1978), the Barratt Impulsiveness Scale (Patton et al. 1995), and the Eysenck Impulsiveness Scale (Eysenck and Eysenck 1978). Studies looking at how emotions influence risk taking behavior in the BART are rare. Heilman et al. (2010) find that emotion regulation, i.e., reappraising the negative emotions fear and disgust increases risky decisions (measured as average pumps per unexploded balloon) in the laboratory and in a natural setting (induced by telling students (N = 44) their final exam results). Heilman et al. (2010) find here that participants in the positive affect control group (no emotion regulation) take higher risks than the negative affect group. Other studies (Maner et al. 2007) relate the BART to trait anxiety (r=-.22) (scale by Spielberger 1989), to social anxiety (trait) (r=-.2) assessed via the fear of negative evaluation scale (Leary 1983), and to worry (r=-.21), measured with the 'Penn State worry questionnaire' (Meyer et al. 1990).

Previous literature shows that the BART can identify individuals prone to high risk taking (Aklin et al. 2005, Lejuez et al. 2002, Lejuez et al. 2003a, Lejuez et al. 2003b, Lejuez et al. 2004, Wallsten et al. 2005). Interesting features of using the BART include that the task is a repeated measure with feedback. Moreover it is easy to understand and quite realistic. It allows identifying individual differences in risk taking behavior and is hence well suited for the present research question. Note that the BART may also be characterized as measure for ambiguity tolerance. We will discuss this in the discussion part of this paper.

IV.1.4 Results

IV.1.4.1 Sample

Of our N = 184 participants, N=181 are usable responses (three observations had to be excluded because one of the video clips did not play steadily or the volume was turned off at the respective computer in the laboratory). Overall, 78 males and 103 females participated. The mean age was 25 years (SD = 4.78). Forty-three percent of subjects

were majoring in business or economics. Mean profit was EUR 6.62 (*SD* 3.78, range EUR 0 - 12.88). Each session lasted about 30 minutes.

Table IV-6: Descriptive characteristics – sample

	All	Females	Males
Observations	181	103	78
Age	25 (4.78)	24 (4.811)	26 (4.511)
Major of studies			
Business studies	58		
Economics	22		
Biology	21		
Sociology	12		
Language studies	13		
Computer science	9		
Agricultural studies	10		
Other fields	29		
No studies	7		

IV.1.4.2 Gamble choices (Eckel & Grossman task)

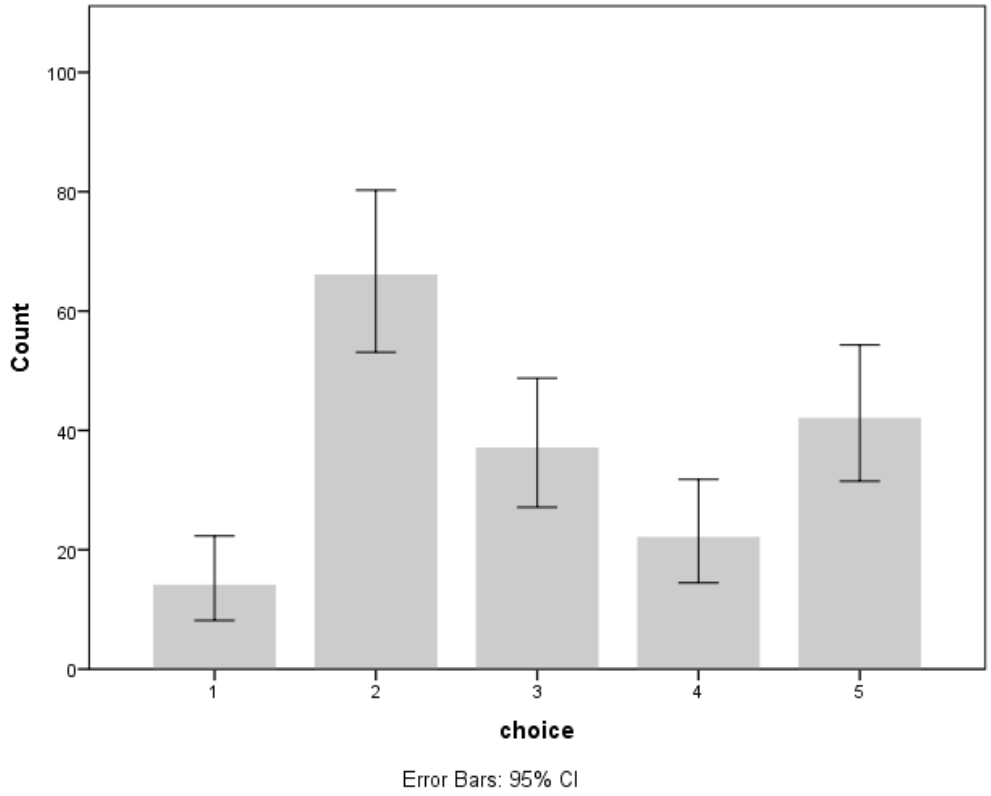
Mean gamble choice for all (both women and men) was $M = 3.07$ ($SD = 1.32$), median = 3, and mode = 2. The histogram below depicts the distribution. Most people chose gamble two (36 percent), and interestingly 23 percent chose gamble 5, i.e., the riskiest gamble (losing everything with probability of 50 percent). Comparing, E&G find that most people chose gamble 3 (33 percent), and second most chose gamble 5 (24 percent) and 4 (23 percent).

Table IV-7: Gamble choices by gender

Gamble choice	ALL	Women	Men
1	8%	7%	1%
2	36%	19%	18%
3	20%	9%	11%
4	12%	10%	2%
5	23%	12%	11%
N	181	103	78
Mean	3.07	3.04	3.10

(SD)	(1.32)	(1.36)	(1.27)

Figure IV-1: Distribution of choices in gamble task



We observe differences in choices of women and men. This is in line with E&G (2008). Both groups choose gamble 2 most frequently. The frequency distribution for women is much more dispersed than for men, see below. Only two male respondents choose gamble 1 (safe gamble) as compared to 12 female respondents.

Running a Mann-Whitney U test we find however, that distributions for females (M = 3.00) do not significantly differ from males (Mdn = 3.00), U = 3876.00, z = -.419, *ns*.

Figure IV-2: Histogram for dependent variable choice (females)

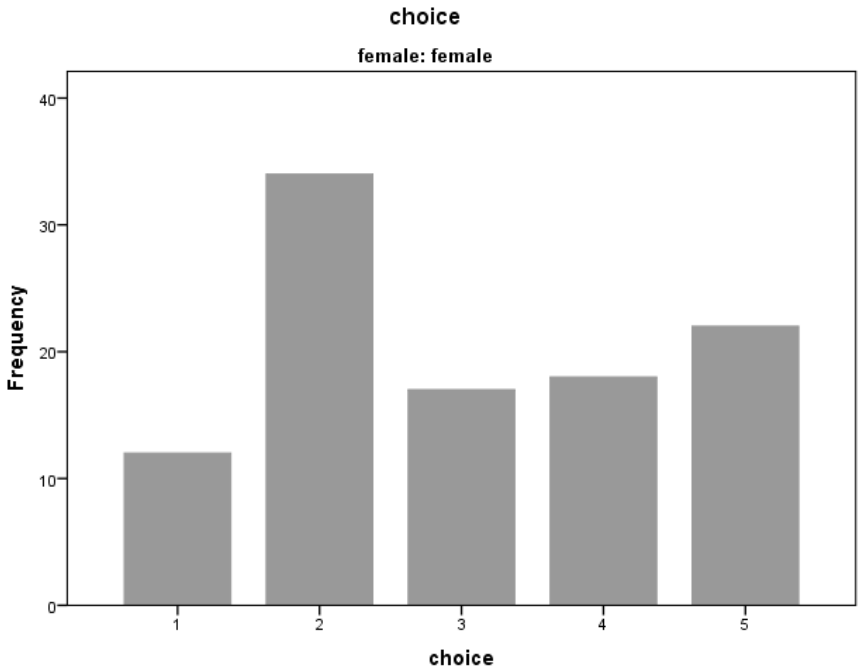
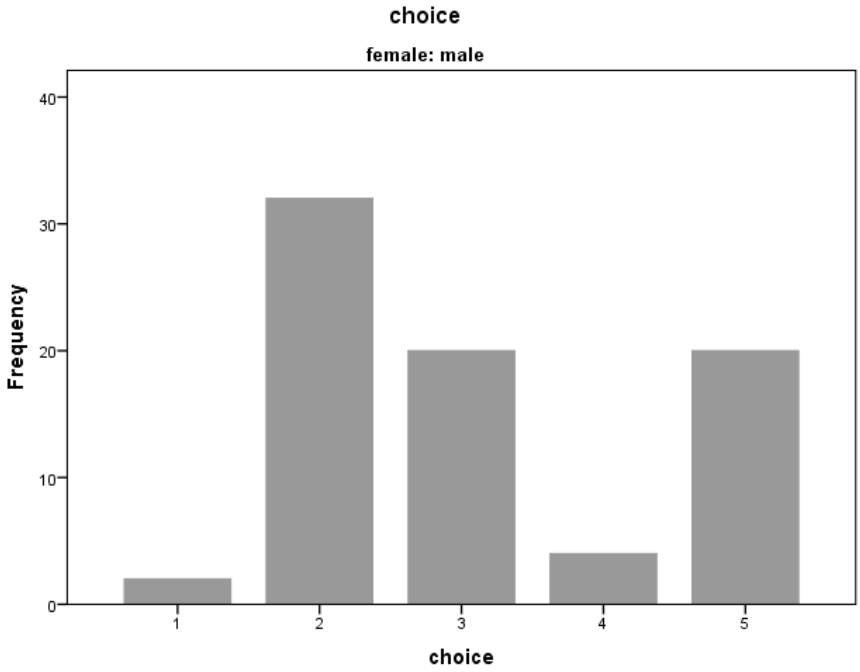


Figure IV-3: Histogram for dependent variable choice (males)



IV.1.4.3 Balloon pumps (BART)

For the BART task, usually the average number of successful pumps (i.e., pumps of rounds with no explosion) is used to measure individual's risk propensity (Lejuez et

al. 2002, Wallsten et al. 2005). Measuring risk propensity in this manner is potentially problem as it systematically dismisses risk seekers whose balloon exploded. I will further discuss this after reporting the findings. The table below summarizes frequencies of successful average pumps. Mean successful pumps were $M = 6.26$ ($SD = 2.396$), median 5.9, mode 7.5, range 0-13.5. Females ($M = 6.231$, $SD = 2.454$) and males ($M = 6.292$, $SD = 2.332$) did not differ, $U = 3960.50$, $z = -.125$, ns.

For comparisons, we also look at all average pumps and first pumps. Mean average pumps were 10.77 ($SD = 3.519$). Females $M = 10.85$ ($SD = 3.383$) and males $M = 10.65$ ($SD = 3.71$) did not differ. Mean first pump was $M = 11.65$ ($SD = 6.591$), median 10, mode 15, range 1-30. Again, no significant gender differences were found (M_{female}=11.28 and $M_{male} = 11.68$). Regarding payouts, mean average profits from the BART are M = EUR 2.46 ($SD = 97.12$) and we find no significant gender differences (M_{male} = EUR 2.49 ($SD = 89.79$) and M_{female} = EUR 2.44 ($SD = 102.58$).

Table IV-8: Descriptive statistics BART task

		Av. successful pump	First pump	Earnings (in cents)
ALL	***Mean***	6.26 (2.396)	11.46 (6.713	246.28 (97.115)
men	***Mean***	6.30 (2.332)	11.68 (6.456)	249.14 (89.790)
women	***Mean***	6.23 (2.454)	11.28 (6.925)	244.15 (102.579)

* Standard deviations in parentheses

The problem with analyzing only successful average pumps is that one automatically dismisses those risk seekers whose balloon popped. Hence, the analysis has a bias from systematically excluding those. On the other hand, analyzing average pumps of all balloons includes a 'randomized' censoring problem, i.e., one would analyze all clicks of the rounds where the balloon exploded and hence systematically include this stochastic factor. Moreover, participants whose balloons exploded early in the first few rounds may behave differently than those whose first balloons did not explode (randomly determined).

IV.1.4.4 Treatment effects

We do not find significant differences between order of treatments, i.e., choosing a lottery first or pumping a balloon first and completing the other task second. Hence, in the following I will analyze both groups (order) together. We are interested in group differences between participants in a happy versus fearful emotional state.

For the dependent variable *choice* (i.e., the E&G gamble task) we do not find a significant main effect of group of emotion (i.e., happiness or fear inducing clip) ($F(3, 173) = 1.120$, ns) or gender ($F(1, 173) = .032$, ns). There is no significant interaction effect between group of emotion and gender, $F(3, 173) = .456$, ns.

Table IV-9:ANOVA output table: between-subjects effects (choice)

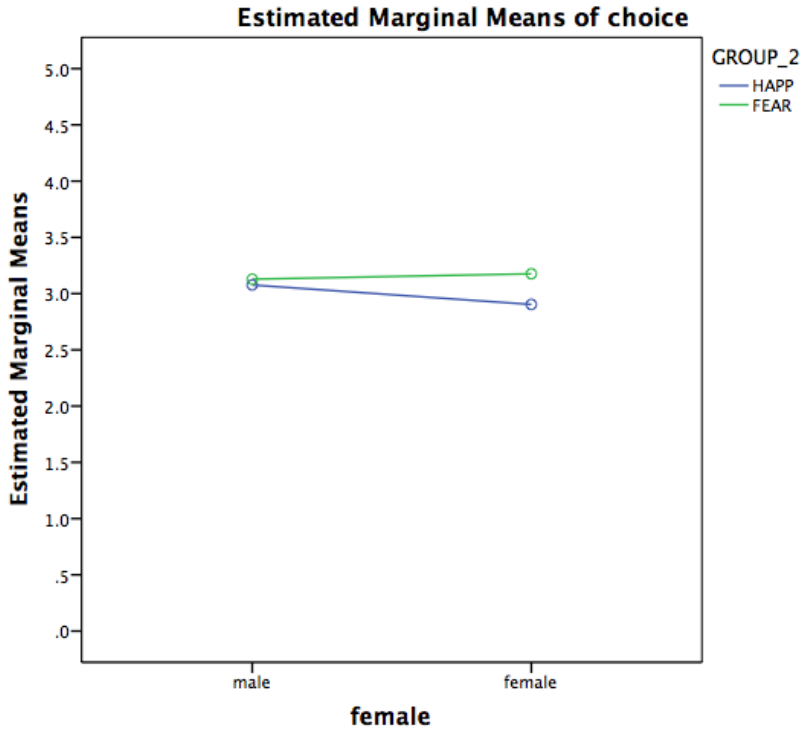
Dependent Variable: choice

Source	***Type III Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
Corrected Model	9.869a	7	1.410	.809	.581
Intercept	1.561.615	1	1.561.615	896.541	.000
female	.056	1	.056	.032	.858
Group	5.850	3	1.950	1.120	.343
female * Group	2.381	3	.794	.456	.714
Error	301.335	173	1.742		
Total	2.013.000	181			
Corrected Total	311.204	180			

a R Squared = .032 (Adjusted R Squared = -.007)

Graphing behavior of men and women for each group of emotion we observe the following. Females in the happy group behave minimally less risk taking (M = 2.9) than males (M = 3.08) and females in the fearful group choose slightly riskier (M = 3.18) than men (M = 3.13).

Figure IV-4: Interaction effects (choice)



Non-parametric tests confirm that the small differences between groups are not statistically significant. Testing for gender effects in the Eckel and Grossman task, a Mann Whitney U test shows no significant differences (U = 3876.000, p = .675). Regarding group differences between emotions we do not find significant differences either X^2 (3) = 4.400, p = .221).

For the dependent variable *average successful pumps* there was no significant main effect of group of emotion (F(3, 173) = 2.340, ns) or gender (F(1, 173) =.056, ns). There was also no significant interaction effect between group of emotion and gender, F(3, 173) =.276, ns. The ANOVA table below depicts both main effects (*female* and *group*) and the interaction effect (f*emale x group*).

Table IV-10: ANOVA output table: between-subjects effects (pumps)

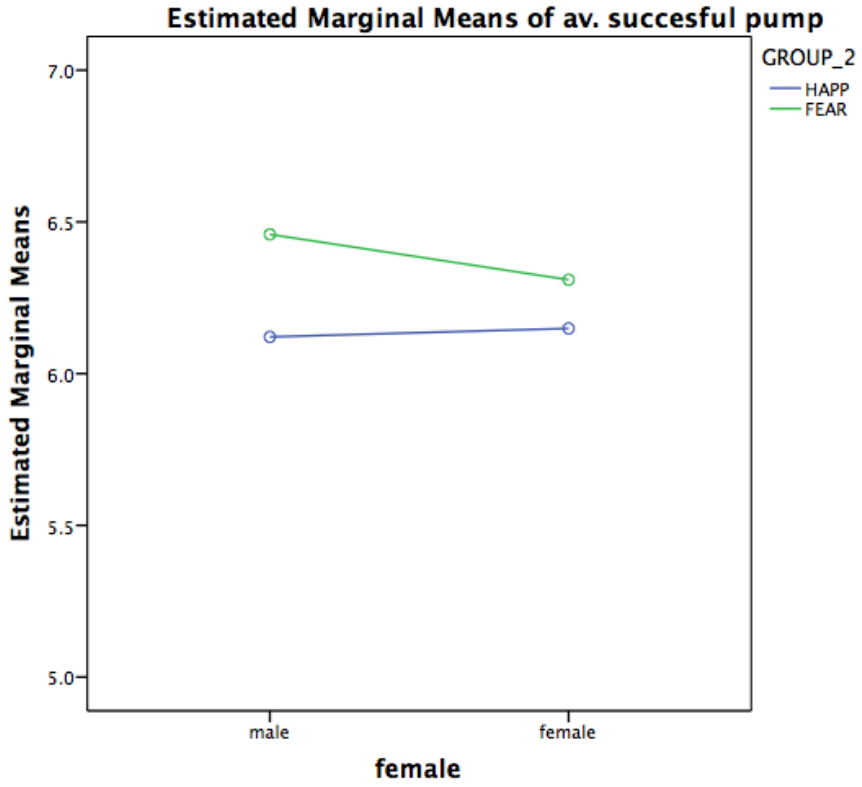
Dependent Variable: av. successful pump

Source	***Type III Sum of Squares***	***df***	***Mean Square***	***F***	***Sig.***
Corrected Model	8.515a	7	1.216	.205	.984
Intercept	6.578.887	1	6.578.887	1.110.378	.000
female	.331	1	.331	.056	.813
Group	4.161	3	1.387	.234	.873
female * Group	4.902	3	1.634	.276	.843
Error	1.025.009	173	5.925		
Total	8.119.470	181			
Corrected Total	1.033.524	180			

a R Squared = .008 (Adjusted R Squared = -.032)

Plotting the variable successful average pumps separately by gender for each emotion happiness and fear, we observe that happy females pump marginally more in the happy group ($M = 6.149$) than men ($M = 6.121$) but less in the fearful group ($M = 6.309$) than men ($M = 6.459$), see figure below. Overall people in the fearful group have slightly higher pumps than people induced with happiness. All of the described patterns are insignificant.

Figure IV-5: Interaction effects (BART)



Non-parametric tests show the same results. Employing a Mann Whitney U test and a Kruskal Wallis tests, we see that there is no significant difference between males and females (U = 3960.500, z = -.125, p = .901) nor group of emotion (X^2 (3) = 1.638, p = .651) on risk taking behavior in the BART.

IV.1.4.5 Further analyses

In our sample, 43 percent of the respondents were majoring in economics or business studies. Scholars studying risk taking behavior oftentimes find differences in demographics such as field of studies. We are interested in whether students who specialize in economics or business studies and are potentially more experienced when it comes to risky choices show a different behavior from others who do not specialize. In the E&G (2008) task, we see that economics and business students make riskier choices ($M_{econ/bus}$ = 3.26 (SD = 1.430)) than other students (M_{others} = 2.91 (SD =1.201)). Running one-way ANOVAs we find this difference is marginally significant, $F(180,1)=3.232$, p = .074. Regarding mean average pumps, we observe that economics and business majors are slightly more risk taking but find no statistically significant difference ($M_{econ/bus}$ = 6.29 (SD = 2.445)) than other students (M_{others} = 6.23 (SD =2.348)).

Table IV-11: ANOVA output table, by studies

		Sum of Squares	***df***	***Mean Square***	***F***	***Sig.***
choice	**Between Groups**	5.519	1	5.519	3.232	.074
	Within Groups	305.686	179	1.708		
	Total	311.204	180			
av succ. pump	**Between Groups**	.157	1	.157	.027	.869
	Within Groups	1.033.367	179	5.773		
	Total	1.033.524	180			

IV.1.5 Discussion, limitations of this study and future research

Summarizing, we do not find the expected treatment effects from emotion induction in the present study. We also do not observe gender differences in risk taking behavior nor interaction effects of emotion induction and type of player. Given ample experimental evidence and existing theories on emotions influence on risk preferences this is unexpected and surprising. We will discuss this in the following.

One possible explanation is that the setting in this straightforward laboratory experiment was perceived as too artificial. Koellinger and Treffers (2015) find in a very clever incentive compatible experiment that joy induced overconfidence but only if joy was unrelated to the task in form of an unexpected gift. If joy was induced together with asking respondents to reflect on their mood, they did not find this effect. They conclude that being aware of one's mood actually leads to well calibrated judgments of participants. Gasper and Clore (2000) find similar behavior of participants when evaluating risks in two experimental studies. Hence, one possibility in the present design is that people became aware of their emotions and in turn were not affected by the induced mood. The participants did not need to engage in difficult tasks or consider other factors than the risk tasks. We explicitly aimed to design the experiment in such a straightforward in order to reduce noise from people not understanding the respective economic task (see Charness et al. 2013 for a discussion). Maybe the tasks were too simple to disguise the induction for our sample of students.

Hence, maybe in the present setting, tasks that are more complex and not straightforward risk measures would have been more successful for analyzing risk propensity and induced emotions in the laboratory without becoming too obvious. Examples for more complex types of situations in the laboratory are strategic games. In such type of situations, participants are more involved in the task and have to consider several factors such as others' behavior resulting in strategic uncertainty. The subsequent chapter presents and discusses evidence for the value of emotions in strategic settings.

When studying emotions in the laboratory one issue that is often raised is potential demand effects. We did not ask participants to fill out emotion questionnaires such as the PANAS-X (Watson and Clarke 1982) for exactly this reason. One possibility remains that the participants may have just by watching the videos before the task

anticipated the purpose of the experiment (see also Heilmann et al. 2010, Baillion et al. 2016). Both tasks are incentive compatible and incentivized with real cash. Maybe participants became aware of the fact that watching the film clip had the purpose to induce emotional states and in turn influence their choices so that they consequently controlled their own emotions. This is however very unlikely as it would require sophisticated recalibration to result in no significant effect over all players. Moreover, all respondents anticipating the desired outcome of the induction of fear and happiness and purposely deciding against this does not seem plausible. Apparently, there is just no effect of induced happiness and fear on our two experimental risk measurements.

Overall, emotions and risk taking behavior in the laboratory as compared to the field remains an intensely discussed topic as already laid out in chapter IV.1.1.3. It would be interesting and desirable to carry out further studies looking at how fear and happiness of people in the field or quasi field influence risk preferences. This does not come without challenges of course. It is hard to measure or induce emotions in the field especially when it comes to emotions such as fear. Moreover, more rigorous and incentive compatible experiments looking at induced emotions and economic preferences would be desirable. This would allow comparison to mixed findings of the influence of emotions on behavior from mostly psychological experiments without incentives.

In general, risk preferences and especially risk perceptions are oftentimes influenced by environmental factors including emotions. Scholars like Johnson and Tversky (1983) or Sunstein (2003) have provided clever designs to study such questions for instance in the context of terrorists' attacks. When providing more feasible frames as compared to pure economic risk tasks people apparently relate to induced emotions to a greater extend even in the laboratory or classroom. Such approaches are important regarding policy implications and risk communication strategies. Better understanding how emotional components in communicating risks influence risk perception needs to be studied further in survey studies with employing different frames.

IV.2 The strategic value of emotions – happiness and fear in market entry [12]

IV.2.1 Introduction

Coordination mechanisms are important in daily life interactions and for economics in general. Plenty researchers study how individuals coordinate in a range of games (Cooper 1998), and especially markets (Camerer and Lovallo 1999, Erev and Rapoport 1998, Rapoport et al. 1995). Recently, scholars highlight the fact that there is an emotional component to strategic decisions. Winter (2014) discusses in his book the idea that understanding own and foremost others' emotions enables people becoming better strategists. In this sense, he stresses the concept of 'rational emotions'. Meshulam et al. (2012) and Gneezy and Imas (2014) study anger in strategic games in the laboratory and find that people use the possibility to anger opponents in order to maximize own outcomes. We are interested in the strategic value of induced happiness and fear in repeated market entry decisions. Hence, this next chapter adds one further level to the study of emotions. Rather than looking at individuals' decisions only, we include a strategic component to the discussion. Consequently, we draw on concepts from game theory to analyze and better understand strategic emotions.

In this study, we address the influence of discrete emotions, namely happiness, and fear, on individuals' behavior in an economic experiment with real monetary incentives. We conduct an incentive compatible experiment with N=168 students and entrepreneurs testing whether discrete emotions influence individual's choice of market entry in a simultaneous market entry game, and how knowledge about others' emotional state influences choices. We employ the framework of the classic simultaneous market entry game (Selten and Güth 1982, Kahneman 1988) with three asymmetric players who simultaneously decide to enter a market or not (Schade, Schröder, and Krause 2010). The framework of the market entry game offers a number of desirable features and is widely used in studying entrepreneurs' behavior. The players cannot communicate or observe others' behavior thus face strategic uncertainty about their opponents' behavior as in real markets. Before making the

[12] This chapter is based on joint work with Christian D. Schade.

entry decisions, all players are randomly assigned to watch a validated film clip inducing either happiness, or fear, or they watch a neutral scene. We then communicate the induced emotional states of all three players who will enter the same market so that induced emotional states are common knowledge to all players. Individuals are matched randomly with opponents knowing their respective emotional state and are then re-matched with other players for each new round. In this way, they play multiple rounds of the market entry game against players with different induced emotional states. Before all entry decisions we measured risk attitude with the lottery comparison task by Holt and Laury (2002) and with the risk questions administered in the Socioeconomic Panel (SOEP). Further, we measure trait happiness with the 'satisfaction with life scale' (SWLS) by Diener et al. (1985) and trait anxiety using the questions of the SOEP.

We find that people tend to enter more when induced to a happy clip (mean entry rate M=54) as compared to neutral scenes (M=48) and enter less when induced to a fearful film clip (M=40). This difference is statistically significant for female players ($p < .001$). Moreover, women enter less than men in all three groups (M_f=43 vs. M_m=54) and, interestingly, anxious men enter even more than happy women. Male entrepreneurs enter most of all (M=56). Most strikingly, all players react to their opponents' emotions regardless of their emotion. Agents enter most when playing against two anxious players and least when facing two happy players ($p < .001$). When playing against one happy and one anxious player, women tend to stay out but men enter more ($p < .05$). We can conclude that people use the information about others' emotional states to coordinate. Moreover, women react more to own emotions than men do.

Our paper makes the following main contributions: With our study design, we are able to determine the strategic value of emotion. Specifically, we add an incentive compatible experimental study to the very small number of papers on the influence of emotions on strategic choices. To our best knowledge, there exists no experimental study that investigates the influence of induced happiness and fear in strategic games. We provide an incentive compatible experiment with students and entrepreneurs as sample and study an important entrepreneurial decision framework. Moreover, we study coordination decisions with entrepreneurs as important application of decision makers under uncertainty. Even though studying emotions in strategic games has

become more established over the past 15 years, incentive compatible economic experiments are still quite rare. We thus contribute to the young but growing field of the experimental literature on emotions and decision making. Finally, we add to the literature on gender differences in competitive markets.

The remainder of this chapter is organized as follows: the next section provides relevant literature, presents the underlying model and derives the hypotheses. Subsequent parts describe the experimental design and procedure, present the results, and analyses. The chapter concludes with a discussion, limitations of this study and implications for future research.

IV.2.2 Relevant literature and hypotheses

In chapter II.5, I extensively discussed studies investigating the impact of emotions and mood on behavior in strategic settings. Of those studies, most of the papers discussed actually *induce* emotions with either film clips (as we do), relived emotions, or both. Exceptions are Kugler et al. (2014) who study trait emotions (self-reported data), Kopelman et al. (2006) who examine the influence of the display of positive versus negative faces of opponents, and Gneezy and Iman (2014) who give respondents the option to anger opponents (making them stay in the laboratory for an extra-long time). All of these studies agree that (induced) emotions have a significant influence on respondents' choices. Whereas all of the studies discussed investigate strategic games only some of them explicitly consider opponents' emotions in the laboratory: Kausel and Connoly (2014) include opponents' anger, guilt, and gratitude in trust games, Andrade and Ho (2009) investigate opponents' happiness and anger in the ultimatum game, Kugler et al. (2014) study opponents' trait anger and anxiousness in entry decisions,

In line with the existing literature on emotions in strategic games we are interested in the influence of own emotions on choices but also in the influence of knowledge about opponents' emotions on market entry decisions. Hence, what is novel in our approach is that we examine both the direct and indirect (i.e., other players' emotion) effect of induced happiness and fear on peoples' decisions in the setting of an important strategic game, the market entry game (Selten and Güth 1982, Kahneman 1988).

IV.2.2.1 Direct effect of emotions

Recently, a range of studies finds systematic influences of emotions on economic variables such as the endowment effect (Lerner et al. 2013), WTP for insurance (Schade et al. 2012), or time preferences (Ifcher and Zahrgamee 2011). Scholars from psychology largely agree that emotions play an important role for our judgment and decision making (e.g., Lerner et al. 2015). Moreover, from an evolutionary perspective, people are able to experience emotions in order to deal with threats and opportunities in their environment. From this standpoint, emotions are useful and have an adaptive function (Darwin 2013/1872, Fessler et al. 2004, Frank 1988, Frey et al. 2014), see chapter II.2.4.

In this experiment, we study induced happiness and fear. Fear is an emotion of negative valence and is associated with little individual control and high uncertainty according to the ATF (Lerner and Keltner 2000, 2001). In its adaptive function as response to threat, fear motivates escape (Frank 1988, Frey et al. 2014, Nesse 1990). Further, drawing on the literature on action-tendencies fear presents an avoidance-oriented emotion (Fredrickson 2004). Happiness on the other hand, is an emotion of positive valence and associated with high control and less uncertainty. The adaptive function is rather motivational and leads to exploration (Fessler et al. 2004, Frank 1988, Frey et al. 2014, Nesse 1990). Looking at action-tendencies happiness represents an approach-oriented emotion. Happiness triggers the urge to play and to explore and motivates people (Fredrickson 2004). Hence, we expect happiness-induced players to enter markets more than 'neutral' players, and fear-induced players to enter less than 'neutral' players. This leads to our first hypothesis:

Hypothesis 1: *Agents enter the markets more when induced to happy film clips and less when induced to anxious film clips compared to a 'neutral' control group ($M_H > M_N > M_A$).*

IV.2.2.2 Indirect effect of emotions

We study the framework of the market entry game. Studying market entry games has several benefits for studying individual decision making and especially that of entrepreneurs. In the standard framework (Selten and Güth 1982, Kahneman 1988), individuals repeatedly decide to enter or to stay out of a market. Players cannot communicate or observe others' behavior and have to decide simultaneously. Usually, payoffs are decreasing with N players who enter and agents make losses whenever the number of entrants m is larger than the capacity c of the respective market. Hence, the structure of the market entry game echoes fundamental properties of real world markets. Further, the game is easy to understand for players. Agents should only want to enter whenever the total number of entrants $[(N\text{-}1)+1]$ is smaller than c and ideally aim to enter alone.

Economists have been interested in this type of game for a long time. Starting with Chamberlain (1933), market entry games have been studied extensively from a theoretical perspective highlighting the importance of the Nash equilibrium as normative solution to this type of noncooperative n-person games (Selten and Güth 1982). In the Nash equilibrium each player's strategy is his best response to other players' strategies (Fudenberg and Tirole 1991). Hence, no player in the market would have been better off staying out and nobody would be better off entering. Several experimental studies find that in a class of market entry games with large N that behavior is accounted for best by the Nash equilibrium (Duffy and Hopkins 2005, Erev and Rapoport 1998, Kahneman 1988, Rapoport 1995, Rapoport et al. 1998, Sundali et al. 1995). Finding that the number of entrants usually ranged from [c+2; c-2], Kahneman (1988) stated: "To a psychologist it looks like magic" (p.12).

We are building our predictions in analogy to the model by Schade, Schroeder, and Krause (2010) who investigate the effects of loss and gain experiences prior to making strategic decisions in two coordination games. The authors are the first studying the influence of gain and loss experiences in strategic decision environments developing a mathematical model and hence providing a framework for analyzing individuals' prior loss and gain experiences in strategic decision situations. This is important because there are rarely decisions where individuals need to coordinate without history. Schade et al. (2010) assume that individuals' payoffs can be evaluated by a reference-dependent value function according to prospect theory as developed by

Kahneman and Tversky (1979), i.e. people behave rather risk averse after experiencing gains and risk seeking after experiencing losses. Further they assume each individual to expect his/her counter player to react to gains and losses in the same way he/her does, in line with the concept of social projection (Allport 1924, Festinger 1954). Moreover, individuals are assumed to process loss and gain experiences in an aggregated form (see e.g., Thaler and Johnson 1990). Finally, the authors assume individuals to behave according to general equilibrium point selection theory developed by Harsanyi and Selten (1988). Schade et al. (2010) calculate behavioral equilibrium predictions leading to the hypotheses that player should enter most when having experienced a loss and facing to people that experienced gains. They should enter least when having experienced a gain prior to entering and are facing to player who lost before, and so on. They test their predictions in two experimental studies employing a market entry game and a battle of the sexes game. The authors find the hypothesized pattern for male players; female players do not behave according to the predictions.

Instead of gain and loss experiences prior to entering markets we are interested in different emotional states of players. In line with the existing experimental studies finding significant influences of own and others' emotional states on choices by Meshulam et al. (2012), Gneezy and Iman, and Kugler et al. (2014) we expect not only own emotions to play a role for individuals' choices but also information about opponents' emotional states. Contrary to the above studies we do not examine trait emotions such as anger and anxiety (Kugler et al. 2014), nor are subjects given the possibility to anger each other (Meshulam et al. 2012, Gneezy and Iman 2014). Rather we induce happiness, fear, and neutral states using a battery of pre-tested film clips in the laboratory.

We expect individuals to react to the information about induced emotional states. Specifically, we expect subjects to behave according to social projection hence to enter when facing fear-induced players because they assume them to stay out of the competitive market (according to hypothesis 1, people enter less when induced to fear). We hypothesize individuals to stay out of the market when facing happiness-induced players because they would expect those players to enter. It would not make sense to enter against two people they believe to enter for sure (according to hypothesis 1) as $N \geq 2$ leads to $\pi \leq 0$. Concluding, building on hypothesis 1 and social

projection, and in analogy to predictions by Schade et al. (2010) we expect players to behave as follows:

Hypothesis 2: *Market entry is expected to be highest with a happiness-induced player facing two anxiousness-induced players and lowest with an anxious-induced player facing two happiness-induced players.*

IV.2.2.3 Running the experiment with entrepreneurs and students – a robustness check

Studying entrepreneurs' behavior is especially interesting for research in judgment and decision making as the entrepreneur can be described as expert decision maker in an inherently uncertain and complex environment in the economic domain (Knight 1921). Moreover, scholars find entrepreneurs to be more or less susceptible to cognitive biases such as overconfidence or the status quo bias than non-entrepreneurs (e.g., Busenitz and Barney 1997, Camerer and Lovallo 1999, Burmeister and Schade 2005).

Market entry problems (Selten and Güth 1982, Kahneman 1988, Camerer und Lovallo 1999, Schade et al. 2010) have been of interest to scholars from different fields of research for several reasons. Entrepreneurship researchers are interested in how individuals behave in entrepreneurial settings (Camerer and Lovallo 1999) or how entrepreneurs act in situations facing market entry decisions (Artinger and Schade 2014). Researchers from organizational behavior are interested in firms' behavior when for instance entering new markets in foreign countries with publicly known capacity and competitors (see Sundali et al. 1995). In fact, a typical observation in entrepreneurial markets is excess entry of startups (e.g., Koellinger et al. 2007, Bolger et al. 2008, Artinger and Powell 2015). Hence, we will run our experiments with entrepreneurs as important real life decision makers under uncertainty and observe their behavior in comparison to students' behavior.

IV.2.3 Equilibrium analysis

IV.2.3.1 Normative equilibrium analysis

Our setting has the following characteristics: $N = 3$ players can privately and simultaneously decide to enter ($s_i = 1$) or not ($s_i = 0$) on each trial. Payoffs π_i are linearly decreasing with $0 \leq m < N$ number of people who enter and zero entry costs. The capacity of the market $c = 2$ is fixed, and publicly known. The scaling parameter is $r = 6$ and m represents the number of players entering. Players cannot communicate or observe others' behavior. Hence, they face strategic uncertainty about other opponents' behavior.

$$\boldsymbol{\pi_i = \begin{cases} r(c-m), if\ s_i = 1 \\ 0 \qquad\quad , if\ s_i = 0 \end{cases}}$$

It follows that a profit-maximizing player should stay out of the market if the other two players enter, and enter if nobody else enters. If one player enters, the others are indifferent between entering and not entering. Hence, this game has six pure Nash equilibria (see appendix Figure VII-4) and one mixed strategy equilibrium (Rapoport et al. 1998). In the symmetric mixed strategy equilibrium, each agent enters with probability p and stays out with $1- p$. The mixed strategy equilibrium is

$$\boldsymbol{p* = \frac{c-1}{N-1}}.$$

Given the parameters in our game the mixed equilibrium is $p^* = ½$.

In the market entry game, strategy selection is difficult because of the existence of multiple Nash equilibria. Schade et al. (2010) derive unique behavioral equilibria under asymmetric starting conditions.

IV.2.3.2 Descriptive equilibrium analysis

Schade et al. (2010) show that unique behavioral equilibria can be derived under asymmetric starting conditions. In their set up asymmetric starting conditions were gain or loss experiences prior market entry decisions. Please refer to Schade et al.

(2010) for detailed explanations and a mathematical development of equilibrium predictions based on prospect theory (TAP games).

In our study, we suggest entry *tendencies* in the following table, in analogy to reference dependent equilibrium predictions according to Schade et al. (2010). According to their predictions a loser always enter the market in all player combinations where a loser (L) faces combinations of winners (G) and neutral players (N), i.e., in the following combinations L enters: (L-LN), (L-LG), (L-NN), (L-NG), (L-GG). On the other hand, a winner (G) facing combinations of loser (L) and neutral players (N) would not enter the market according to the predictions. Table 7 on p.433 depicts all equilibrium forecasts for asymmetric combinations (Schade et al. 2010).

Even though we are not able to calculate equilibrium predictions we attempt to translate the above predictions to induced emotions. Respective entry tendencies are denoted by t_i, t_j, and t_k for $N = 3$ players. Positive signs denote a tendency to enter, negative signs to stay out, and ~ indifference. For instance, the first row depicts entry tendencies for fear-induced player (F) playing against two happiness induced players (H,H) with the fear-induced player having a strong tendency to stay out of the market. On the other hand, one happiness-induced player (H) facing two fear-induced players (F, F) has a very strong tendency to enter the market.

Table IV-12: Entry tendency predictions

	t_i	t_j	t_k
F – HH	- - -	+	+
F – HN	-	+ +	~
F – HF	~	+ + +	~
F – NN	-	+	+
F – NF	+	+ +	+
F – FF	+	+	+
N – HH	- -	-	-
N – HN	-	+ +	-
N – HF	~	+	-
N – NN	~	~	~
N – NF	+	+	-
N – FF	+ +	+	+
H – HH	-	-	-
H – HN	+	+	- -
H – HF	+	+	- - -
H – NN	+ +	-	-
H – NF	+ +	~	-
H – FF	+ + +	~	~

IV.2.4 Experimental design

We carried out a laboratory experiment studying the effect of happiness and fear on strategic decisions in the market entry game. The computerized experiment was programmed in z-Tree (Fischbacher 2007). Table IV-13 depicts the experimental design. First, all participants received and signed an informed consent form. They were then welcomed to the laboratory and randomly assigned seats. Instructions were printed and read aloud. Each student participant received a show up fee of EUR 14. Entrepreneurs' payoffs were scaled by a factor of four in order to account for possible income differentials and to ensure salience of incentives. They were informed that only one of the rounds would become payout relevant and thus they had the incentive to make their best decision in each round. Before all entry decisions and emotion induction we measured risk attitude with the lottery comparison task by Holt and Laury (2002) and using the risk questions administered in the Socioeconomic Panel (SOEP). Further, we measure trait happiness with the satisfaction with life scale (SWLS) by Diener et al. (1985) and trait anxiety using the questions of the SOEP. Then, instructions for the second and main part of the experiment were read out loud.

Participants answered five comprehension questions to make sure they thoroughly understand the economic task. They played 18 rounds of the three-player market entry game. Before starting and after every fifth round, everybody watched a short film clip (either four times a happiness-inducing scene, or four times a fear-inducing scene, or four times a 'neutral' scene). After completing all rounds, the participants answered some questions about their strategic behavior and demographic details. Finally, they got informed of their payoffs and anonymously received the money in cash. The experiment was carried out in German. The instructions can be found in appendix C.

Table IV-13: Overview of experimental design

0	Consent form
1	Welcome and instructions part 1
2	Holt and Laury task (2002)
3	Trait happiness and trait fear questionnaire
4	Instructions part 2 (ME game) & comprehension questions
5	Film clip 1
	ME game round 1-5
	Film clip 2
	ME game round 6-10
	Film clip 3
	ME game round 11-14
	Film clip 4
	ME game round 15-18
6	Demographic questionnaire
7	Anonymous payoffs

IV.2.4.1 Participants and instructions

In total, *N*=168 subjects participated in our experiment. The sample consists of students and entrepreneurs. The *N*=144 students were recruited from an experimental database (ORSEE 2.0, Greiner 2015). The experiment took place in the laboratory of Humboldt-Universitaet zu Berlin. Each of the 12 sessions lasted approximately one hour. The *N*=24 entrepreneurs were recruited mainly via the university's venture service. One session was carried out in the laboratory and one session using a mobile laboratory in the university's incubator building. All participants received detailed

instructions. They could follow the instructions on their computer screens and they were read aloud.

IV.2.4.2 Risk preferences and trait emotions

After welcoming everybody to the experiment, the Holt and Laury (2002) risk lottery was explained. We started off with the lotteries in order not to confound the subjects' risk propensity with the emotion induction process. In the Holt and Laury lottery, subjects have to decide between ten paired lottery choices that are structured so that the degree of risk aversion can be inferred on the basis of the crossover point to the high-risk lottery. Payoffs for option A (EUR 2 or EUR 1.60) are less variable than payoffs of option B (EUR 3.85 or EUR 0.10). Hence, option B can be characterized as being riskier. In the first decision, the probability of getting the higher payoff of each option is ten percent. Only extreme risk seekers would choose option B, i.e., receiving EUR 3.85 with a probability of ten percent as compared to receiving EUR 2 with ten percent or EUR 1.60 with 90 percent. With each decision, the probability of getting the higher payoff of each option increases (in decision two the probability of receiving EUR 2 or EUR 3.85 respectively amounts to 20 percent, decision three implies a probability of 30 percent, and so on). Appendix C provides screenshots of the actual table. At some point, any decision maker should cross from choosing option A to choosing B since the probabilities for getting higher payoffs increase. Note that even an extreme risk seeker should choose option B in the last decision (probability of 100 percent of winning the high lottery).

Further, all participants answered questions accessing individuals' risk preferences. We chose seven questions that are used in the Socio-economic panel (SOEP), a representative panel survey of the German population since 1984 (please see e.g., Dohmen et al. 2011, or, Schupp and Wagner 2002 for a detailed description). In the first question, individuals are asked for their attitude towards risk in general ("Are you generally a person who is fully prepared to take risks or do you try to avoid taking risks?"). The following questions ask for risk attitude in specific domains: car driving, finances, sports, career, and health. Participants could indicate their willingness to take risks on a ten-point scale ranging from complete unwillingness to complete willingness to take the risk. One further question presents the participants

with an investment choice, telling them that they had won 100,000 EUR in a lottery and could invest a fraction or everything at a bank whereas the amount of money doubles or is cut in half with probability of 50 percent[13]. We administered both the lottery choices and the risk scales in order to get a comprehensive picture of individuals' risk preferences. The Holt and Laury lottery task has the clear advantage of being an incentivized measure that reveals individuals real risk preferences. However, empirical evidence shows that participants oftentimes show inconsistent behavior by having multiple switching points or not choosing option B in the last choice. Self-reported risk question cannot be incentivized but are easily accessible for respondents.

Next, we administered two questionnaires accessing participants' general happiness and fear (before any emotion induction was carried out). Participants answered the Satisfaction With Life Scale (SWLS), a short 5-item instrument that measures cognitive judgments of satisfaction with one's life (Diener et al. 1985). Moreover, they answered three questions regarding their general fear that are also used in the SOEP (Wagner et al. 2007). Participants could state whether they agree or not on a seven point Likert scale.

IV.2.4.3 Market entry game

Then, participants received instructions for the second part of the experiment. They were informed that they would play 18 rounds of the market entry game and that they were playing against a different randomly determined combination of players in each round. Before starting and in between the rounds they and every other player would see a short video clip, see Table IV.13 (Experimental design) for details. Before each round, they would receive information about the nature of the video the other player had seen. Moreover, they were informed that all three players simultaneously decide to enter the market or not. The market has a limited capacity so that if all three players enter everybody suffers a loss, if two players enter everybody gets 0 and if one person enters he wins. They were explicitly informed that only one of the rounds will be

[13] The exact wording is: "Imagine you had won 100,000 Euros in a lottery. Almost immediately after you collect, you receive the following financial offer from a reputable bank, the conditions of which are as follows: There is the chance to double the money within two years. It is equally possible that you could lose half of the amount invested." All questions in German can be found here: www.diw.de/deutsch/sop/service/fragen/personen/2004.pdf.

chosen in the end that becomes payoff relevant. Thus, they had the incentive to make their best possible decision in every round.

Subsequently, subjects had to answer five comprehension questions to make sure they understood the instructions. After all market entry decisions, participants answered four questions asking whether they anticipated what the other players would do and answered demographic questions. In the end, they were informed about their payoffs from part one and two and the experimenter secretly handed out the payoffs in cash.

Additionally, participants had the opportunity to state their entry decisions by using a randomizing device, a procedure called explicit randomization (Anderhub et al. 2002, Camerer 2003, Schade et al. 2010). They were told that an imaginary bingo cage would determine whether they would enter the market or not. The bingo cage contains 100 lots and in each round the participant could decide what type of lots to fill it with. They could assign either 100 lots to enter for sure or 0 lots to stay out for sure. Alternatively, they could fill any kind of combination of entry and no-entry lots that would then reflect the probability of the bingo cage determining entering the market or not.[14] This procedure has the advantage that participants have the possibility to make non-binary decisions and it allows comparing respondents' strategies with mixed strategy equilibria.

IV.2.4.4 Emotion induction

We introduced emotions in the laboratory via showing participants a short film clip. Using film clips to elicit emotions is common in psychological and economic experiments (e.g., Ifcher and Zhargamee 2011, Lerner et al. 2011) and has several advantages as discussed extensively in chapter III.2. However, one challenge is the question of which set of stimuli to use. For this purpose, we conducted a pre-study, please refer to chapter III.2 for details. We identified the following movies for each treatment condition (N = neutral, F = fearful, H = happy):

[14] The exact description can be found in appendix C, instructions.

Table IV-14: Emotion induction - stimuli

N1	All the Presidents' Men	F1	The Shining	H1	Harry and Sally
N2	The Network	F2	Lambs	H2	The Hangover
N3	Jane Eyre	F3	Blairwitch Project	H3	Big Bang Theory
N4	North by Northwest	F4	Insidious	H4	The Naked Gun

IV.2.5 Data and results

IV.2.5.1 Sample

We conducted 14 sessions with 12 players each and collected the data within one month. Each session lasted about one hour. The table below summarizes by type of player. The student sample consists of 90 females and 54 males with an average age of 26 from several fields of study. On average, students earned 16 Euro. Only one female entrepreneur participated in the entrepreneurial sample (N=24)[15], the average age here was 31 and average profit 59 Euro. Entrepreneurs enter most of all (mean entry 56%) but only slightly more than male students (55%). Female students enter significantly less (43%). Looking at the Holt and Laury lottery, students are more risk averse than entrepreneurs: students' average switching point was 6, whereas entrepreneurs switched earlier at option 5 (note that the earlier the switching point the more risk loving, and a switching point of 4 denotes risk neutrality). Regarding the general and domain specific questions of the SOEP (scale from 0-10 with 10 being risk loving) we find entrepreneurs to be more risk taking than students and to invest more hypothetically. All participants tend to be satisfied with their life (M_{stud} = 5.11 / 4.92, M_{entr} = 5.54) whereas entrepreneurs are slightly more satisfied than female and male students are. Male students tend to be a bit more worried than female students and entrepreneurs (M_{stud} = 3.91 / 4.34, M_{entr} = 3.96).

[15] In the following analysis, we will not distinguish between male and female entrepreneurs since we only have one female in our sample.

Table IV-15: Descriptive statistics

	Female students	Male students	Entre-preneurs
Observations	90	54	24
Age	26	26	31
Mean entry	43%	55%	56%
Av. Profit (in EUR)	16.20	16.70	59
*Risk propensity (H&L) **	6	7	5
Risk propensity (SOEP)			
General (av.)	4.32	3.84	5.69
Financial (in EUR)	20k	20k	40k
SWLS (scale 1-7)	5.11	4.92	5.54
Anxiety (scale 1-7)	3.91	4.34	3.96

** switching point*

IV.2.5.2 Individual analysis: mean entry rates

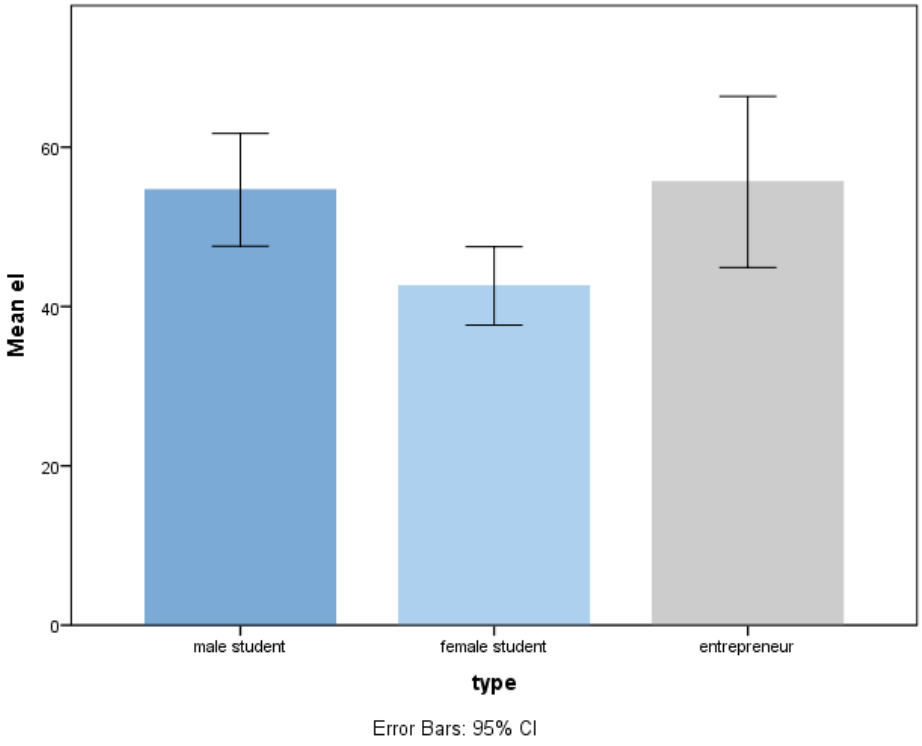
IV.2.5.2.1 Direct effect of own emotional state on behavior

IV.2.5.2.1.1 Entry lots

Participants had the possibility to explicitly 'mix' their entry strategies, i.e., they could specify whether they want to enter for sure (100 lots), want to stay out for sure (0 entry lots), or mix over the interval [0,100]. We find, that 57 percent of the players mix their entry lots and 43 percent play pure strategies. Sixty-two percent of female players play mixing strategies whereas 56 percent of male students and only 38 percent of entrepreneurs chose to mix. Mean entry is 48.32 (*SD* = 25.21) and median is 50. For the distribution of our dependent variable *entry lots* this implies a binary censored distribution, see histogram Figure VII-5 in appendix C.

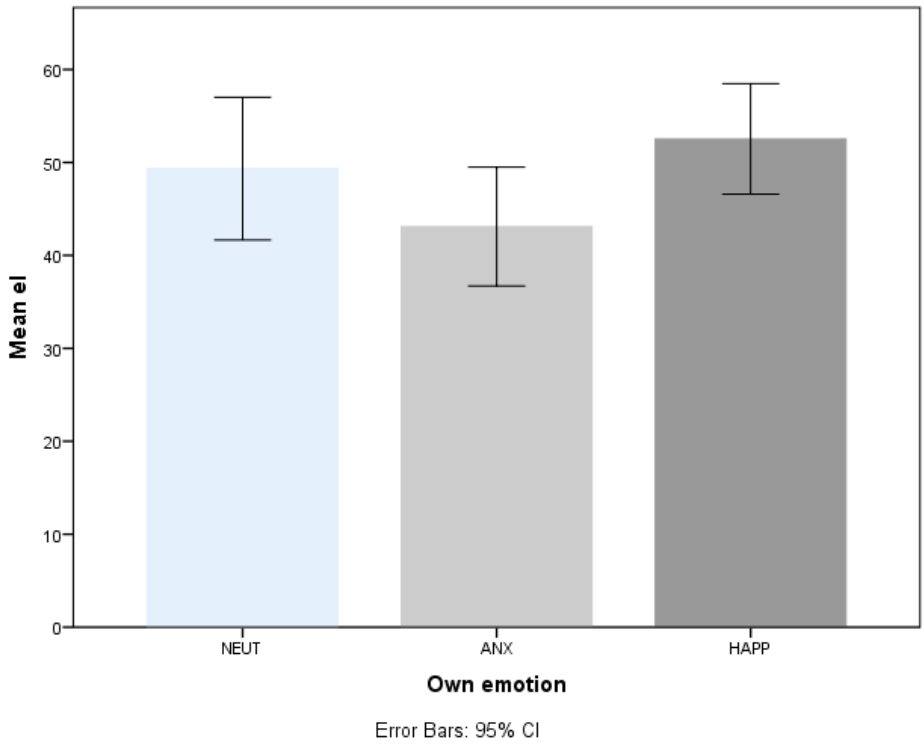
Looking at mean entry rates separately by groups, we find women overall to enter fewer than men. Mean entry of women is M_f= 42.58 (SD = 23.49) whereas men on average enter with a mean of M_m = 54.65 (SD = 25.95). Entrepreneurs enter most of all M_e = 55.63 (SD = 25.45). The difference between entry of females and male students and entrepreneurs is significant, $F(2, 165) = 5.306$, $p = .006$.

Figure IV-6: Mean entry rate by type of player



Moreover, we find that on average individuals tend to enter more when watching a happiness-inducing film clip M_{HAPP} = 52.53 (SD = 34.15) as compared to 'neutral' scenes M_{NEUT} = 49.34 (SD = 39.32) and enter fewer when watching a fear-inducing film clip M_{ANX} = 43.10 (SD = 37.59), see figure below. This difference is however not significant, $F(2, 165) = 2.051$, n.s.

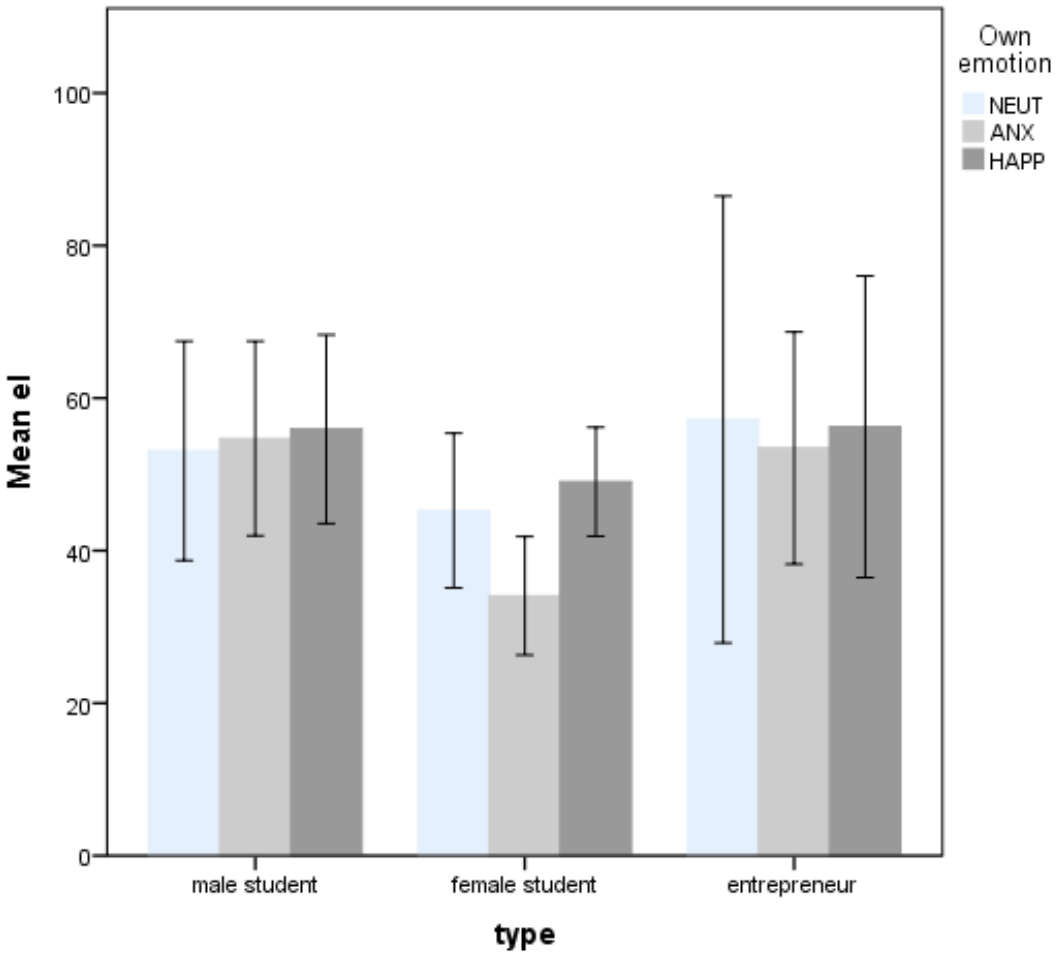
Figure IV-7: Mean entry rate by emotion



Looking at entry behavior by type of player *and* own emotion we find an interesting difference. The difference between men and women is so large that a fear-induced male player enters even more (M = 54.70) than a happiness-induced female player (M = 49.04). Figure IV-8 summarizes this difference of entry lots by type and emotion.

Running a two way ANOVA with *el* as dependent variable we find a significant main effect of the type of player on entry behavior, $F(2,159)=5.079$, $p < .01$. There was a non-significant main effect of own emotion on entry behavior, $F(2,159)=.736$, $p = .481$. There was a nonsignificant interaction of type of player and own emotion on entry behavior, $F(4,159)=.612$, $p = .654$. Bonferroni post-hoc tests showed no difference in entry behavior between male students and male entrepreneurs, M_{diff} = -.99, 95% [-15.57, 13.59], $p = 1$. Entry behavior was however significantly lower for female students compared to male students, M_{diff} = 12.07, 95% [1.84, 22.30], $p < .05$, and compared to entrepreneurs, M_{diff} = -13.05, 95% [-.60, 26.71], $p < .1$.

Figure IV-8: Mean entry rates by type and emotion



Concluding, the above findings are in favor of hypothesis 1. People enter more when induced to happy clips as compared to neutral and anxious clips. This difference is however only significant for female students, ($F(2,87) = 3.473$, $p = .035$). Moreover, we find that female students enter significantly fewer than male students and entrepreneurs.

IV.2.5.2.1.2 Payoffs

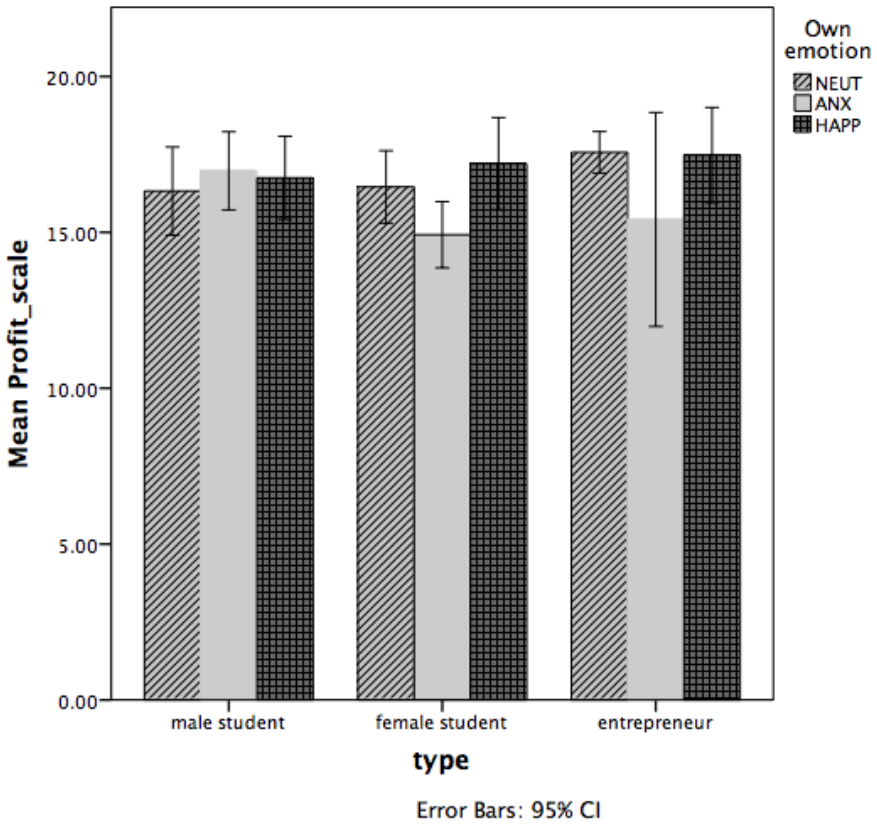
In the following, we will look at payoffs of respondents by type of player and by induced emotion. Female players earned M_F = 16.16 (SD = 3.39), male students learned a bit more M_M = 16.69 (SD = 2.66), and entrepreneurs earned most[16] M_E = 16.82 (SD = 2.71). The differences between type of players are not significant, $F(2,165)=.722$, $p = .487$.

Comparing payoffs by type of induced emotion, we find a significant difference determined by an one-way ANOVA, $F(2,165)=3.370$, $p < .05$. A Bonferroni post-hoc test revealed that the happiness-induced players earned significantly more (M_{HAP} = EUR 17.08, $p = .034$) than anxiousness-induced players (M_{ANX} = EUR 15.62). There are no significant differences compared to the neutral group (M_{NEUT} = EUR 16.58).

Running a two-way ANOVA this effect disappears. We observe a non-significant main effect of type of players, $F(2,159)= .656$, $p = 520$. We also find a non-significant main effect of own emotion, $F(2,159) = 2.323$, $p = .101$. Last, there was a non-significant interaction of both variables type of player and own emotion, $F(4,159) = 1.309$, $p = .269$. Individuals' payoffs by group of emotion and type of player are depicted below.

[16] We scaled back payoffs to entrepreneurs to be able to compare payoffs across groups.

Figure IV-9: Mean payoffs by type of player and own emotion



Running split file analyses, we find that female players earn significantly less when in an anxious state compared to being in a happy state determined by one-way ANOVA, ($F(2,87) = 3.719$, $p = .028$). A Bonferroni post-hoc test shows that the final profit was significantly lower in the anxious treatment (M_{ANX} = EUR 14.92 ± 2.9, p = .028) than in the happy treatment (M_{HAP} = EUR 17.20 ± 3.8). There are no statistically significant differences to the neutral group (M_{NEUT} = EUR 16.46 ± 3.2). For male students and entrepreneurs, we find no significant differences in payoffs between treatments (*ownemo*).

IV.2.5.2.1.3 Pure vs. mixing strategies

Looking at entry strategies for male and female students separately (see table below), we find that women decide for mixing strategies more often than men (62 percent vs. 56 percent). Entrepreneurs play mixed strategies in 38 percent of cases only. Moreover, only 14 percent of the female students fill in 100 lots as compared to 26

percent of the male students and 37 percent of the entrepreneurs. The same pattern holds for zero entry lots, women indicate to stay out of the market in 24 percent of all decisions whereas male students stay out only 18 percent. Entrepreneurs interestingly choose zero lots in 25 percent of all cases. Please find all relevant histograms in Appendix C.

Table IV-16: Entry strategies by type

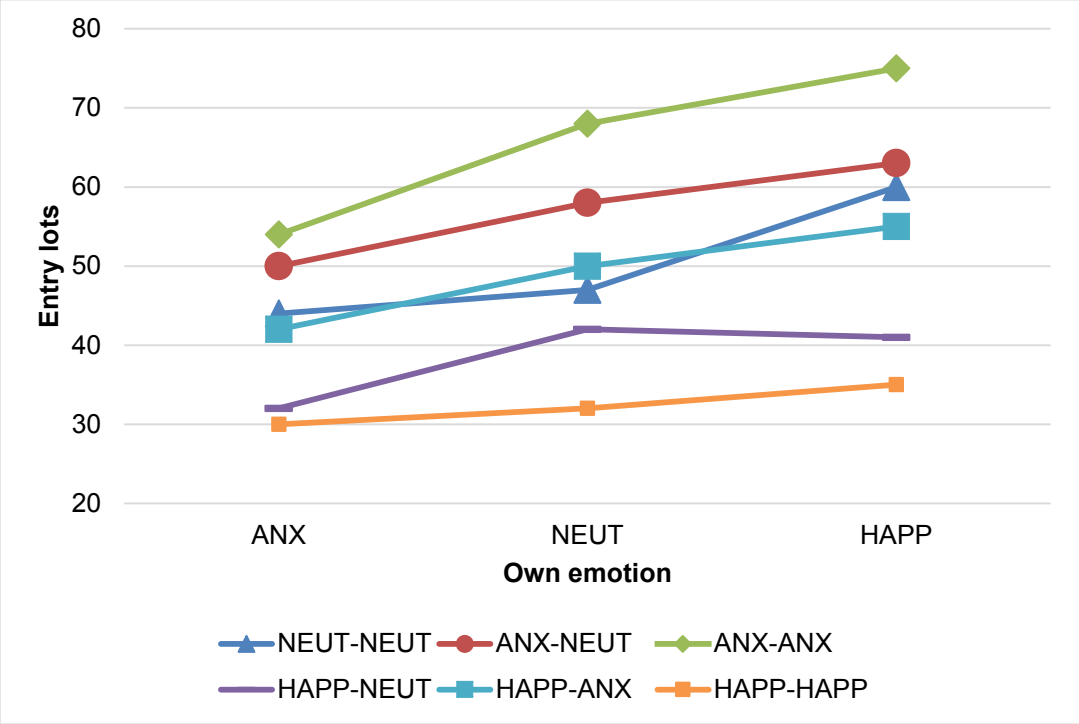
Entry lots	All	Female students	Male students	Entrepreneurs
mean	48	43	55	56
100	21	14	26	37
0	22	24	18	25
mix	57	62	56	38
pure	43	38	44	62

(in percent)

IV.2.5.2.2 Influence of information about others' emotional states

Figures IV.10 – IV.12 below graphically show mean entry rates depending on own emotional states (depicted on x-axis) and opponents' emotional states (depicted on y-axis). Each line represents a combination of two opponent players. Each combination of all three players is represented by one of the data points. For instance, the lower left square shows mean entry for a fear-induced person playing against two happiness-induced individuals. The upper right rhomb illustrates the situation of a happiness-induced individual playing against two fear-induced people. We see that players react differently to their opponents' emotions. All players enter least when facing two happiness-induced players (orange line) and enter most when playing against two fear-induced players (green line). Happiness-induced players facing two fear-induced players enter most of all (M=74) and fear-induced players facing two happiness-induced opponents enter least of all (M=32).

Figure IV-10: Mean entry rates given opponents' emotion (0;100)



Moreover, we observe a clear difference in behavior when comparing the behavior of women and men. For both groups, we see the same pattern when facing different opponents: highest entry rates against two anxiousness-induced players (green line), second highest entry against the combination anxious and neutral; lowest entry rates against two happiness induced players, second lowest against happy and neutral. However, the graph of men's behavior depicts flat lines, i.e., they seem to ignore the influence of own emotion but behave as presumed to opponents' emotional states. Women do both: they enter more in a happy emotional state and less when anxious and expect the same behavior of their opponents. In the next sub-chapter we will analyze these pattern estimating regression models.

Figure IV-11: Men's mean entry rates given opponents' emotion (0;100)

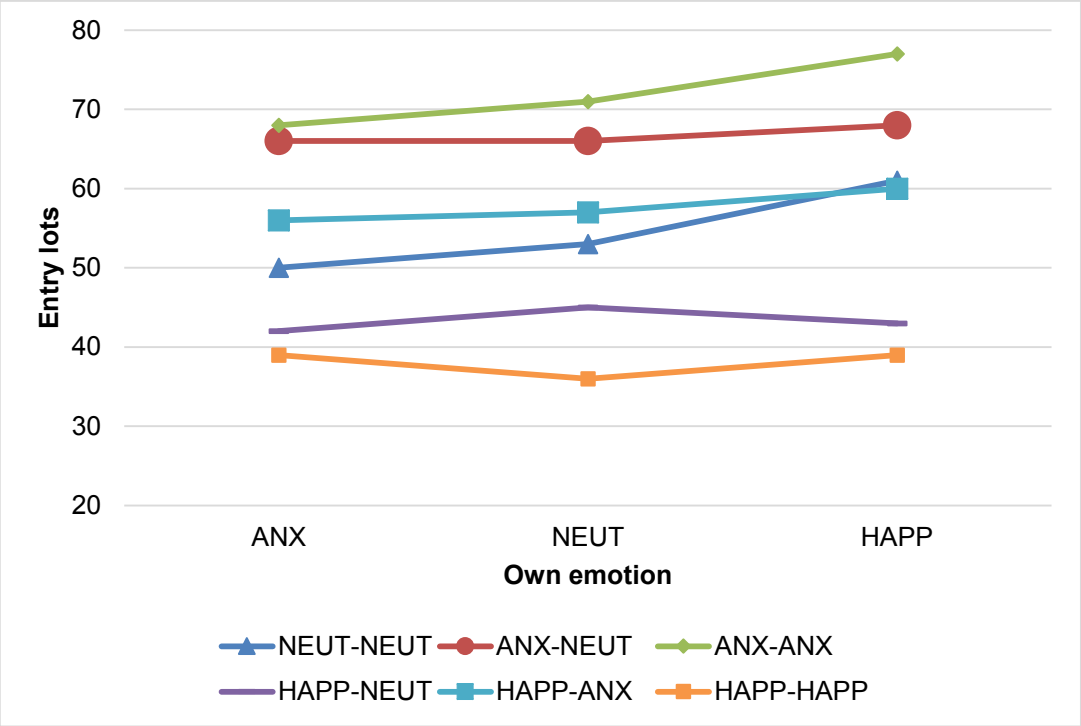
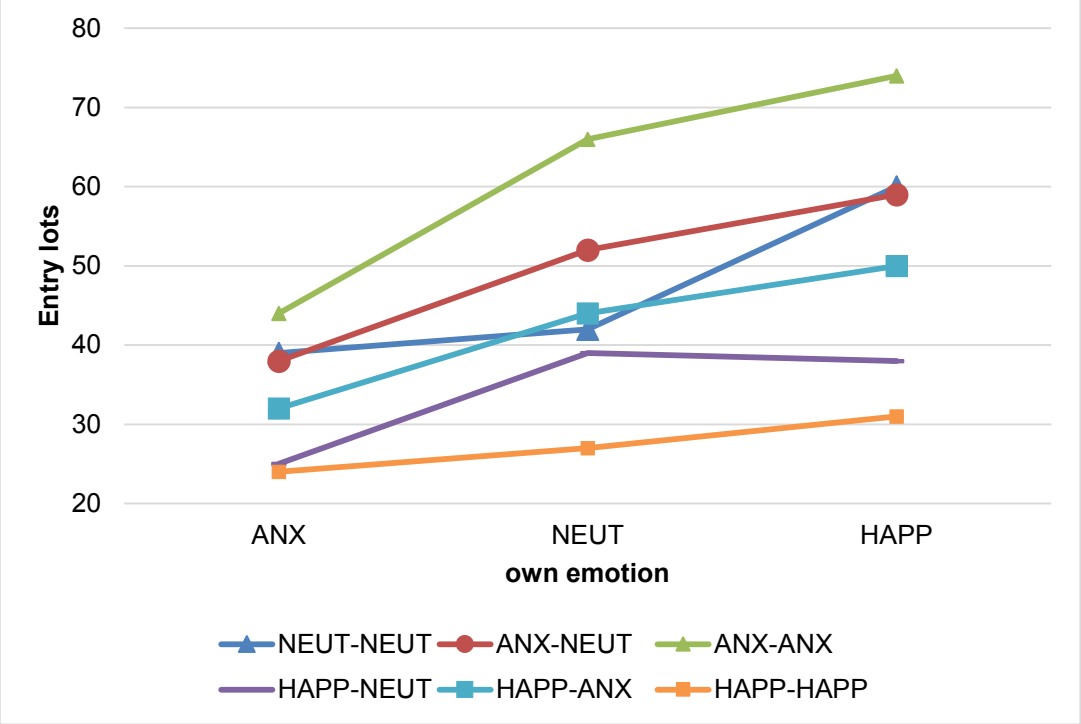


Figure IV-12: Women's mean entry rates given opponents' emotion (0;100)



IV.2.5.3 Model estimates

IV.2.5.3.1 Repeated-measures ANOVA

We now turn to model estimation in order to be able to evaluate the size and significance of the observed patterns in the previous graphs. We run repeated-measures ANOVAs with Bonferroni post-hoc test and random-effects Tobit models as robustness checks. In our general linear model, the between subjects variable is a subjects' own emotion (*emo_own*). The within-subjects factors are opponents' emotions (*emo_opp*). Hence we have three between factors *(NEUT, ANX, HAPP)* and six within-subjects factors *(NEUT-NEUT, NEUT-ANX, ANX-ANX, NEUT-HAPP, ANX-HAPP, HAPP-HAPP*). All tables can be found in Appendix C. All effects are reported as significant at $p < .05$.

First, there is a significant main effect of own emotion on the dependent variable entry lots (*el*), $F(2, 165) = 3.568$, $p = .03$. Bonferroni post-hoc tests reveal that happiness-induced subjects enter more than anxiousness-induced subjects (mean difference = 12.58, $p = .026$). There was no significant mean difference comparing happy and anxious subjects to the neutral group.

We also find a significant main effect of opponents' emotions on entry lots (*el*), $F(5, 825) = 61.044$, $p = .000$). Contrasts show that comparing to NEUT-NEUT, people enter significantly more when facing two anxiousness-induced players, $F(1, 165) = 36.505$, $p = .000$, or one 'anxious' and one 'neutral' player, $F(1, 165) = 9.078$, $p = .003$. They enter significantly less when facing two 'happy' players, $F(1, 165) = 65.324$, $p = .000$, or facing one 'happy' and one 'neutral' player, $F(1, 165) = 39.187$, $p = .000$. No significant effect is found when comparing entry against one 'anxious' and one 'happy' player.

Looking at the effects per type of player, we find the main effect of opponents to be significant for all three groups. Interestingly, comparing the situation (*ANX-HAPP*) to (*NEUT-NEUT*) by group we find that male students and entrepreneurs enter more, $F(1, 51) = 3.831$, $p = .056$, whereas female students enter less, $F(1, 87) = 3.445$, $p = .067$.

IV.2.5.3.2 Random-effects Tobit regressions

We now turn to regression estimation. Analyzing panel data, we can run fixed- or random-effects regressions. Whereas fixed-effects always give consistent results random-effects models may be more efficient. In order to choose between fixed- and random-effects we ran a Hausman (1978) test (the generally accepted test to use). The Hausman (1978) test compares both models in order to ensure that the potentially more efficient model also provides consistent results (Wooldridge 2010). Here, the Hausman test shows no significant difference, *Prob>chi2* = 0.9037. Hence, we use random-effects models. Further, looking at our predictor we find the dependent variable *el* is binary censored, see figure 8, hence we run Tobit models[17]. Note that we also run OLS models and find the same results.

Table IV.17 reports the results for two models both with the dependent variable entry lots (*el*). Model 1 shows the main effects of individuals' own emotions (*emo-own*) happiness (*HAPP*) or anxiety (*ANX*) compared to neutral (*NEUT* omitted), and the effects of the five different combinations of opponents' emotions (*emo-opp*) compared to the situations of two neutral players (*NEUT-NEUT* omitted). We find that compared to the neutral group people enter more in the happy situation and less in the anxious group (marginal significance $p<.1$). Comparing the entry behavior given their opponents' emotional states, we find that participants enter significantly less against two 'happy' players (*HAPP-HAPP*) or one 'happy' and one 'neutral' player (*HAPP-NEUT*) (-32.04 and -18.79 respectively, $p<.001$) and significantly more against two anxiousness-induced players (*ANX-ANX*) or one 'anxious' and one 'neutral' player (*NEUT-ANX*) (24.51 and 10.72 respectively, $p<.001$) than compared to two 'neutral' players (*NEUT-NEUT*). We do not find a statistically significant difference for the situation facing one anxiousness-induced and one happiness-induced player (*ANX-HAPP*). Model 2 additionally takes into account the type of player (*type*). We see females entering significantly less than males (-26.39, $p<.01$) and male entrepreneurs entering slightly more than male students do (n.s.).

Running split file random-effects Tobit regressions, we see that the influence of fear on entry behavior is significant ($p<.05$) for female players and not for male players. Moreover, females facing the ambiguous situation of one 'happy' and one

[17] For estimations we used the software package Stata 11.

‘anxious’ player enter less whereas male players in the same situation enter more often (p<.05). Please find all relevant output tables in appendix C.

Table IV-17: Random-effects Tobit regression (*N*=168)

	Model 1	***Model 2***
el	**Coef.**	**Coef.**
emo-own		
ANX	-14,81 †	-14,81 †
	(10,70)	(10,37)
HAPP	7,04	5,62
	(10,68)	(10,36)
emo-opponent		
NEUT-ANX	10,72 ***	10,72 ***
	(2,85)	(2,85)
ANX-ANX	24,51 ***	24,51 ***
	(3,20)	(3,20)
NEUT-HAPP	-18,79 ***	-18,79 ***
	(2,86)	(2,86)
ANX-HAPP	-2,55	-2,55
	(2,86)	(2,86)
HAPP-HAPP	-32,04 ***	-32,04 ***
	(3,22)	(3,22)
type		
Female student		-26,39 **
		(9,46)
Entrepreneur		3,14
		(13,48)
_cons	53,85	68,09
	(7,85)	(9,91)
/sigma_u	54,98	53,24
	(3,72)	(3,60)
/sigma_e	39,15	39,15
	(0,74)	(0,74)
observ.	3024	3024
Wald CHI 2	437,1	437,1

Dep. Var.: entry lots; standard errors in parentheses, individual clusters.
*sign. levels ***<.001, **<.01, *<.05, †<.1*

IV.2.6 Discussion

IV.2.6.1 Summary

We study the influence of happiness and fear on market entry decisions. We find that individuals enter less when fearful and more when happy (compared to a neutral treatment). This effect is significant for women. All individuals react to information

about other players' emotions. They enter least when facing two happy players and most when competing against two anxious players compared to playing against two neutral players. Overall, our findings indicate that people use emotions to coordinate. Regarding our hypotheses, this implies we find hypothesis 1 to hold only for women. Our main hypothesis 2 holds for all individuals. Moreover, we find that happiness-induced individuals tend to earn more and that payoffs significantly differ between happiness-induced female players and fear-induced female players. We do not find important differences between students and entrepreneurs. In the following, we will discuss our main findings and relate them to existing experimental findings and literature.

IV.2.6.2 Strategic value of emotions

In this study, we find that people seem to understand the strategic value of emotions and use them to coordinate. We are the first that study induced happiness and fear in coordination situations in an incentive compatible framework. *All* respondents use emotions strategically - not only women. Even though we do not find significant direct influences of emotions on men's decisions we find indirect influences. This is very interesting. Men seem to anticipate their opponents' behavior in a way we expected them to even though they do not act according to this themselves. This is in line with findings from existing studies on emotions influence in strategic games.

Our findings are in line with Meshulam et al (2012) and Gneezy and Iman (2014) who find that people use emotions strategically, i.e., players choose to anger people in strategic situations in the laboratory because they expect them to perform worse than 'neutral' people. They are also in line with the findings by Kugler et al. (2014) who study trait anger and anxiousness and find that people who score high on trait anger do not only enter more and people whose trait anxiousness is high enter less in two player entry decisions but also react to their opponents' personality characteristics accordingly. Our findings add to the idea formulated by Winter (2014) that better understanding emotions is beneficial for strategic behavior such as coordination decisions. This young but growing line of research is very interesting and can help to better understand individuals' strategic decision making and economic behavior in

general. More experimental studies inducing different discrete emotions and different frameworks are desirable.

In coordination decisions, one's own decision depends on other individuals' decisions. In this type of decisions oftentimes, *social projection* plays an important role, i.e., the tendency to expect other people to think and behave as oneself (Robbins and Krueger 2005, Ross, Greene, and House 1977, Schade et al. 2010). Regarding emotions, Lee and Andrade (2011) find social projection to explain the phenomenon that people sell stocks to early when experiencing fear. In our study, apparently, women behave according to social projection. They expect others to enter less when being in fear because they enter less themselves in this case.

IV.2.6.3 Gender differences

We find that that female players react more to own emotions than male players. Our findings somewhat relate to Lerner et al. (2003) who find that women who had been induced with fear perceive risks as comparably higher than male respondents. Shortly after 9/11, using a representative sample of the US population (N=973) the authors induce fear and anger using two distinct newspaper articles between subjects. Afterwards, respondents answered three questionnaires about perceived risks to the US, to self, and to the median American. They find that in general fear-induced people perceive risks as greater than anger-induced people. Note that this applies for both types of risks, related to and independent of terrorism. The effect was especially strong amongst women in the sample.

Apparently, male respondents are not influenced by their own emotions but expect their opponents to be. It could also be the case that women adjust their own entry strategy to their expectations about others' behavior. This implies they use k-level thinking (Camerer et al. 2004). We asked participants whether their decision was influenced by what strategies their opponent would play and by their opponents thinking strategically but find no gender differences.

Moreover, women seem to rather shy away from ambiguous situations whereas men try to exploit such situations. In our study, the situation when someone needs to decide whether to enter or not against one happy and one anxious player evokes

ambiguity. Prior research on ambiguity aversion shows that women tend to be more ambiguity and risk averse than men (e.g., Charness and Gneezy 2010, 2012).

IV.2.6.4 Pure vs. mixed strategies

We find that women choose mixing strategies more often than male students and entrepreneurs. This can be interpreted as men being more confident in their decision making. This is in line with findings by Schade et al. (2010) and has been interpreted as indicating uncertainty about what to expect from opponent players.

IV.2.7 Limitations of this study and future research

We acknowledge several limitations of our paper. Inducing emotions in the laboratory is difficult and of course artificial compared to real-life emotions. However, we extensively pre-tested our stimuli and used four different clips for each target emotion over the course of each session. Hence, we are confident that the film clips had the targeted effect on our participants. Alternatively, one could conduct a field study and manipulate real emotions. However, especially for negative emotions we believe this to be ethically problematic. One interesting approach would be to conduct research in a setting where negative emotions occur naturally. Possible situations could be a dentist's waiting room (Frey et al. 2014), the crocodile house at the local zoo, a scary movie in the cinema, or a tunnel of horror on a fair. Especially regarding the latter examples, it is questionable as how much individuals would have self-selected into this setting, i.e., somebody who is a rather anxious person would probably not actively and voluntarily decide to visit a haunted house.

Participants' emotional states were not measured by asking them how they felt as in the pretest. We extensively pre-tested the videos and find our clips to evoke the desired target emotions as discussed in chapter III.2. We randomized the groups so to control for individual differences. Moreover, previous research shows that manipulation checks potentially reduce the effect of manipulated emotional states on judgments (see for instance Gorn et al. 1993, Keltner et al. 1993).

We are only able to evaluate our findings for male entrepreneurs as our random selection of high tech entrepreneurs resulted in a sample with only one women. It

would be desirable to include women entrepreneurs in future studies on strategic emotions.

Psychologists have been discussing demand effects as a possible problem resulting in potential distortions of responses in questionnaires (e.g., Zizzo 2010, Fleming et al. 2007). Further, scholars find that social desirability is more pronounced with women than with men (e.g., Herbert et al. 1995). We cannot rule out the possibility that maybe women show a greater experimenter demand effect as men, i.e., act more towards what they think would be a desirable outcome for the experimenter. However, given induced emotions it may be hard to justify a demand effect as emotions happen as an immediate consequence and are hence presumably not subject to social desirability bias.

Running economic experiments in the laboratory always implies a discussion of the generalizability of results. Even though experiments have become considerably more accepted by economists there is still an ongoing debate on whether researchers should use laboratory experiments for analyzing behavioral decision making. Criticism usually points to using student samples from mostly US and European colleges as sample and of course the generalizability of laboratory results to the 'real' world (see e.g. Levitt and List 2007, Schade 2005). Whereas students depict some desirable characteristics as subjects in economic experiments (see chapter III.1.2 for a discussion) the question remains whether findings from running experiments with mostly US sophomores can be transferred as general knowledge about human behavior (Dothy and Silverthorne 1975, Levitt and List 2007, Rosenthal et al. 2009). This study uses both students and entrepreneurs as sample and behavior does not significantly differ between our groups of people. So it seems using students subjects is rather unproblematic in our setting. However, the question remains whether our findings in an artificial laboratory can be applied to actual markets. The setting of the market entry game is quite realistic in the sense that players have to decide simultaneously and are not able to communicate. We do of course not know as in how far context would influence peoples' choices. Hence, it would be interesting to use different frames of the market entry game, e.g., describing a more abstract investment decision as compared to a rather emotional application decision to enter into one's favorite job market. One would presume that the role of emotions would be even more pronounced in the second scenario. Note however, that in the present study we did not use any

frame but a rather clinical description of a market mechanism and we find significant influences of emotions.

IV.2.8 Conclusion

Emotions' influence on coordination and choices in general is a central question in behavioral and entrepreneurial decision making. In real life and in actual markets this is important because entrepreneurs and all other decision makers have to make important decisions under uncertainty. Information about others' emotional states might provide useful clues to enhance coordination and ultimately decision outcomes. We contribute to the field by providing an incentive compatible experiment with entrepreneurs and students. Given our significant effects of discrete emotions on behavior, we suggest further incorporating emotions into the literature on strategic interaction and models of behavioral game theory.

V General discussion and implications

V.1 Implications and future research

V.1.1 Implications for economics and decision making theories

Emotions potentially influence economic behavior in two ways: in form of *anticipated* or *immediate emotions*. Decision makers anticipate how they might feel about the consequences of their actions and alternatives. For instance, making a substantial investment an entrepreneur might anticipate the regret he would experience in case it turns out a bad investment and losing money, or the pleasure from gaining a lot of money (e.g., Loewenstein and Lerner 2003, Rick and Loewenstein 2008). Economic theory has considered and modeled this type of emotions in form of regret theory (Bell 1982, Loomes and Sudgens 1982) and experiencing relative pleasure from decisions (Loewenstein 1987, Mellers 2004).

The latter type of emotion is the topic of the present dissertation thesis. Psychology has a long tradition in studying immediate emotions. Recently, decision theory started to integrate the influence of immediate emotions into models of decision making under risk (e.g., Loewenstein et al. 2001, Rottenstreich and Hsee 2001, Loewenstein and Lerner 2003, Lerner et al. 2015), and models of intertemporal choice (McClure, Laibson, Loewenstein, and Cohen 2004). Growing empirical evidence studies the influence of immediate emotions in the economic domain (e.g., Ifcher and Zarghamee 2011, Schade et al. 2012) and on social preferences (e.g., Capra 2004, Kirchsteiger et al. 2006). Hertwig and Vohs (2016) call for more theory building in the literature as opposed to what they call vague and contradictory approaches and concepts (p.101).

In Part II of this thesis, I provide a theoretical background of emotions in standard psychology discuss more modern approaches including neuroscience. I further review and synthesize normative and descriptive decision theories and attempts of modeling emotions within these frameworks as well as findings from the literature on strategic games. The question whether the influence of emotions is beneficial (i.e., provide information for the decision maker that helps to understanding own values) or not (i.e., distorting preferences) in general is hard to answer taking a consequentialist approach. Rather, I believe emotions' influence on choices is dependent on the environment – as it is the case with heuristics. Emotions cannot be described having a positive or negative influence per se but depending on the situation can be beneficial or not (Todd, Gigerenzer, & The ABC Research Group 2012). In some environments emotions can

be completely rational whereas in other environments emotions lead to irrational or undesirable behavior (self-control) (see also Hertwig and Volz 2016, and Winter 2014). I believe this field of the adaptive function of emotions also in relation to evolutionary approaches is a very promising avenue.

Further, our findings contribute to the aspiring field of rational or strategic emotions (Gneezy and Imas 2014, Meshulam et al. 2013, Winter 2014). Aiming to build models of rational decision making that are more complete as proposed by Simon (1983) and others, some scholars experimentally investigate whether emotions can be rational for decisions makers and of strategic value. In his recent book, Winter extensively discusses and synthesizes findings on how emotions are rational and how understanding emotions better can be valuable for becoming better strategists. In this spirit, some experiments (Meshulam et al. 2013, Gneezy and Imas 2014) study whether people understand strategic components of emotions. To date, mostly the role of anger has been investigated. Anger is especially important in social interactions such as to negotiations or cooperation (Gneezy and Imas 20014, Meshulam et al. 2012). With our experimental study, we contribute by providing an incentive compatible economic experiment studying the strategic value of two induced emotions: fear and happiness. In line with the results of Winter, Gneezy and colleagues, we find an effect of emotions on choices in strategic situations.

V.1.2 Managerial implications

Our results have potential implications for managerial and organizational behavior and strategic management practice. Entry into competitive markets is an important question for firms, entrepreneurs, and individual decision makers (take for example academic job markets). We observe that knowing about opponents' emotions helps people to coordinate.

Consider for instance the market for promotion in large organizations. Employees oftentimes have to self-nominate themselves to be considered for upcoming promotions. This has considerable opportunity costs however large potential benefits. Decision makers can potentially make use of their competitors' emotional states for entering the current round of this promotion market, hence coordinate with their coworkers.

Moreover, we find large gender effects in market entry tendencies in general and depending on own emotions. Hence, it is important to make women aware of the fact that they enter markets only about 40 percent as compared to males entering in 55 percent of cases.

Our findings moreover contribute to the growing field of strategic emotions (Winter et al. 2016). For instance, anger can be beneficial or destructive in competitions and people use such effects of emotions to their strategic advantage (Gneezy and Imas 2014). Understanding the effects of emotions on decisions such as market entry choice, or competition in general has important value for instance to managers and entrepreneurs and calls for future research.

Further, communicating risks that evoke fear can have dramatic influences on individuals' perception of small risks such as terrorists' attacks. Slovic and Slovic (2015) provide in their book 'Numbers and Nerves' a remarkable compilation of studies and thoughts on how only presenting numbers of horrible incidents such as hundreds of people dying in the Mediterranean Sea seems to not affect people anymore after a while. In contrast, when seeing affect-laden pictures of one child suffering from war people become more aware. Slovic coins the term *compassion fade* or *psychic numbing* in this context. This topic and field of research is one of the most important questions in our society and recent situations in the world require further scientific elaboration and empirical evidence (see Slovic and Slovic 2015, Slovic and Västfjäll 2015, Västfjäll et al. 2014).

V.1.3 Implications for behavioral insights

The field of behavioral economics and economic psychology has gained prominent attention outside academia by policymakers, consulting firms and the media over the past decade especially since the success of Cass Sunstein and Dick Thaler promoting their concept of 'nudges' (Sunstein and Thaler 2008, 2014). Nudges are nothing new per se (see for instance, Simon, Dantzig, Hogarth, Plott, Raiffa, Schelling, Shepsle, Thaler, Tversky, and Winter 1987). However, the systematic argument of how beneficial and costless a certain nudge strategy in contrast to laws or incentives might be is new. Moreover, behavioral units advising the governments of for instance the UK (Behavioral Insights Team), or the World Bank (GINI) are causing widespread suspicion in the media and population. This is partly due to a misunderstanding of

what nudges and libertarian paternalism are. By definition: *"A nudge, as we will use the term, is any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates. Putting fruit at eye level counts as a nudge. Banning junk food does not."* (Thaler and Sunstein 2009). This definition is very straightforward – a nudge is any intervention that alters peoples' behavior without forbidding options and or changing incentives. This definition has since then however been modified largely.

In general, the trend of a thorough analysis and application of findings by behaviorists is extremely beneficial for finding solutions to a range of problems in our world. Pursuing a comprehensive strategy of better educating people about risks and benefits in the area of medical or financial decision making (see for instance Gigerenzer 2015 on 'risk savyness') is important. However, one needs of course to be careful when implementing seemingly 'cost efficient' means of choice architecture especially when such actions are introduced by governmental units.

Within the discussion about choice architecture emotions potentially play an important role. For instance, in many US states there are waiting times by law before people can buy a gun so that people who are angry at the moment of the decision to buy a weapon (as immediate emotion) cannot buy one immediately. In this manner, using means of choice architecture may reduce the influence of potentially harmful emotions (see Lerner et al. 2015). This field of research of reducing 'unwanted' emotions such as anger or grief is nearly non-existing today; hence further empirical studies of mechanisms are desirable.

V.1.4 Future research

Until today, scholars have a relatively good understanding of how emotional states and traits influence choice in the laboratory. Studies employing video clips, relived emotions, or scales measuring trait emotions have been increasing over the past 15 years. One area that from my point of view has received too little attention are field studies exploring the influence of emotions in behavioral decision making. Field studies provide the advantage that they have a high external validity (especially

compared to laboratory studies). However, measuring and what is more manipulating emotions in the field is challenging. Regarding negative emotions this is above all oftentimes ethically problematic. For instance, frightening people before making important insurance buying decisions in real life in order to study the outcome would not be right (even though this may in fact be what is happening in reality). In this example, using large-scale incentivized experiments with real monetary outcomes as in Schade et al. (2012) would be the adequate solution.

An interesting field approach would be to make use of aroused states and measure decision outcomes in emotion-laden field settings. For instance, Lambsdorff, Giamattei, and Werner (2016) study cooperation with individuals during a public viewing event in a beer garden during the soccer world cup in 2014. Other possible situations would range from studying choices of people after they have been watching an amusing film in a theatre, the setting of an amusement park or in sport stadiums. Clearly, the people one would reach would be far from a randomized selection but it would be interesting to see how emotions impact those economic choices heavily studied in laboratory experiments (i.e., risky gambles, simple dictator or trust games, or buying decisions). Hence, following up on the findings from part IV, one stream for future research would be to implement incentivized risk measures (such as the Eckel and Grossmann task) in a surrounding where people are positively aroused.

Further research avenues would include looking at different kinds of emotions, e.g. anger, sadness, or hope, and mixed emotions. It is important to investigate discrete emotions rather than just valence since previous research shows for instance fear and anger being of the same valence (negative) having an opposite influence on risk perceptions (e.g. Lerner and Keltner 2000). Especially anger is an important emotion to study in strategic settings. Gneezy and Iman (2014) find that people use anger strategically and also intuitively one can relate to how anger can potentially be beneficial (or dreadful) in interactive decisions such as negotiations.

Further, emotions and heuristics are extremely under researched to my best knowledge. For instance, even though almost all scholars highlight the role emotions play when searching for information and choosing (Gigerenzer et al. 2002, Hanoch 2002, Muramatsua and Hanoch 2005, Slovic 2002) there is no research looking at how emotions influence satisficing behavior. Simon (1983) pointed out over 30 years ago

that one needs to better understand the role of emotion in decision making. More theoretical and empirical studies are needed (see also Hertwig and Volz 2016).

V.2 Concluding remarks

This doctoral thesis takes an experimental approach to studying emotions and economic behavior. Research on the role of emotions and behavior in general has a long tradition in emotion psychology and has received new attention among decision making scholars starting in the 1980s. Behavioral economists have not concerned themselves with the role of immediate emotions much yet. Anticipatory emotions on the other hand, especially regret, have been investigated considerably more (Sudgen and Loomes 1982, Bell 1982). Only recently, a few studies have been published examining the role of immediate emotions on economic variables in rigorous experiments (Ifcher and Zarghamee 2011, Schade et al. 2012). Moreover, studying the role of emotions using behavioral game theory gained momentum. In 2000, Richard Thaler (2000) predicted the:

> "homo oeconomicus will become more emotional by which I mean that economists will devote more attention to the study of emotions." (p.139).

About 15 years later this seems indeed to be the case. We hope to contribute to this change by providing empirical evidence on how emotions influence economic behavior.

Part II of this thesis covers theories from psychology, behavioral decision making, neuroscience, and economics. Given the recent increase in empirical papers studying emotions and decision making (see chapters II.4 and II.5), it is important to provide rigorous theory and models in order to be able to form testable hypotheses, and experimentally challenge such models – as proposed by Popper (1959).

One of the biggest challenges for emotion research and experimental approaches is how to induce emotions in the laboratory. Part III-2 extensively covers this topic by providing an own database of film clips for reliably inducing discrete emotions (happiness, fear, and neutral states) in the laboratory. This is not a trivial question as for instance, failed replications of rigor experimental studies inducing emotions (Ifcher and Zarghamee 2011 in *AER*, see Camerer et al. 2016 and chapter III.2) show. These film clips serve as induction method for the experimental studies in part IV of this thesis.

In Part IV, I present experimental studies explicitly investigating induced emotions and economic behavior. The first experiment draws on ample experimental evidence of emotions' influence on risk taking behavior and aims to clarify competing findings and theories. We conduct a simple yet rigorous economic experiment with real monetary incentives and induced emotions. Contrary to our hypotheses we do not find treatment effects of happiness or fear on risk preferences. We also do not observe gender differences. Compared to most of previous papers studying emotions and 'risk' (see table IV-1) finding positive or negative influences of happiness and fear or mostly positive and bad mood in psychological experiments without incentives, we do not find such effects. We can only hypothesize as to why this is the case. Further research employing different economic risk measures and also field research is needed to elaborate on the observed phenomena.

Chapter IV.2 presents the second experiment that allows determining the strategic value of emotions. Scholars such as Herbert Simon or Eyal Winter stress the importance for studying emotions within social interaction. The young but growing field of research of emotions in strategic games follows this advice (see chapter II.5). In a large incentivized experiment with entrepreneurs and students we study happiness and fear in market entry games. Building on behavioral equilibrium predictions based on Schade et al. (2010) we expect emotions and information about opponents' emotional states to influence behavior. We find that women react more to own emotions than men and that all individuals react to others' emotions. People use emotions to coordinate in the market.

This thesis began with the statement that behavioral economics can be described as mixture of economics and psychology. Only recently, the field's attention has started to shift to the influence of emotions even though psychology has long been studying the role of emotions and behavior. Recent theoretical approaches as well as a growing body of empirical, mostly experimental, evidence shows that emotions can play an important role not only regarding economic variables but foremost in strategic behavior. Interdisciplinary work by economists, psychologists, and neuroscientists making use of methods and concepts from evolution theory and game theory provides a promising avenue for better understanding the role of emotions in economic behavior, and may lead to better (descriptive) models of economic behavior in general.

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VII Appendices

A Additional material chapter III.2

Figure VII-1: Visual of the ‘Denali National Park’

Source: denaliparkvillage.com

Table VII-1: Descriptives Pretest round 1 by gender

film clip		G	N	MEAN	amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
neutral																						
1	**Adria**	M	(N=12)	MEAN	4,4	0,0	0,1	1,1	0,0	0,0	0,1	0,7	0,0	4,3	5,3	3,5	2,0	0,5	0,3	0,0	3,3	0,0
				MEDIAN	5	0	0	0	0	0	0	0	0	5	7	3	1	0	0	0	4	0
				SD	3,0	0,0	0,3	2,1	0,0	0,0	0,3	1,0	0,0	3,0	3,1	3,0	2,4	1,2	0,6	0,0	2,6	0,0
		F	(N=11)	MEAN	4,1	0,1	0,0	0,1	0,0	0,1	0,0	0,2	0,0	4,0	5,7	2,9	1,2	0,0	0,0	0,0	0,5	0,0
				MEDIAN	4	0	0	0	0	0	0	0	0	3	6	2	0	0	0	0	0	0
				SD	1,7	0,3	0,0	0,3	0,0	0,3	0,0	0,6	0,0	2,0	1,7	2,4	1,7	0,0	0,0	0,0	1,0	0,0
		All	(N=23)	MEAN	3,5	0,0	0,0	0,0	0,0	0,5	0,0	0,1	0,0	3,0	6,9	1,5	0,6	0,0	0,0	0,0	0,3	0,0
				MEDIAN	4	0	0	0	0	0	0	0	0	3	6	2	0	0	0	0	0	0
				SD	2,5	0,2	0,2	1,6	0,0	0,2	0,2	0,9	0,0	2,6	2,5	2,7	2,1	0,9	0,4	0,0	2,4	0,0
2	**All the pres**	M	(N=10)	MEAN	3,8	0,3	0,0	1,0	0,3	0,0	0,0	0,2	0,1	3,4	5,5	1,7	0,9	0,9	0,0	0,0	2,4	0,2
				MEDIAN	4	0	0	0	0	0	0	0	0	3	6	1	0	0	0	0	3	0
				SD	2,1	0,9	0,0	1,5	0,9	0,0	0,0	0,4	0,3	2,5	2,2	2,5	1,6	1,8	0,0	0,0	2,2	0,4
		F	(N=8)	MEAN	2,8	0,0	0,0	3,4	0,0	0,0	0,1	0,1	0,3	1,4	3,6	0,3	0,0	0,0	0,0	0,0	1,4	0,1
				MEDIAN	3	0	0	3	0	0	0	0	0	1	3	0	0	0	0	0	2	0
				SD	1,6	0,0	0,0	2,8	0,0	0,0	0,3	0,3	0,7	1,7	2,4	0,4	0,0	0,0	0,0	0,0	1,2	0,3
		All	(N=20)	MEAN	3,3	0,2	0,0	2,2	0,2	0,0	0,1	0,2	0,2	2,4	4,6	1,0	0,5	0,5	0,0	0,0	1,9	0,2
				MEDIAN	4	0	0	1	0	0	0	0	0	2	5	0	0	0	0	0	2	0
				SD	1,9	0,7	0,0	2,4	0,7	0,0	0,2	0,4	0,5	2,3	2,4	1,9	1,2	1,4	0,0	0,0	1,8	0,4
3	**Vögel**	M	(N=10)	MEAN	4,1	0,6	0,1	0,6	0,2	0,5	0,0	0,5	0,2	3,9	4,4	3,4	2,3	1,3	0,1	0,0	2,2	0,0
				MEDIAN	5	0	0	0	0	0	0	0	0	5	6	5	2	0	0	0	2	0
				SD	2,5	1,8	0,3	1,0	0,6	1,5	0,0	1,0	0,6	2,5	2,7	2,5	2,5	2,1	0,3	0,0	2,3	0,0
		F	(N=10)	MEAN	4,5	0,0	0,0	0,0	0,2	0,4	0,0	0,0	0,0	4,5	6,0	3,7	1,8	0,4	0,0	0,0	0,6	0,0
				MEDIAN	4	0	0	0	0	0	0	0	0	5	6	5	1	0	0	0	0	0
				SD	1,7	0,0	0,0	0,0	0,6	0,8	0,0	0,0	0,0	2,0	1,5	2,3	1,9	0,9	0,0	0,0	1,0	0,0
		All	(N=20)	MEAN	4,3	0,3	0,1	0,3	0,2	0,5	0,0	0,3	0,1	4,2	5,2	3,6	2,1	0,9	0,1	0,0	1,4	0,0

			MEDIAN	5	0	0	0	0	0	0	0	0	5	6	5	1	0	0	0	0	0
			SD	2,2	1,3	0,2	0,8	0,6	1,2	0,0	0,8	0,4	2,2	2,3	2,4	2,2	1,7	0,2	0,0	2,0	0,0
Film clip		G	N	MEAN	amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
4	**GBR**	M	(N=14)	MEAN	5,3	0,0	0,1	0,0	0,0	0,1	0,0	0,5	0,1	5,4	6,6	4,5	1,4	0,9	0,0	0,0	1,4	0,0
				MEDIAN	6	0	0	0	0	0	0	0	0	6	7	5	0	0	0	0	1	0
				SD	2,3	0,0	0,3	0,0	0,0	0,5	0,0	1,3	0,3	1,8	1,4	1,9	2,3	1,8	0,0	0,0	1,8	0,0
		F	(N=11)	MEAN	3,9	0,1	0,1	0,0	0,0	0,0	0,2	0,2	0,4	4,5	5,8	3,3	1,3	1,0	0,2	0,0	0,4	0,0
				MEDIAN	4	0	0	0	0	0	0	0	0	4	6	3	0	0	0	0	0	0
				SD	2,3	0,3	0,3	0,0	0,0	0,0	0,6	0,6	1,1	2,3	1,8	2,4	2,1	2,1	0,6	0,0	0,9	0,0
		All	(N=25)	MEAN	4,6	0,0	0,1	0,0	0,0	0,1	0,1	0,3	0,2	5,0	6,2	3,9	1,3	1,0	0,1	0,0	0,9	0,0
				MEDIAN	5	0	0	0	0	0	0	0	0	5	7	4	0	0	0	0	0	0
				SD	2,4	0,2	0,3	0,0	0,0	0,4	0,4	1,1	0,8	2,1	1,7	2,2	2,2	1,9	0,4	0,0	1,5	0,0
5	**Mythos Wald**	M	(N=15)	MEAN	6,1	0,0	0,0	0,2	0,0	0,0	0,0	0,0	0,0	6,3	5,7	6,0	3,6	1,0	0,0	0,0	1,7	0,0
				MEDIAN	7	0	0	0	0	0	0	0	0	7	7	7	4	0	0	0	0	0
				SD	2,1	0,0	0,0	0,5	0,0	0,0	0,0	0,0	0,0	1,9	2,5	2,5	2,9	1,5	0,0	0,0	2,0	0,0
		F	(N=9)	MEAN	5,4	0,0	0,1	0,1	0,0	0,2	0,0	0,1	0,2	5,7	5,1	5,1	2,9	1,3	0,3	0,1	0,6	0,1
				MEDIAN	5	0	0	0	0	0	0	0	0	7	6	5	3	1	0	0	0	0
				SD	2,3	0,0	0,3	0,3	0,0	0,6	0,0	0,3	0,6	2,6	1,8	2,3	2,5	1,6	0,9	0,3	0,7	0,3
		All	(N=24)	MEAN	5,8	0,0	0,1	0,2	0,0	0,1	0,0	0,1	0,1	6,0	5,4	5,6	3,2	1,2	0,2	0,1	1,1	0,1
				MEDIAN	7	0	0	0	0	0	0	0	0	7	6	7	4	1	0	0	0	0
				SD	2,2	0,0	0,2	0,5	0,0	0,4	0,0	0,2	0,4	2,2	2,3	2,4	2,8	1,5	0,6	0,2	1,7	0,2
6	**Wasserfall**	M	(N=12)	MEAN	5,4	0,5	1,0	0,5	0,6	0,0	0,2	1,6	0,2	5,7	6,4	4,6	2,8	1,9	0,3	0,4	2,7	0,8
				MEDIAN	6	0	0	0	0	0	0	0	0	6	7	5	3	1	0	0	3	0
				SD	2,7	1,2	1,6	1,0	1,7	0,0	0,6	2,4	0,6	2,5	2,2	3,0	2,9	2,2	0,6	0,9	1,9	2,2
		F	(N=8)	MEAN	3,9	0,0	0,0	0,5	0,0	0,0	0,0	0,6	0,0	5,3	6,6	4,5	2,0	0,8	1,0	0,0	2,0	0,3
				MEDIAN	4	0	0	0	0	0	0	0	0	5	7	5	2	0	0	0	2	0
				SD	1,1	0,0	0,0	0,7	0,0	0,0	0,0	1,1	0,0	1,3	1,2	2,1	1,9	1,3	2,6	0,0	1,9	0,4

	All	(N=20)	MEAN	4,6	0,3	0,5	0,5	0,3	0,0	0,1	1,1	0,1	5,5	6,5	4,5	2,4	1,3	0,6	0,2	2,3	0,5
			MEDIAN	5	0	0	0	0	0	0	0	0	5,5	7	5	3	0,5	0	0	2	0
			SD	2,3	1,0	1,3	0,9	1,3	0,0	0,4	2,0	0,4	2,1	1,9	2,7	2,6	2,0	1,8	0,7	2,0	1,7

Film clip	G	N	MEAN	amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
7 Wüste	M	(N=13)	MEAN	4,6	0,1	0,2	0,2	0,0	0,0	0,0	0,7	0,2	4,2	6,4	2,5	0,8	0,8	0,0	0,0	1,8	0,2
			MEDIAN	5	0	0	0	0	0	0	0	0	4	7	2	0	0	0	0	1	0
			SD	2,2	0,3	0,6	0,4	0,0	0,0	0,0	1,1	0,5	2,1	1,5	2,4	1,9	1,5	0,0	0,0	1,8	0,5
	F	(N=12)	MEAN	3,5	0,2	0,2	0,5	0,1	0,0	0,2	0,3	0,3	3,3	6,6	2,9	1,3	1,0	0,2	0,0	0,7	0,0
			MEDIAN	3	0	0	0	0	0	0	0	0	3	7	4	0	0	0	0	0	0
			SD	2,7	0,6	0,6	0,8	0,3	0,0	0,6	0,6	0,7	2,4	1,8	2,6	2,2	1,8	0,6	0,0	1,1	0,0
	All	(N=25)	MEAN	4,1	0,1	0,2	0,3	0,0	0,0	0,1	0,5	0,2	3,7	6,5	2,7	1,0	0,9	0,1	0,0	1,2	0,1
			MEDIAN	5	0	0	0	0	0	0	0	0	4	7	3	0	0	0	0	0	0
			SD	2,5	0,4	0,6	0,6	0,2	0,0	0,4	0,9	0,6	2,3	1,7	2,5	2,1	1,6	0,4	0,0	1,6	0,4
8 Kaukasus	M	(N=14)	MEAN	3,5	0,2	0,1	1,5	0,1	0,0	0,1	0,5	0,2	2,5	5,9	1,2	0,8	0,9	0,0	0,1	1,7	0,1
			MEDIAN	4	0	0	2	0	0	0	0	0	2	6	0	0	0	0	0	1	0
			SD	2,2	0,8	0,5	1,6	0,3	0,0	0,5	0,7	0,6	2,5	1,2	2,5	2,1	1,7	0,0	0,3	1,8	0,3
	F	(N=14)	MEAN	2,9	0,1	0,1	1,5	0,2	0,0	0,1	0,5	0,2	2,7	4,6	1,6	0,5	0,9	0,3	0,2	1,0	0,0
			MEDIAN	3	0	0	0	0	0	0	0	0	3	4	0	0	0	0	0	0	0
			SD	1,9	0,5	0,3	2,1	0,6	0,0	0,5	0,7	0,8	2,7	2,1	2,4	1,1	2,0	0,8	0,8	1,6	0,0
	All	(N=28)	MEAN	3,2	0,2	0,1	1,5	0,1	0,0	0,1	0,5	0,2	2,6	5,3	1,4	0,6	0,9	0,1	0,1	1,4	0,0
			MEDIAN	3	0	0	0,5	0	0	0	0	0	2	5,5	0	0	0	0	0	0	0
			SD	2,1	0,7	0,4	1,8	0,4	0,0	0,5	0,7	0,7	2,6	1,8	2,5	1,7	1,8	0,6	0,6	1,7	0,2
FEAR																					
9 Shining	M	(N=13)	MEAN	3,0	0,6	4,0	3,2	0,8	1,2	0,2	4,2	0,2	1,9	4,0	0,8	0,2	0,0	0,2	0,1	3,2	2,1
			MEDIAN	2	0	4	3	0	0	0	4	0	0	4	0	0	0	0	0	3	2
			SD	2,7	0,8	2,3	2,3	1,7	2,0	0,8	2,2	0,6	2,3	2,6	1,6	0,6	0,0	0,8	0,3	2,3	2,0

	F	(N=12)	MEAN	1,3	0,3	4,8	1,8	0,7	1,1	0,0	4,8	0,0	0,8	1,8	0,2	0,4	0,0	0,1	0,0	1,1	2,0
			MEDIAN	1	0	4	1	0	0	0	5	0	0	1	0	0	0	0	0	0	2
			SD	1,7	0,6	2,9	2,3	2,2	2,5	0,0	3,0	0,0	1,5	2,3	0,6	1,0	0,0	0,3	0,0	2,1	2,5
	All	(N=25)	MEAN	2,2	0,4	4,4	2,5	0,8	1,1	0,1	4,5	0,1	1,3	2,9	0,5	0,3	0,0	0,2	0,0	2,1	2,0
			MEDIAN	2	0	4	2	0	0	0	5	0	0	2	0	0	0	0	0	1	2
			SD	2,4	0,8	2,6	2,5	2,0	2,3	0,6	2,6	0,4	2,1	2,7	1,3	0,8	0,0	0,6	0,2	2,4	2,3
10	**Lambs**	M	(N=11)	MEAN	2,5	0,9	5,1	3,2	1,9	2,3	0,5	6,5	0,0	1,7	4,1	0,3	0,1	0,0	0,6	0,4	3,7	1,8
				MEDIAN	1	0	5	3	1	1	0	7	0	0	4	0	0	0	0	0	4	1
				SD	2,8	1,1	2,1	1,8	2,5	2,3	1,2	1,7	0,0	2,6	2,8	0,6	0,3	0,0	1,4	0,8	2,5	2,0
		F	(N=11)	MEAN	2,4	1,0	4,8	3,1	1,1	1,5	0,2	5,6	0,1	1,6	4,2	0,0	0,0	0,0	0,0	0,1	2,6	2,3
				MEDIAN	2	0	4	3	0	1	0	7	0	0	4	0	0	0	0	0	3	1
				SD	2,0	1,7	1,8	2,1	1,7	1,7	0,6	2,5	0,3	2,4	2,6	0,0	0,0	0,0	0,0	0,3	2,4	2,4
		All	(N=22)	MEAN	2,5	1,0	5,0	3,1	1,5	1,9	0,4	6,0	0,0	1,7	4,1	0,1	0,0	0,0	0,3	0,2	3,2	2,0
				MEDIAN	2	0	5	3	1	1	0	7	0	0	4	0	0	0	0	0	3	1
				SD	2,4	1,4	2,0	1,9	2,2	2,1	0,9	2,2	0,2	2,5	2,7	0,5	0,2	0,0	1,0	0,6	2,5	2,2
11	**BWP**	M	(N=12)	MEAN	1,3	0,3	3,9	5,5	1,2	1,8	0,8	6,0	0,0	0,6	2,8	0,0	0,3	0,0	0,7	0,8	3,3	4,3
				MEDIAN	1	0	4	5	0	1	0	7	0	0	3	0	0	0	0	0	4	4
				SD	1,7	0,6	2,1	1,6	1,8	2,2	2,2	1,8	0,0	1,3	2,3	0,0	0,8	0,0	1,7	1,7	2,3	2,3
		F	(N=10)	MEAN	0,2	0,3	3,8	3,0	0,3	2,5	0,0	4,2	0,0	0,0	1,2	0,0	0,0	0,0	0,1	0,1	0,9	2,1
				MEDIAN	0	0	5	3	0	2	0	4	0	0	0	0	0	0	0	0	1	2
				SD	0,4	0,9	2,0	2,4	0,9	2,2	0,0	2,2	0,0	0,0	1,8	0,0	0,0	0,0	0,3	0,3	1,0	1,9
		All	(N=22)	MEAN	0,8	0,3	3,9	4,3	0,7	2,1	0,4	5,1	0,0	0,3	2,0	0,0	0,1	0,0	0,4	0,4	2,1	3,2
				MEDIAN	0	0	5	5	0	2	0	5	0	0	2	0	0	0	0	0	2	3
				SD	1,4	0,8	2,1	2,4	1,5	2,3	1,7	2,2	0,0	1,0	2,3	0,0	0,6	0,0	1,3	1,3	2,2	2,4
12	**Insidious**	M	(N=12)	MEAN	2,5	1,6	5,0	4,8	2,3	3,3	0,8	5,5	0,3	1,9	3,3	0,2	0,3	0,1	1,2	0,9	4,2	2,5
				MEDIAN	3	0	6	6	0	3	0	6	0	1	3	0	0	0	0	0	5	1

			SD	2,4	2,7	2,0	2,6	2,9	2,8	1,5	2,1	0,8	2,5	3,1	0,6	0,6	0,3	2,1	2,0	2,4	2,9
	F	(N=10)	MEAN	0,9	0,2	4,9	5,0	1,1	3,3	0,1	5,1	0,0	0,7	1,6	0,0	0,0	0,0	0,2	0,0	2,2	2,9
			MEDIAN	0	0	6	5	0	3	0	5	0	0	1	0	0	0	0	0	2	2
			SD	1,4	0,6	3,0	2,5	1,8	2,9	0,3	2,5	0,0	1,0	1,7	0,0	0,0	0,0	0,4	0,0	2,3	3,0
	All	(N=22)	MEAN	1,7	0,1	5,5	5,3	0,6	3,2	0,1	5,3	0,0	0,6	2,1	0,0	0,0	0,0	0,1	0,0	3,4	1,7
			MEDIAN	1	0	6	5	0	3	0	5	0	1	3	0	0	0	0	0	4	2
			SD	2,1	1,7	2,5	2,6	2,3	2,8	0,9	2,3	0,6	2,0	2,7	0,4	0,5	0,2	1,6	1,5	2,6	2,9

film clip	G	N		amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
13 Mirrors	M	(N=15)	MEAN	1,3	1,4	4,3	4,7	2,0	2,9	1,1	5,7	0,3	0,6	2,8	0,1	0,5	0,1	0,5	0,4	4,0	3,7
			MEDIAN	1	1	5	5	1	2	0	6	0	0	2	0	0	0	0	0	4	4
			SD	1,6	2,1	2,5	2,1	2,5	2,4	2,1	1,9	0,7	1,2	2,8	0,2	0,9	0,2	0,9	1,0	2,2	2,6
	F	(N=9)	MEAN	0,7	1,2	6,3	4,0	2,2	3,6	0,1	6,6	0,1	0,6	1,4	0,0	1,1	0,0	0,6	0,0	1,7	2,8
			MEDIAN	0	0	7	5	0	3	0	7	0	0	0	0	0	0	0	0	0	2
			SD	1,1	1,8	1,8	2,9	2,5	3,1	0,3	1,3	0,3	0,8	1,8	0,0	2,1	0,0	1,1	0,0	1,9	2,6
	All	(N=24)	MEAN	1,0	1,3	5,3	4,3	2,1	3,2	0,6	6,1	0,2	0,6	2,1	0,0	0,8	0,0	0,5	0,2	2,8	3,2
			MEDIAN	1	0	5	5	1	3	0	7	0	0	2	0	0	0	0	0	4	4
			SD	1,5	2,0	2,4	2,4	2,5	2,7	1,7	1,8	0,6	1,1	2,6	0,2	1,5	0,2	1,0	0,8	2,4	2,6
14 H, Psycho	M	(N=12)	MEAN	3,3	0,5	2,5	1,3	1,4	1,0	0,3	3,9	0,0	2,5	4,3	0,9	0,2	0,5	0,4	0,3	2,3	1,5
			MEDIAN	3	0	2	1	0	0	0	4	0	2	5	1	0	0	0	0	2	1
			SD	2,2	1,0	2,3	1,6	2,0	1,9	0,4	3,1	0,0	1,9	2,2	1,1	0,4	1,7	1,4	0,6	2,4	2,2
	F	(N=11)	MEAN	2,7	0,0	3,7	0,4	0,7	0,5	0,1	4,8	0,0	1,7	2,9	0,1	0,0	0,0	0,0	0,3	0,1	3,3
			MEDIAN	3	0	2	0	0	0	0	5	0	0	3	0	0	0	0	0	0	0
			SD	2,9	0,0	3,1	0,6	1,1	1,0	0,3	2,8	0,0	2,7	2,6	0,3	0,0	0,0	0,0	0,6	0,3	3,6
	All	(N=23)	MEAN	2,5	0,5	3,0	1,0	1,4	1,2	0,3	4,0	0,0	1,8	2,6	0,6	0,2	0,8	0,7	0,4	1,2	2,7
			MEDIAN	3	0	2	0	0	0	0	5	0	1	4	0	0	0	0	0	0	0
			SD	2,6	0,7	2,8	1,3	1,7	1,6	0,4	3,0	0,0	2,3	2,5	0,9	0,3	1,2	1,0	0,6	2,1	3,1

15	**H, Birds**	M	(N=13)	MEAN	2,8	0,2	3,7	2,8	0,1	0,9	0,0	4,9	0,0	1,8	4,8	0,3	0,2	0,0	0,1	0,1	4,0	1,4
				MEDIAN	2	0	4	2	0	0	0	6	0	1	4	0	0	0	0	0	4	0
				SD	2,0	0,5	2,6	2,3	0,3	1,3	0,0	2,5	0,0	1,9	1,7	0,8	0,5	0,0	0,3	0,3	2,0	1,9
		F	(N=10)	MEAN	2,1	0,0	2,5	1,6	0,0	1,3	0,0	3,4	0,0	0,5	2,7	0,0	0,1	0,0	0,0	0,0	2,8	1,1
				MEDIAN	2	0	3	2	0	1	0	3	0	0	3	0	0	0	0	0	2	1
				SD	1,9	0,0	1,1	1,6	0,0	2,3	0,0	1,5	0,0	1,0	2,2	0,0	0,3	0,0	0,0	0,0	1,5	1,1
		All	(N=23)	MEAN	2,5	0,1	3,1	2,2	0,0	1,1	0,0	4,2	0,0	1,1	3,8	0,2	0,1	0,0	0,0	0,0	3,4	1,2
				MEDIAN	2	0	3	2	0	0	0	4	0	0	4	0	0	0	0	0	4	1
				SD	2,0	0,4	2,2	2,1	0,2	1,8	0,0	2,2	0,0	1,7	2,2	0,6	0,4	0,0	0,2	0,2	1,9	1,6
16	**Lord of the rings**	M	(N=13)	MEAN	5,3	0,7	3,5	0,9	0,2	1,8	0,1	5,1	0,2	3,4	5,4	1,3	1,1	0,8	0,0	0,1	3,4	1,4
				MEDIAN	6	0	4	0	0	2	0	6	0	3	6	1	0	0	0	0	3	1
				SD	2,0	1,3	1,4	1,1	0,5	1,6	0,3	2,4	0,4	2,6	2,2	1,6	1,4	1,7	0,0	0,3	2,7	1,7
		F	(N=11)	MEAN	3,0	1,6	3,9	1,4	2,0	1,4	0,8	4,7	0,0	2,0	3,6	0,3	0,2	0,6	0,7	0,0	2,0	1,1
				MEDIAN	3	0	3	1	0	0	0	4	0	1	4	0	0	0	0	0	1	1
				SD	2,0	2,7	3,1	1,5	2,8	2,2	2,2	2,8	0,1	2,1	2,3	0,5	0,5	1,4	2,2	0,1	2,1	1,3
		All	(N=24)	MEAN	4,2	1,1	3,7	1,1	1,1	1,6	0,4	4,9	0,1	2,7	4,5	0,8	0,6	0,7	0,4	0,1	2,7	1,2
				MEDIAN	5	0	4	0	0	1	0	6	0	2	5	0	0	0	0	0	2	1
				SD	2,4	2,2	2,4	1,4	2,2	2,0	1,6	2,6	0,3	2,6	2,5	1,3	1,2	1,6	1,6	0,2	2,6	1,6
HAPPINESS																						
17	**Harry und Sally**	M	(N=14)	MEAN	7,2	0,0	0,0	0,9	0,0	0,1	1,6	0,0	0,1	6,5	5,4	4,3	2,5	0,5	0,0	2,1	2,5	0,0
				MEDIAN	8	0	0	0	0	0	2	0	0	7	6	5	3	0	0	2	2	0
				SD	1,1	0,0	0,0	1,2	0,0	0,3	1,3	0,0	0,3	1,2	2,0	2,2	2,4	1,0	0,0	1,8	2,6	0,0
		F	(N=11)	MEAN	7,0	0,0	0,0	0,3	0,0	0,0	1,0	0,0	0,0	6,5	4,8	3,9	0,5	0,1	0,0	1,5	2,1	0,0
				MEDIAN	7	0	0	0	0	0	1	0	0	7	5	4	0	0	0	1	0	0
				SD	1,0	0,0	0,0	0,6	0,0	0,0	1,0	0,0	0,0	1,4	2,2	2,1	1,0	0,3	0,0	1,6	2,7	0,0
		All	(N=25)	MEAN	7,1	0,0	0,0	0,6	0,0	0,0	1,3	0,0	0,0	6,5	5,1	4,1	1,5	0,3	0,0	1,8	2,3	0,0

			MEDIAN	7	0	0	0	0	0	1	0	0	7	5	5	0	0	0	2	1	0
			SD	1,1	0,0	0,0	1,0	0,0	0,2	1,2	0,0	0,2	1,3	2,1	2,2	2,1	0,8	0,0	1,7	2,7	0,0
18	**Hangover**	M	(N=13)	MEAN	4,9	0,2	0,8	3,0	1,5	2,1	1,8	2,7	0,0	4,4	4,0	1,5	0,6	0,5	0,0	2,1	5,3	1,0
				MEDIAN	5	0	0	2	0	2	1	3	0	5	4	0	0	0	0	2	6	0
				SD	2,5	0,5	1,3	3,0	2,2	1,9	2,1	2,0	0,0	2,6	2,7	1,9	1,6	1,6	0,0	2,1	2,8	2,1
		F	(N=9)	MEAN	7,0	0,3	0,1	1,0	0,8	1,3	1,0	0,6	0,0	5,9	4,2	2,4	0,9	0,6	0,0	0,3	3,1	0,2
				MEDIAN	7	0	0	0	0	1	0	0	0	6	5	3	0	0	0	0	3	0
				SD	0,9	0,9	0,3	1,2	1,6	1,2	1,9	1,0	0,0	1,5	2,5	2,4	1,6	1,6	0,0	0,7	2,7	0,6
		All	(N=22)	MEAN	6,0	0,2	0,5	2,0	1,2	1,7	1,4	1,6	0,0	5,1	4,1	2,0	0,8	0,5	0,0	1,2	4,2	0,6
				MEDIAN	6	0	0	2	0	2	0	1	0	6	4	1	0	0	0	0	5	0
				SD	2,2	0,7	1,1	2,6	2,0	1,7	2,0	1,9	0,0	2,4	2,6	2,2	1,6	1,6	0,0	1,8	2,9	1,7
19	**Manitu**	M	(N=11)	MEAN	5,3	0,5	0,0	1,3	0,9	0,4	1,5	0,0	0,2	4,6	3,3	3,0	0,6	0,1	0,3	1,6	1,6	0,0
				MEDIAN	6	0	0	0	0	0	1	0	0	5	2	3	0	0	0	0	1	0
				SD	2,7	0,9	0,0	1,8	1,2	0,8	1,7	0,0	0,6	2,5	2,9	2,4	0,8	0,3	0,9	2,1	2,3	0,0
		F	(N=11)	MEAN	5,4	0,0	0,0	0,2	0,6	0,0	0,4	0,0	0,0	5,0	2,8	1,8	0,2	0,3	0,2	0,2	0,4	0,0
				MEDIAN	6	0	0	0	0	0	0	0	0	6	3	2	0	0	0	0	0	0
				SD	2,6	0,0	0,0	0,6	1,5	0,0	0,9	0,0	0,0	2,7	2,4	1,3	0,6	0,9	0,6	0,4	0,9	0,0
		All	(N=22)	MEAN	5,3	0,2	0,0	0,7	0,8	0,2	1,0	0,0	0,1	4,8	3,0	2,4	0,4	0,2	0,2	0,9	1,0	0,0
				MEDIAN	6	0	0	0	0	0	0	0	0	6	3	3	0	0	0	0	0	0
				SD	2,7	0,7	0,0	1,4	1,4	0,6	1,5	0,0	0,4	2,6	2,7	2,0	0,7	0,6	0,7	1,7	1,8	0,0
20	**BBT - KKH**	M	(N=11)	MEAN	5,1	0,9	0,0	0,5	1,5	0,4	1,4	0,1	0,0	4,5	3,2	2,0	0,3	0,0	0,0	0,6	2,1	0,6
				MEDIAN	6	0	0	0	0	0	0	0	0	5	3	2	0	0	0	0	1	0
				SD	2,3	2,1	0,0	1,2	2,2	0,9	1,9	0,3	0,0	2,5	2,2	1,8	0,4	0,0	0,0	1,2	2,3	2,0
		F	(N=10)	MEAN	6,8	0,2	0,0	0,2	0,6	0,0	0,8	0,0	0,0	6,4	5,0	3,7	1,6	0,3	0,0	0,6	0,8	0,0
				MEDIAN	7	0	0	0	0	0	0	0	0	7	6	4	1	0	0	0	0	0
				SD	1,4	0,4	0,0	0,6	1,8	0,0	2,4	0,0	0,0	1,4	2,5	2,5	2,2	0,6	0,0	1,8	1,2	0,0

	F	(N=10)	MEAN	5,9	0,6	0,0	0,4	1,0	0,2	1,1	0,0	0,0	5,5	4,1	2,9	0,9	0,2	0,0	0,6	1,4	0,3
			MEDIAN	6	0	0	0	0	0	0	0	0	6	4	3	0	0	0	0	0	0
			SD	2,1	1,6	0,0	1,0	2,1	0,7	2,2	0,2	0,0	2,2	2,5	2,3	1,7	0,5	0,0	1,5	2,0	1,5
21	**BBT - FFF**	M	(N=10)	MEAN	5,2	0,6	0,0	0,4	0,8	0,0	0,9	0,0	0,4	4,6	3,9	3,3	1,5	0,6	0,2	1,3	1,9	0,1
				MEDIAN	6	0	0	0	0	0	0	0	0	5	4	4	1	0	0	0	1	0
				SD	2,2	1,8	0,0	0,6	2,1	0,0	1,3	0,0	1,5	2,3	2,0	2,0	2,1	1,8	0,8	1,8	2,2	0,5
		F	(N=14)	MEAN	4,2	0,3	0,0	0,9	1,4	0,0	1,1	0,0	0,0	4,2	3,0	3,0	1,4	0,1	0,0	0,7	0,2	0,0
				MEDIAN	6	0	0	0	1	0	0	0	0	6	3	3	1	0	0	0	0	0
				SD	3,2	0,6	0,0	2,4	1,8	0,0	1,7	0,0	0,0	3,3	2,7	2,8	1,9	0,3	0,0	1,4	0,4	0,0
		All	(N=24)	MEAN	4,7	0,5	0,0	0,6	1,1	0,0	1,0	0,0	0,2	4,4	3,5	3,1	1,5	0,3	0,1	1,0	1,1	0,1
				MEDIAN	6	0	0	0	0	0	0	0	0	6	4	4	1	0	0	0	0	0
				SD	2,7	1,5	0,0	1,6	2,0	0,0	1,5	0,0	1,2	2,8	2,4	2,4	2,0	1,4	0,6	1,7	1,9	0,4
22	**Naked gun**	M	(N=12)	MEAN	6,0	0,2	0,0	1,6	0,7	0,1	0,7	0,3	0,0	5,3	5,4	3,8	0,6	1,4	0,0	1,0	3,9	0,0
				MEDIAN	7	0	0	1	0	0	0	0	0	7	7	4	0	0	0	0	5	0
				SD	2,8	0,6	0,0	1,8	1,4	0,3	1,2	0,8	0,0	2,8	2,5	2,9	1,1	2,1	0,0	1,8	2,8	0,0
		F	(N=11)	MEAN	5,0	0,1	0,3	2,8	0,0	0,1	0,1	0,5	0,0	4,7	3,9	1,7	0,3	0,3	0,0	0,0	2,1	0,0
				MEDIAN	5	0	0	2	0	0	0	0	0	5	4	1	0	0	0	0	1	0
				SD	1,9	0,3	0,9	2,8	0,0	0,3	0,3	0,8	0,0	2,1	1,9	1,8	0,9	0,9	0,0	0,0	2,5	0,0
		All	(N=23)	MEAN	5,5	0,1	0,1	2,2	0,3	0,1	0,4	0,4	0,0	5,0	4,7	2,8	0,4	0,8	0,0	0,5	3,0	0,0
				MEDIAN	6	0	0	1	0	0	0	0	0	6	5	3	0	0	0	0	2	0
				SD	2,4	0,4	0,6	2,4	1,1	0,3	0,9	0,8	0,0	2,5	2,3	2,6	1,0	1,7	0,0	1,4	2,8	0,0
23	**Woody Allen**	M	(N=13)	MEAN	6,0	0,9	0,0	1,5	1,2	0,1	1,1	0,2	0,4	5,5	5,4	3,0	1,9	1,0	0,2	1,1	3,2	0,8
				MEDIAN	7	0	0	1	0	0	0	0	0	6	6	3	1	0	0	0	3	0
				SD	1,9	1,4	0,0	1,8	1,7	0,3	1,9	0,6	0,7	1,9	2,2	2,4	2,1	2,4	0,6	1,8	2,3	1,7
		F	(N=11)	MEAN	4,3	0,3	0,0	1,1	0,1	0,0	0,5	0,0	0,0	3,4	3,1	1,5	0,5	0,5	0,0	0,8	1,3	0,0

			MEDIAN	4	0	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0
			SD	2,8	0,6	0,0	1,6	0,3	0,0	1,2	0,0	0,0	2,6	2,2	2,1	1,4	1,2	0,0	1,6	1,9	0,0
	All	(N=24)	MEAN	5,1	0,6	0,0	1,3	0,6	0,0	0,8	0,1	0,2	4,4	4,2	2,3	1,2	0,8	0,1	0,9	2,3	0,4
			MEDIAN	6	0	0	1	0	0	0	0	0	5	5	1	1	0	0	0	2	0
			SD	2,5	1,2	0,0	1,7	1,4	0,2	1,6	0,4	0,6	2,5	2,5	2,4	1,9	2,0	0,4	1,7	2,4	1,3
24	**Loriot**	M	(N=12)	MEAN	4,6	0,7	0,0	1,7	0,6	0,2	1,8	0,2	0,5	3,7	3,1	2,3	0,5	0,3	0,3	1,5	1,6	0,8
				MEDIAN	4	0	0	0	0	0	1	0	0	4	3	2	0	0	0	0	0	0
				SD	2,0	1,3	0,0	2,4	1,3	0,4	2,2	0,4	1,2	2,1	2,7	2,2	0,9	0,8	0,8	2,1	2,3	1,7
		F	(N=11)	MEAN	5,2	0,0	0,0	0,4	0,2	0,0	0,4	0,0	0,0	4,7	4,5	2,5	1,6	1,0	0,0	0,2	0,5	0,0
				MEDIAN	6	0	0	0	0	0	0	0	0	5	5	3	1	0	0	0	0	0
				SD	2,1	0,0	0,0	0,8	0,6	0,0	0,6	0,0	0,0	2,7	2,3	2,4	1,9	2,1	0,0	0,6	1,0	0,0
		F	(N=23)	MEAN	4,9	0,3	0,0	1,0	0,4	0,1	1,1	0,1	0,3	4,2	3,8	2,4	1,1	0,7	0,1	0,8	1,0	0,4
				MEDIAN	5,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	0,0	5,0	4,0	3,0	0,0	0,0	0,0	0,0	0,0	0,0
				SD	2,1	1,0	0,0	1,9	1,1	0,3	1,8	0,3	0,9	2,4	2,6	2,3	1,5	1,6	0,6	1,7	1,9	1,3

Table VII-2: Descriptives Pretest round 2 by gender

film clip		G	N	MEAN	amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
neutral																						
1	**All the pres**	M	(N=7)	MEAN	3,3	0,3	0,0	2,3	1,1	0,0	0,0	0,4	0,1	2,7	5,0	1,4	0,0	0,1	0,0	0,0	2,9	0,4
				MEDIAN	3	0	0	2	0	0	0	0	0	3	5	1	0	0	0	0	2	0
				SD	0,8	0,5	0,0	2,4	1,9	0,0	0,0	0,8	0,4	1,0	0,8	1,0	0,0	0,4	0,0	0,0	1,6	0,8
		F	(N=13)	MEAN	1,4	0,4	0,3	2,9	0,6	0,4	0,5	0,0	0,1	0,3	3,2	0,0	0,0	0,0	0,4	0,5	0,7	0,5
				MEDIAN	1	0	0	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0
				SD	1,3	1,6	0,8	2,5	1,9	1,3	1,6	0,0	0,3	0,8	2,0	0,0	0,0	0,0	1,3	1,6	1,1	1,9
		All	(N=20)	MEAN	2,3	0,4	0,1	2,6	0,9	0,2	0,3	0,2	0,1	1,5	4,1	0,7	0,0	0,1	0,2	0,3	1,8	0,5
				MEDIAN	2	0	0	2	0	0	0	0	0	0	4	0	0	0	0	0	1	0
				SD	1,0	1,0	0,4	2,4	1,9	0,7	0,8	0,4	0,3	0,9	1,4	0,5	0,0	0,2	0,7	0,8	1,4	1,3
2	**Last Kaiser**	M	(N=7)	MEAN	3,4	0,7	0,3	2,1	1,6	0,6	0,9	0,3	0,7	2,6	5,4	1,6	0,4	0,3	0,1	0,7	2,0	0,7
				MEDIAN	4	0	0	2	1	0	0	0	0	3	5	1	0	0	0	0	2	0
				SD	2,0	1,5	0,5	2,0	2,1	1,1	1,9	0,5	1,3	1,5	1,4	1,8	1,1	0,5	0,4	1,3	1,9	1,1
		F	(N=13)	MEAN	3,0	0,2	0,0	0,8	0,3	0,1	0,5	0,2	0,2	1,4	5,0	0,8	0,5	0,4	0,2	0,3	0,2	0,5
				MEDIAN	3	0	0	0	0	0	0	0	0	1	6	0	0	0	0	0	0	0
				SD	1,6	0,6	0,0	1,4	0,6	0,3	1,0	0,6	0,6	1,7	2,4	1,4	1,4	1,1	0,6	0,9	0,4	1,1
		All	(N=20)	MEAN	3,2	0,5	0,1	1,5	0,9	0,3	0,7	0,2	0,5	2,0	5,2	1,2	0,4	0,3	0,1	0,5	1,1	0,6
				MEDIAN	3	0	0	0	0	0	0	0	0	2	6	1	0	0	0	0	0	0
				SD	1,8	1,0	0,2	1,7	1,4	0,7	1,4	0,5	0,9	1,6	1,9	1,6	1,3	0,8	0,5	1,1	1,1	1,1
3	**Angeln**	M	(N=7)	MEAN	2,3	0,6	0,1	0,4	0,4	0,3	0,0	0,0	0,7	1,4	3,6	0,7	0,0	0,1	0,6	0,4	1,0	0,7
				MEDIAN	3	0	0	0	0	0	0	0	0	1	4	0	0	0	0	0	1	1
				SD	1,0	1,0	0,4	0,5	0,8	0,5	0,0	0,0	1,0	1,4	1,6	1,3	0,0	0,4	0,8	0,8	1,2	0,8
		F	(N=13)	MEAN	1,0	0,0	0,0	0,7	0,0	0,8	0,5	0,1	0,2	0,3	2,7	0,2	0,0	0,0	0,1	0,2	0,4	0,0
				MEDIAN	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0

			SD	1,3	0,0	0,0	1,4	0,0	1,2	1,1	0,3	0,8	0,6	2,2	0,6	0,0	0,0	0,3	0,8	1,1	0,0
	All	(N=20)	MEAN	1,6	0,3	0,1	0,6	0,2	0,5	0,2	0,0	0,5	0,9	3,1	0,4	0,0	0,1	0,3	0,3	0,7	0,4
			MEDIAN	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
			SD	1,1	0,5	0,2	1,0	0,4	0,9	0,6	0,1	0,9	1,0	1,9	0,9	0,0	0,2	0,5	0,8	1,1	0,4

Target emotion		G	N	MEAN	amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
4	**Presse**	M	(N=7)	MEAN	2,0	0,4	0,3	3,9	0,3	0,1	0,3	0,7	0,9	1,0	3,4	0,3	0,0	0,3	0,1	0,1	2,0	1,3
				MEDIAN	2	0	0	5	0	0	0	0	0	1	3	0	0	0	0	0	2	1
				SD	1,5	0,8	0,5	2,7	0,5	0,4	0,8	1,0	1,2	1,0	1,0	0,5	0,0	0,8	0,4	0,4	1,6	1,5
		F	(N=13)	MEAN	1,1	0,0	0,0	3,3	0,2	0,0	0,4	0,4	0,8	0,1	2,6	0,2	0,0	0,3	0,1	0,0	0,5	0,2
				MEDIAN	1	0	0	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0
				SD	1,1	0,0	0,0	2,6	0,4	0,0	1,0	0,7	1,4	0,3	2,4	0,4	0,0	1,1	0,3	0,0	1,1	0,4
		All	(N=20)	MEAN	1,5	0,2	0,1	3,6	0,3	0,1	0,3	0,5	0,8	0,5	3,0	0,2	0,0	0,3	0,1	0,1	1,3	0,7
				MEDIAN	1	0	0	4	0	0	0	0	0	0	3	0	0	0	0	0	0,5	0
				SD	1,3	0,4	0,2	2,7	0,5	0,2	0,9	0,8	1,3	0,6	1,7	0,4	0,0	0,9	0,3	0,2	1,4	0,9
5	**Jane Eyre**	M	(N=11)	MEAN	1,6	0,2	0,4	1,4	0,7	0,5	0,4	0,8	0,2	1,2	3,3	0,7	0,3	0,5	0,3	0,1	0,6	0,3
				MEDIAN	2	0	0	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0
				SD	1,4	0,6	0,9	1,8	1,6	1,2	1,2	1,8	0,6	1,5	1,4	1,3	0,6	1,5	0,6	0,3	1,5	0,5
		F	(N=16)	MEAN	2,4	0,1	0,1	1,1	0,1	0,0	0,0	0,4	0,0	1,3	4,4	1,0	0,6	0,1	1,0	0,0	1,1	0,6
				MEDIAN	2	0	0	1	0	0	0	0	0	0	5	1	0	0	0	0	0	0
				SD	2,0	0,5	0,3	1,5	0,5	0,0	0,0	0,9	0,0	2,0	1,6	1,2	1,2	0,3	1,8	0,0	1,9	1,5
		All	(N=27)	MEAN	2,0	0,2	0,3	1,3	0,6	0,4	0,3	0,8	0,1	1,4	3,9	1,0	0,4	0,4	0,7	0,1	1,0	0,5
				MEDIAN	2	0	0	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0
				SD	1,7	0,6	0,7	1,5	1,2	0,7	0,8	1,5	0,4	1,9	1,6	1,4	0,8	1,1	1,3	0,2	1,9	1,0
6	**Postauto**	M	(N=11)	MEAN	3,8	0,0	0,0	0,4	0,0	0,0	0,0	0,2	0,0	2,4	4,7	1,6	0,2	0,3	0,3	0,0	0,7	0,0
				MEDIAN	4	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0
				SD	2,1	0,0	0,0	0,7	0,0	0,0	0,0	0,6	0,0	1,9	2,2	2,2	0,4	0,6	0,9	0,0	0,9	0,0

	F	(N=17)	MEAN	3,5	0,0	0,0	0,5	0,0	0,0	0,0	0,1	0,0	2,3	4,8	0,5	0,1	0,1	0,0	0,0	1,0	0,0
			MEDIAN	4	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0
			SD	1,9	0,0	0,0	1,1	0,0	0,0	0,0	0,2	0,0	1,5	1,9	0,6	0,3	0,2	0,0	0,0	1,7	0,0
	All	(N=28)	MEAN	3,6	0,0	0,0	0,4	0,0	0,0	0,0	0,1	0,0	2,3	4,7	1,1	0,1	0,2	0,1	0,0	0,9	0,0
			MEDIAN	4	0	0	0	0	0	0	0	0	2	5	0	0	0	0	0	0	0
			SD	2,0	0,0	0,0	0,9	0,0	0,0	0,0	0,4	0,0	1,7	2,0	1,4	0,4	0,4	0,5	0,0	1,3	0,0
Target emotion	G	N	MEAN	amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
7 Frachter	M	(N=11)	MEAN	2,8	0,0	0,0	0,1	0,0	0,0	0,0	0,0	0,0	1,5	4,1	0,8	0,1	1,5	0,0	0,0	0,7	0,4
			MEDIAN	2	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0
			SD	2,7	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0	2,4	2,8	1,8	0,3	2,6	0,0	0,0	1,2	1,2
	F	(N=17)	MEAN	2,1	0,0	0,0	0,5	0,0	0,0	0,0	0,0	0,0	1,4	3,3	0,6	0,2	0,0	0,0	0,0	0,8	0,0
			MEDIAN	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
			SD	2,5	0,0	0,0	1,5	0,0	0,0	0,0	0,0	0,0	2,2	2,8	1,9	0,5	0,0	0,0	0,0	1,7	0,0
	All	(N=28)	MEAN	2,5	0,0	0,0	0,3	0,0	0,0	0,0	0,0	0,0	1,4	3,7	0,7	0,1	0,7	0,0	0,0	0,8	0,2
			MEDIAN	1	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0
			SD	2,6	0,0	0,0	0,9	0,0	0,0	0,0	0,0	0,0	2,3	2,8	1,9	0,4	1,3	0,0	0,0	1,4	0,6
8 60s	M	(N=11)	MEAN	2,8	0,0	0,1	0,9	0,2	0,0	0,1	0,1	0,1	1,7	3,5	1,1	0,1	0,5	0,0	0,2	0,5	0,2
			MEDIAN	2	0	0	1	0	0	0	0	0	1	5	0	0	0	0	0	0	0
			SD	2,3	0,0	0,3	0,9	0,6	0,0	0,3	0,3	0,3	2,0	2,5	1,6	0,3	1,5	0,0	0,4	0,7	0,4
	F	(N=17)	MEAN	3,1	0,0	0,0	1,5	0,0	0,0	0,1	0,0	0,2	1,8	3,7	1,1	0,4	0,0	0,0	0,0	0,8	0,1
			MEDIAN	2	0	0	0	0	0	0	0	0	1	3	0	0	0	0	0	0	0
			SD	2,7	0,0	0,0	1,9	0,0	0,0	0,2	0,0	0,7	2,6	2,8	1,5	0,9	0,0	0,0	0,0	1,0	0,3
	All	(N=28)	MEAN	2,9	0,0	0,0	1,2	0,1	0,0	0,1	0,0	0,1	1,7	3,6	1,1	0,3	0,3	0,0	0,1	0,7	0,1
			MEDIAN	2	0	0	1	0	0	0	0	0	1	3	0	0	0	0	0	0	0
			SD	2,5	0,0	0,2	1,4	0,3	0,0	0,3	0,2	0,5	2,3	2,6	1,5	0,6	0,8	0,0	0,2	0,8	0,4
FEAR																					
9 Shining	M	(N=18)	MEAN	1,9	0,0	2,8	2,2	0,4	0,9	0,1	4,2	0,2	1,2	3,4	0,4	0,0	0,1	0,4	0,3	3,1	1,7
			MEDIAN	2	0	3	2	0	0	0	4	0	1	3	0	0	0	0	0	3	1

			SD	1,6	0,0	2,2	1,8	0,8	1,7	0,2	1,9	0,7	1,4	1,9	0,8	0,0	0,2	1,0	0,8	2,1	2,2
	F	(N=30)	MEAN	1,1	0,0	4,2	3,1	0,1	0,1	0,0	4,4	0,0	0,4	2,4	0,0	0,0	0,0	0,1	0,0	2,3	1,5
			MEDIAN	0	0	4	3	0	0	0	5	0	0	2	0	0	0	0	0	2	1
			SD	1,4	0,0	2,0	2,2	0,6	0,4	0,2	2,4	0,2	1,1	2,3	0,0	0,0	0,0	0,5	0,2	2,1	2,0
	All	(N=48)	MEAN	1,5	0,0	3,5	2,7	0,3	0,5	0,0	4,3	0,1	0,8	2,9	0,2	0,0	0,0	0,3	0,2	2,7	1,6
			MEDIAN	1	0	4	2,5	0	0	0	4	0	0	3	0	0	0	0	0	2	0,5
			SD	1,5	0,0	2,1	2,0	0,7	1,1	0,2	2,2	0,5	1,2	2,1	0,4	0,0	0,1	0,7	0,5	2,1	2,1
10	**Lambs**	M	(N=18)	MEAN	2,1	0,8	2,9	1,9	2,1	1,8	0,6	4,7	0,2	0,9	2,8	0,5	0,0	0,1	0,6	0,6	2,9	1,8
				MEDIAN	2	0	3	1	1	1	0	5	0	0	2	0	0	0	0	0	3	1
				SD	1,7	1,0	2,1	2,2	2,4	2,2	0,9	1,9	0,7	1,3	2,2	0,9	0,0	0,5	1,1	1,3	2,2	2,3
		F	(N=30)	MEAN	1,3	0,4	4,3	1,8	1,2	1,2	0,1	5,4	0,0	0,5	2,7	0,0	0,0	0,0	0,1	0,0	2,4	2,3
				MEDIAN	1	0	5	1	0	0	0	6	0	0	2	0	0	0	0	0	2	2
				SD	1,6	0,9	2,2	1,9	1,6	1,6	0,3	2,0	0,2	1,1	2,3	0,0	0,0	0,0	0,4	0,2	2,2	2,4
		All	(N=48)	MEAN	1,7	0,6	3,6	1,9	1,6	1,5	0,3	5,1	0,1	0,7	2,8	0,3	0,0	0,1	0,3	0,3	2,7	2,1
				MEDIAN	1	0	4	1	0	0	0	6	0	0	2	0	0	0	0	0	3	2
				SD	1,7	0,9	2,1	2,0	2,0	1,9	0,6	2,0	0,5	1,2	2,3	0,4	0,0	0,2	0,8	0,7	2,2	2,3
11	**BWP**	M	(N=18)	MEAN	1,1	0,3	3,6	3,6	1,0	1,8	0,3	4,7	0,3	0,4	3,0	0,1	0,2	0,0	1,2	0,1	2,4	3,2
				MEDIAN	1	0	3	4	0	1	0	6	0	0	3	0	0	0	0	0	2	3
				SD	1,4	0,6	2,4	2,7	1,8	1,8	0,8	1,9	1,0	0,8	1,8	0,2	0,5	0,0	1,6	0,2	2,2	2,8
		F	(N=30)	MEAN	0,4	0,1	5,1	4,2	0,3	1,7	0,1	5,7	0,3	0,1	1,9	0,1	0,0	0,0	0,9	0,2	1,2	3,0
				MEDIAN	0	0	6	4	0	2	0	6	0	0	2	0	0	0	0	0	0	3
				SD	1,0	0,4	2,5	2,6	0,5	1,9	0,4	2,2	1,0	0,6	1,9	0,4	0,0	0,0	1,4	0,7	1,8	2,7
		All	(N=48)	MEAN	0,8	0,2	4,4	3,9	0,7	1,7	0,2	5,2	0,3	0,3	2,5	0,1	0,1	0,0	1,0	0,1	1,8	3,1
				MEDIAN	0	0	5	4	0	1	0	6	0	0	2	0	0	0	0	0	1	3
				SD	1,2	0,5	2,4	2,7	1,2	1,9	0,6	2,0	1,0	0,7	1,8	0,3	0,3	0,0	1,5	0,5	2,0	2,7
12	**Insidious**	M	(N=18)	MEAN	2,1	0,2	4,3	3,9	0,8	1,4	0,2	4,2	0,2	1,1	3,2	0,4	0,1	0,2	0,7	0,3	3,3	2,0

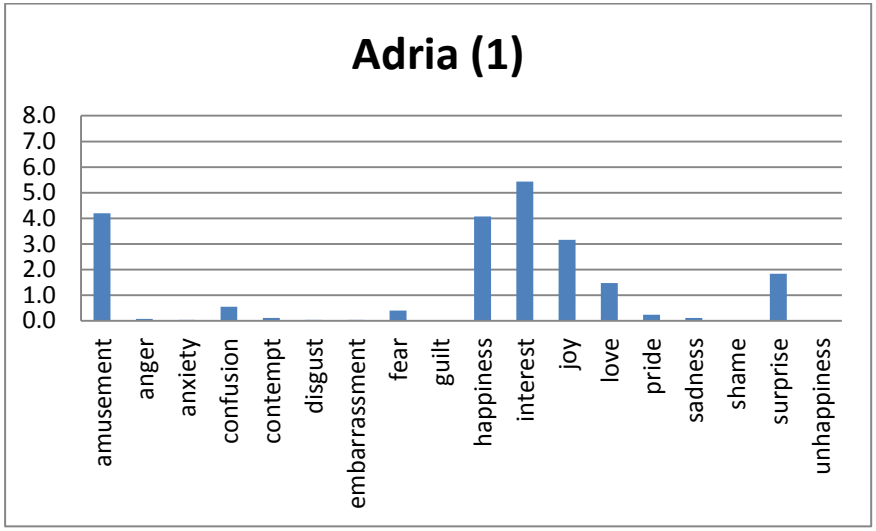
		MEDIAN	2	0	5	3	0	1	0	4	0	1	3	0	0	0	0	0	3	1
		SD	2,1	0,4	2,2	2,6	1,4	1,5	0,7	2,1	0,7	1,9	2,1	1,2	0,2	0,9	1,3	1,0	2,4	2,7
F	(N=30)	MEAN	1,0	0,1	6,1	4,6	0,6	2,0	0,1	5,7	0,2	0,3	2,1	0,0	0,0	0,0	0,5	0,0	3,0	2,8
		MEDIAN	0	0	6	5	0	2	0	6	0	0	1	0	0	0	0	0	4	3
		SD	1,7	0,3	1,7	2,4	1,4	2,2	0,4	2,0	0,9	0,7	2,5	0,0	0,0	0,0	1,3	0,2	2,4	2,6
All	(N=48)	MEAN	1,5	0,1	5,2	4,2	0,7	1,7	0,1	5,0	0,2	0,7	2,6	0,2	0,0	0,1	0,6	0,2	3,2	2,4
		MEDIAN	1	0	6	4	0	1	0	6	0	0	2	0	0	0	0	0	3	2
		SD	1,9	0,3	2,0	2,5	1,4	1,9	0,5	2,1	0,8	1,3	2,3	0,6	0,1	0,5	1,3	0,6	2,4	2,7

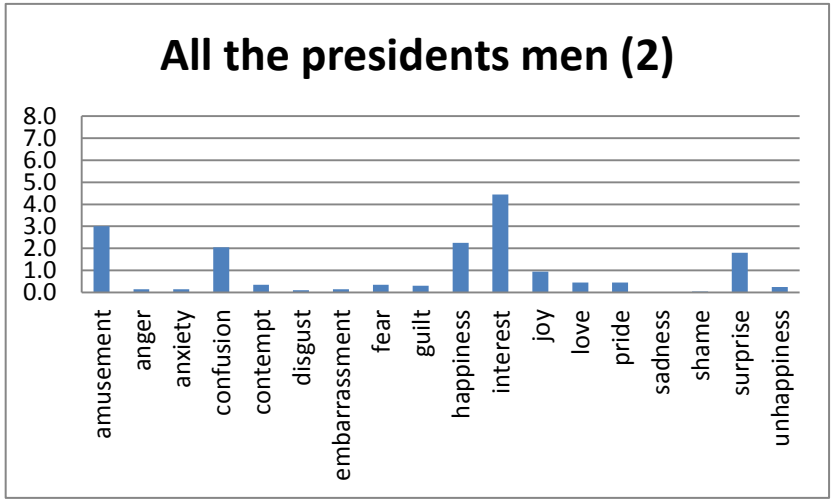
film clip	G	N		amus	ange	anxi	conf	cont	disg	emba	fear	guil	happ	inte	joy	love	prid	sadn	sham	surp	unha
HAPPINES																					
13 Harry und Sally	M	(N=18)	MEAN	5,3	0,1	0,1	0,8	0,4	0,5	2,1	0,2	0,1	4,1	3,2	1,7	0,7	0,4	0,0	2,3	2,5	0,2
			MEDIAN	6	0	0	0	0	0	2	0	0	4	3	1	0	0	0	2	3	0
			SD	1,6	0,3	0,2	1,4	1,0	1,2	2,0	0,5	0,2	2,2	1,9	1,9	1,0	0,8	0,0	2,3	2,5	0,4
	F	(N=30)	MEAN	6,2	0,0	0,0	0,4	0,3	0,4	2,2	0,0	0,0	4,6	3,5	1,6	0,7	0,4	0,0	2,1	1,3	0,0
			MEDIAN	7	0	0	0	0	0	1	0	0	5	4	1	0	0	0	1	0	0
			SD	2,1	0,2	0,0	1,0	0,8	1,3	2,4	0,0	0,0	2,5	2,5	2,0	1,5	1,4	0,0	2,7	1,9	0,0
	All	(N=48)	MEAN	5,8	0,1	0,0	0,6	0,4	0,4	2,1	0,1	0,0	4,3	3,3	1,7	0,7	0,4	0,0	2,2	1,9	0,1
			MEDIAN	6	0	0	0	0	0	2	0	0	4	3	1	0	0	0	1	1	0
			SD	1,9	0,3	0,1	1,2	0,9	1,3	2,2	0,3	0,1	2,4	2,2	2,0	1,3	1,1	0,0	2,5	2,2	0,2
14 Hangover	M	(N=18)	MEAN	5,3	0,2	0,3	1,2	0,5	1,2	1,0	0,9	0,1	4,3	3,7	2,8	0,3	0,3	0,0	1,3	2,2	0,7
			MEDIAN	6	0	0	0	0	1	0	1	0	4	4	2	0	0	0	1	2	0
			SD	2,5	0,4	0,6	1,7	0,9	1,4	1,5	1,1	0,3	2,6	2,4	2,8	0,8	0,7	0,0	1,6	2,5	1,2
	F	(N=30)	MEAN	6,4	0,1	0,3	1,4	0,5	1,2	1,2	0,4	0,0	4,7	3,8	2,0	0,3	0,0	0,0	0,9	2,2	0,3
			MEDIAN	7	0	0	0	0	0	0	0	0	5	4	1	0	0	0	0	2	0
			SD	1,8	0,4	0,8	1,8	1,3	1,7	1,7	1,0	0,2	2,5	2,8	2,4	1,1	0,2	0,2	1,7	2,2	0,7

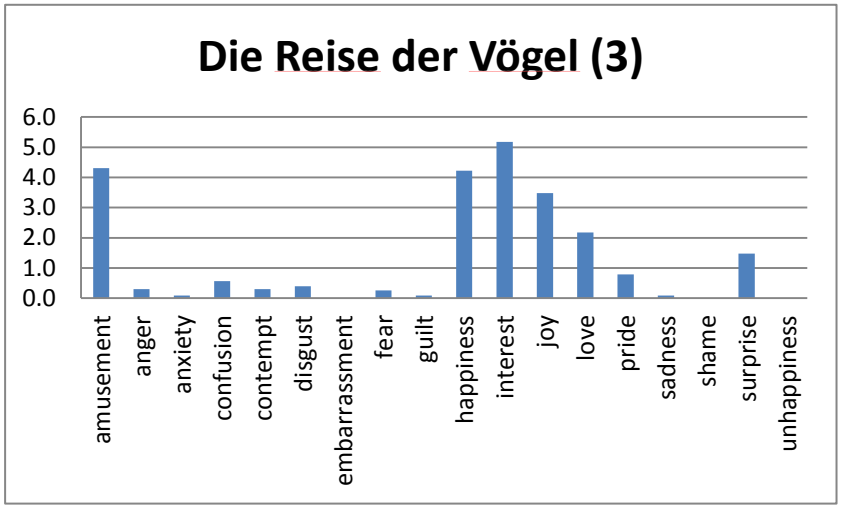
	All	(N=48)	MEAN	5,8	0,1	0,3	1,3	0,5	1,2	1,1	0,6	0,1	4,5	3,8	2,4	0,3	0,2	0,0	1,1	2,2	0,5
			MEDIAN	6	0	0	0	0	1	0	0	0	5	4	1	0	0	0	0	2	0
			SD	2,1	0,4	0,7	1,8	1,1	1,5	1,6	1,1	0,3	2,5	2,6	2,6	0,9	0,4	0,1	1,6	2,4	1,0
15	**BBT**	M	(N=18)	MEAN	5,3	0,3	0,0	0,3	0,7	0,4	1,1	0,0	0,0	4,7	3,2	1,8	0,6	0,4	0,0	1,4	1,2	0,2
				MEDIAN	6	0	0	0	0	0	0	0	0	6	3	1	0	0	0	1	0	0
				SD	2,3	0,8	0,0	0,8	1,7	1,0	1,5	0,0	0,0	2,3	2,0	2,0	1,4	1,1	0,0	1,9	2,1	0,5
		F	(N=30)	MEAN	6,3	0,2	0,0	0,2	0,4	0,0	0,7	0,0	0,0	5,7	4,9	2,8	0,3	0,0	0,2	0,8	1,1	0,0
				MEDIAN	7	0	0	0	0	0	0	0	0	6	5	3	0	0	0	0	0	0
				SD	1,9	0,7	0,0	0,6	1,3	0,0	1,5	0,0	0,0	2,2	2,3	2,3	1,1	0,0	0,9	1,7	1,5	0,0
		F	(N=48)	MEAN	5,8	0,3	0,0	0,2	0,5	0,2	0,9	0,0	0,0	5,2	4,0	2,3	0,4	0,2	0,1	1,1	1,1	0,1
				MEDIAN	7	0	0	0	0	0	0	0	0	6	5	3	0	0	0	0	0	0
				SD	2,1	0,8	0,0	0,7	1,5	0,5	1,5	0,0	0,0	2,3	2,2	2,2	1,2	0,6	0,5	1,8	1,8	0,3
16	**Naked gun**	M	(N=18)	MEAN	5,1	0,0	0,1	1,7	0,1	0,1	0,5	0,1	0,0	4,4	3,7	2,3	0,1	0,2	0,0	0,3	2,2	0,0
				MEDIAN	6	0	0	1	0	0	0	0	0	5	4	2	0	0	0	0	2	0
				SD	2,0	0,0	0,2	2,1	0,2	0,2	0,9	0,2	0,0	2,5	1,9	2,2	0,3	0,7	0,0	0,7	2,4	0,0
		F	(N=30)	MEAN	4,4	0,0	0,1	2,7	0,3	0,0	0,4	0,1	0,0	3,5	3,2	1,1	0,0	0,1	0,0	0,4	1,7	0,1
				MEDIAN	5	0	0	2	0	0	0	0	0	3	3	0	0	0	0	0	1	0
				SD	2,3	0,0	0,4	3,1	1,0	0,2	1,4	0,4	0,0	2,2	2,0	1,7	0,2	0,5	0,0	1,1	1,9	0,4
		All	(N=48)	MEAN	4,8	0,0	0,1	2,2	0,2	0,0	0,5	0,1	0,0	4,0	3,4	1,7	0,1	0,1	0,0	0,3	2,0	0,0
				MEDIAN	5	0	0	1	0	0	0	0	0	4	3	1	0	0	0	0	1	0
				SD	2,1	0,0	0,3	2,6	0,6	0,2	1,1	0,3	0,0	2,4	2,0	1,9	0,3	0,6	0,0	0,9	2,2	0,2

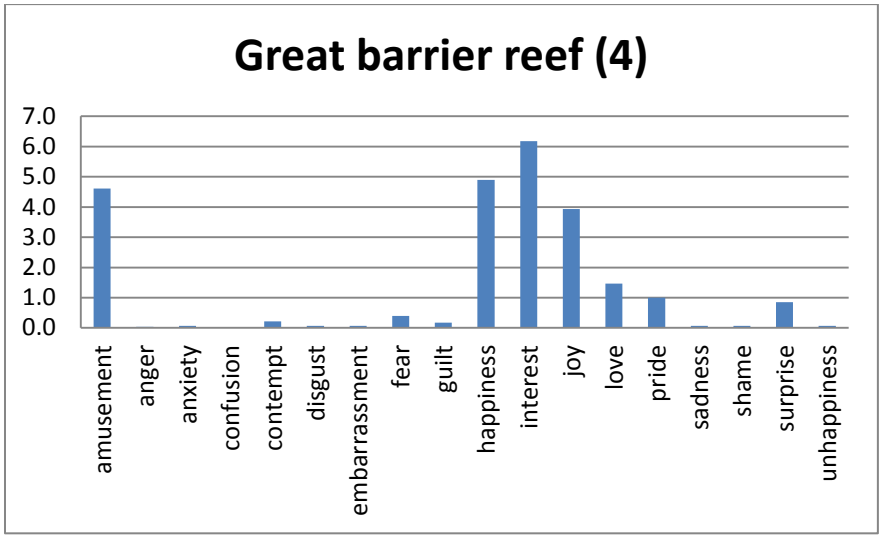
Graphs and figures

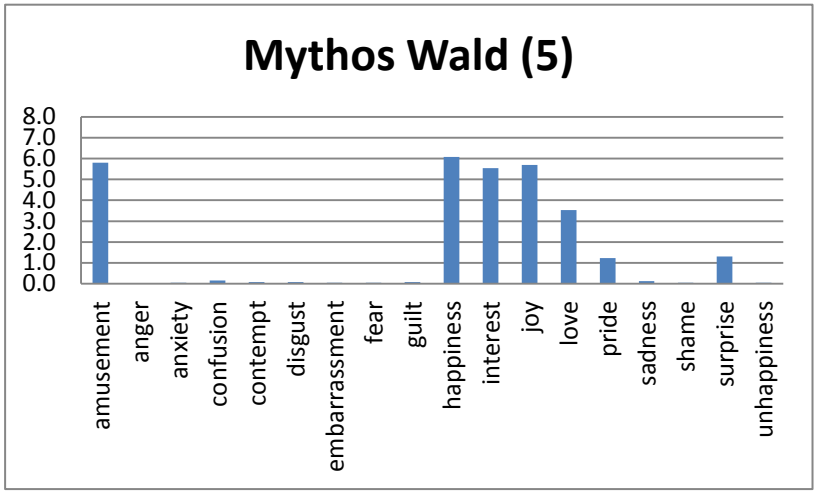
NEUTRAL

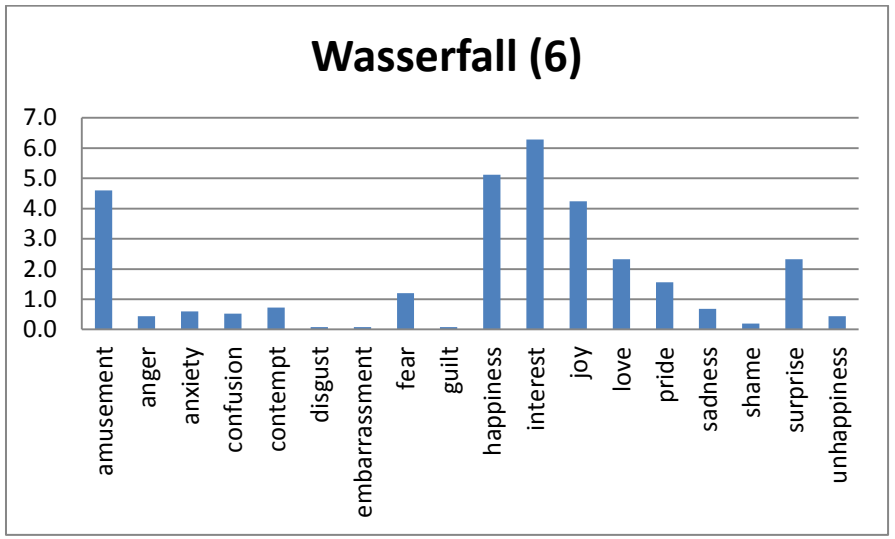


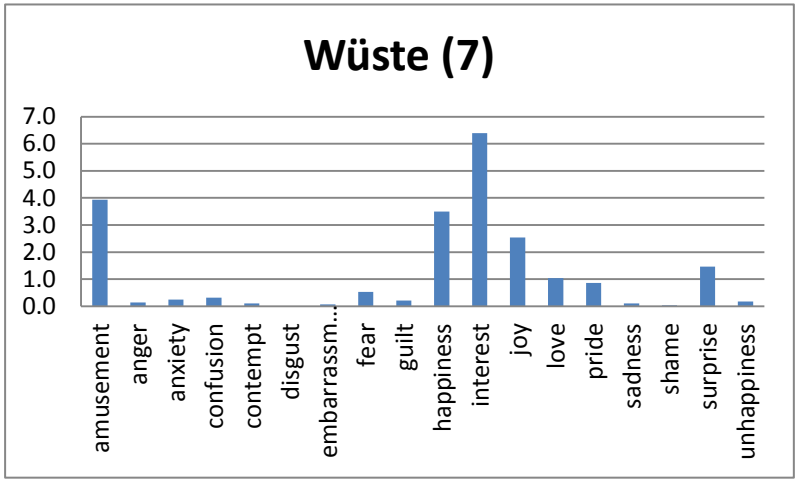


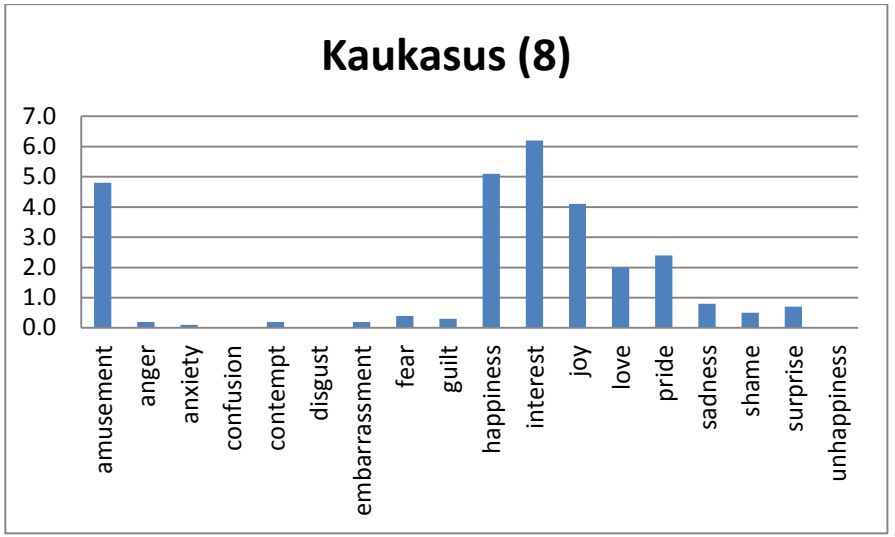

Die Reise der Vögel (3)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Great barrier reef (4)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

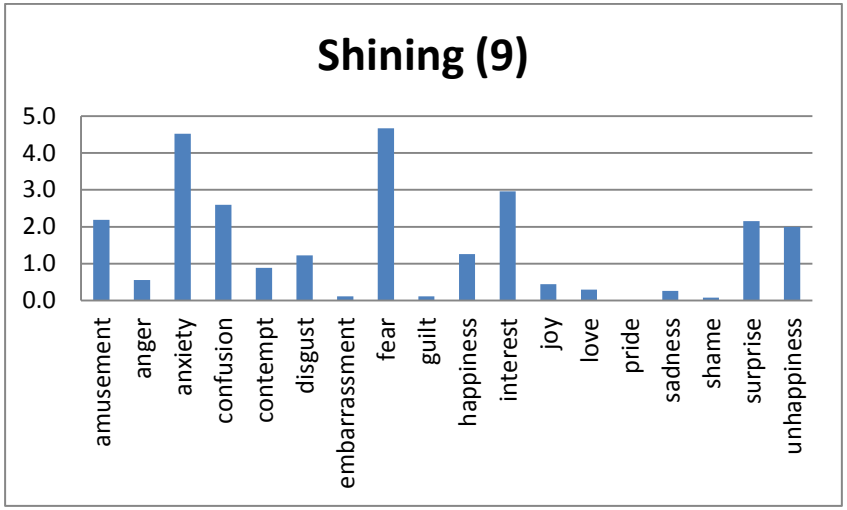

Mythos Wald (5)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

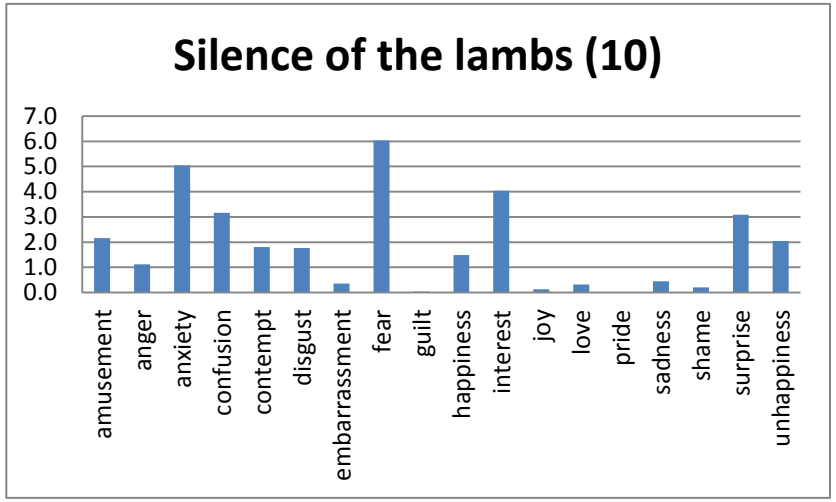

Wasserfall (6)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

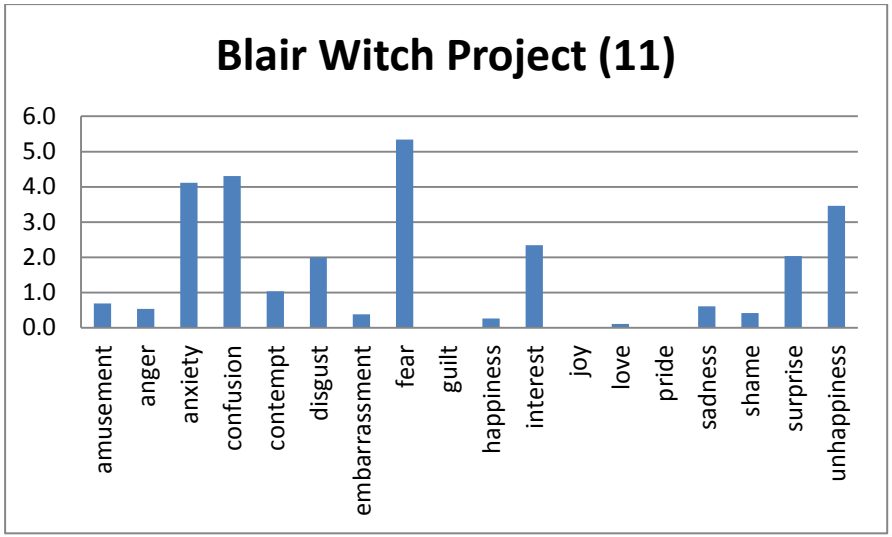

Wüste (7)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassm...
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

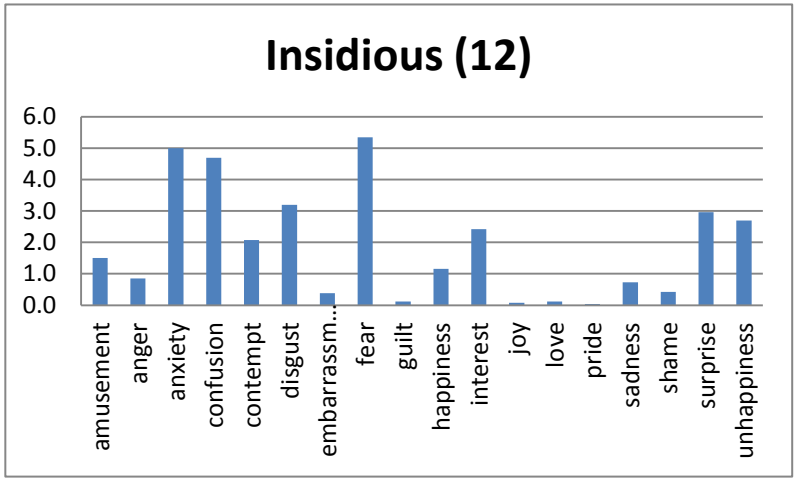

Kaukasus (8)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

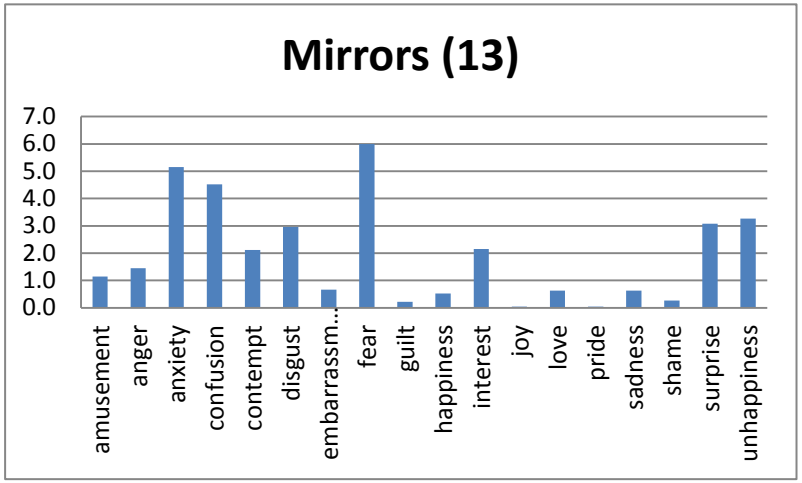
FEAR

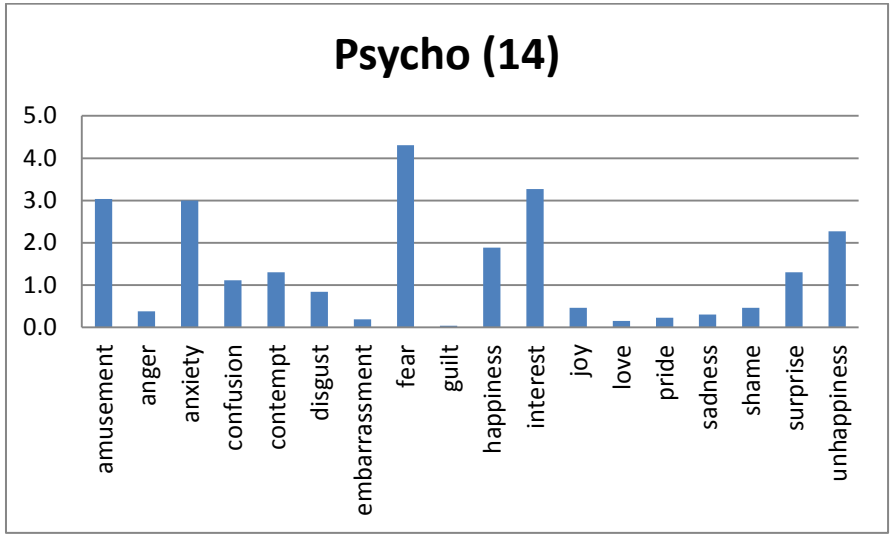

Shining (9)
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

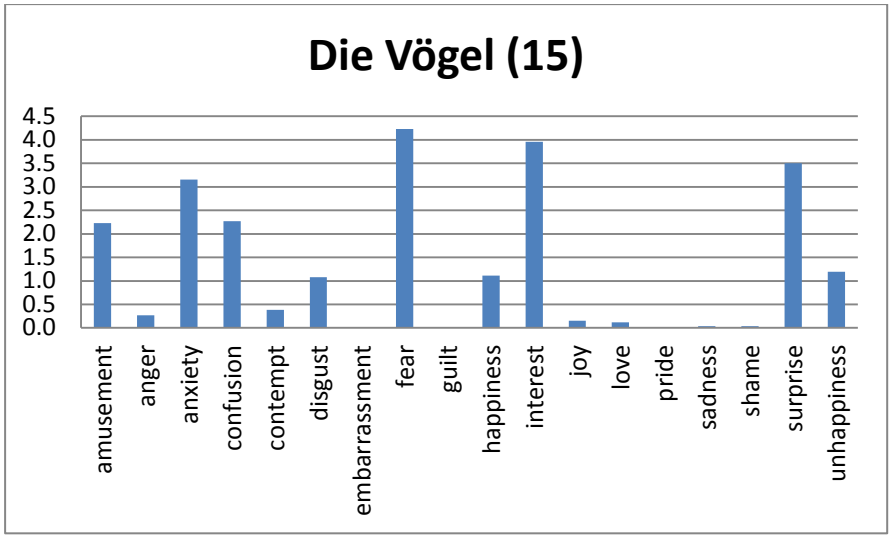

Silence of the lambs (10)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

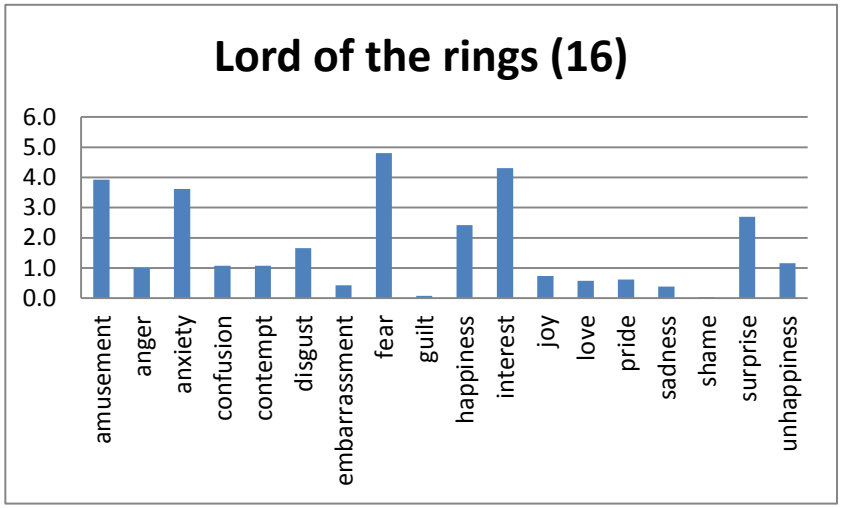

Blair Witch Project (11)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Insidious (12)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassm...
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

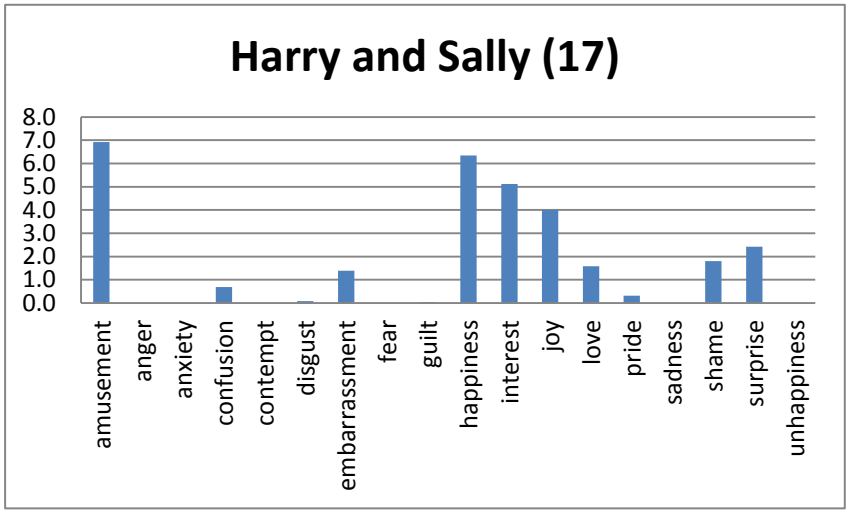

Mirrors (13)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassm...
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

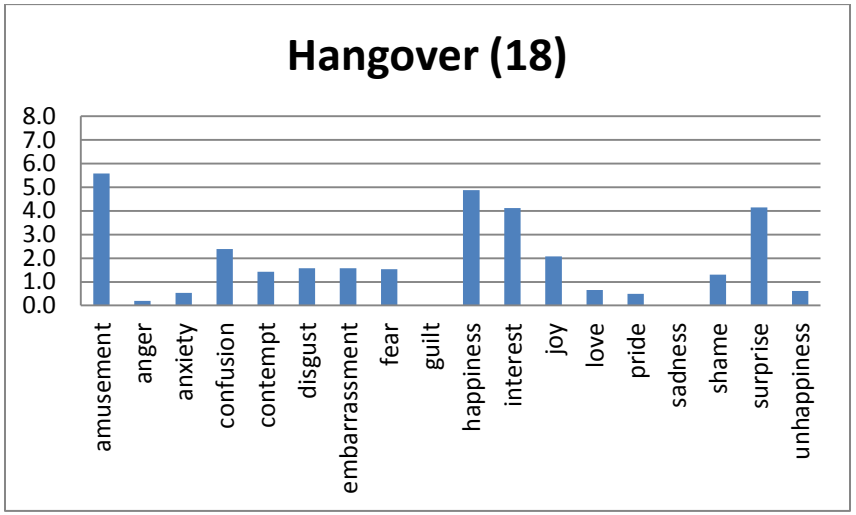

Psycho (14)
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

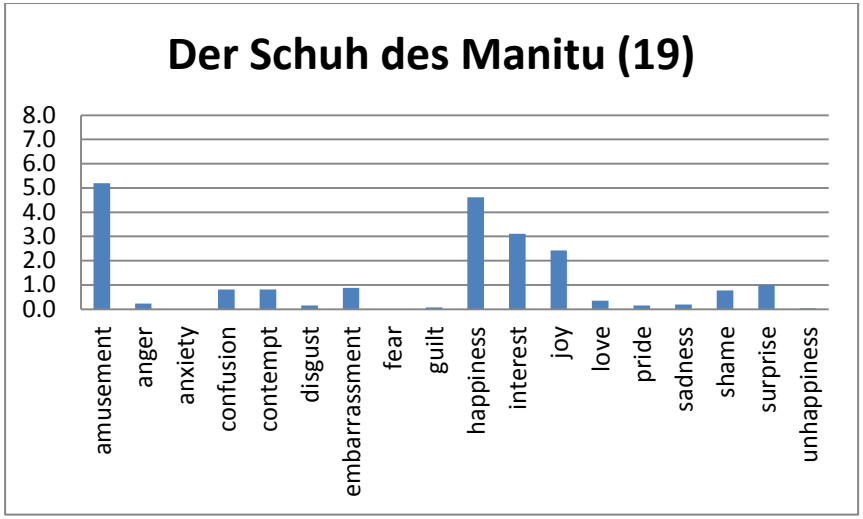

Die Vögel (15)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

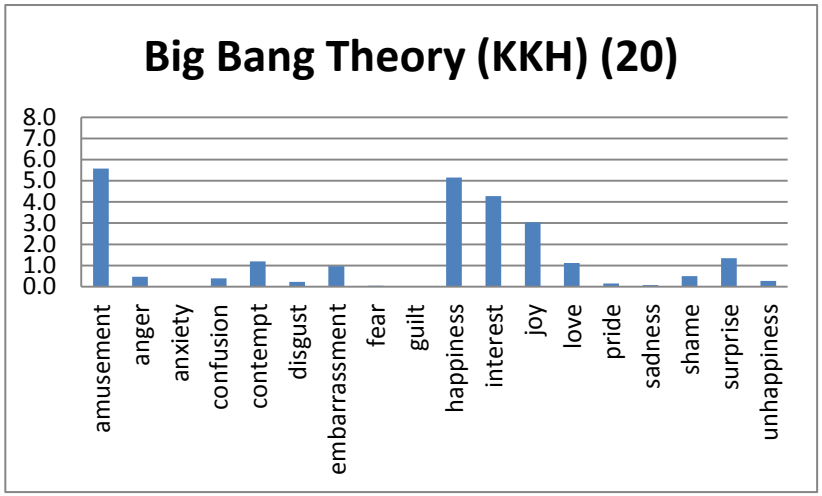

Lord of the rings (16)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

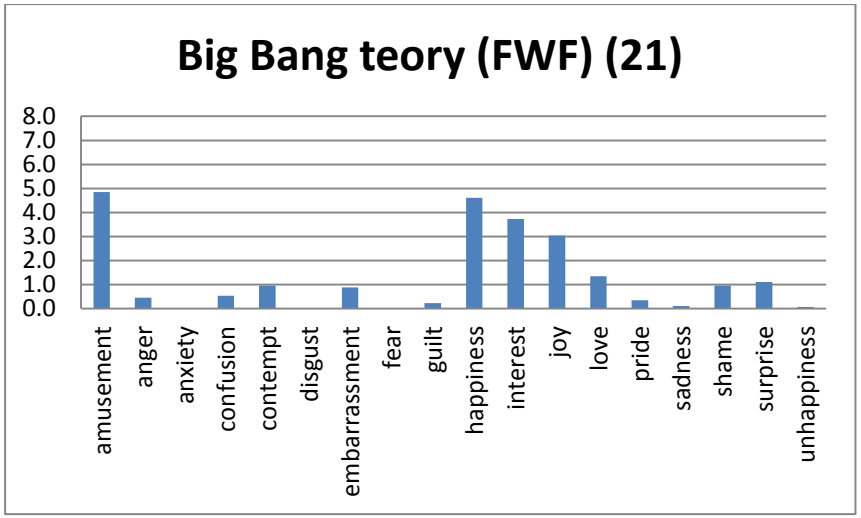
HAPPINESS

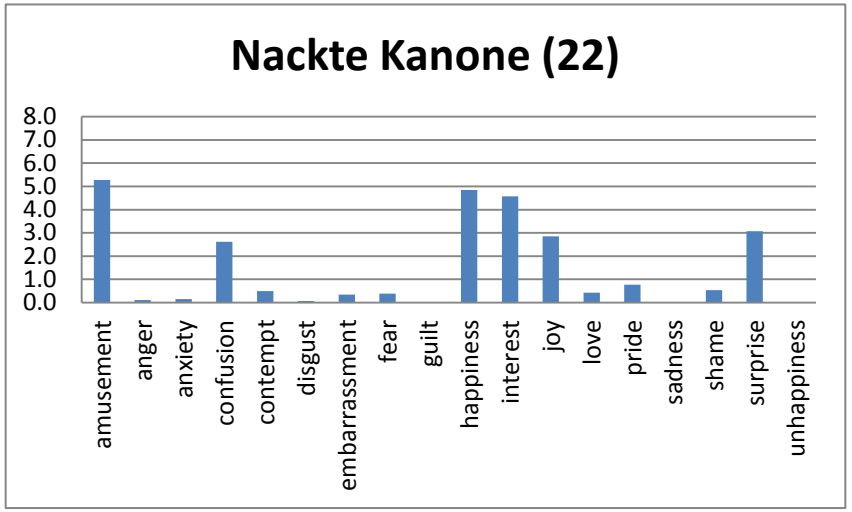

Harry and Sally (17)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

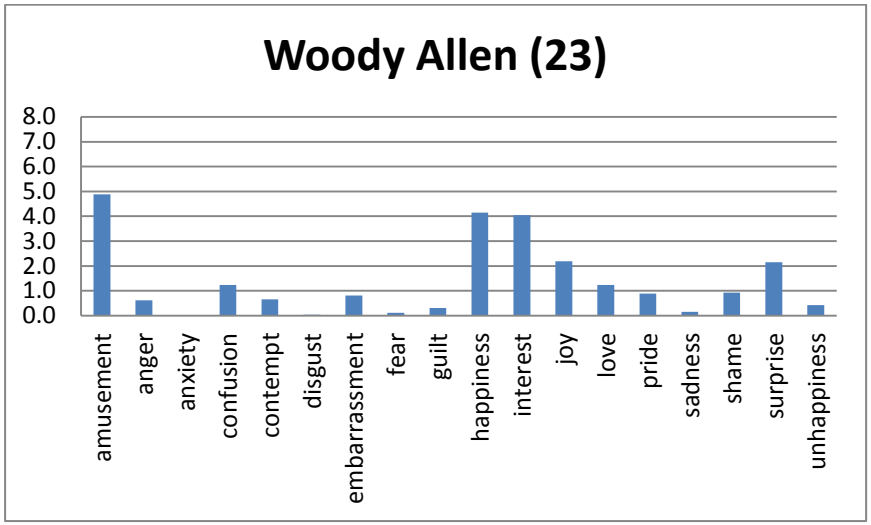

Hangover (18)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Der Schuh des Manitu (19)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Big Bang Theory (KKH) (20)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Big Bang teory (FWF) (21)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Nackte Kanone (22)
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
amusement
anger
anxiety
confusion
contempt
disgust
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Woody Allen (23)
8.0
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anger
anxiety
confusion
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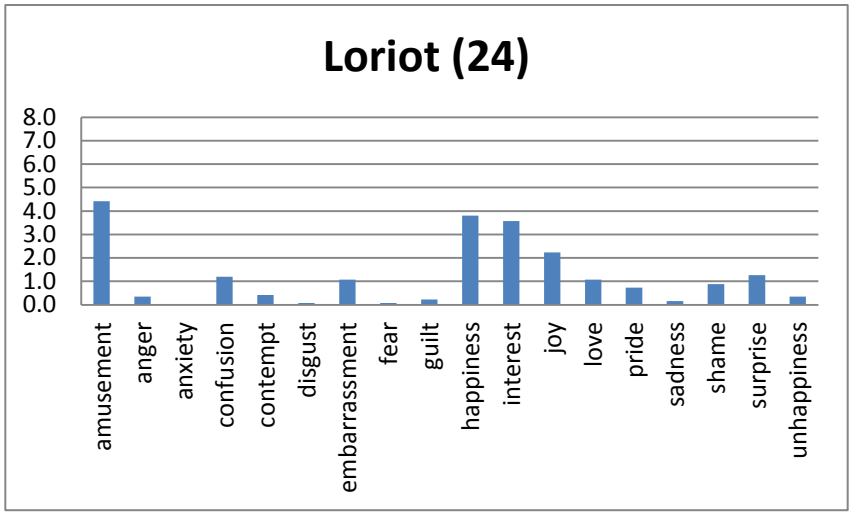
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness


Loriot (24)
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anxiety
confusion
contempt
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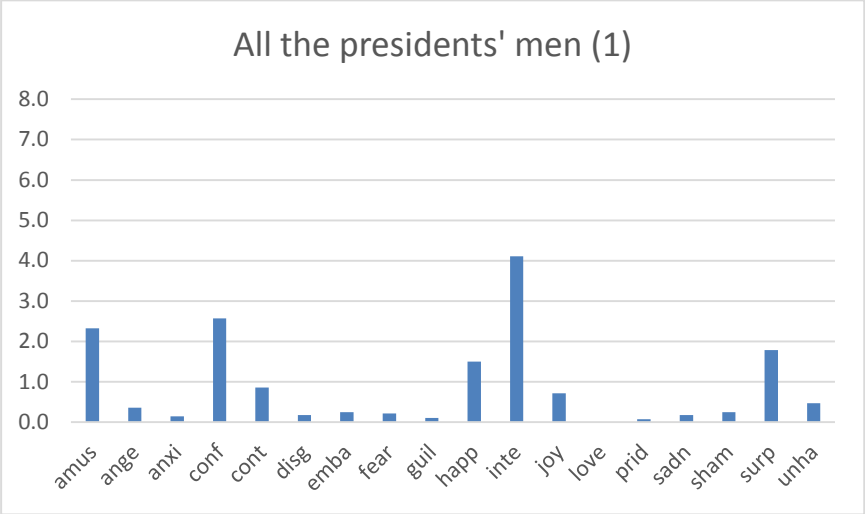
embarrassment
fear
guilt
happiness
interest
joy
love
pride
sadness
shame
surprise
unhappiness

Pretest II


All the presidents' men (1)
8.0
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sadn
sham
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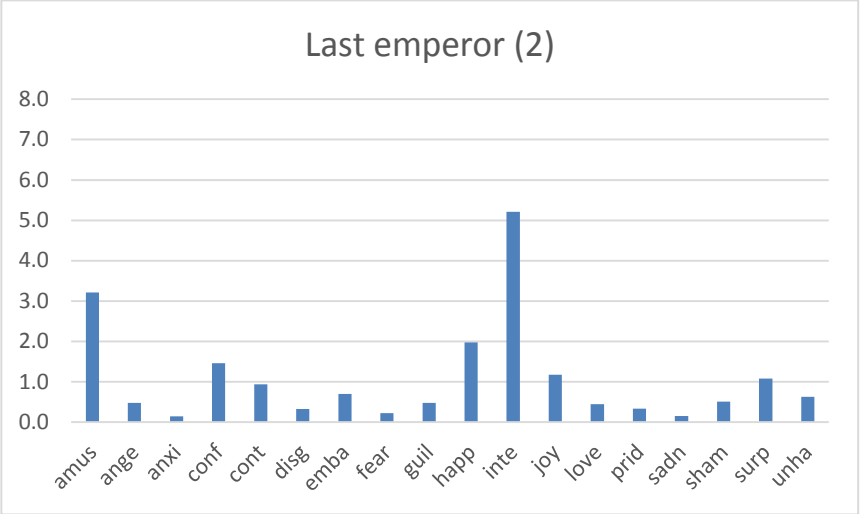
unha


Last emperor (2)
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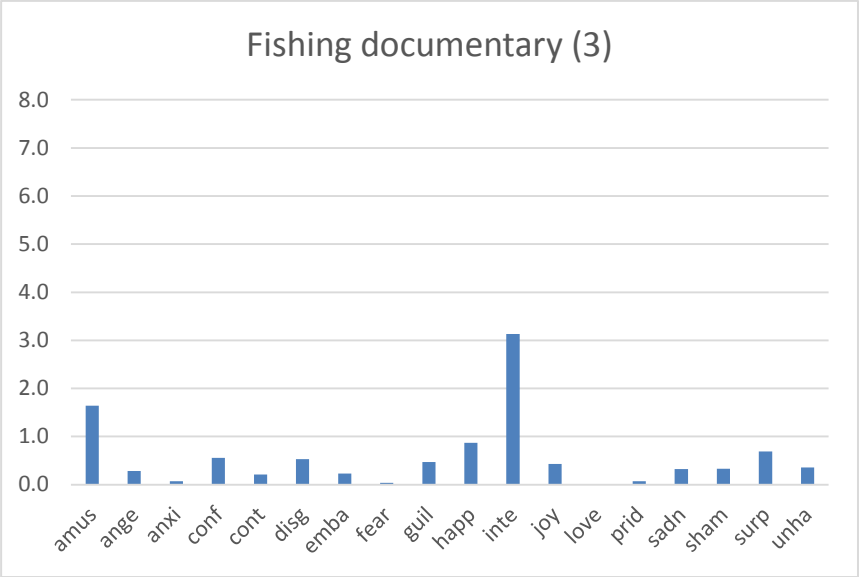
Fishing documentary (3)
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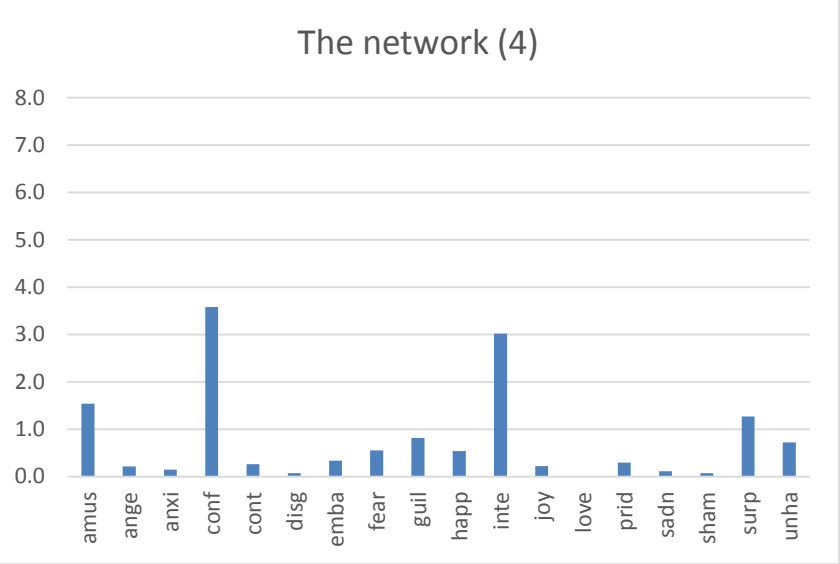
The network (4)
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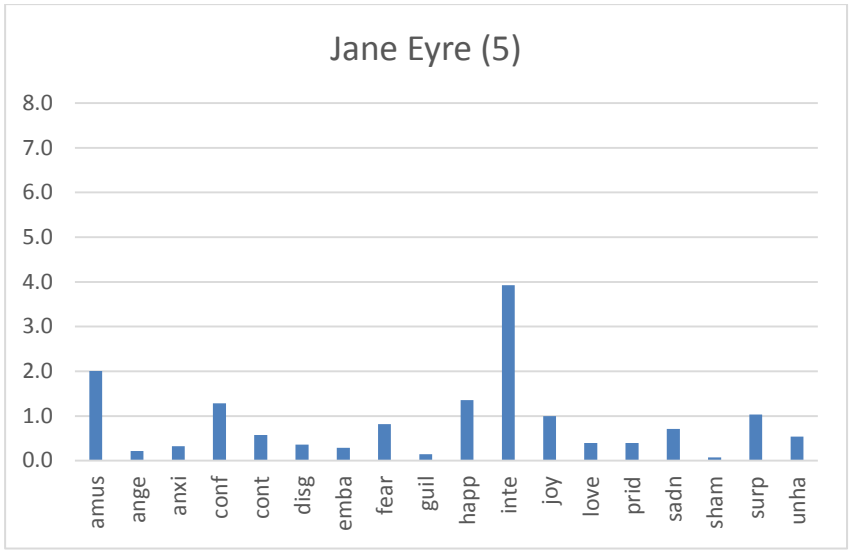
Jane Eyre (5)
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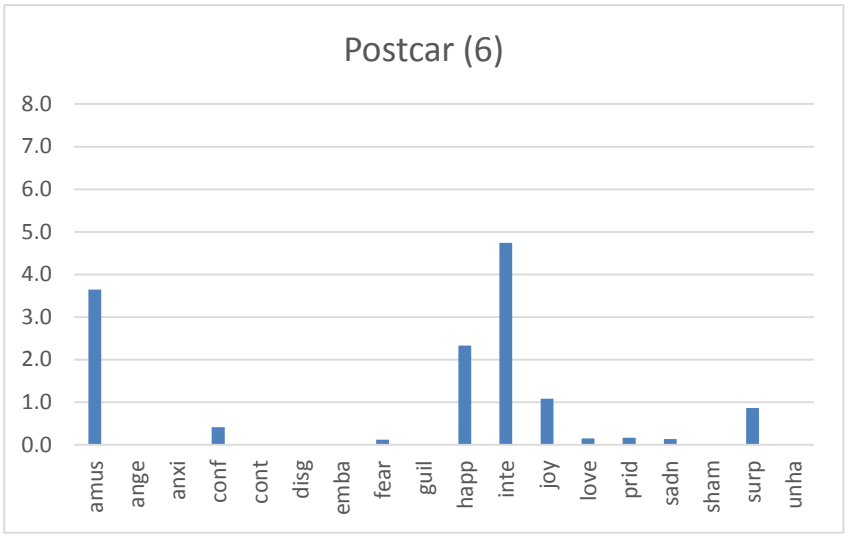
Postcar (6)
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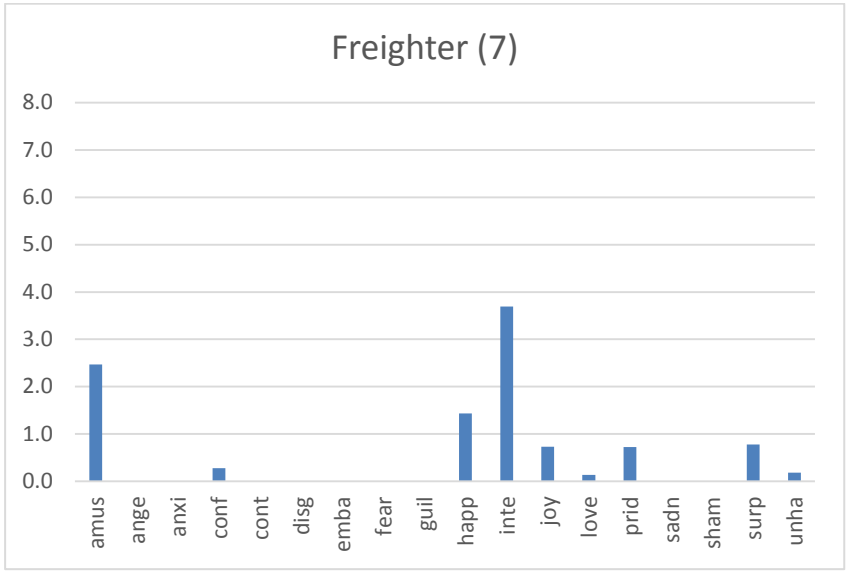
Freighter (7)
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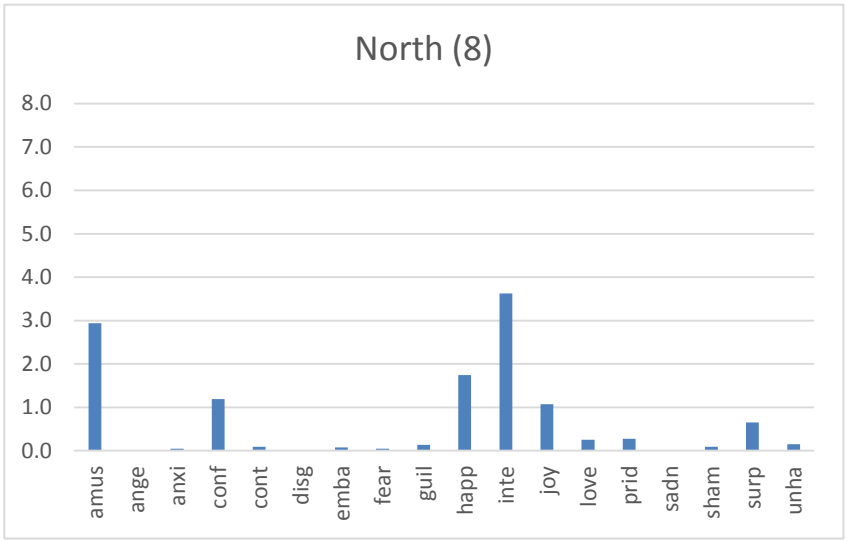
North (8)
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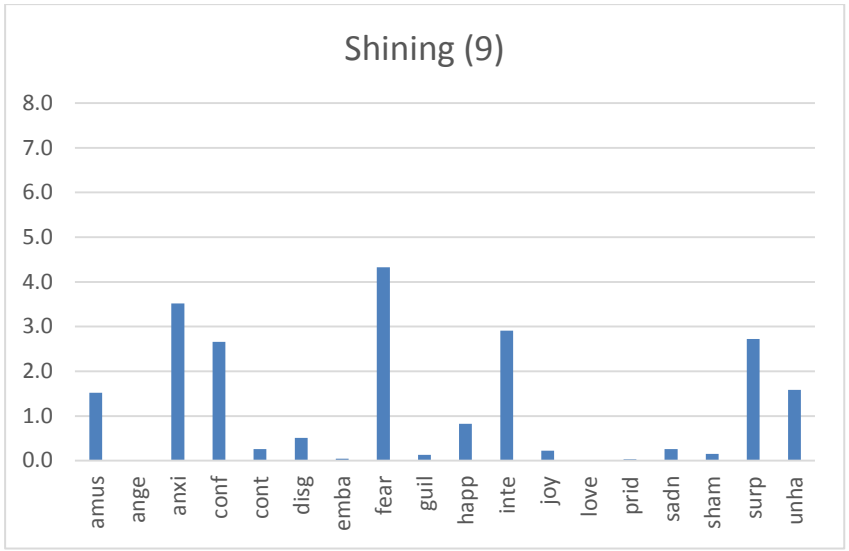
Shining (9)
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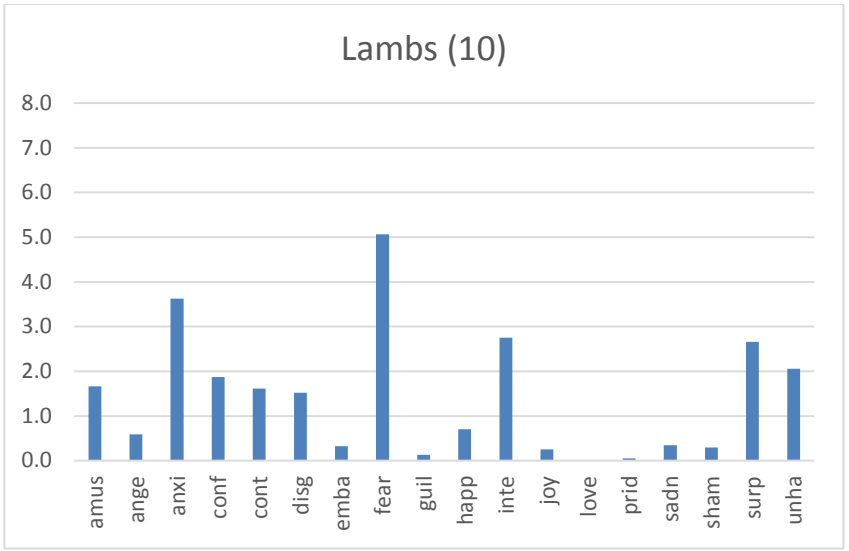
Lambs (10)
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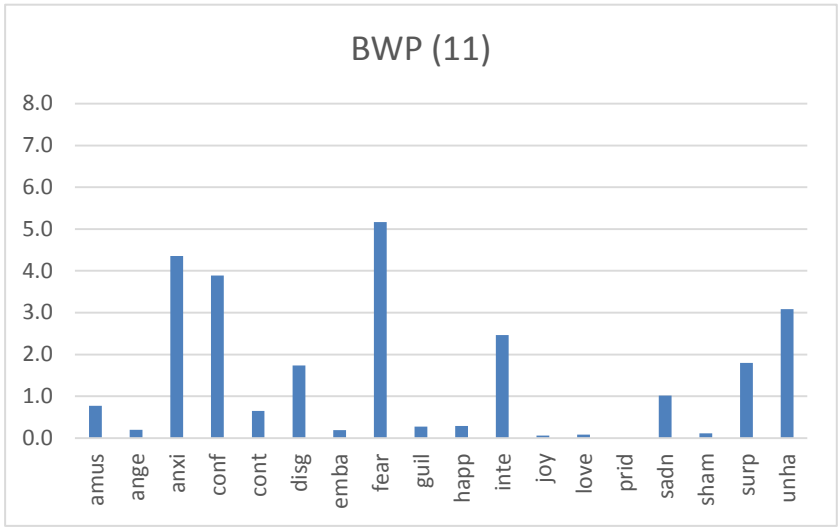
BWP (11)
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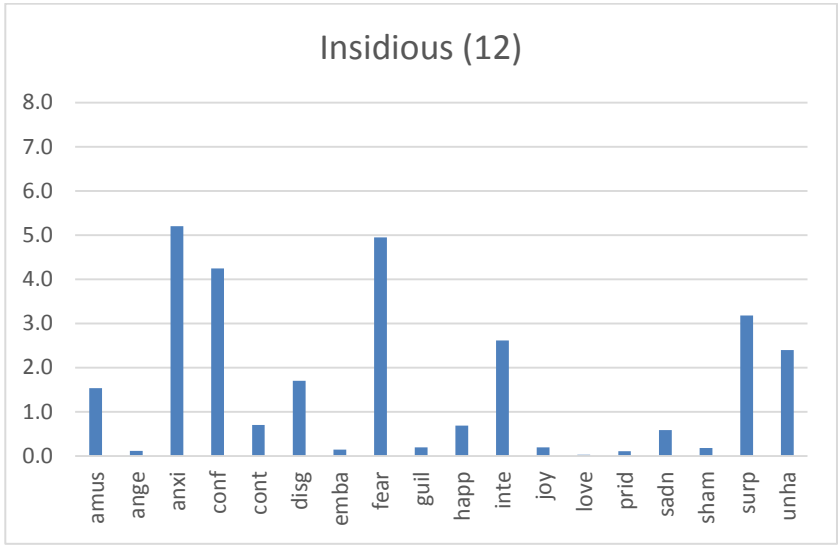
Insidious (12)
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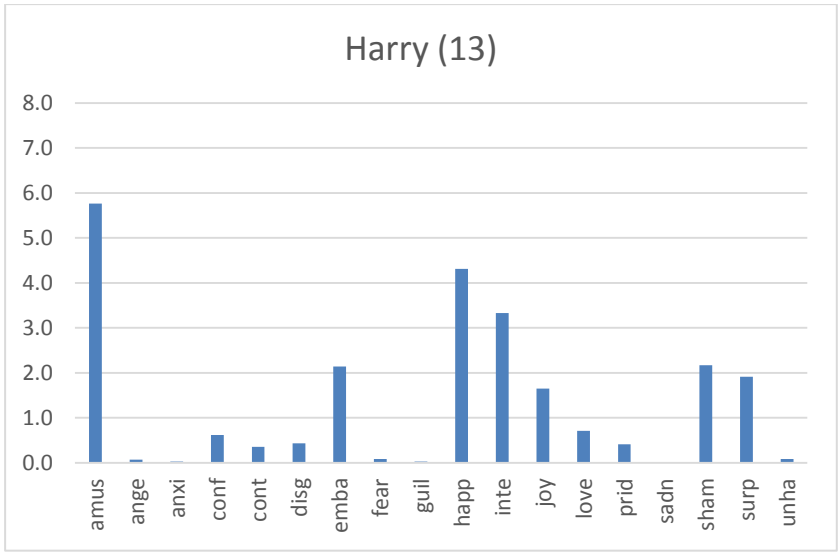
Harry (13)
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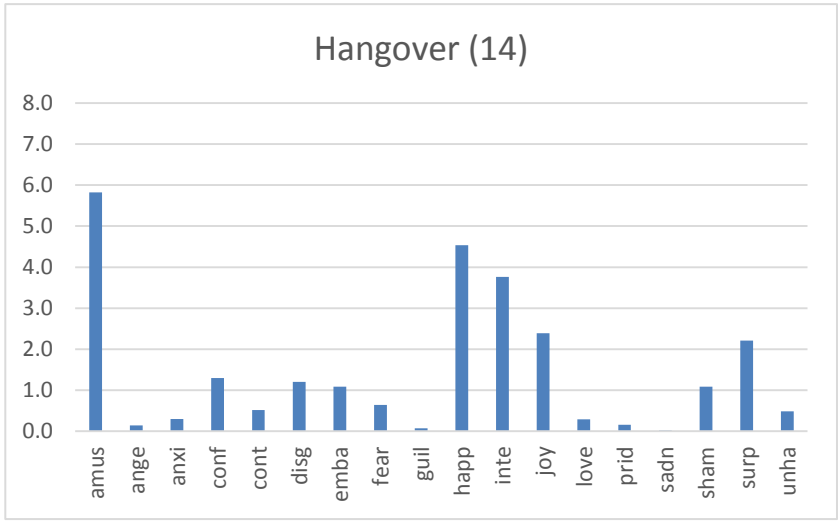
Hangover (14)
8.0
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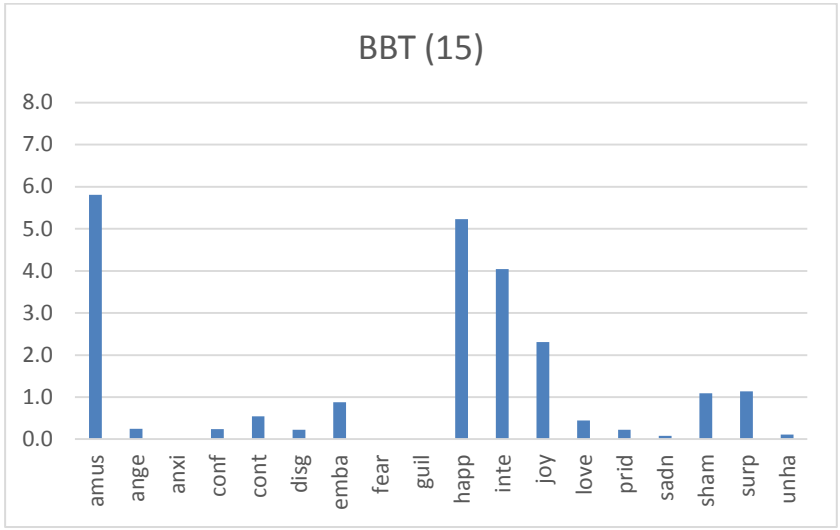
BBT (15)
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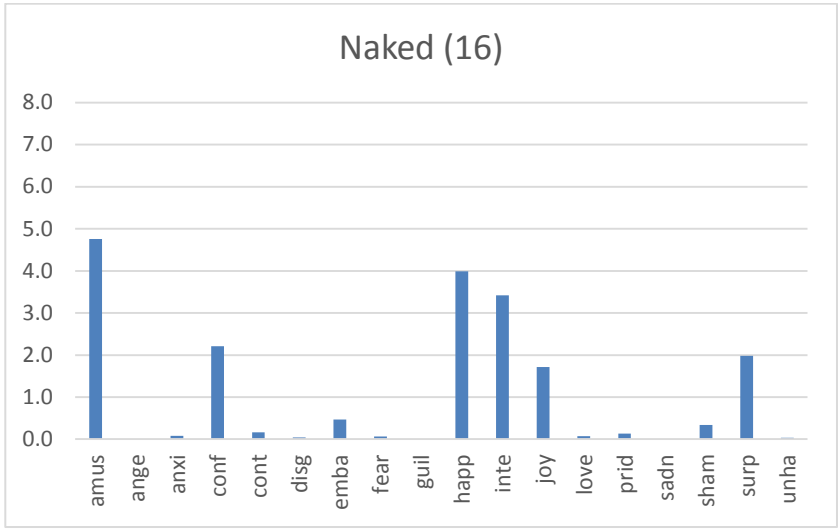
Naked (16)
8.0
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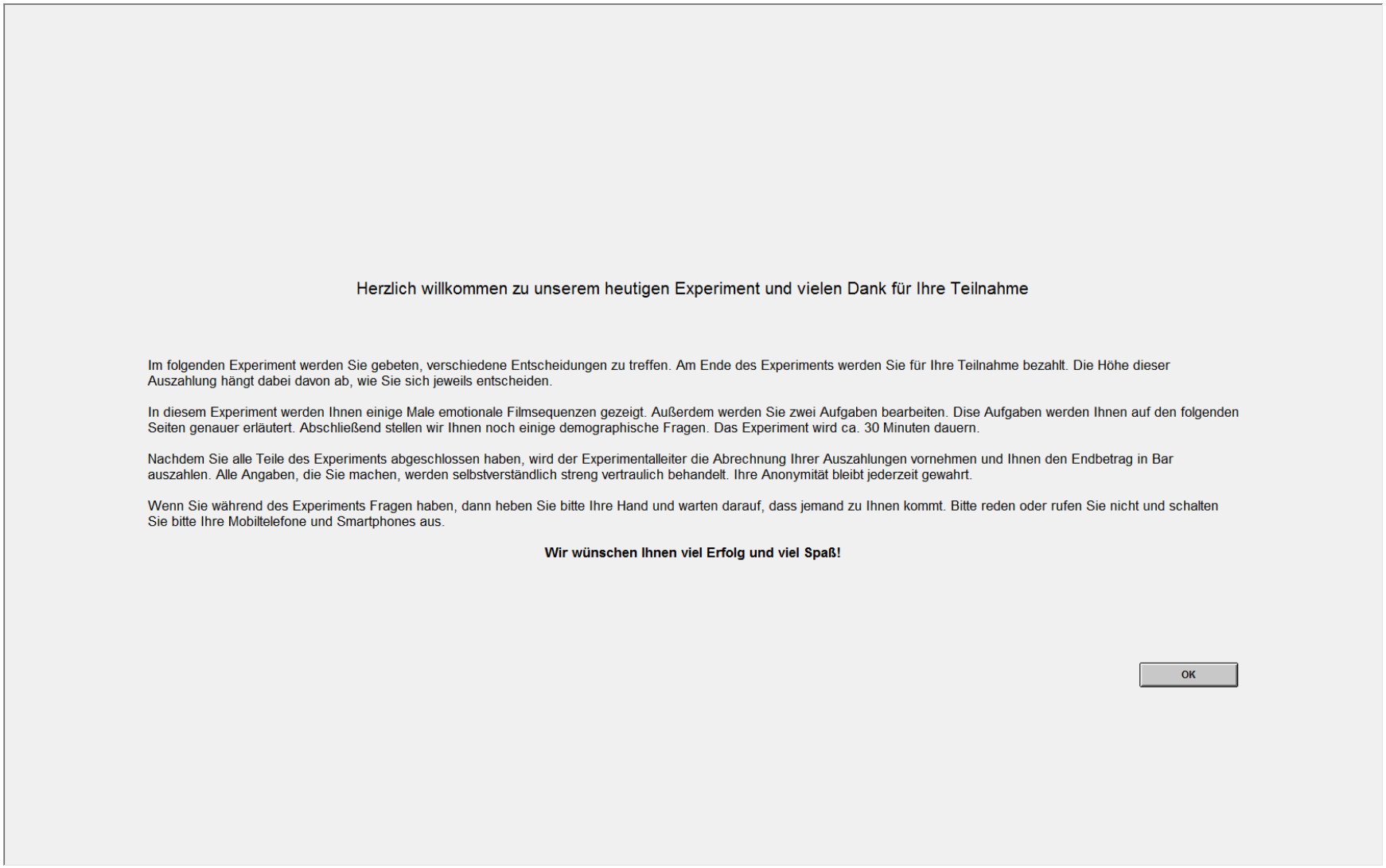
unha

B Additional material chapter IV.1

B.1 Instructions



Erklärung Teil 1

Die folgenden Erklärungen beziehen sich auf einen späteren Zeitpunkt des Experiments.

Im folgenden werden Sie nacheinander über 10 Runden je einen Ballon sehen. Sie können jeden Ballon mit Hilfe eines Klicks mit Ihrer Maus aufpumpen. Jeder Klick pumpt den Ballon ein wenig mehr auf.

Beachten Sie jedoch: Luftballons platzen, wenn Sie sie zu stark aufpumpen. Sie können entscheiden, wie stark Sie den Ballon aufpumpen. Dabei sind Ballons sehr unterschiedlich. Sie wissen nicht, mit was für einem Ballon Sie es zu tun haben und die Art des Ballons ändert sich pro Runde. Einige Ballons platzen eventuell schon nach dem ersten Luftstoß, andere wiederum platzen vielleicht erst nachdem Sie den gesamten Screen einnehmen.

Mit jedem Luftstoß verdienen Sie Geld, nämlich 4 Cent pro Luftstoß. Wenn jedoch ein Ballon platzt, verlieren Sie alles bereits angesammelte Geld aus dieser Runde. Um das Geld einzusammeln, hören Sie auf zu pumpen, bevor der Ballon platzt. Klicken Sie dafür bitte auf den Knopf, "Geld einsammeln".

Nachdem Sie das Geld eingesammelt haben oder ein Ballon geplatzt ist, erscheint ein neuer Ballon.

In jeder Runde wir Ihnen angezeigt, (1) wie viele Cent Sie für diesen Ballon bekommen würden, (2) die Anzahl an Klicks dieser Runde und (3) Ihr kumulierter Verdienst aus den vorherigen Runden.

Am Ende des Experiments erhalten Sie für jeden erfolgreich aufgepumpten Ballon das verdiente Geld in Euro.

Zusammengefasst:
Für jeden Klick auf **"Pumpen"** erhalten Sie 4 Cent.
Wenn sie **"Geld einsammeln"** klicken, behalten Sie die Zahl der Luftstöße mal 4 Cent aus dieser Runde.
Wenn ein Ballon platzt, verlieren Sie alle Cents in Euro aus dieser Runde.
Sie sehen insgesamt 10 Luftballons.

OK

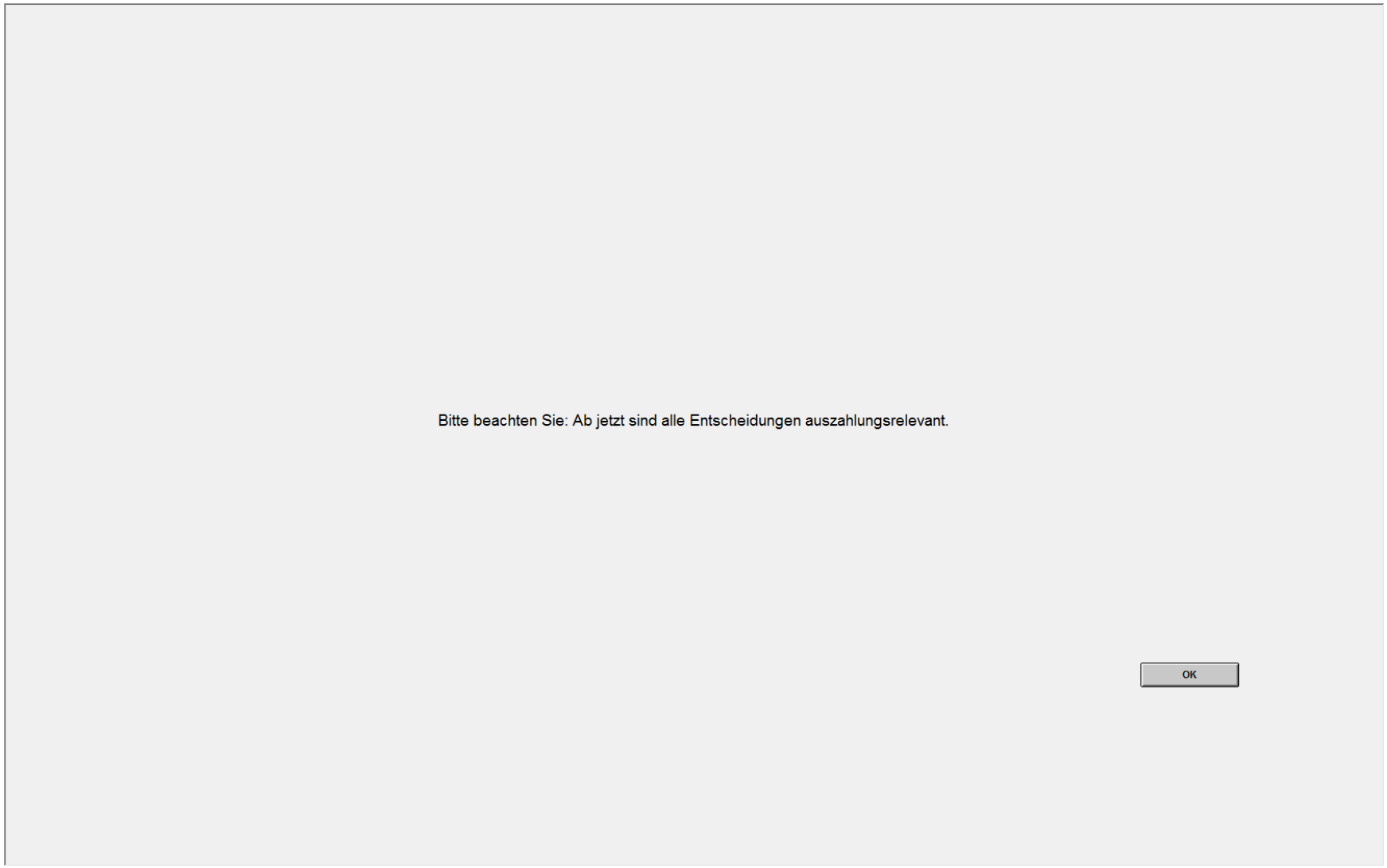
Erklärung Teil 2

In einem Teil des Experiment treffen Sie eine Wahl aus verschiedenen Lotterien. Es werden Ihnen fünf Lotterien gezeigt. Von diesen fünf Lotterien können Sie **eine** Lotterie auswählen, nämlich die Lotterie, die Sie spielen möchten.

Jede der 5 Lotterien hat zwei mögliche Ergebnisse (A oder B), die jeweils mit einer Wahrscheinlichkeit von 50 Prozent eintreten.

Ihre Auszahlung in dieser Runde hängt davon ab, (1) welche Lotterie Sie wählen und (2) welches der zwei möglichen Ergebnisse dann tatsächlich eintritt.

Weiter

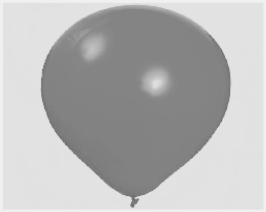

Bitte beachten Sie: Ab jetzt sind alle Entscheidungen auszahlungsrelevant.
OK

Sie sehen nun ein Video:

OK

Weiter

Ballon 2 von 10



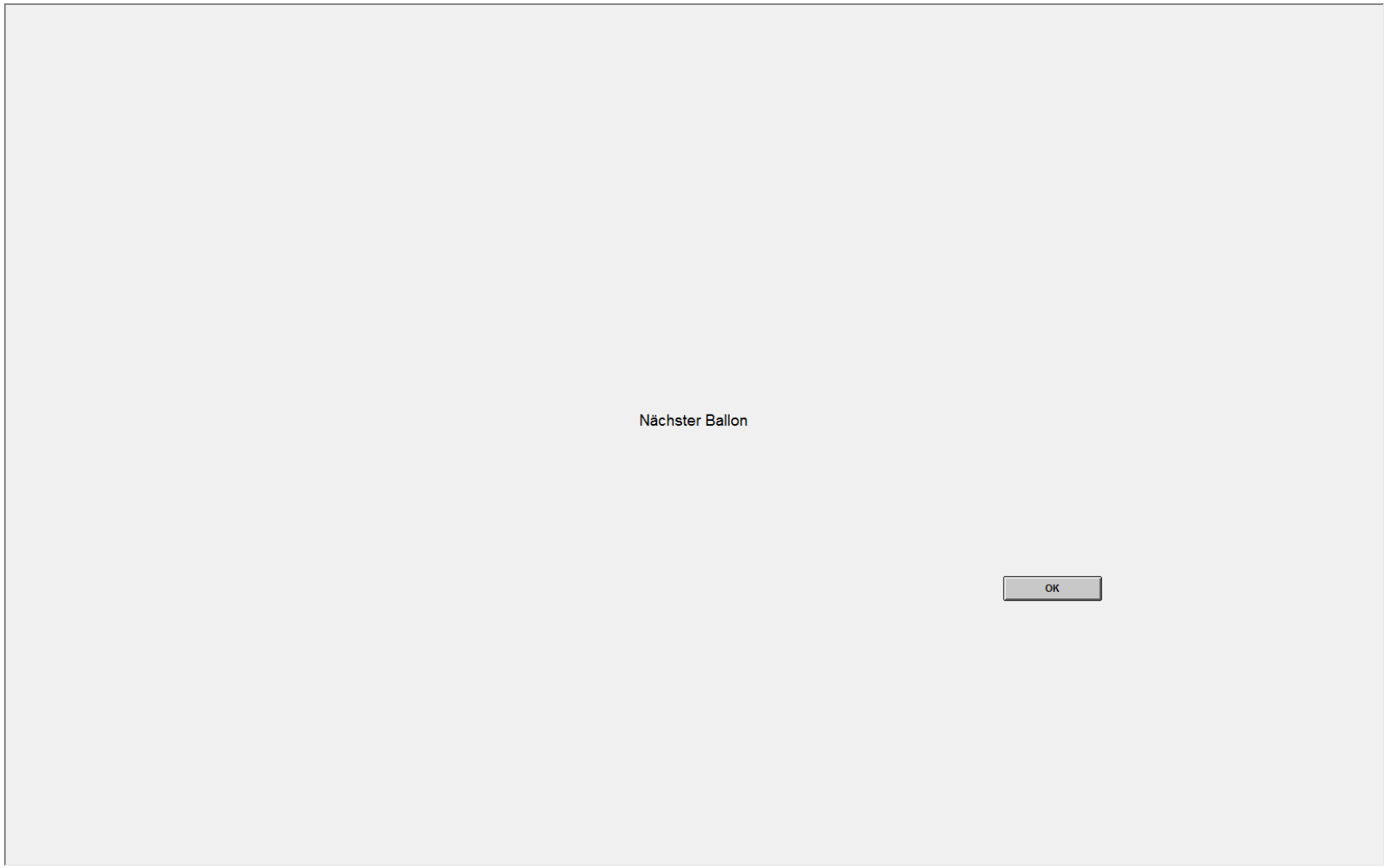
Verdienst für diesen Ballon in Cent: 20

Anzahl an Klicks: 5

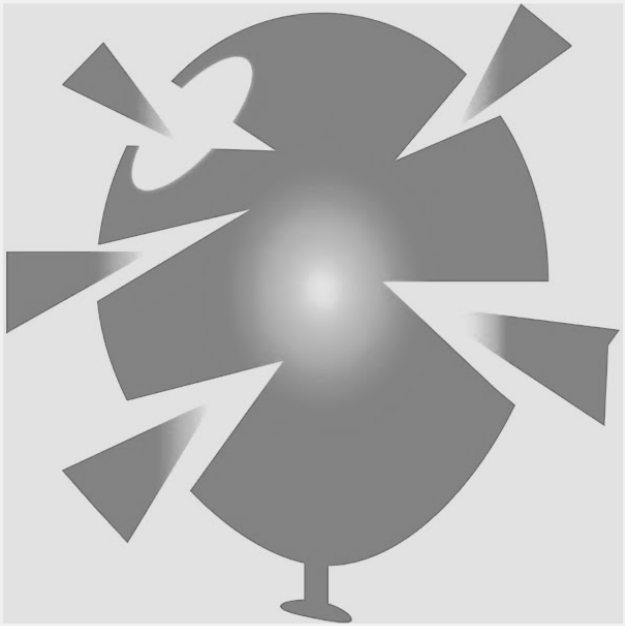
Verdienst der letzten Ballons in Cents: 0

Pumpen

Geld einsammeln


Nächster Ballon
OK

Ballon 3 von 10



Verdienst für diesen Ballon in Cent: 48

Anzahl an Klicks: 12

Verdienst der letzten Ballons in Cents: 0

Pumpen

Geld einsammeln

Sie sehen nun ein Video:

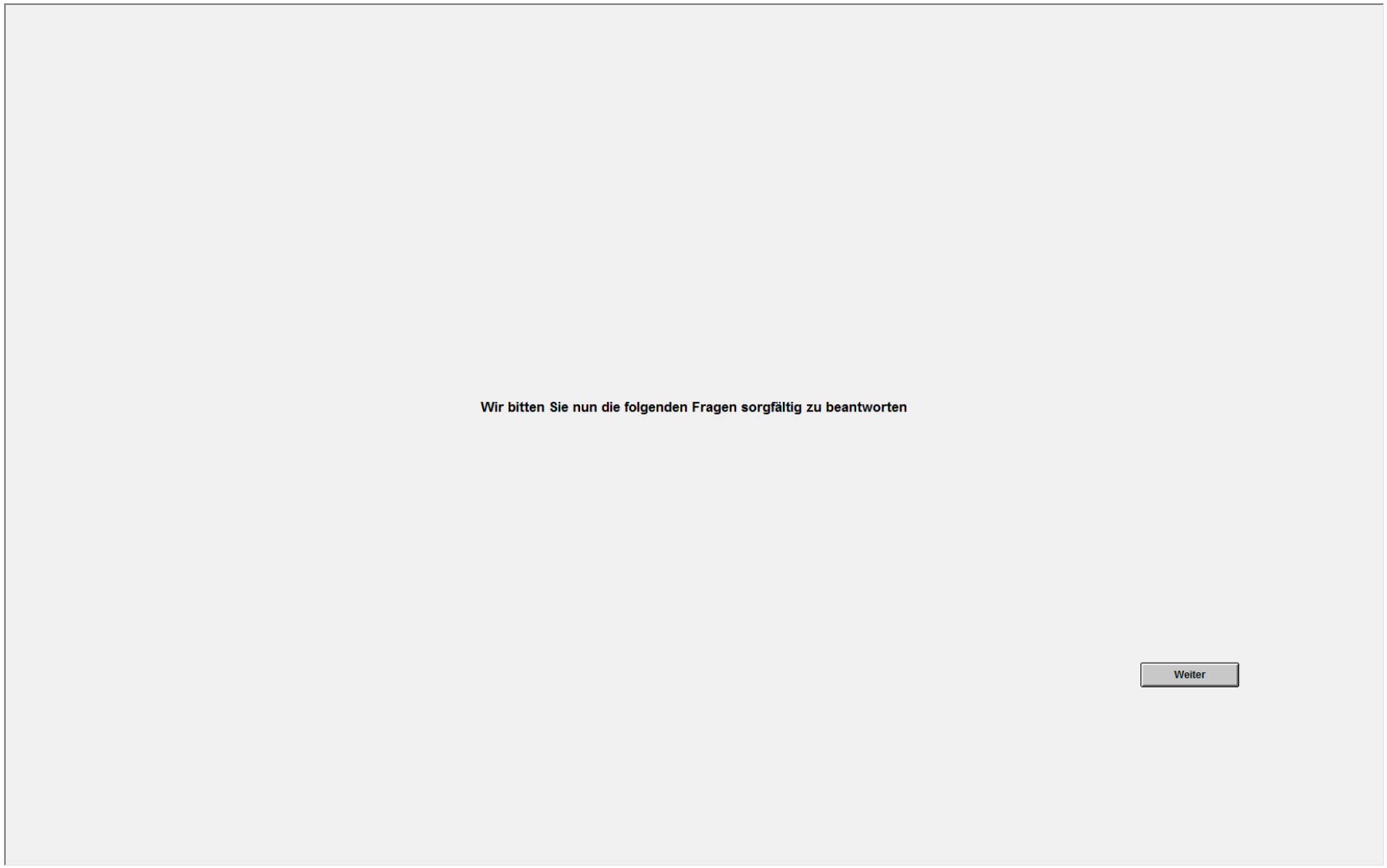
OK

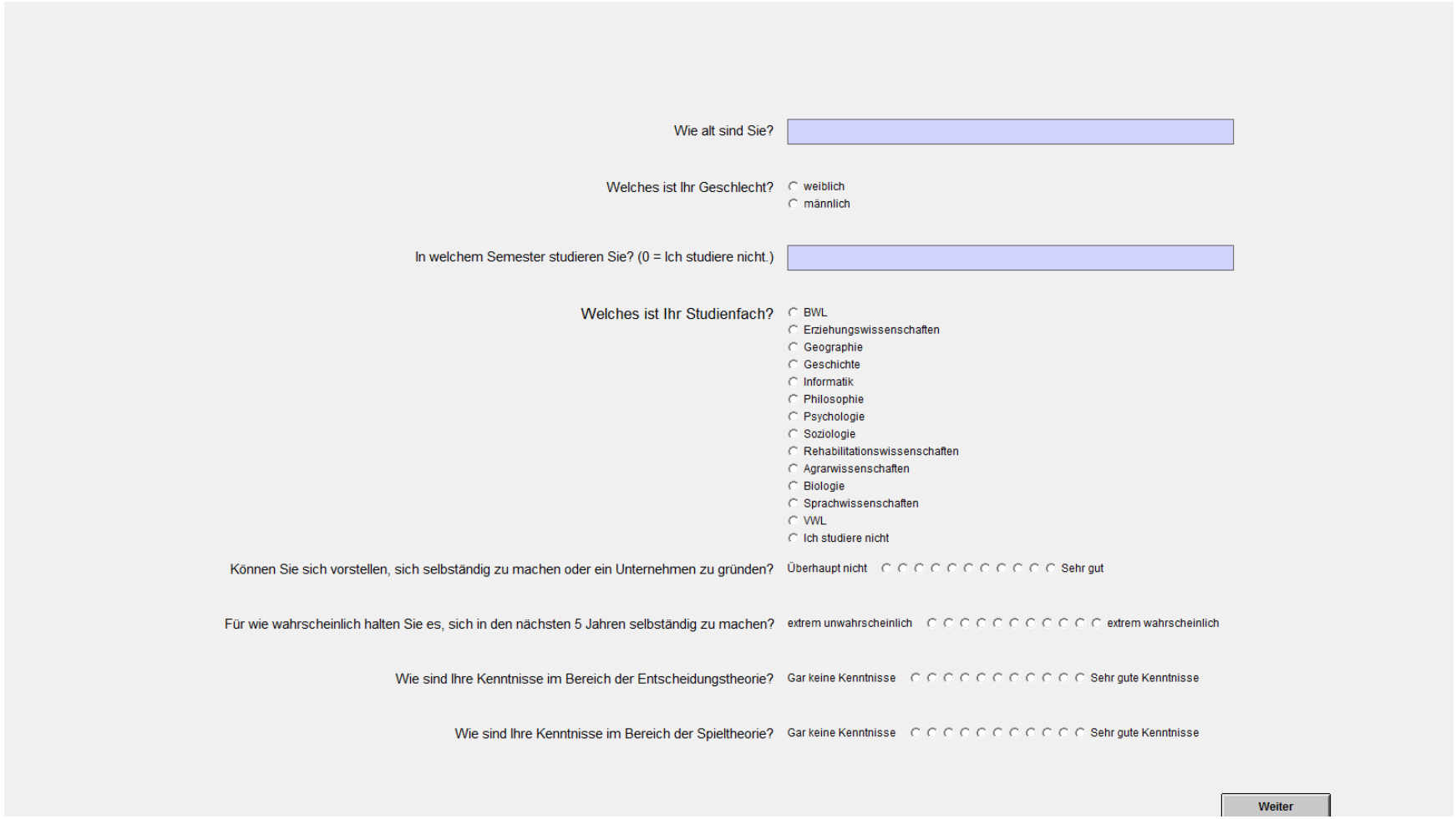
Weiter

Bitte entscheiden Sie nun, welche der folgenden fünf Lotterien Sie gerne spielen würden. Wenn Sie eine Lotterie ausgewählt haben, dann wird diese ausgespielt. Denken Sie also daran, dass Ihre Auszahlung für diesen Teil des Experiments davon abhängt, welche Lotterie Sie wählen und welches der beiden Ereignisse A oder B letztlich realisiert wird.

Lotterie	Ereignis	Auszahlung	Wahrscheinlichkeit	Ihre Entscheidung
1	A	EUR 2	50 Prozent	
	B	EUR 2	50 Prozent	
2	A	EUR 3,60	50 Prozent	
	B	EUR 1,20	50 Prozent	
				○ 1 ○ 2 ○ 3 ○ 4 ○ 5
3	A	EUR 5,20	50 Prozent	
	B	EUR 0,40	50 Prozent	
4	A	EUR 6,80	50 Prozent	
	B	EUR -0,40	50 Prozent	
5	A	EUR 8,40	50 Prozent	
	B	EUR -1,20	50 Prozent	

OK


Wir bitten Sie nun die folgenden Fragen sorgfältig zu beantworten
Weiter


Wie alt sind Sie?
Welches ist Ihr Geschlecht?
weiblich
männlich
In welchem Semester studieren Sie? (0 = Ich studiere nicht.)
Welches ist Ihr Studienfach?
BWL
Erziehungswissenschaften
Geographie
Geschichte
Informatik
Philosophie
Psychologie
Soziologie
Rehabilitationswissenschaften
Agrarwissenschaften
Biologie
Sprachwissenschaften
VWL
Ich studiere nicht
Können Sie sich vorstellen, sich selbständig zu machen oder ein Unternehmen zu gründen?
Überhaupt nicht
Sehr gut
Für wie wahrscheinlich halten Sie es, sich in den nächsten 5 Jahren selbständig zu machen?
extrem unwahrscheinlich
extrem wahrscheinlich
Wie sind Ihre Kenntnisse im Bereich der Entscheidungstheorie?
Gar keine Kenntnisse
Sehr gute Kenntnisse
Wie sind Ihre Kenntnisse im Bereich der Spieltheorie?
Gar keine Kenntnisse
Sehr gute Kenntnisse
Weiter


Sie haben in der Lotterie 2.0 Euro verdient.
Sie haben 40 Cent beim Ballon pumpen verdient.
Somit beträgt Ihre gesamte Auszahlung 2.40 Euro.
OK

Vielen Dank für die Teilnahme an diesem Experiment.

Sie werden zur Auszahlung einzeln nach vorne gerufen.

B.2 Additional tables and figures

Figure VII-2: Eckel & Grossman (2008), original gamble selection sheet

GAMBLE SELECTION SHEET

Player # **01**

Mark your gamble selection with an **X** in the last column across from your preferred gamble.

Gamble	Event	Payoff	Probabilities	Your Selection
1	A	$16	50%	
	B	$16	50%	
2	A	$24	50%	
	B	$12	50%	
3	A	$32	50%	
	B	$8	50%	
4	A	$40	50%	
	B	-$4	50%	
5	A	$48	50%	
	B	-$0	50%	

Table VII-3: Between-subjects variables

Emotion/Order	***Risk task 1***	***Risk task 2***
Happiness clip 1	*N*=22	*N*=22
Happiness clip 2	*N*=22	*N*=22
Fear clip 1	*N*=22	*N*=22
Fear clip 2	*N*=22	*N*=22

C Additional material chapter IV.2

C.1 Instructions

Herzlich willkommen zu unserem heutigen Experiment und vielen Dank für Ihre Teilnahme.

Im folgenden Experiment werden Sie gebeten, verschiedene Entscheidungen zu treffen. Am Ende des Experiments werden Sie für Ihre Teilnahme bezahlt. Die Höhe dieser Auszahlung hängt dabei von Ihren Entscheidungen und von den Entscheidungen anderer Teilnehmer ab.

Wenn Sie während des Experiments Fragen haben, dann heben Sie bitte Ihre Hand und warten darauf, dass jemand zu Ihnen kommt. Bitte reden oder rufen Sie nicht, und unterlassen auch jeden anders gearteten Kommunikationsversuch mit anderen Experimentteilnehmern. Schalten Sie außerdem Ihre Mobiltelefone und Smartphones aus.

Das Experiment besteht aus mehreren Teilen. Zunächst werden Sie gebeten, verschiedene Lotterien zu vergleichen und einige Fragen zu beantworten. Im zweiten Teil werden Ihnen in diesem Experiment einige Male emotionale Filmsequenzen gezeigt. Außerdem besteht das Experiment aus mehreren Runden eines Markteintrittspiels, welches wir Ihnen im Folgenden ausführlich erklären werden. Abschließend stellen wir Ihnen noch einige demographische Fragen. Das Experiment wird ca. 90 Minuten dauern.

Nachdem Sie alle Teile des Experiments abgeschlossen haben, wird der Experimentalleiter die Abrechnung Ihrer Auszahlungen vornehmen und Ihnen den Endbetrag in Bar auszahlen. Alle Angaben, die Sie machen, werden selbstverständlich streng vertraulich behandelt. Ihre Anonymität bleibt jederzeit gewahrt.

Wir wünschen Ihnen viel Erfolg und viel Spaß!

Zunächst wählen Sie nun zwischen Lotterien

Ihre Auszahlung hängt nur von Ihren eigenen Entscheidungen und dem Zufall ab.

Auf der nächsten Seite werden Ihnen zehn Wahlmöglichkeiten zwischen zwei Lotterien gegeben: Lotterie A und Lotterie B (z.B. **Lotterie A**: 40% 2,00 €; 60% 1,60 €; **Lotterie B** 40% 3,85 €; 60% 0,10 €).

Die Prozentangaben zeigen, mit welcher Wahrscheinlichkeit Sie den jeweiligen Geldbetrag gewinnen können. Bitte entscheiden Sie sich für jede der zehn Möglichkeiten für jeweils eine der vorgestellten Lotterien A oder B. Der Computer zieht dann zufällig eine dieser Wahlmöglichkeiten und führt die Lotterie aus, für die Sie sich entschieden haben. Der Gewinn, den Sie in dieser Lotterie erzielen, wird zu Ihrem bisherigen Kontostand hinzuaddiert.

Da jede Zeile ausgewählt werden könnte, denken Sie bitte gut über Ihre Entscheidungen nach.

Erklärung: Das Spiel

Im Folgenden werden Sie 18 Runden eines 3-Personen-Spiels spielen. In jeder Runde werden Sie dabei gegen andere zufällig ausgewählte Spieler aus diesem Raum spielen. Alle fünf Runden sehen Sie und auch Ihre Mitspieler einen kurzen Videoclip. Sie erhalten dann jeweils zu Beginn einer jeden Runde eine Information darüber, welche Art von Video die beiden Spieler gesehen haben.

In dem Spiel entscheiden alle 3 Spieler gleichzeitig darüber, ob Sie in einen Markt eintreten möchten oder nicht. Der Markt hat eine begrenzte Kapazität, so dass nur eine bestimmte Anzahl von Spielern mit Gewinn eintreten kann. Das bedeutet:

- Wenn Sie sich alle drei für einen Markteintritt entscheiden, so erleidet jeder von Ihnen einen Verlust in Höhe von -6.00 €
- Wenn sich zwei von Ihnen für einen Markteintritt entscheiden, so erhalten sowohl die zwei eingetretenen Spieler als auch der eine nicht eingetretene Spieler 0.00 €.
- Wenn sich einer von Ihnen als einziger für einen Markteintritt entscheidet, so erhält dieser 6.00 € und die zwei nicht eingetretenen Spieler 0.00 €.
- Wenn keiner von Ihnen sich für einen Markteintritt entscheidet, so erhalten alle drei Spieler 0.00 €.

Ihre Entscheidung wird mit Hilfe einer imaginären Lostrommel getroffen, deren Inhalt Sie selbst bestimmen können. Sie können insgesamt 100 Lose einfüllen, wobei es zwei verschiedene Losarten gibt: Eintritts-Lose und Nicht-Eintritts-Lose.

Der Computer zieht aus dieser Lostrommel und entscheidet damit über Ihren Markteintritt. Je nach dem Verhältnis der Lose, die Sie einfüllen, zieht er den Markteintritt mit größerer oder kleinerer Wahrscheinlichkeit. Sie können zum Beispiel 100 Eintrittslose einfüllen und treten dann auf jeden Fall in den Markt ein. Oder Sie können 100 Nicht-Eintrittslose einfüllen, sodass sie auf jeden Fall nicht eintreten. Oder Sie füllen ein Mischverhältnis an Losen ein, welches dann die Wahrscheinlichkeiten des Eintritts / Nicht-Eintritts widerspiegeln.

Auf der nächsten Seite bitten wir Sie, einige Verständnisfragen zu beantworten. Wenn Sie diese Fragen richtig beantwortet haben, können sie mit dem Spiel beginnen.

Am Ende des Experiments wird per Zufall eine Runde ausgewählt, auf der Ihre Auszahlung beruht. Die anderen Runden werden nicht zahlungsrelevant. Da jede Runde ausgewählt werden kann, treffen Sie bitte in jeder Runde Ihre bestmögliche Entscheidung.

Bitte beachten Sie folgendes:

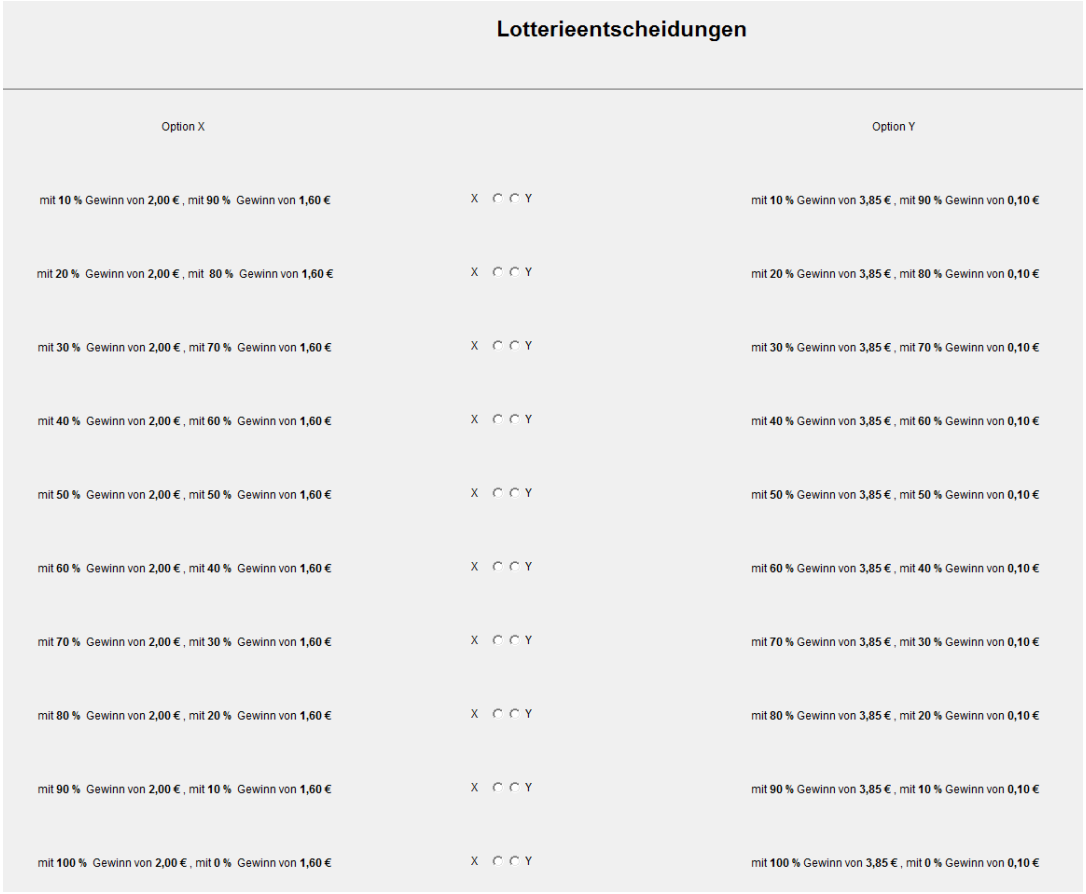
Sie spielen jede Runde gegen eine neue Kombination von Spielern, genauer: mindestens ein Spieler wechselt immer.

Die Ergebnisse der einzelnen Runden werden Ihnen erst zum Schluss des Experiments mitgeteilt. Nach den einzelnen Runden erhalten Sie keine Informationen über die Ergebnisse. Zum Schluss wählt ein Zufallsmechanismus aus, welche der gespielten Runden für die Auszahlung aus dem Spiel relevant sein wird.

Ab jetzt kann jede Runde für die Auszahlung relevant sein. Bitte treffen Sie daher in jeder Runde ihre bestmögliche Entscheidung!

Viel Spaß!

Figure VII-3: Screenshot of Holt and Laury lottery



C.2 Documentation

Table VII-4: Documentation of experiment

Frage	**Variable**	**Fragentyp, Werte**
Risiko		
Wie schätzen Sie sich persönlich ein: Sind Sie im Allgemeinen ein risikobereiter Mensch oder versuchen Sie Risiken zu vermeiden?	risktaking_general	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10
Man kann sich in verschiedenen Bereichen ja auch unterschiedlich verhalten. Wie würden Sie Ihre Risikobereitschaft in Bezug auf die folgenden Bereiche einschätzen?		
Beim Autofahren:	risktaking_car	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10
Bei Geldanlagen:	risktaking_money	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10
Bei Freizeit und Sport:	risktaking_sports	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10
Bei Ihrer beruflichen Karriere:	risktaking_job	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10
Bei Ihrer Gesundheit:	risktaking_health	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10

Beim Vertrauen in fremde Menschen:	risktaking_trust	!radioline: 0 = "Gar nicht risikobereit"; 10 = "Sehr risikobereit"; 10
Überlegen Sie bitte, was Sie in folgender Situation tun würden: Stellen Sie sich vor, dass Sie in einer Lotterie 100.000 € gewinnen. Unmittelbar nach Erhalt des Gewinns bekommen Sie von einer angesehenen Bank ein Angebot für eine Geldanlage, die folgendes beinhaltet: Es gibt eine Chance, das Geld innerhalb von zwei Jahren zu verdoppeln. Es gibt aber auch ein gleich hohes Risiko, die Hälfte des eingesetzten Geldes zu verlieren. Sie können das Geld ganz oder teilweise in folgender Weise anlegen oder das Angebot ablehnen. Welchen Teil des Lotteriegewinns würden Sie für die einerseits riskante, andererseits gewinnversprechende Geldanlage einsetzen?	Betrag_Geldanlage	!radio: 1 = "Den ganzen Betrag von 100.000 Euro"; 2 = "Den Betrag von 80.000 Euro"; 3 = "Den Betrag von 60.000 Euro"; 4 = "Den Betrag von 40.000 Euro"; 5 = "Den Betrag von 20.000 Euro"; 6 = "Überhaupt nichts. Ich würde das Angebot ablehnen"
Trait emotions		
In den meisten Bereichen entspricht mein Leben meinen Idealvorstellungen.	hap1	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Meine Lebensbedingungen sind ausgezeichnet.	hap2	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Ich bin mit meinem Leben zufrieden.	hap3	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Bisher habe ich die wesentlichen Dinge erreicht, die ich mir für mein Leben wünsche.	hap4	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Wenn ich mein Leben noch einmal leben könnte, würde ich kaum etwas ändern.	hap5	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7

Ich bin jemand, der sich oft Sorgen macht.	anx1	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Ich bin jemand, der leicht nervös wird.	anx2	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Ich bin jemand, der entspannt ist, mit Stress gut umgehen kann.	anx3	!radioline: 1= "trifft überhaupt nicht zu (1)"; 7 ="(7) trifft voll zu"; 7
Wie stark wurden Ihre Entscheidungen durch Überlegungen beeinflusst, welche Strategien Ihre Gegenspieler spielen?	strategie_gegenspieler	!radioline: 1 = gar nicht; 11 = sehr stark; 11;
Wie stark wurden Ihre Entscheidungen durch Überlegungen beeinflusst, welche Gedanken sich Ihre Gegenspieler darüber machen, welche Strategie Sie spielen?	gedanken_gegenspieler	!radioline: 1 = gar nicht; 11 = sehr stark; 11;
Wie stark wurden Ihre Entscheidungen durch Überlegungen beeinflusst, welche Gedanken sich Ihre Gegenspieler darüber machen, was Sie denken, welche Strategien sie spielen werden?	gedanken_gegenspieler2	!radioline: 1 = gar nicht; 11= sehr stark; 11;
Wie stark wurden Ihre Entscheidungen durch Überlegungen beeinflusst, welche Gedanken sich Ihre beiden Gegenspieler übereinander machen, welche Strategien sie spielen?	gedanken_gegenspieler3	!radioline: 1 = gar nicht; 11= sehr stark; 11;
Wie alt sind Sie?	alter	
Welches ist Ihr Geschlecht?	geschlecht	!radioline: 1=weiblich; 2=männlich; 2;

In welchem Semester studieren Sie? (0 = Ich studiere nicht.)	Semester	
Welches ist Ihr Studienfach?	Studienfach	!radio: 6="BWL"; 5="VWL"; 4="Wirtschaftspädagogik"; 3="Mathematik"; 2="Informatik"; 1="Sonstige"; 0="Ich studiere nicht.";
Können Sie sich vorstellen, sich selbständig zu machen oder ein Unternehmen zu gründen?	selbst	!radioline: 1 = "Überhaupt nicht"; 11 = "Sehr gut"; 11
Für wie wahrscheinlich halten Sie es, sich in den nächsten 5 Jahren selbständig zu machen?	selbst2	!radioline: 1 = "extrem unwahrscheinlich"; 11 = "extrem wahrscheinlich"; 11
Wie sind Ihre Kenntnisse im Bereich der Entscheidungstheorie?	entsch	!radioline: 1 = gar keine Kenntnisse; 11 = sehr gute Kenntnisse; 11;
Wie sind Ihre Kenntnisse im Bereich der Spieltheorie?	spieltheo	!radioline: 1 = gar keine Kenntnisse; 11 = sehr gute Kenntnisse; 11;

C.3 Additional tables and figures

Figure VII-4: Pure Nash equlibria

				P3	
				$s_3=1$	$s_3=0$
P1	$s_1=1$	**P2**	$s_2=1$	-6 -6 -6	**0 0 0**
			$s_2=0$	**0 0 0**	**6 0 0**
	$s_1=0$	**P2**	$s_2=1$	**0 0 0**	**0 6 0**
			$s_2=0$	**0 0 6**	0 0 0

Figure VII-5: Histogram of dependent variable *el*

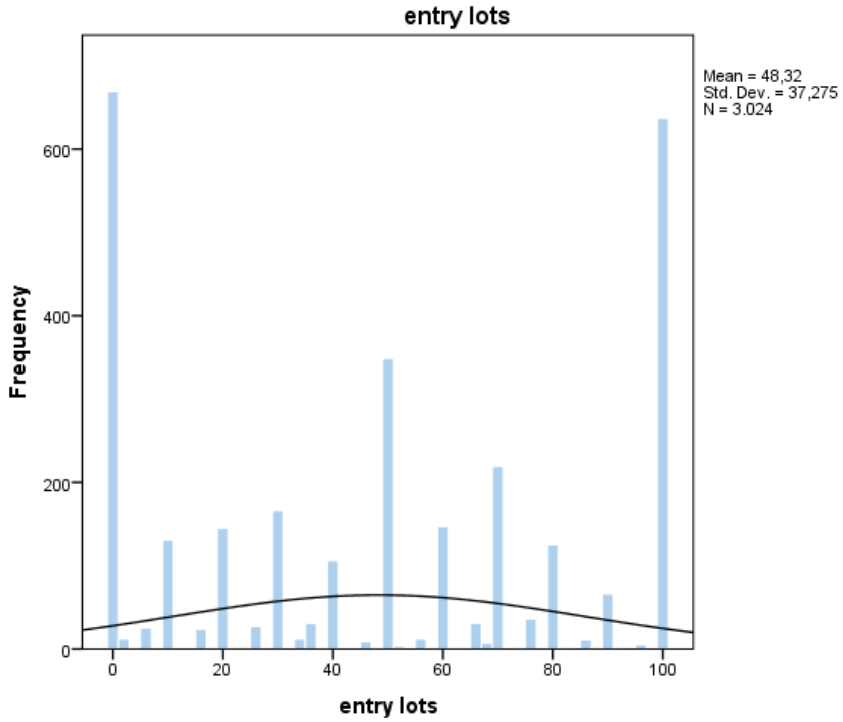


Figure VII-6: Histogram of dependent variable el (male students)

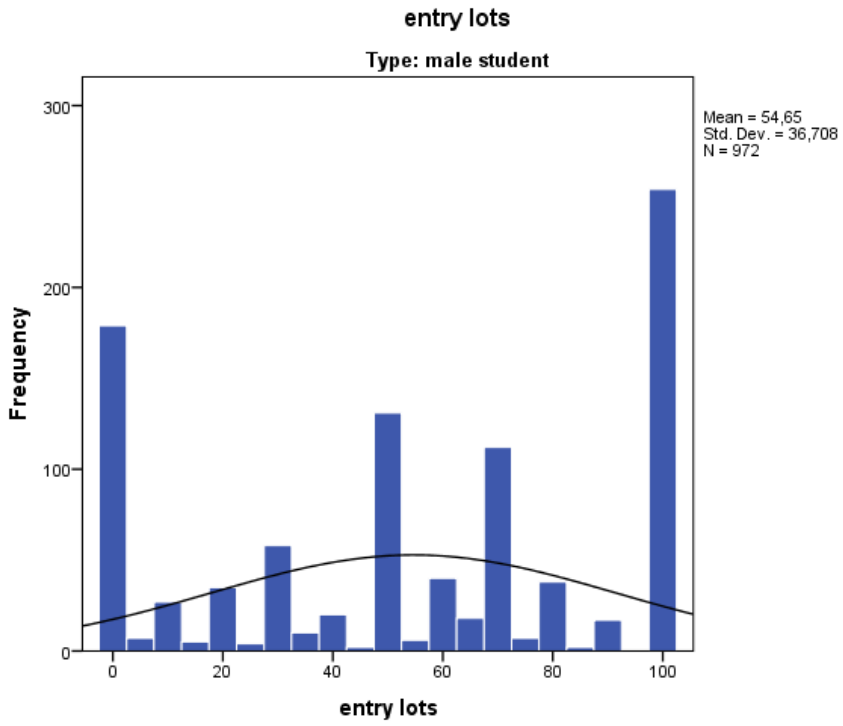


Figure VII-7: Histogram of dependent variable el (female students)

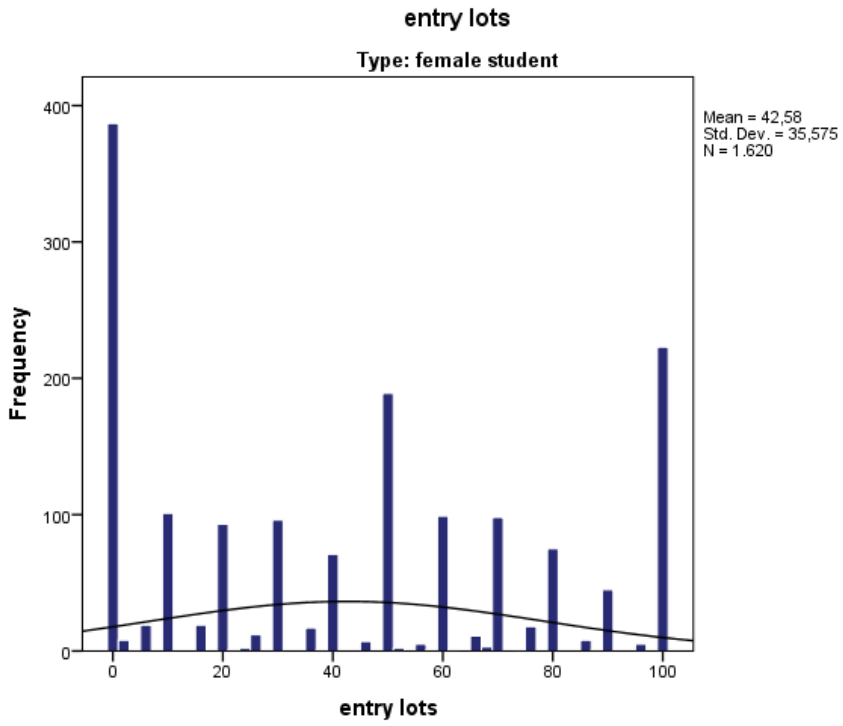
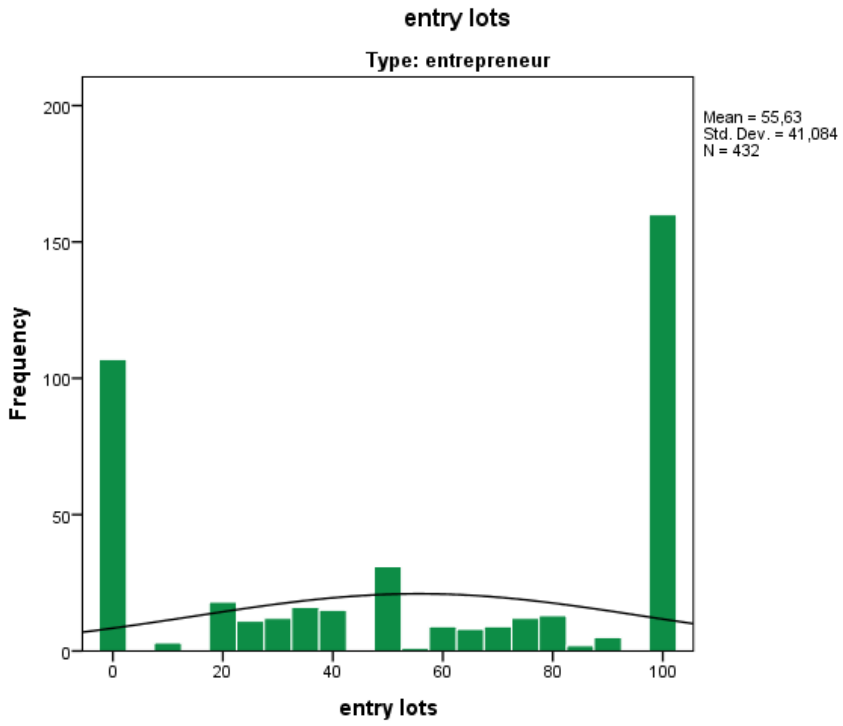


Figure VII-8: Histogram of dependent variable el (entrepreneurs)



C.4 Output tables

ANOVAS chapter IV.2

Oneway

Descriptives

el

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
male student	54	54,65	25,950	3,531	47,56	61,73	0	100
female student	90	42,58	23,490	2,476	37,66	47,50	0	100
entrepreneur	24	55,63	25,446	5,194	44,89	66,38	0	100
Total	168	48,32	25,206	1,945	44,48	52,16	0	100

ANOVA

el

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	6411,378	2	3205,689	5,306	,006
Within Groups	99691,809	165	604,193		
Total	106103,187	167			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: el

Bonferroni

(I) type	(J) type	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
male student	female student	12,067*	4,231	,015	1,83	22,30
	entrepreneur	-,987	6,030	1,000	-15,57	13,60
female student	male student	-12,067*	4,231	,015	-22,30	-1,83
	entrepreneur	-13,055	5,647	,066	-26,71	,60
entrepreneur	male student	,987	6,030	1,000	-13,60	15,57
	female student	13,055	5,647	,066	-,60	26,71

*. The mean difference is significant at the 0.05 level.

Descriptives

el

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
NEUT	56	49,34	28,676	3,832	41,66	57,02	0	100
ANX	56	43,10	23,842	3,186	36,72	49,49	0	100
HAPP	56	52,53	22,172	2,963	46,59	58,47	0	100
Total	168	48,32	25,206	1,945	44,48	52,16	0	100

ANOVA

el

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2573,752	2	1286,876	2,051	,132
Within Groups	103529,435	165	627,451		
Total	106103,187	167			

Post Hoc Tests

Multiple Comparisons

Dependent Variable: el

Bonferroni

(I) Own emotion	(J) Own emotion	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
NEUT	ANX	6,232	4,734	,569	-5,22	17,68
	HAPP	-3,193	4,734	1,000	-14,64	8,26
ANX	NEUT	-6,232	4,734	,569	-17,68	5,22
	HAPP	-9,426	4,734	,144	-20,87	2,02
HAPP	NEUT	3,193	4,734	1,000	-8,26	14,64
	ANX	9,426	4,734	,144	-2,02	20,87

General Linear Model: Repeated-measures ANOVA

Within-Subjects Factors

Measure: MEASURE_1

emo_opp	Dependent
1	NN
2	NA
3	AA
4	NH
5	AH
6	HH

Between-Subjects Factors

		Value Label	N
Own emotion	1	NEUT	56
	2	ANX	56
	3	HAPP	56

Descriptive Statistics

	Own emotion	Mean	Std. Deviation	N
NN	NEUT	46,36	33,926	56
	ANX	46,77	35,598	56
	HAPP	58,48	31,699	56
	Total	50,54	34,046	168
NA	NEUT	58,30	31,920	56
	ANX	49,79	29,808	56
	HAPP	62,95	25,897	56
	Total	57,01	29,647	168
NH	NEUT	68,48	36,184	56
	ANX	54,43	31,583	56
	HAPP	77,48	26,390	56
	Total	66,80	32,857	168
AA	NEUT	41,70	32,898	56
	ANX	32,43	32,205	56
	HAPP	40,82	25,527	56
	Total	38,32	30,499	168
	NEUT	49,48	35,260	56

AH	ANX	41,80	28,294	56
	HAPP	54,57	27,323	56
	Total	48,62	30,768	168
HH	NEUT	32,38	37,463	56
	ANX	28,18	33,104	56
	HAPP	34,59	27,827	56
	Total	31,71	32,943	168

Box's Test of Equality of Covariance Matrices[a]

Box's M	69,819
F	1,576
df1	42
df2	80825,260
Sig.	,010

Tests the null hypothesis that the observed covariance matrices of the dependent variables are equal across groups.

a. Design: Intercept + ownemo

Multivariate Tests[a]

Effect		Value	F	Hypothesis	Error df	Sig.
emo_opp	Pillai's Trace	,514	34,072[b]	5,000	161,000	,000
	Wilks' Lambda	,486	34,072[b]	5,000	161,000	,000
	Hotelling's	1,058	34,072[b]	5,000	161,000	,000
	Roy's Largest	1,058	34,072[b]	5,000	161,000	,000
emo_opp * ownemo	Pillai's Trace	,085	1,445	10,000	324,000	,159
	Wilks' Lambda	,916	1,437[b]	10,000	322,000	,163
	Hotelling's	,089	1,428	10,000	320,000	,166
	Roy's Largest	,051	1,659[c]	5,000	162,000	,147

a. Design: Intercept + ownemo

b. Exact statistic

c. The statistic is an upper bound on F that yields a lower bound on the significance level.

Mauchly's Test of Sphericity[a]

Measure: MEASURE_1

			df	Sig.	Epsilon[b]

Within Subjects Effect	Mauchly's W	Approx. Chi-Square			Greenhouse-Geisser	Huynh-Feldt	Lower-bound
emo_opp	,390	153,390	14	,000	,697	,723	,200

Tests the null hypothesis that the error covariance matrix of the orthonormalized transformed dependent variables is proportional to an identity matrix.

a. Design: Intercept + ownemo

Within Subjects Design: emo_opp

b. May be used to adjust the degrees of freedom for the averaged tests of significance. Corrected tests are displayed in the Tests of Within-Subjects Effects table.

Tests of Within-Subjects Effects

Measure: MEASURE_1

Source		Type III	df	Mean	F	Sig.
emo_opp	Sphericity	133767,600	5	26753,520	61,044	,000
	Greenhouse-	133767,600	3,485	38379,042	61,044	,000
	Huynh-Feldt	133767,600	3,613	37023,924	61,044	,000
	Lower-bound	133767,600	1,000	133767,600	61,044	,000
emo_opp * ownemo	Sphericity	7372,188	10	737,219	1,682	,080
	Greenhouse-	7372,188	6,971	1057,571	1,682	,111
	Huynh-Feldt	7372,188	7,226	1020,230	1,682	,108
	Lower-bound	7372,188	2,000	3686,094	1,682	,189
Error(emo_opp)	Sphericity	361569,711	825	438,266		
	Greenhouse-	361569,711	575,097	628,711		
	Huynh-Feldt	361569,711	596,146	606,512		
	Lower-bound	361569,711	165,000	2191,332		

Tests of Within-Subjects Contrasts

Measure: MEASURE_1

Source	emo_opp	Type III	df	Mean	F	Sig.
emo_opp	Level 1 vs.	59513,357	1	59513,357	65,324	,000
	Level 2 vs.	107514,881	1	107514,881	83,765	,000
	Level 3 vs.	206781,167	1	206781,167	132,212	,000

	Level 4 vs.	7320,720	1	7320,720	10,195	,002
	Level 5 vs.	48009,524	1	48009,524	44,063	,000
emo_opp * ownemo	Level 1 vs.	2754,750	2	1377,375	1,512	,224
	Level 2 vs.	1309,190	2	654,595	,510	,601
	Level 3 vs.	7843,619	2	3921,810	2,508	,085
	Level 4 vs.	731,583	2	365,792	,509	,602
	Level 5 vs.	1135,012	2	567,506	,521	,595
Error(emo_opp)	Level 1 vs.	150323,893	165	911,054		
	Level 2 vs.	211781,929	165	1283,527		
	Level 3 vs.	258061,214	165	1564,007		
	Level 4 vs.	118482,696	165	718,077		
	Level 5 vs.	179779,464	165	1089,573		

Levene's Test of Equality of Error Variances[a]

	F	df1	df2	Sig.
NN	,876	2	165	,418
NA	2,333	2	165	,100
NH	3,840	2	165	,023
AA	3,796	2	165	,024
AH	4,364	2	165	,014
HH	4,221	2	165	,016

Tests the null hypothesis that the error variance of the dependent variable is equal across groups.

a. Design: Intercept + ownemo

Within Subjects Design: emo_opp

Tests of Between-Subjects Effects

Measure: MEASURE_1

Transformed Variable: Average

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Intercept	400612,389	1	400612,389	640,113	,000
ownemo	4465,512	2	2232,756	3,568	,030

Error	103264,682	165	625,847		

Custom Hypothesis Tests

Contrast Results (K Matrix)

Own emotion Simple Contrast[a]			Averaged Variable
			MEASURE_1
Level 2 vs. Level 1	Contrast Estimate		-7,217
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		-7,217
	Std. Error		4,728
	Sig.		,129
	95% Confidence Interval for Difference	Lower Bound	-16,552
		Upper Bound	2,117
Level 3 vs. Level 1	Contrast Estimate		5,366
	Hypothesized Value		0
	Difference (Estimate - Hypothesized)		5,366
	Std. Error		4,728
	Sig.		,258
	95% Confidence Interval for Difference	Lower Bound	-3,969
		Upper Bound	14,701

a. Reference category = 1

Test Results

Measure: MEASURE_1

Transformed Variable: AVERAGE

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	4465,512	2	2232,756	3,568	,030
Error	103264,682	165	625,847		

Post Hoc Tests

Own emotion

Multiple Comparisons

Measure: MEASURE_1

Bonferroni

(I) Own emotion	(J) Own emotion	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
NEUT	ANX	7,22	4,728	,386	-4,22	18,65
	HAPP	-5,37	4,728	,774	-16,80	6,07
ANX	NEUT	-7,22	4,728	,386	-18,65	4,22
	HAPP	-12,58*	4,728	,026	-24,02	-1,15
HAPP	NEUT	5,37	4,728	,774	-6,07	16,80
	ANX	12,58*	4,728	,026	1,15	24,02

Based on observed means.

The error term is Mean Square(Error) = 625,847.

*. The mean difference is significant at the ,05 level.

VIII Eidesstaatliche Erklärung

Hiermit versichere ich, dass ich die vorliegende Arbeit ohne fremde Hilfe selbständig verfasst und nur die aufgeführten Quellen und Hilfsmittel benutzt habe. Die Arbeit wurde bisher in gleicher oder ähnlicher Form keiner anderen Prüfungsbehörde oder anderen Fakultät vorgelegt. Ich habe mich bisher keinem anderen Doktorexamen unterzogen.

Ich bezeuge durch meine Unterschrift, dass meine Angaben über die bei der Abfassung meiner Dissertation benutzten Hilfsmittel, über die mir zuteil gewordene Hilfe sowie über frühere Begutachtungen meiner Dissertation in jeder Hinsicht der Wahrheit entsprechen.

Santa Cruz, 29. Mai 2017