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The role of cognitive frames in combined decisions about risk and effort

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ABSTRACT

Cognitive framing influences the subjective valuation of monetary payoffs and an individual's willingness to exert effort and take risk. In this paper, we explore how cognitive frames created by incentive design and the outcome's fairness influence decisions on risk and effort. While such decisions are often combined in practice, the theories that study risk-taking and motivation to exert effort remain discrete. We set up a multiperiod, 2 × 2 experiment in which we analyze the effects of a bonus versus a penalty contract and a fair versus an unfair outcome distribution. We use a modified Sternberg task to measure risk-effort decisions. We hypothesize that in the case of conflicting cues from the two frames, the cue that creates a perception of loss dominates the decision. We also hypothesize that over time, prior performance influences current decisions by creating a new cognitive frame. We find that if the pay is unfair, neither a bonus nor a penalty seems to matter. If it is fair, high risk-effort tasks are stimulated more by a penalty than a bonus contract. The effect of prior performance eventually outweighs the effect of both incentive manipulations. Our results help to advance the management accounting literature by integrating separate theories on risk-taking and effort exertion to better understand interactive cognitive frames in comprehensive decision-making.

1. Introduction

Notable psychological theories stress that decision-making depends on an individual's cognitive frames or mental representations of the decision problem (Birnberg et al., 2007). The design of incentive systems has an important effect on cognitive frames that influence individuals' perception of fairness, their levels of aspiration, and whether they see outcomes as gains or losses. Two leading psychology theories − organizational justice theory (Adams, 1963, 1966) and prospect/framing theory (Kahneman and Tversky, 1979; Kahneman, 2003) − propose that cognitive frames arise by comparing an outcome to a reference point. In organizational justice theory, the reference point represents a comparison with a relevant other, whereas in prospect theory the reference point is basically the status quo (Kahneman, 2003) and may be invoked by a variety of characteristics of the incentive system. An idea common to both theories is that reference points shape cognitive frames and that a deviation from them causes internal conflicts that individuals try to avoid (Birnberg et al., 2007). In more complex decision situations, individuals face several cognitive frames at the same time, and the question arises on which one plays a central role in decision-making and how they interact.

Although the two theories share a profoundly related concept, it is interesting that they remain discrete: whereas the organizational justice theory applies reference values to decisions about motivation to exert effort without explicit consideration of the outcome risk, prospect theory uses them to predict risk-taking behavior (pure monetary payoffs in the absence of any effort). Yet, in practice, decisions about risk and effort are often simultaneous: in many settings individuals face an option that requires a lot of effort, which potentially brings a high payoff, but the probability of obtaining that payoff depends on the success in completing the task. The alternative is to choose an easy option that requires little effort and has a high probability of success but results in a low payoff. Examples of these options are choosing between a more difficult or an easier field of study that leads to different future salary levels; between a demanding or a less demanding job with the corresponding pay levels and chances of success; between writing a scientific paper for a high impact journal or a low impact journal with the corresponding effort, probabilities of success, and impact factors; choosing between highly uncertain but high-yielding projects in which a lot of effort and new knowledge has to be invested or certain low-yielding projects that require an average amount of work and acquired knowledge.

The aim of this paper is to use both theories to establish which cognitive frames dominate in simultaneous decisions on risk and effort. The literatures on neuroscience, psychology (Hughes et al., 2015; Salamone et al., 1994; Treadway et al., 2015; Walton et al., 2006; Wardle et al., 2012), and animal behavior (Cocker et al., 2012; Hosking et al., 2014a,b) jointly examine the relation between risk and effort

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(reviewed in Salamone et al., 2012; Miller et al., 2013). This body of work reinforces the conjecture that decisions about risk and effort are related because the neural networks activated in both types of decisions tend to overlap.

We analyze the decisions on effort and risk when two features of the incentive scheme give two distinct cues for the formation of the reference point. The first cue comes from labeling performance pay as a bonus rather than a penalty. The second comes from the fairness or unfairness of the payoff with respect to peers. As the base pay is likely to be perceived as the reference point, labeling performance pay as a bonus creates a perception of a gain, and labeling it as a penalty creates a perception of a loss. Similarly, if peers receive a larger bonus or a smaller penalty for the same effort, then the peers' pay level could become the reference point, and the individual's own bonus could appear as a loss. We explore whether one cue strengthens the effect of the other if they are consistent or whether one cue dominates the other if they are inconsistent.

To understand these questions, we develop a three-period, between-subjects, 2 × 2 (bonus vs. penalty and fair vs. unfair outcome) experiment in which we test the effects of manipulations on joint risk-effort decisions. We use a modified Sternberg task (Sternberg, 1966). The Sternberg task is broadly used in psychology to measure cognitive effort (Burrows and Okada, 1973a,b; D'Esposito et al., 2000; Jansma et al., 2007; Zakrzewska and Brzezicka, 2014). We operationalize the risk component by designing three periods, offering increasing incentives for rising task difficulty and probability of failure. We, thus, operationalize joint risk-effort decisions as choices between a high-yielding task that requires high effort with a higher chance of failure (a difficult task) and a low-yielding task that requires low effort with a lower chance of failure (an easy task). A temporal setting creates a third cognitive frame because a positive or a negative prior outcome affects the current decision differently (Thaler and Johnson, 1990). The experiment is tested on 100 students.

We find that the frequency of high risk-effort decisions is the lowest under a fair bonus contract and higher under either a penalty or unfair contract. In a comprehensive setting where both incentive frames are at work if the pay is unfair, it matters little whether the contract is framed as a bonus or a penalty. If the pay is fair, high risk-effort decisions are stimulated more by a penalty than a bonus contract. A fair penalty contract elicits high risk-effort decisions most frequently. A fair bonus contract seems to represent a comfort zone that invokes risk-effort decisions least frequently. In the second round, we observe that the participants' prior performance becomes relevant; and in the third round, the effect of prior performance completely overrides all others: the incentive frames are no longer important. This effect suggests that the evaluation of the probability that one can successfully complete a task based on prior performance and prior choices becomes more important than the incentive scheme or the outcome's fairness and forms a reference point on its own.

The paper makes several contributions to the literature. The first contribution is the examination of simultaneous risk-effort decisions. Without considering such decisions, it is impossible to fully understand the effectiveness of incentive schemes. Performance is frequently a function of risk and effort, yet to our knowledge there is only one paper that explicitly addresses how managerial accounting practices affect risk and effort decisions (Sprinkle et al., 2008). However, unlike our study in which risk and effort are related, Sprinkle et al. (2008) examine risk-taking independently of the participants' exertion of effort. Most management accounting studies adopt the expectancy theory's assumption about the relationship between risk and effort where the higher the probability that effort will lead to increased performance, the more motivated a person will be to exert effort (Vroom, 1964). In this decision context, an individual may affect the probability of success by exerting more effort (i.e., probability of success is endogenous). On the other hand, we study the decisions in which an individual ex ante chooses a level of a task difficulty that comprises the required effort and acceptable risk. In our decision context, the estimated probability of success is exogenously chosen. Once a level of task difficulty is chosen, the expectancy theory's assumption applies in that more effort will increase the probability of success.

The paper's second contribution is in analyzing how individuals consider more than one cognitive frame at a time. Our findings indicate that the bonus and penalty schemes invoke cognitive frames in line with prospect theory, which adds to the evidence on how various incentive practices shape cognitive frames. We show that when multiple frames interact they stimulate different behavior to that elicited by a single cognitive frame. Third, by studying decision-making in a multiperiod setting, we show that the effect of incentive schemes fades over time as a new salient piece of information emerges (i.e., prior performance) that helps re-evaluate the probability of an outcome. Fourth, our findings hold practical implications for designing effective incentive schemes. The penalty scheme has been found to fuel high risk-effort decisions. As penalty schemes are gaining popularity via a bonus deferral system containing potential penalties and clawback clauses (Hartmann and Slapničar, 2014; Van der Stede, 2011), our findings indicate that they must be implemented with a clear awareness of their effects. Finally, this paper integrates two influential psychological theories with the management accounting literature and practice.

The remainder of the paper is organized as follows. The theoretical background and hypotheses are presented in Section 2. Section 3 introduces the experimental design and its execution. Section 4 presents the results, while Section 5 concludes with a discussion and the implications and limitations of the study.

2. Theoretical background and hypotheses development

The importance of cognitive frames was first described by Kahneman and Tversky (1979). In their paper on prospect theory, they showed that the utility of an outcome depends on whether it is perceived as a gain or a loss, rather than on its absolute value and probability. This perception depends on a reference value against which the outcome can be measured. The wording of a decision problem itself (i.e., framing) may change the perceived outcome's utility and influence risk choices. In general, people are risk-averse in the gain domain and risk-seeking in the loss domain: they opt for a higher but probable loss over a smaller but certain one. Further theoretical development has resulted in the so-called theory of framing (Kahneman, 2003), which postulates that reference points may arise from various comparisons, such as with relevant others and with prior periods. The explanation of framing closely coincides with Thaler's (1999) idea of mental accounting.

Independently of the research on decision-making under risk, the organizational justice literature stresses the importance of reference values for motivation. This literature proposes that people are motivated if they perceive a balance in exchange relationships and evaluate the balance by comparing their effort and outcomes to comparable others' effort-outcome ratios (Adams, 1963). If they perceive injustice, they adjust their effort downwards. Comparison with a relevant other is hence one of the central reference points in organizational justice theory. A large body of evidence demonstrates that a perception of distributive fairness has a major impact on motivation.

While the organizational justice theory acknowledges that cognitive frames affect risk-taking and the willingness to exert effort, the questions of which cognitive frames various management accounting practices elicit and whether they are perceived as fair or unfair are less understood. What is the reference point against which one evaluates gains and losses for risk-taking, and does the same reference point impact decisions about effort? Druckman (2001) and Maule and Villejoubert (2007) find that people consider different reference points. These different points explain why the empirical findings on the effects of framing are contradictory. The management accounting literature has relatively neglected the examination of an incentive scheme's effect on risk-taking compared to some other areas (Sprinkle, 2003; Sprinkle et al., 2008). Tests of goal setting on motivation alone result in over 1000 studies (Birnberg et al., 2007), whereas to our knowledge only a handful of studies examine how framing of incentive schemes influences risk-taking (Ruchala, 1999; Chow et al., 2007; Sprinkle et al., 2008; Drake and Kohlmeyer, 2010; Hartmann and Slapničar, 2014). These studies show that various designs of incentive schemes create cognitive frames and influence the perceptions of gains and losses in relation to risk-taking.

The empirical studies on risk behavior are predominantly conducted on lottery gambles that isolate the decision on risk from the decision on effort, whereas the motivation literature analyzes the effect of incentives on effort but disregards the uncertainty or risk associated with increasingly large outcomes. Real-life decisions are not structured as lotteries with known probabilities of failure, and it is not always the case that probabilities of large outcomes can be increased with greater effort. Real-life alternatives are often associated with effort and uncertainty simultaneously.

The following sections will briefly overview the empirical evidence on how incentive schemes and the outcome's fairness influence the exertion of effort and risk-taking. We then hypothesize how they are expected to work in combination for joint decisions on effort and risk-taking.

2.1. The influences of bonus and penalty contracts on risk and effort decisions

Numerous studies on the effect of *bonus and penalty contracts* on *exerting effort* find that penalty contracts elicit a greater level of effort than bonus contracts (Brooks et al., 2013; Church et al., 2008; Gose and Sadrieh, 2012; Hannan et al., 2005; Hossain and List, 2012; Van De Weghe and Bruggeman, 2006). The authors explain the effect as either because of loss aversion or a fear of losing. Their findings support the idea that penalty contracts invoke the perception of a loss domain, which affects behavior more strongly than a gain domain (Cacioppo and Berntson, 1994). However, in practice not all tasks can be governed by an incentive contract. In an incomplete contract setting, Christ et al. (2012) find that penalty contracts are associated with lower trust in the principal and that they lead to lower effort than bonus contracts in all tasks not governed by a contract.

The research on the effects of bonus and penalty contracts on *risk-taking* reports consistent findings that those incentive characteristics that create the perception of a loss domain increase risk propensity. Interestingly, such perceptions may be invoked by various management accounting mechanisms. Budget levels can, for example, form a positive or a negative frame. A loss frame is induced when individuals are failing to achieve their budget goal and, to reach it, they indulge in risk-seeking behavior. On the other hand, a gain frame occurs when individuals are ahead of their budget goal. They then show risk-averse behavior (Ruchala, 1999). Chow et al. (2007) find that high budget targets promote higher risk-taking. However, Sprinkle et al. (2008) find a more complex U-shaped relationship between budget levels and risk-taking: low budget levels stimulate risk-seeking behavior, higher budget levels suppress such behavior, and stretch budget levels again promote risk-seeking behavior as the only way to potentially meet budget targets. Based on these findings we propose that a penalty contract leads to greater effort and higher risk-taking than a bonus contract:

H1. The frequency of high risk-effort decisions is higher under a penalty than under a bonus contract.

2.2. The influence of the outcome's fairness on risk and effort decisions

The feeling that an outcome distribution is unfair can create a cognitive conflict that influences the motivation to exert effort. The effect of the *outcome's fairness* on *exerting effort* has been extensively empirically investigated. Laboratory and field studies provide robust evidence that unfair treatment results in decreased effort (Akerlof and Yellen, 1990; Blau, 1993; Byrne et al., 2005; Cohn et al., 2014, 2011; Gächter and Thöni, 2010; Hannan et al., 2005; Hartmann and Slapničar, 2008; Lindquist, 2010).[1] We are aware of only one study, Charness and Kuhn (2007), that reports no social comparison effect. Whether it works the other way is unclear: the findings on unfairness from overcompensation have been less coherent than those on undercompensation (Ambrose and Kulik, 1999).

There is also the question of whether the outcome's fairness can invoke a gain or loss domain that affects risk-taking. Diecidue and van de Ven (2008) explain the role of reference points as an aspiration level. A simple loss frame may not elicit risk-seeking per se but it will elicit risk-seeking if the aspiration level can be achieved by assuming greater risk. Linde and Sonnemans (2012) test this question experimentally. They predict that a participant will be risk-seeking in the social loss frame and risk-averse in the social gain frame. However, they find the opposite: participants are more risk-averse in the social loss frame (i.e., unfair treatment) than in the social gain frame (fair treatment). They may have behaved so because they could not make up for their social loss with higher risk-taking. Haisley et al. (2008) also suggest that social status may invoke the perception of a social loss frame and increase risk-seeking. In their experiment, people who are shown that their social status is at the bottom of the income distribution are more willing to buy lottery tickets than those who are shown that their social status is somewhere in the middle. Schwerter (2013) analyzes the gambling decisions of participants who observe the earnings of peer participants before making a risky choice. Participants in a treatment group in which their peers' earnings are higher are more risk-seeking than those in a treatment group in which peer's earnings are lower. Overall, these findings show that an outcome's fairness also invokes a gain or loss domain that influences risk-taking, which is consistent with prospect theory.

The effect of fairness on risk-effort decisions is, thus, ambiguous. While perceived unfairness in comparison to peers leads to a decrease in effort (in the absence of risk), most studies generally find that unfairness can increase risk-taking (in the absence of effort) if higher risk taking is what it takes to achieve a more favorable social comparison. Which effect will dominate in combined risk-effort decisions may depend on the context and other cues.

2.3. The interaction effect of both frames on risk and effort decisions

While the theories on risk behavior and effort exertion (motivation) in humans are more or less unconnected, many studies on animal behavior take a unitary approach. An important stream of literature looks at risk-effort decisions from an evolutionary perspective. Bhatti et al. (2014) suggest that loss avoidance is an evolutionary conserved trait, and the studies that explore its origins may help uncover the mechanisms behind decision-making preferences. According to Thorndike (1898) and Williams (1988), human responses to risky situations derive from the same mechanisms that evolved in animals. The evolutionary process theory finds that loss aversion arises from the goal of minimizing the possibility of extinction (Robson and Samuelson, 2009). Animals exhibit risk-averse behavior and exert less effort when not in danger of energy depletion (gain domain) and risk-seeking behavior and exert more effort when in danger of starvation (loss domain) (Jentsch et al., 2010; Miller et al., 2013). The neuroscientific research on the relatedness of risk and effort decisions finds that the neural networks involved in risk and effort behaviors to some extent overlap

[1] The effect is not limited to people. Capuchin monkeys also demonstrate a negative response to the unequal distribution of rewards by refusing to participate in an effortful task if they witness that other participants receive equal reward for less work (Brosnan and De Waal, 2003).

(Hughes et al., 2015; Miller et al., 2013; Platt and Huettel, 2008; Salamone et al., 2012; Treadway et al., 2009; Walton et al., 2006; Wardle et al., 2012). Several neuroscientific studies report that risk-effort types of decisions are jointly moderated by the neurotransmitter dopamine, which functions as a reward and probability signal (Bardgett et al., 2009; Bautista et al., 2001; Cowen et al., 2012; Kennerley et al., 2006; Kirshenbaum et al., 2003; Salamone et al., 1994, 2012).

A perception of loss seems to be the ultimate driver of behavior. The research consistently finds that penalty contracts induce such a domain but a perception that outcome distribution is unfair also creates a loss domain that can stimulate risk-taking. A bonus contract may be perceived as a loss if an individual sees that others are getting higher pay. It is therefore highly likely that any cue that triggers a perception of a loss is dominant and overrides an alternative cue. In an interaction between a bonus or a penalty contract and the outcome's fairness, it may well be that in the case of a bonus contract, unfairness is such a cue; whereas in the case of a penalty contract and the outcome's fairness, the penalty contract itself suffices to create a perception of loss. We thus propose to test the following interaction effect:

H2. The frequency of high risk-effort decisions is lower under a fair bonus contract and higher under either a penalty or an unfair contract.

2.4. The influence of a prior outcome on risk and effort decisions

So far, we have predicted the effects of both incentive frames in a one-period setting, but decisions are rarely made in isolated time-periods. Introducing time into the decision framework creates new cognitive frames (Benartzi and Thaler, 1999). One aspect of framing is related to the broad versus narrow evaluation of outcomes and its consequences for risk-taking (Thaler et al., 1997). Broad framing means that individuals adopt a long-term horizon and evaluate the outcomes from several periods together. This evaluation renders them less sensitive to interim outcomes. Narrow framing, on the other hand, is when individuals react to a single period outcome that causes excessive risk aversion (Barberis and Huang 2001; Barberis et al., 2006). Another aspect of framing is how outcomes of prior decisions are integrated into current decision problems. It seems that people value gains and losses differently (gain-loss asymmetry), but the empirical findings are inconsistent (Ahlbrecht and Weber 1997; Green and Myerson, 2004; Shelley 1994). Furthermore, there are different mechanisms of integration between prior gains and losses with subsequent outcomes. Thaler and Johnson (1990) find that an initial loss caused increased risk aversion in a multiperiod gamble if the second choice did not provide the opportunity to break even. A loss after a larger initial gain, on the other hand, is integrated with the gain. Such integration mitigates the loss aversion and facilitates risk-seeking.

In a management accounting setting, Drake and Kohlmeyer (2010) investigate the effect of the past performance history and bonus incentive schemes on managers' framing of current decisions and their risk behavior. They report that individuals with negative past performance are motivated to engage in more risk-seeking behavior than those with positive past performance. Hartmann and Slapničar (2014) study the effect of bonus versus penalty contracts and deferred versus immediate payout in a multiperiod setting. They find higher risk-taking in the penalty scheme, but only in the first period. In the second period, the outcome from the first period outweighs the effect of the incentive design in the deferred payout scheme: a negative prior outcome suppresses risk-seeking and a positive one exacerbates it. The explanation for their different results to those in Drake and Kohlmeyer (2010) may lie in the fact that Drake and Kohlmeyer manipulate past performance as a treatment in a one-period setting, while the participants in Hartmann and Slapničar's (2014) study use two periods: earned an outcome in the first period and could increase or lose it in the second one.

We suggest that in a decision-making context in which prior outcomes help an agent to revise the probability of an outcome, a prior failure will decrease the likelihood of high risk-effort decisions and a prior success will increase it. We thus propose the following hypothesis:

H3. The frequency of high risk-effort decisions is higher following a positive prior outcome than following a negative one.

3. Research method

3.1. Participants and task

To test the hypotheses, we conducted a three-period, between-subject experiment. All participants were randomly assigned to one of four groups, in which we manipulated two types of incentives contracts (bonus and penalty) and two types of fairness outcomes (fair and unfair). Fair and unfair conditions were manipulated as comparisons of a participants' pay to other participants. A total of 100 undergraduate and graduate students from the Faculty of Economics at the University of Ljubljana participated in the study (74 female, mean age $M = 23.5$, $SD = 3.6$, range = 20–44 years; work experience $M = 2.1$, $SD = 3.2$, range = 0–20 years). The participants were compensated based on their task performance. The average compensation was 5.05 ($SD = 1.89$) experimental units (denoted as EU) that translate into EUR 2.525 for 20 min of activity, which approximately corresponds to the standard hourly rate for student work. Additionally, for their voluntary participation they were awarded credits for courses. All participants signed a written consent form prior to participating in the research and were informed that they were free to withdraw from the study at any point. The experimental design and the procedures were in accordance with the Helsinki Declaration as revised in 2013.[2]

To measure risk-effort decisions, we used a modified Sternberg task (Sternberg, 1966), which is widely used in cognitive psychology to measure cognitive effort (Burrows and Okada, 1973a,b; D'Esposito et al., 2000; Jansma et al., 2007; Zakrzewska and Brzezicka, 2014). It requires the activation of short-term memory, attention, inhibitory control, and motor control (Kelly et al., 2004; Oberauer, 2001; Vinkhuyzen et al., 2010). We used a cognitive rather than a physical effort task because in contemporary organizations an increasing number of choices in pursuit of valuable outcomes involve cognitive rather than physical effort, particularly those managerial tasks incentivized by the contracts studied here. We operationalized the risk component by using a multiperiod setting, in which we incrementally increased the task's difficulty and hence the probability of failure.

The task was as follows: A series of random letters was presented to the participants on a computer screen. Each letter appeared alone at one second intervals, until the whole sequence was presented (e.g. the letter B, the letter C, then the letter D, to make up the sequence BCD). The sequence of letters then disappeared and a memory maintenance period followed. The end of the maintenance period was signaled by the appearance of a probe letter. The probe letter was one of the letters that was shown in the sequence. Participants were asked to indicate the place of the letter in the sequence by pressing the correct number on the keyboard (e.g., if the letter was second in the sequence, they had to press the number 2). Participants had to correctly respond to all letters in the sequence. After each response, visual feedback was given as to whether the answer was correct (a green square) or incorrect (a red

[2] The Declaration guides ethical principles for medical research involving human participants, but the use of its principles is also rising in social science experiments. The experimental procedure needs to protect the well-being and rights of the participants that are consistent with existing ethical norms in scientific research. The research protocol in medicine must be submitted for approval to the research ethics committee before the study begins. Given the unavailability of such a committee in the Faculty of Economics at the University of Ljubljana at the time the experiment was conducted in November 2014, we obtained a positive opinion of the research ethics committee of the Faculty of Arts (the Department of Psychology) of the same university ex post.

square). Complete silence was maintained during the experiment to ensure the students' concentration.

The task is suitable for the research questions since the performance is easily measurable and does not require prior knowledge. Although there is little possibility of a training effect (Shiran and Breznitz, 2011; Sternberg, 2008), ample evidence reports that incentives can increase cognitive effort and performance via increased attention and proactive cognitive control strategies (Braver, 2016; Chiew and Braver, 2013, 2014; Fröber and Dreisbach, 2014; Jimura et al., 2010; Ličen et al., 2016; Padmala and Pessoa, 2011; Pessoa, 2009). Individuals also vary considerably in their sensitivity to motivational incentives (Ličen et al., 2016). Despite the fact that we calibrated the task's difficulty to each individual's achievement level, we expected that decisions on cognitive effort could vary with increasing bonuses or penalties, the participants' risk inclination, and the framing of incentives but that these effects would not be unlimited. To measure to what extent the participants would be willing to accept high risk-effort decisions, the experiment comprised three rounds in which we incrementally increased the probability of failure, required effort, and the incentives. As it is impossible to design a task in which the outcome would depend on effort with a fixed probability of success, the participants could not exactly evaluate this probability, which is akin to real-life decisions. The task is not very exciting in that it entails a positive cost for effort. After the experiment, the participants complete an exit questionnaire with manipulation checks and demographic questions. None of the participants were excluded based on a misunderstanding of the manipulation conditions.[3] The experiment was Web-based, developed in JavaScript, and designed with HTML and CSS. The data were stored in textual format and analyzed with Stata.

3.2. Procedure and manipulation

The two manipulation treatments were an incentive contract (bonus vs. penalty) and the outcome's fairness (fair vs. unfair outcome). The bonus contract comprised fixed pay in the amount of two EU plus a bonus for correct responses, while the penalty contract comprised fixed pay (EU 8) minus a penalty for any incorrect responses (see Fig. 1). The conditions, the expected total payment in the bonus and the penalty conditions for the same decisions (difficult/easy), were the same after three rounds. Participants in the penalty condition could not end up in negative territory because any losses were covered by a higher initial endowment. The expected payments differ in the interim periods because holding them equivalent would require the use of fixed endowments in each round, which would blur the effect of bonuses and penalties. Nevertheless, the comparison between bonuses and penalties in each round was reasonable because the incentive manipulation that *increases* or *decreases* the payment for correctly or incorrectly solved tasks was equivalent in both conditions in all three rounds. Prospect theory argues that our perceptual system reacts to relative changes and differences (Kahneman and Tversky, 1979; Kahneman, 2003). Accordingly, for the formation of cognitive frames, the relative changes are more important than absolute values.

Participants in the fair outcome condition were told that they would earn the same amount for the same level of effort as their peers; in the unfair condition, they were told that they would earn less. This fairness cue appeared before each session so that they were continuously reminded about the outcome's fairness. At the end of the session we explained that unequal payment was an experimental manipulation that was not actually exercised. That led to participants receiving better payment than expected, so they were not negatively affected by our unfairness manipulation. Paying all participants fairly regardless of the manipulative condition they were coincidentally assigned to is in line with the Helsinki Declaration, according to which research goals should never take precedence over the interests of the participants. It would have not been possible to compellingly manipulate unfairness in any other way. The only alternative to manipulate pay inequity and not deceive participants might be by using hypothetical incentives. Hypothetical incentives are common in psychological research (Hill and Buss, 2010; Wang et al., 2016), but are far less acceptable in the behavioral economics and accounting researches. The use of hypothetical incentives would be less powerful in particular in our design where we not only test the effect of pay inequity but also bonus versus penalty contracts. According to the Helsinki Declaration experimental research can only be conducted if the importance of the research objective outweighs the risks and burdens to the participants. Thus, analyzing the effect of unfairness is such an objective in our field, and we have minimized any potential costs to participants. We explained to the participants that participation was entirely voluntary and that they could withdraw their participation at any point without consequences. None of them exercised that right. Greenberg (1993), Libby (2001), Gächter and Thöni (2010), and Gabaldón et al. (2014) treated their participants after unfairness manipulation in a similar way.

3.2.1. Calibration phase

To become familiarized with the task, participants undertook two trial tests during which their performance was not recorded. To calibrate the level of difficulty in the main task, each participant then underwent a phase in which we learned about their ability to memorize the number of letters in a sequence. This phase started with a sequence of three letters. Each sequence was repeated three times. The next sequence contained an additional letter. If two sequences were incorrectly solved, the calibration phase ended and the attained number of letters was coded as the participant's maximum sequence length. Based on each individual's result, his or her difficulty level in the main task was created. We thereby eliminated the effect of an individual's working memory capacity on his or her decisions. For illustration, if one individual could solve five letters and another seven letters, then solving seven letters was not equally difficult for them. After the calibration phase, participants received fixed pay in EU. This was their playing money in the following phase. The participants were also informed of their best result to give them a sense of what for them would be an easy or difficult task and to help them estimate the effort required and the probability of success.

3.2.2. Decision task

In the main task participants had to choose an easy or a difficult task that was defined as the number of letters below or above their performance in the calibration phase. They thereby decided on the effort needed to solve the task and the probability that the task would be correctly solved. The easy task was defined as the sequence that was two letters shorter than their maximum achieved length in the calibration phase and was the same throughout all three rounds. In the difficult task, the sequence length in the first round had the same number of letters as the maximum achieved length in the calibration phase, while in the second and the third rounds the sequence was one and two letters longer, respectively. In the bonus condition, the reward for successfully solving the easy task was smaller than the reward for successfully solving the difficult task. In the penalty condition, the loss for successfully solving the difficult task was smaller than the loss for successfully solving the easy task (see Fig. 1).

3.2.3. Control variable

In cognitive tasks, individuals do not only respond to incentives, but they are also driven by their internal needs (Khandekar, 2012). The decision for an easy or a difficult task thus also expresses risk

[3] Manipulation check questions: For incorrect answers I could not lose additional money. [True/False] In the first round, probability of failure for the choice of the difficult task was higher than for the choice of the easy task. [True/False]. In the second round, probability of failure for the choice of the difficult task was higher than for the choice of the difficult task in the first round. [True/False] I was paid the same amount of money as my peers for the same performance. [True/False].

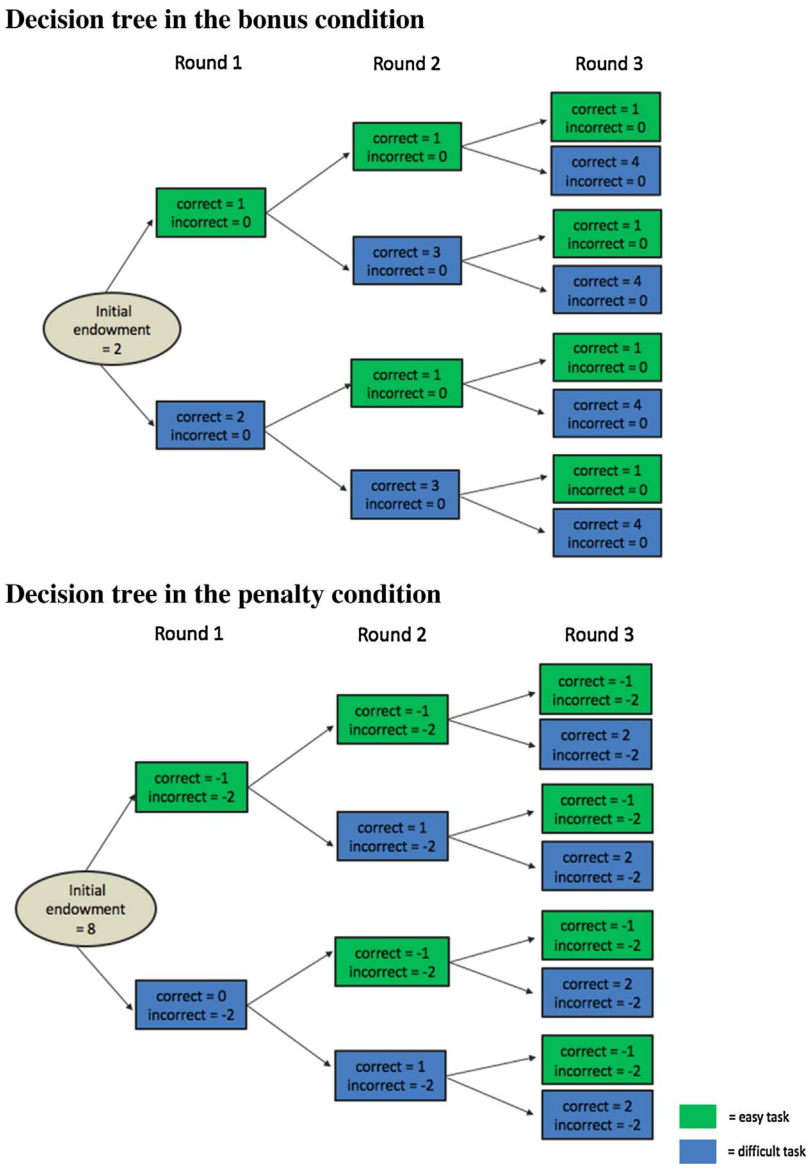

Fig. 1. Decision tree in the risk-effort task for the bonus and the penalty conditions. The number in the ellipse is the initial endowment for each condition. All incentives are expressed in experimental units (EU 1 = EUR 0.5). The participants could choose between the easy task with a sequence length that is two letters shorter than the sequence length achieved in the calibration phase; or the difficult task that is as long as the sequence length achieved in the calibration phase in the first round, has one letter more than the sequence length achieved in the calibration phase in the second round, and two letters more in the third round. The green squares represent the decisions on the easy task and the corresponding rewards or penalties for correctly and incorrectly solved tasks. The blue squares represent the decision on the difficult task and the rewards or penalties for correctly and incorrectly solved tasks. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

inclination and the need for achievement, both relatively stable personal characteristics. We control for the persistence of decisions with a variable *Prior choice* in the second and the third rounds of the experiment.

4. Results

4.1. Descriptive statistics

The average sequence length the participants completed in the calibration phase was 5.86 letters (SD = 1.48, median = 6 letters). This result is in line with a general memory span of seven items (range = 5–9 items; Miller, 1956). We found no significant effect of gender, age, years of work experience, or sequence length achieved in the calibration between the treatment groups[4] (Table 1) or the choices made.[5] Nor did we find any significant differences between the total payoffs across the four groups, which indicates a properly designed incentive structure.

In H1 we predicted that the decisions on difficult tasks would be more frequent under a penalty contract. The descriptive statistics are presented in Table 2. The results show that the participants in the penalty condition decided more frequently on difficult tasks throughout all three rounds than those in the bonus condition. In the first round, 63.3% of the participants in the penalty condition decided on a difficult task, which required higher effort and brought about higher risk of failure, as opposed to 47.1% of the participants in the bonus condition. In the second round, the frequency of the decision on the difficult task was 59.2% versus 31.4% for the participants in the penalty versus the bonus condition, respectively. In the third round, it amounted to 53.1% versus 31.4% for the penalty versus the bonus condition, respectively. The results across the fairness condition show that participants in the

[4] Pearson χ^2 tests indicate no significant difference in the frequencies for gender (χ^2 = 0.53, p = 0.912). One-way ANOVA tests indicate no significant differences in group means for age (F = 0.47, p = 0.943), work experience (F = 0.65, p = 0.796), number of letters achieved in the calibration phase (F = 0.66, p = 0.722), and the total payoff (F = 0.73, p = 0.678).

[5] Pearson χ^2 tests indicate no significant difference in the frequencies of the chosen task difficulty for gender in any of the three rounds (χ^2 = 1.53, p = 0.216; χ^2 = 2.29, p = 0.130; χ^2 = 2.02, p = 0.155). Nor do one-way ANOVAs indicate any significant differences in choices in any of the three rounds for age (F = 1.06, p = 0.407; F = 1.15, p = 0.329; F = 0.48, p = 0.937), work experience (F = 0.87, p = 0.582; F = 1.20, p = 0.294; F = 0.79, p = 0.659), and number of letters achieved in the calibration phase (F = 1.49, p = 0.173; F = 1.59, p = 0.140; F = 1.10, p = 0.372).

Table 1
Descriptive statistics by treatment group.

	Penalty		Bonus		Total
	Unfair	Fair	Unfair	Fair	
N	23	26	24	27	*100*
Gender					
Female (N)	17	19	19	19	*74*
Mean	73.9%	73.1%	79.2%	70.4%	*74.0%*
(S.D.)	(0.45)	(0.45)	(0.42)	(0.47)	*(0.44)*
Age					
Mean	22.52	23.93	24.13	23.41	*23.51*
(S.D.)	(2.09)	(3.96)	(4.67)	(3.13)	*(3.59)*
Years of work experience					
Mean	1.96	2.77	1.96	1.56	*2.06*
(S.D.)	(2.31)	(3.25)	(4.23)	(2.75)	*(3.19)*
Sequence length achieved in calibration					
Mean	5.52	6.23	5.71	5.93	*5.86*
(S.D.)	(1.38)	(1.56)	(1.49)	(1.47)	*(1.48)*
Variable pay (EU)					
Mean	−2.17	−3.23	3.17	2.56	*0.11*
(S.D.)	(2.41)	(1.82)	(1.88)	(1.25)	*(3.38)*
Total payoff (EU)					
Mean	5.83	4.77	5.17	4.56	*5.05*
(S.D.)	(2.41)	(1.82)	(1.88)	(1.25)	*(1.89)*

Note: Descripitive statistics for each of the manipulation treatments. Sequence length is defined as the maximum length of letters achieved in the calibration phase. Variable pay is the pay earned with chosen tasks. Total payoff is the sum of the variable pay and the initial endowment (EU 2 in the bonus scheme and EU 8 in the penalty scheme). EU 1 is worth EUR 0.5.

Fig. 2. The decision for the difficult task of all treatment groups in all three rounds. Lines represent the percentage of choices for the difficult task in all four treatments groups in each round.

frequent under a fair bonus contract and more frequent under either a penalty or unfair contract. A comparison of the four treatment groups (unfair/penalty, fair/penalty, unfair/bonus, fair/bonus) in the first round reveals that in the fair/penalty condition, participants opted for the difficult task in 76.9% of the cases compared to 44.4% in the fair/bonus, 47.8% in the unfair/penalty, and 50.0% in the unfair/bonus condition. Also in the second round the difficult task was undertaken in 73.1% of the fair/penalty condition cases compared to 18.5% in the fair/bonus, 43.5% in the unfair/penalty, and 45.8% in the unfair/bonus conditions. In the third round this pattern no longer held as 61.5% of the participants in the fair/penalty condition opted for the difficult task compared to 40.7% in the fair/bonus, 43.5% in the unfair/penalty, and 20.8% in the unfair/bonus conditions (see Table 2). Overall, the participants who by far most frequently decided on the difficult task in all

Table 2
Choice and outcome by treatment group.

		Round 1				Round 2				Round 3				Total
		Easy	Difficult	% Succesfully solved task (S.D.)	% Succesfully solved difficult task (S.D.)	Easy	Difficult	% Succesfully solved task (S.D.)	% Succesfully solved difficult task (S.D.)	Easy	Difficult	% Succesfully solved task (S.D.)	% Succesfully solved difficult task (S.D.)	
Penalty	Unfair	12	11	73.9%	63.6%	13	10	82.6%	80.0%	13	10	73.9%	40.0%	23
		52.2%	47.8%	(0.45)	(0.50)	56.5%	43.5%	(0.39)	(0.42)	56.5%	43.5%	(0.45)	(0.52)	
	Fair	6	20	50.0%	35.0%	7	19	61.5%	47.4%	10	16	46.2%	12.5%	26
		23.1%	76.9%	(0.51)	(0.49)	26.9%	73.1%	(0.50)	(0.51)	38.5%	61.5%	(0.51)	(0.34)	
	Total	*18*	*31*	*61.2%*	*45.2%*	*20*	*29*	*71.4%*	*58.6%*	*23*	*26*	*59.2%*	*23.1%*	*49*
		36.7%	*63.3%*	*(0.49)*	*(0.51)*	*40.8%*	*59.2%*	*(0.46)*	*(0.50)*	*46.9%*	*53.1%*	*(0.50)*	*(0.43)*	
Bonus	Unfair	12	12	66.7%	41.7%	13	11	70.8%	36.4%	19	5	87.5%	60.0%	24
		50.0%	50.0%	(0.48)	(0.51)	54.2%	45.8%	(0.46)	(0.50)	79.2%	20.8%	(0.34)	(0.55)	
	Fair	15	12	63.0%	33.3%	22	5	85.2%	60.0%	16	11	59.3%	9.1%	27
		55.6%	44.4%	(0.49)	(0.49)	81.5%	18.5%	(0.36)	(0.55)	59.3%	40.7%	(0.50)	(0.30)	
	Total	*27*	*24*	*64.7%*	*37.5%*	*35*	*16*	*78.4%*	*43.8%*	*35*	*16*	*72.5%*	*25.0%*	*51*
		52.9%	*47.1%*	*(0.48)*	*(0.49)*	*68.6%*	*31.4%*	*(0.42)*	*(0.51)*	*68.6%*	*31.4%*	*(0.45)*	*(0.45)*	
Total	Unfair	24	23	70.2%	52.2%	26	21	76.6%	57.1%	32	15	80.9%	46.7%	47
		51.1%	48.9%	(0.46)	(0.51)	55.3%	44.7%	(0.43)	(0.51)	68.1%	31.9%	(0.40)	(0.52)	
	Fair	21	32	56.6%	34.4%	29	24	73.6%	50.0%	26	27	52.8%	11.1%	53
		39.6%	60.4%	(0.50)	(0.48)	54.7%	45.3%	(0.45)	(0.51)		50.9%	(0.50)	(0.32)	
	Total	*45*	*55*	*63.0%*	*41.8%*	*55*	*45*	*75.0%*	*53.3%*	*58*	*42*	*66.0%*	*23.8%*	*100*
		45.0%	*55.0%*	*(0.49)*	*(0.50)*	*55.0%*	*45.0%*	*(0.44)*	*(0.50)*	*58.0%*	*42.0%*	*(0.48)*	*(0.43)*	

fair condition in all rounds somewhat more frequently opted for the difficult task, but the differences between the fair and the unfair group are less pronounced. In the first round, the frequency of the difficult task was 60.4% versus 48.9% in the fair versus the unfair outcome condition, respectively. In the second round, the frequency of the difficult task choice became almost equal, 45.3% versus 44.7% in the fair versus the unfair condition, and in the third round, 50.9% versus 31.9%, respectively.

In H2 we hypothesize that decisions for difficult tasks are less

rounds were those in the fair/penalty condition. This decision was least frequently adopted in the fair/bonus condition in the first and the second rounds, and in the bonus unfair condition in the third round. Fig. 2 presents the frequency of the difficult task choice for all group treatments for all three rounds.

In H3 we postulate that decisions for difficult tasks are more frequent following a positive prior outcome than a negative one. The descriptive statistics of the prior choice and the prior outcome are presented in Table 3. Regarding a prior outcome, the results show that

Table 3
Choice and outcome by prior performance.

		Round 2					Round 3				
		Easy	Difficult	*Total*	% Succesfully solved task (S.D.)	% Succesfully solved difficult task (S.D.)	Easy	Difficutl	*Total*	% Succesfully solved task (S.D.)	% Succesfully solved difficult task (S.D.)
Prior Outcome	Negative	24 64.9%	13 35.1%	37	70.3% (0.46)	38.5% (0.51)	18 72.0%	7 28.0%	25	76.0% (0.44)	14.3% (0.38)
	Positive	31 49.2%	32 50.8%	63	77.8% (0.42)	59.4% (0.50)	40 53.3%	35 46.7%	75	62.7% (0.49)	25.7% (0.44)
Prior Choice	Easy	33 73.3%	12 26.7%	45	77.8% (0.42)	41.7% (0.51)	42 76.4%	13 23.6%	55	76.4% (0.43)	15.4% (0.38)
	Difficult	22 40.0%	33 60.0%	55	72.7% (0.45)	57.6% (0.50)	16 35.6%	29 64.4%	45	53.3% (0.50)	27.6% (0.45)
Total		*55* *55.0%*	*45* *45.0%*	100	*75.0%* *(0.44)*	*53.3%* *(0.50)*	*58* *58.0%*	*42* *42.0%*	100	*66.0%* *(0.48)*	*23.8%* *(0.43)*

50.8% of those who had successfully completed the task in the first round opted for the difficult task in the second round, whereas only 35.1% of the participants who had incorrectly completed the task in the first round, chose the difficult one in the second round. The results are similar in the third round: 46.7% of those who had correctly solved the task in the second round decided on the difficult task in the third round, while only 28.0% of the participants who had incorrectly solved the task in the prior round decided on the difficult task again. With respect to the prior choice, the results reveal that 60.0% of the participants who had chosen the difficult task in the first round, made the same decision in the second round, whereas only 26.7% of the participants who had previously chosen the easy task decided on the difficult task in the second round. In the third round, 64.4% of the participants who had chosen the difficult task in the second round did so again, while only 23.6% of the participants who decided on the easy task in the previous round chose the difficult one. Overall, the results indicate the effect of a prior outcome and a prior choice on the decision to choose a difficult task.

4.2. Results of the model estimation

The results on the model estimation are presented in Table 4. In a logistic regression where the independent variables are dichotomous, a true main effect is that of a variable across all of the observed levels of the other variable. It is only meaningful when there is no interaction, that is, when the effect of the first variable is similar at each level of the second variable. When there is significant interaction, a main effect is not unambiguously interpretable. A nonsignificant main effect of one variable could mean either that its effect is truly zero at both levels of the second variable, or that its effect is positive at one level of the other independent variable and negative at the other. It is normal, therefore, not to regard main effects as informative in of themselves when an interaction occurs. We therefore analyze the effect of each incentive variable at both levels of the second variable via a pairwise comparison. This analysis more clearly explains the model itself and provides significance levels for all four treatments.

4.2.1. Test of H1 and H2

In the first round (see Round 1, Table 4), we observe a significantly positive effect of fairness on the penalty condition, b = 1.29, $F = 2.05$, $p = 0.040$. In the bonus condition, the effect of fairness is insignificant, b = −0.22, $F = -0.39$, $p = 0.693$. Furthermore, the bonus/penalty coefficient is insignificant and close to zero in the unfair treatment, b = 0.09, $F = 0.15$, $p = 0.882$; whereas in the fair condition, its effect is significant and negative, b = −1.43, $F = -2.34$, $p = 0.019$, which indicates that the penalty positively influences the choice of the difficult task. The interaction term in the first round is negative, b = −1.51, $F = -1.79$, $p = 0.073$ but only marginally significant. The marginal significance is reflected in the significantly different results for only two groups. The marginal effects show how the probability of choosing the difficult task changes if the fairness condition changes from unfair to fair and from penalty to bonus.

The results of the second round (see Round 2, Table 4) are consistent with the first round: the outcome's fairness has a significant and positive effect on the penalty condition, b = 1.54, $F = 2.13$, $p = 0.033$, and a significantly negative effect on the bonus condition, b = −1.52, $F = -2.16$, $p = 0.031$. These results explain why the descriptive statistics show almost no difference in the frequency of choices for the difficult task between the fair and unfair conditions as the two effects cancel each other out (see Fig. 3). Fairness has the opposite effect on the penalty and the bonus groups, whereas in the unfair condition the effect of the bonus and the penalty are roughly the same. The bonus/penalty coefficient is insignificant and close to zero in the unfair condition, b = 0.37, $F = 0.54$, $p = 0.589$; while in the fair condition, it is significant and negative, b = −2.69, $F = -3.55$, $p < 0.001$, which confirms the effect of the penalty from the first round only if the payout is fair. The interaction term is significantly negative, b = −3.06, $F = -3.07$, $p = 0.002$, which shows the reversal of the effects in both conditions. These results indicate that, in contrast to the descriptive statistics and H1, there is no main effect from the penalty, as it differs from the bonus only in the fair condition. In H2 we predict that either the penalty or unfairness will elicit decisions for the difficult task: the descriptive statistics speak for such an interpretation and so do the significant interaction term and the pairwise comparisons.

4.2.2. Test of H3

In H3 we predict that a positive prior outcome positively affects the choice on a difficult task. Rounds 2 and 3 in Table 4 present the analysis of the effects of the success the participants had in completing the selected task (outcome round 1) after controlling for the choice from the first round (choice round 1). In round 2 we find highly significant effects (the coefficient for outcome round 1 is b = 2.83, $F = 3.17$, $p = 0.004$; for a choice in round 1 b = 2.85, $F = 3.52$, $p < 0.001$), whereas the effect of our incentive variables remained comparable to those in round 1.

Interestingly, in the third round (see Round 3, Table 4) the incentive variables become insignificant. A pairwise comparison shows that fairness is significant in only one of the four groups (in the fair/bonus condition the coefficient is significant and positive b = 1.87, $F = 2.38$, p = 0.017), but on the whole, decisions on the difficult tasks in the fair/bonus treatment still do not exceed those from the fair/penalty treatment. The interaction term is insignificant and close to zero, b = 0.97, $F = 0.85$, p = 395), which reflects similar differences in the bonus and penalty conditions for unfair compared to fair treatment (see

Table 4
Logistic regression predicting the decision for the difficult task.

	Round 1		Round 2		Round 3	
	Model 1	Mfx	Model 2	Mfx	Model 3	Mfx
Intercept	−0.09		**−3.79*** **		**−4.82*** **	
	(−0.21)		(−3.43)		(−4.19)	
Bonus (1)/Penalty (0)	0.09	0.02	0.37	0.09	−1.03	−0.25
	(0.15)		(0.54)		(−1.12)	
Fair (1)/Unfair (0)	**1.29***	**0.31***	**1.54***	**0.36***	0.91	0.22
	(2.05)		(2.13)		(1.09)	
Bonus/Penalty * Fair/Unfair	−1.51[a]	**−0.36***	**−3.06****	**−0.56*****	0.97	0.24
	(−1.79)		(−3.07)		(0.85)	
Prior Outcome – Incorrect (0)/Correct (1)			**2.83****	**0.57*****	**3.40*****	**0.57*****
			(3.17)		(3.68)	
Prior Choice – Easy (0)/Difficult (1)			**2.85*****	**0.60*****	**3.80*****	**0.74*****
			(3.52)		(4.65)	
Wald χ^2	6.45		22.49		27.94	
χ^2	0.092		0.000		0.000	
Pseudo R^2	0.053		0.305		0.336	
Pairwise Comparison	**Round 1**		**Round 2**		**Round 3**	
*Bonus/Penalty * Unfair (0)*	*0.09*		*0.37*		*−1.03*	
	(0.15)		*(0.54)*		*(−1.12)*	
*Bonus/Penalty * Fair (1)*	***−1.43****		***−2.69******		*−0.06*	
	(−2.34)		*(−3.55)*		*(−0.09)*	
*Fair/Unfair * Penalty (0)*	***1.29****		***1.54****		*0.91*	
	(2.05)		*(2.13)*		*(1.09)*	
*Fair/Unfair * Bonus (1)*	*−0.22*		***−1.52****		***1.87*****	
	(−0.39)		*(−2.16)*		*(2.38)*	

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, [a] $p = 0.073$; Significant coefficients less than 0.05 appear in bold. Mfx stands for marginal effects. Pairwise comparison presents the effect of each incentive variable at both levels of the second variable: e. g. in the first line of the first round in which contracts are unfair, the effect of bonus does not differ from the effect of penalty. In the second line in which contracts are fair, the effect of bonus is significantly negative in comparison to the effect of penalty, indicating that penalty positively influences the choice of the difficult task.

Fig. 3, Round 3). These results show that the choice of the difficult task can only be explained by the prior outcome: b = 3.40, $F = 3.68$, $p < 0.001$ and the prior choice, b = 3.80, $F = 4.65$, $p < 0.001$. If a prior outcome is positive (i.e., if participants are successful in whatever task they chose in the prior round), it positively influences the decision for the same level of difficulty in the next round. This is in line with the results reported by Thaler and Johnson (1990) and Hartmann and Slapničar (2014). The participants to a large extent preserve their initial choice throughout the three rounds. There are two alternative explanations for no effect from the incentive variables: either a prior outcome or a prior choice outweighs the effect of the incentive schemes and the outcome's fairness, or a prior choice picks up a part of the effect of the manipulations and weakens the coefficients for the bonus/penalty and fairness, which means that our manipulations lose power. The increase in explanatory power of the model after the inclusion of the prior outcome and the prior choice speaks for the first interpretation (from Pseudo R^2 0.065–0.336, for brevity only the comprehensive model is reported). The participants in the third round seem to have no longer cared about their incentive scheme or its fairness. What they relied on most was the assessment of the probability of success based on their abilities and their inherent need for achievement, which is reflected in the consistency of the choices throughout the experiment. This corroborates the proposition of Thaler and Johnson (1990) who argue that in intertemporal settings, the prior outcome shifts the individuals' reference points and changes their risk perceptions. The effect of the prior choice can be understood as a sign of the persistence in the choices over time and stable personality traits.

To summarize, the results show that joint risk-effort decisions in time are influenced by all three frames: in the first two rounds both incentive scheme frames interact; but with increasing risk and effort, a prior outcome and a prior choice become dominant reference points. We find that in a multiple frame setting, the effect of the penalty condition cannot be validly observed on a standalone basis. As implied in H2, a single cue creating a loss perception is enough to significantly change the inclination toward effort and risk. We find that the fair/penalty condition most frequently elicits the decision on a high risk-effort task. The unfair/bonus condition is about the same as the unfair/penalty condition in eliciting high risk-effort decisions and more prompting than the fair/bonus condition. The latter may represent a comfort zone, which does not create a need to accept challenges. However, a penalty contract and unfair payment may no longer be perceived as loss domains if one is persuaded of one's own abilities and is confident of success in the task with a high payoff. This is already evident in the second round, and in the third round it overrides the incentive effects.

5. Discussion and conclusion

We investigate the effects of two incentive features − a bonus versus a penalty and an outcome's fairness − on the assumption that via cognitive framing, they influence risk and effort decisions. Our predictions are based on two influential theories: prospect theory (Kahneman and Tversky, 1979; Kahneman, 2003) and organizational justice theory (Adams, 1963; Akerlof and Yellen, 1990). These theories share a common feature: a reference point against which people determine the utility of their outcome. Both theories have been extensively tested and convincingly confirmed, but only for a single behavioral outcome − either risk-taking or exerting effort. We tested their effects on behavior that is usually beyond the scope of each theory and in a multiperiod setting. We were interested in whether social comparisons matter for risk-taking and whether gain and loss domains matter in exerting effort. Our more specific research question addressed how these frames combine in joint decisions about risk and effort. Prior empirical evidence is inconsistent showing that a variety of incentive system characteristics may invoke the same cognitive frames (i.e., gain and loss domains). But more importantly, there is no evidence on the interactive or additive effects of various frames, and whether the cues are consistent or conflicting.

The interaction effect that we find indicates that both incentive features might invoke the perception of a loss domain, which in turn

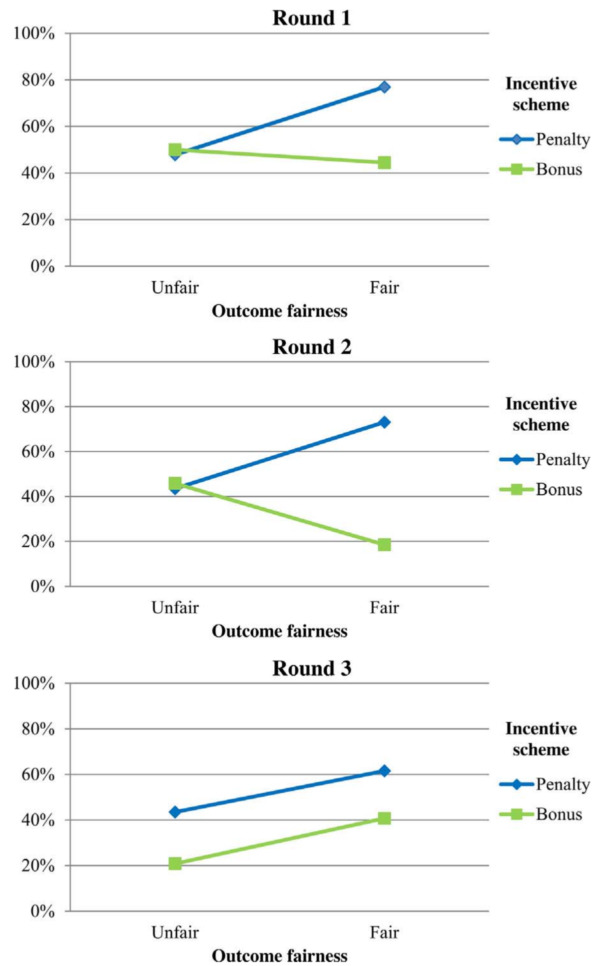

Fig. 3. The decisions for the difficult task according to incentive scheme and outcome fairness for round 1–3. The green and blue line represent the percentage of choices for the difficult task in the bonus and the penalty condition respectively in the fair and the unfair conditions. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

stimulates risk and effort. If the level of payment is unfair, neither a bonus nor a penalty seems to matter. If individuals see that they earn less than their peers, they perceive it as a loss. The difference in frequency of high risk-effort decisions between the unfair bonus and the unfair penalty conditions is negligible. This finding contributes to the evidence documented by Hartmann and Slapničar (2012a) that the effect of distributive justice outweighs the effect of procedural justice on intrinsic motivation. In other words, people care more about how fair their pay is compared to others than how their pay is determined. If in contrast, payment is fair, then a shift from a bonus to a penalty contract significantly increases risk-taking and effort. In the fair/bonus condition the frequency of high risk-effort decisions is radically lower than in the fair/penalty condition. In the second round, the interaction effect becomes more pronounced and statistically significant. All in all, when the cues are consistent, they do not add up; when conflicting, they do not cancel out but a loss cue prevails. Fairness and bonus/penalty framing may thus be seen as complementary, in that loss perception and elicitation of risk taking behavior, accompanied with higher effort, may be created by either.

In spite of the results in this and prior studies on the effect of penalty contracts on effort and the productivity of firms (Hossain and List, 2012), in practice bonus contracts are much more widely spread than penalty contracts. This pervasiveness can be partly explained by employees' preferences (Frederickson and Waller, 2005; Hannan et al., 2005; Luft, 1994). To accept a penalty contract, they would require higher payment (Hannan et al., 2005). Respecting employees' preferences leads to positive effects in principal-agent relationships. These positive effects can explain the findings of Christ et al. (2012) that bonus contracts stimulate higher effort on tasks not governed by the contract, for which there is no performance pay at all. Many critical managerial tasks and targets that cannot be completely predefined in a contract fall into this domain, particularly because of task uncertainty, that makes preset tasks and explicit targets less controllable and relevant (Hartmann, 2005; Lau and Moser, 2008; Hartmann and Slapničar, 2012b). The third reason for a wider use of bonus contracts may be in the effect of penalty contracts on (excessive) risk-taking. However, overall, contract characteristics that invoke a perception of a loss remain under-researched, and the evidence is inconsistent.

Although penalty schemes are not very common in the nonfinancial sector, in the European Union they have been introduced by a recent banking regulation (CRD III) as a deferred bonus system that accommodates a potential penalty and a clawback. It may well be that such penalty clauses are one step closer to fairer compensation because managerial pay will become more closely aligned with the long-term performance of the firm. But the effect on risk-taking may not be what the regulators hoped for, particularly if the penalty is offset by some other forms of compensation. As found by Hartmann and Slapničar (2014), if the potential of a penalty is offset with high upside compensation, it exacerbates risk-taking. In the design of a managerial incentive scheme, it is therefore very important to consider the balance between the number of tasks that can be governed by a contract and those that cannot, and the alignment of an incentive scheme with the risk appetite of an organization. In the case of penalty contracts other mechanisms should also be in place to prevent excessive risk-taking (such as the use of appropriate and balanced performance measures, including risk measures, prudential monitoring, and an independent risk management function).

The results of the third round of the experiment show that the choice of a high risk-effort task over time becomes associated with an evaluation of the probability of success, which depends on one's past performance. This evaluation may develop as a new reference point that delineates between the gain and loss domains in which the individual estimates the probability of winning or losing (Kahneman, 2003). With continuous success, such a reference point may prompt the adoption of increasingly demanding and risky behaviors. Rising reference points may have occurred in the financial and other sectors before the financial crisis. Fueled with prior success, managers took increasingly risky decisions. Another interesting finding is the persistence of choices throughout the rounds. It raises a question about the effectiveness of incentive schemes in the long run. Can incentives systematically influence risk and effort decisions over extended periods of time, or do people predominantly rely on their own abilities regardless of the incentive scheme? Do personality traits outweigh incentives in determining risk propensity, preparedness to exert effort, and the willingness to undertake demanding tasks in the long run? These questions could be answered by studying further periods and the effect of personality traits. It remains debatable whether organizations want to stimulate high risk-effort behavior in the long run or whether this would have too many negative consequences, such as excessive performance volatility, increased stress levels in employees, and damage to the superior-subordinate relationship.

A limitation of this study is inherent in the experimental method. The results of an experiment are not to be taken at face value: Had we varied the intensity of the penalty and bonus and the fairness manipulation, the relative relation between the four experimental groups might be different. However, our results are relatively robust and tested over three rounds of the experiment in which we intensified the rewards and the difficulty of the task; we thus believe that our main findings remain intact. Future studies could test the phenomenon in other contexts through survey methods. Another limitation of the study is that we do not control for the personality traits of the decisionmakers and their autonomous motivation (Kunz, 2015). One such personality characteristic is an individual's need for achievement (McClelland, 1987). The participants with a stronger need for achievement may be more risk and effort prone. This inclination may be evident in the significant effect of the prior choice, which we control for. The use of students is not a limitation per se as the Sternberg task is purely cognitive. Future research could also aim to develop a more comprehensive cognitive theory on risk-effort behavior, most likely involving the more advanced research methods that are emerging in neuroscience. The cognitive effects of incentives remain a fertile area for future research with great potential for practical applicability.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.mar.2017.07.001.

References

Adams, J.S., 1963. Towards an understanding of inequity. J. Abnorm. Psychol. 67, 422–436.
Adams, J.S., 1966. Inequity in social exchange. Adv. Exp. Soc. Psychol. 2, 267–299.
Ahlbrecht, M., Weber, M., 1997. An empirical study on intertemporal decision making under risk. Manage. Sci. 43, 813–826.
Akerlof, G.A., Yellen, J.L., 1990. The fair wage-effort hypothesis and unemployment. Q. J. Econ 105, 255–283.
Ambrose, M.L., Kulik, C.T., 1999. Old friends, new faces: motivation research in the 1990. J. Manag. 25, 231–292.
Barberis, N., Huang, M., 2001. Mental accounting, loss aversion, and individual stock returns. J. Finance 56, 1247–1292.
Barberis, N., Huang, M., Thaler, R., 2006. Individual preferences, monetary gambles, and stock market participation: a case for narrow framing. Am. Econ. Rev. 96, 1069–1090.
Bardgett, M.E., Depenbrock, M., Downs, N., Points, M., Green, L., 2009. Dopamine modulates effort-based decision making in rats. Behav. Neurosci. 123, 242–251. http://dx.doi.org/10.1037/a0014625.
Bautista, L.M., Tinbergen, J., Kacelnik, A., 2001. To walk or to fly? How birds choose among foraging modes. Proc. Natl. Acad. Sci. U. S. A. 98, 1089–1094.
Benartzi, S., Thaler, R., 1999. Risk aversion or myopia? Choices in repeated gambles and retirement investments. Manage. Sci. 45, 364–381.
Bhatti, M., Jang, H., Kralik, J.D., Jeong, J., 2014. Rats exhibit reference-dependent choice behavior. Behav. Brain Res. 267, 26–32.
Birnberg, J.G., Luft, J., Shields, M.D., 2007. Psychology theory in management accounting research. Handb. Manag. Account. Res. 1, 113–135. http://dx.doi.org/10.1016/S1751-3243(06)01004-2.
Blau, G., 1993. Operationalizing direction and level of effort and testing their relationships to individual job performance. Organ. Behav. Hum. Decis. Process. 55, 152–170.
Braver, T.S. (Ed.), 2016. Motivation and Cognitive Control. Routledge, New York (388 p.).
Brooks, R.R.W., Stremitzer, A., Tontrup, S., 2013. Stretch It But Don't Break It: The Hidden Risk of Contract Framing (No. 13–22), Law-Econ Research Paper. UCLA School of Law.
Brosnan, S.F., De Waal, F.B.M., 2003. Monkeys reject unequal pay. Nature 425, 297–299.
Burrows, D., Okada, R., 1973a. Parallel scanning of semantic and formal information. J. Exp. Psychol. 97, 254–257.
Burrows, D., Okada, R., 1973b. Parallel scanning of semantic and formal information. J. Exp. Psychol. 97, 254–257.
Byrne, Z.S., Stoner, J., Thompson, K.R., Hochwarter, W., 2005. The interactive effects of conscientiousness, work effort, and psychological climate on job performance. J. Vocat. Behav. 66, 326–338.
Cacioppo, J.T., Berntson, G.G., 1994. Relationship between attitudes and evaluative space: a critical review, with emphasis on the separability of positive and negative substrates. Psychol. Bull. 115, 401–423.
Charness, G., Kuhn, P., 2007. Does pay inequality affect worker effort? Experimental evidence. J. Labor Econ. 25, 693–723.
Chiew, K.S., Braver, T.S., 2013. Temporal dynamics of motivation-cognitive control interactions revealed by high-resolution pupillometry. Front. Psychol. 4, 15. http://dx.doi.org/10.3389/fpsyg.2013.00015.
Chiew, K.S., Braver, T.S., 2014. Dissociable influences of reward motivation and positive emotion on cognitive control. Cogn. Affect Behav. Neurosci. 14, 509–529.
Chow, C.W., Kohlmeyer, J.M., Wu, A., 2007. Performance standards and managers' adoption of risky projects. Adv. Manag. Account. 16, 63–105.
Christ, M.H., Sedatole, K.L., Towry, K.L., 2012. Sticks and carrots: the effect of contract frame on effort in incomplete contracts. Account. Rev. 87, 1913–1938.
Church, B.K., Libby, T., Zhang, P., 2008. Contracting frame and individual behavior: experimental evidence. J. Manag. Account. Res. 20, 153–168.
Cocker, P.J., Hosking, J.G., Benoit, J., Winstanley, C.A., 2012. Sensitivity to cognitive effort mediates psychostimulant effects on a novel rodent cost/benefit decision-making task. Neuropsychopharmacology 37, 1825–1837. http://dx.doi.org/10.1038/npp.2012.30.
Cohn, A., Fehr, E., Herrmann, B., Schneider, F., 2011. Social Comparison in the Workplace: Evidence from a Field Experiment (No. 5550). Institute for the Study of Labor (IZA), Bonn (Retrieved from nbn-resolving.de/urn:nbn:de:101:1-201104133729).
Cohn, A., Fehr, E., Goette, L., 2014. Fair wages and effort provision: combining evidence from a choice experiment and a field experiment. Manage. Sci. 61, 1777–1794. http://dx.doi.org/10.1287/mnsc.2014.1970.
Cowen, S.L., Davis, G.A., Nitz, D.A., 2012. Anterior cingulate neurons in the rat map anticipated effort and reward to their associated action sequences. J. Neurophysiol. 107, 2393–2407. http://dx.doi.org/10.1152/jn.01012.2011.
D'Esposito, M., Postle, B.R., Rypma, B., 2000. Prefrontal cortical contributions to working memory: evidence from event-related fMRI studies. Exp. Brain Res. 133, 3–11.
Diecidue, E., van de Ven, J., 2008. Aspiration level, probability of success and failure, and expected utility. Int. Econ. Rev. 49, 683–700. http://dx.doi.org/10.1111/j.1468-2354.2008.00494.x.
Drake, A.R., Kohlmeyer, J.M., 2010. Risk-taking in new project selection: additive effects of bonus incentives and past performance history. Adv. Account. 26, 207–220.
Druckman, J.N., 2001. Evaluating framing effects. J. Econ. Psychol. 22, 91–101.
Fröber, K., Dreisbach, G., 2014. The differential influences of positive affect, random reward, and performance-contingent reward on cognitive control. Cogn. Affect Behav. Neurosci. 14, 530–547.
Frederickson, J.R., Waller, W., 2005. Carrot or stick? Contract frame and use of decision-influencing information in a principal-agent setting. J. Account. Res. 43, 709–733. http://dx.doi.org/10.1111/j.1475-679X.2005.00187.x.
Gächter, S., Thöni, C., 2010. Social comparison and performance: experimental evidence on the fair wage-effort hypothesis. J. Econ. Behav. Organ. 76, 531–543.
Gabaldón, I.M., Vázquez Hernández, F.J., Watt, R., 2014. The effect of contract type on insurance fraud. J. Insurance Regul. 33197–33230.
Gose, K., Sadrieh, A., 2012. Fair wages when employers face the risk of losing money. Econ. Lett. 117, 687–690.
Green, L., Myerson, J., 2004. A discounting framework for choice with delayed and probabilistic rewards. Psychol. Bull. 130, 769–792.
Greenberg, J., 1993. Stealing in the name of justice: informational and interpersonal moderators of theft reactions to underpayment inequity. Organ. Behav. Hum. Decis. Process. 54, 81–103.
Haisley, E., Mostafa, R., Loewenstein, G., 2008. Subjective relative income and lottery ticket purchases. J. Behav. Decis. Mak. 21, 283–295.
Hannan, R.L., Hoffman, V.B., Moser, D.V., 2005. Bonus versus penalty: does contract frame affect employee effort? In: Rapoport, A., Zwick, R. (Eds.), Experimental Business Research. Springer US, pp. 151–169.
Hartmann, F.G.H., Slapničar, S., 2008. Objective rewarding, managerial motivation and organizational commitment: the intervening role of justice. In: In: Epstein, M.J., Jean-François, M. (Eds.), Performance Measurement and Management Control: Measuring and Rewarding Performance Vol. 18. Emerald Group Publishing Limited, pp. 127–144. http://dx.doi.org/10.1016/S1479-3512(08)18006-6.
Hartmann, F.G.H., Slapničar, S., 2012Da. Pay fairness and intrinsic motivation: the role of pay transparency. Int. J. Hum. Resour. Manag. 23, 4283–4300. http://dx.doi.org/10.1080/09585192.2012.664962.
Hartmann, F.G.H., Slapničar, S., 2012Db. The perceived fairness of performance evaluation: the role of uncertainty. Manag. Account. Res. 23, 17–33. http://dx.doi.org/10.1016/j.mar.2011.10.004.
Hartmann, F.G.H., Slapničar, S., 2014. An experimental study of the effects of negative, capped and deferred bonuses on risk taking in a multi-period setting. J. Manag. & Governance 1–22. http://dx.doi.org/10.1007/s10997-014-9297-6.
Hartmann, F.G.H., 2005. The effects of tolerance for ambiguity and uncertainty on the appropriateness of accounting performance measures. ABACUS 41, 241–264.
Hill, S.E., Buss, D.M., 2010. Risk and relative social rank: positional concerns and risky shifts in probabilistic decision-making. Evolution and Human Behavior. 31, 219–226.
Hosking, J.G., Cocker, P.J., Winstanley, C.A., 2014a. Dissociable contributions of anterior cingulate cortex and basolateral amygdala on a rodent cost/benefit decision-making task of cognitive effort. Neuropsychopharmacology 39, 1558–1567. http://dx.doi.org/10.1038/npp.2014.27.
Hosking, J.G., Floresco, S.B., Winstanley, C.A., 2014b. Dopamine antagonism decreases willingness to expend physical, but not cognitive, effort: a comparison of two rodent Cost/Benefit decision-Making tasks. Neuropsychopharmacology 40, 1005–1015. http://dx.doi.org/10.1038/npp.2014.285.
Hossain, T., List, J.A., 2012. The behavioralist visits the factory: increasing productivity using simple framing manipulations. Manage. Sci. 58, 2151–2167.
Hughes, D., Yates, M., Morton, E., Smillie, L., 2015. Asymmetric frontal cortical activity predicts effort expenditure for reward. Soc. Cogn. Affect. Neurosci. 10, 1015–1019.
Jansma, J.M., Ramsey, N.F., De Zwart, J.A., Van Gelderen, P., Duyn, J.H., 2007. fMRI study of effort and information processing in a working memory task. Hum. Brain Mapp. 28, 431–440.
Jentsch, J.D., Woods, J.A., Groman, S.M., Seu, E., 2010. Behavioral characteristics and

neural mechanisms mediating performance in a rodent version of the balloon analog risk task. Neuropsychopharmacology 35, 1797–1806. http://dx.doi.org/10.1038/npp.2010.47.
Jimura, K., Locke, H.S., Braver, T.S., 2010. Prefrontal cortex mediation of cognitive enhancement in rewarding motivational contexts. Proc. Natl. Acad. Sci. U. S. A. 107, 8871–8876.
Kahneman, D., Tversky, A., 1979. Prospect theory: an analysis of decision under risk. Econometrica 47, 263–292.
Kahneman, D., 2003. Maps of bounded rationality: psychology for behavioral economics. Am. Econ. Rev. 93, 1449–1475.
Kelly, A.M., Hester, R., Murphy, K., Javitt, D.C., Foxe, J.J., Garavan, H., 2004. Prefrontal-subcortical dissociations underlying inhibitory control revealed by event-related fMRI. Eur. J. Neurosci. 19, 3105–3112.
Kennerley, S.W., Walton, M.E., Behrens, T.E.J., Buckley, M.J., Rushworth, M.F.S., 2006. Optimal decision making and the anterior cingulate cortex. Nat. Neurosci. 9, 940–947.
Khandekar, R.P., 2012. Interacting sets of contradictory human needs as drivers of human behaviour. Indian Journal of Economics & Business. 11, 323–335.
Kirshenbaum, A.P., Szalda-Petree, A.D., Haddad, N.F., 2003. Increased effort requirements and risk sensitivity: a comparison of delay and magnitude manipulations. Behav. Process. 61, 109–121. http://dx.doi.org/10.1016/S0376-6357(02)00165-1.
Kunz, J., 2015. Objectivity and subjectivity in performance evaluation and autonomous motivation: an exploratory study. Manag. Account. Res. 27, 27–46.
Lau, C.M., Moser, A., 2008. Behavioral effect of nonfinancial performance measures: the role of procedural fairness. Behav. Res. Account. 20, 55–71.
Ličen, M., Hartmann, F., Repovš, G., Slapničar, S., 2016. The impact of social pressure and monetary incentive on cognitive control. Front. Psychol. 93 (16), 1078–1664. http://dx.doi.org/10.3389/fpsyg.2016.00093.
Libby, T., 2001. Referent cognitions and budgetary fairness: a research note. J. Manag. Account. Res. 13, 91–105.
Linde, J., Sonnemans, J., 2012. Social comparison and risky choices. J. Risk Uncertainty 44, 45–72. http://dx.doi.org/10.1007/s11166-011-9135-z.
Lindquist, S.G., 2010. Tournaments and unfair treatment. J. Socio-Econ. 39, 670–682.
Luft, J., 1994. Bonus and penalty incentives: contract choice by employees. J. Account. Econ. 18, 181–206.
Maule, J., Villejoubert, G., 2007. What lies beneath: reframing framing effects. Think. Reason. 13, 25–44.
McClelland, D.C., 1987. Human Motivation. Cambridge University Press.
Miller, M.A., Thomé, A., Cowen, S.L., 2013. Intersection of effort and risk: ethological and neurobiological perspectives. Front. Neurosci. 7. http://dx.doi.org/10.3389/fnins.2013.00208.
Miller, G.A., 1956. The magical number seven, plus or minus two: some limits on our capacity for processing information. Psychol. Rev. 63, 81–97.
Oberauer, K., 2001. Removing irrelevant information from working memory: a cognitive aging study with the modified Sternberg task. J. Exp. Psychol. 27, 948.
Padmala, S., Pessoa, L., 2011. Reward reduces conflict by enhancing attentional control and biasing visual cortical processing. J. Cogn. Neurosci. 23, 3419–3432.
Pessoa, L., 2009. How do emotion and motivation direct executive control? Trends Cogn. Sci. 13, 160–166.
Platt, M.L., Huettel, S.A., 2008. Risky business: the neuroeconomics of decision making under uncertainty. Nat. Neurosci. 11, 398–403.
Robson, A.J., Samuelson, L., 2009. The evolution of time preference with aggregate uncertainty. Am. Econ. Rev. 99, 1925–1953.
Ruchala, L.V., 1999. The influence of budget goal attainment on risk attitudes and escalation. Behav. Res. Account. 11, 161–191.
Salamone, J.D., Cousins, M.S., Bucher, S., 1994. Anhedonia or anergia? Effects of haloperidol and nucleus accumbens dopamine depletion on instrumental response selection in a T-maze cost/benefit procedure. Behav. Brain Res. 65, 221–229.
Salamone, J.D., Correa, M., Nunes, E.J., Randall, P.A., Pardo, M., 2012. The behavioral pharmacology of effort-related choice behavior: dopamine adenosine and beyond. J. Exp. Anal. Behav. 97, 125–146.
Schwerter, F., 2013. Social Reference Points and Risk Taking (No. 11). Bonn Econ Discussion Papers, Bonn.
Shelley, M., 1994. Gain/loss asymmetry in risky intertemporal choice. Organ. Behav. Hum. Decis. Process. 59, 124–159.
Shiran, A., Breznitz, Z., 2011. The effect of cognitive training on recall range and speed of information processing in the working memory of dyslexic and skilled readers. J. Neuroling. 24, 524–537.
Sprinkle, G.B., Williamson, M.G., Upton, D.R., 2008. The effort and risk-taking effects of budget-based contracts. Account. Organ. Soc. 33, 436–452. http://dx.doi.org/10.1016/j.aos.2007.11.001.
Sprinkle, G.B., 2003. Perspectives on experimental research in managerial accounting. Account. Organ. Soc. 28, 287–318.
Sternberg, S., 1966. High-speed scanning in human memory. Science 153, 652–654.
Sternberg, R.J., 2008. Increasing fluid intelligence is possible after all. Proc. Natl. Acad. Sci. 105, 6791–6792. http://dx.doi.org/10.1073/pnas.0803396105.
Thaler, R.H., Johnson, E.J., 1990. Gambling with the house money and trying to Break even: the effects of prior outcomes on risky choice. Manage. Sci. 36, 643–660.
Thaler, R.H., Tversky, A., Kahneman, D., Schwartz, A., 1997. The effect of myopia and loss aversion on risk. Taking an experimental test. Q. J. Econ. 112, 647–661.
Thaler, R.H., 1999. Mental accounting matters. J. Behav. Decis. Mak. 12, 183–206.
Thorndike, E.L., 1898. Animal intelligence: an experimental study of the associative processes in animals. Psychol. Rev. Monogr. Suppl. 2, i.
Treadway, M., Peterman, J., Zald, D., Park, S., 2015. Impaired effort allocation in patients with schizophrenia. Schizophr. Res. 161, 382–385.
Van De Weghe, P., Bruggeman, W., 2006. The Impact of the Number of Performance Measures and Incentive Framing on Performance in a Multidimensional Task Environment (No. 06/404), Working Papers of Faculty of Economics and Business Administration. Ghent University, Belgium Retrieved from: http://econpapers.repec.org/RePEc:rug:rugwps:06/404.
Van der Stede, W.A., 2011. Management accounting research in the wake of the crisis: some reflections. Eur. Account. Rev. 20, 605–623.
Vinkhuyzen, A.A.E., van der Sluis, S., Boomsma, D.I., de Geus, E.J.C., Posthuma, D., 2010. Individual differences in processing speed and working memory speed as assessed with the sternberg memory scanning task. Behav. Genet. 40, 315–326.
Vroom, V.H., 1964. Work and Motivation. Wiley, New York.
Walton, M.E., Kennerley, S.W., Bannerman, D.M., Phillips, P.E.M., Rushworth, M.F.S., 2006. Weighing up the benefits of work: behavioral and neural analyses of effort-related decision making. Neural Netw. 19, 1302–1314.
Wang, D., Zhu, L., Maguire, P., Liu, Y., Pang, K., Li, Z., Hu, Y., 2016. The influence of social comparison and peer group size on risky decision-making. Front. Psychol. 7, 1232.
Wardle, M., Treadway, M., De Wit, H., 2012. Caffeine increases psychomotor performance on the effort expenditure for rewards task. Pharmacol. Biochem. Behav. 102, 526–531.
Williams, B.A., 1988. Reinforcement, choice, and response strengthle. In: Atkinson, R.C., Herrnstein, R.J., Lindzey, G.L.R. (Eds.), Stevens' Handbook of Experimental Psychology. Wiley, New York, pp. 167–244.
Zakrzewska, M.Z., Brzezicka, A., 2014. Working memory capacity as a moderator of load-related frontal midline theta variability in Sternberg task. Front. Hum. Neurosci. 8, 399.