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Abstract

We test the effects of dual processing differences in both individual traits and decision states on risk taking. In an experiment with a large representative sample (N = 1,832), we vary whether risky choices are induced to be based on either emotion or reason, while simultaneously measuring individual decision-making traits. Our results show that decision-making traits are strong and robust determinants of risk taking: a more intuitive trait is associated with more risk taking, while a more deliberative trait is associated with less risk taking. Experimentally induced states, on the other hand, have no effect on risk taking. A test of state-trait interactions shows that the association between an intuitive trait and risk taking becomes weaker in the emotion-inducing state and in the loss domain. In contrast, the association between a deliberative trait and risk taking is stable across states. These findings highlight the importance of considering state-trait interactions when using dual processing theories to predict individual differences in risk taking.

Keywords: risk preferences, intuition, emotion, reason, experiment

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1. Introduction

Risk is a core component of practically all areas of life. Thus, understanding how people respond to risk in various situations is central for both effective public policy making and the success of private-sector companies. Prominent theories suggest that risk taking is affected by emotional reactions (Loewenstein et al. 2001, Slovic 2010). Advertising and civil society campaigns commonly utilize this relation, trying to influence risk taking with appeals to reason, emotion, or both. Buying life insurance, for instance, may be promoted with either a description of financial trade-offs or a reminder of our loved ones. But people who buy insurance may be more or less likely to rely on deliberative rather than emotional decision making in the first place. Thus it is likely that the success of emotion- versus reason-based risk appeals (a temporary state) depend on the generally preferred decision mode of the decision maker (a relatively stable trait). This paper addresses this by studying potential state-trait interactions between emotion- versus reason-based risk taking.

The role of the emotion/reason-distinction in risk taking has received considerable attention following the work of Daniel Kahneman and others (see, e.g., Kahneman 2011, Kocher et al. 2013, Kirchler et al. 2016, Kocher et al. 2018, Persson et al. 2018, Spiliopoulos and Ortmann 2018, Västfjäll et al. 2016). This research area can broadly be divided into two strands; 1) one that studies risk preferences across different situations (i.e. states) and 2) one that studies the relation between risk preferences and individual differences in decision-making traits. The former asks if primarily situational factors drive individuals to rely more (less) on intuition and emotions make people more (less) risk-seeking? The latter instead examine if people who are more (less) predisposed toward an intuitive, emotion-based decision-making trait engage in more (less) risk-seeking behavior? To our knowledge, the influence of intuitive (or emotional) states and intuitive traits on risk taking have only been studied in isolation, neglecting that states and traits are likely to interact when individuals make choices. Here we provide evidence from an experiment varying states and measuring traits in a large-scale, representative sample of the Swedish population. Thus, our data allows us to explore potential interaction effects of individual, trait-like differences in relying on emotion- or reason-based processing and the processing type favored by the situation in risky decision making.

It is well established that decision making does not take place in isolation and free of context. Instead, behavior is likely to be heavily influenced by the interaction between situational factors (i.e. states) and dispositional factors (i.e. traits) (Block 2005; Hammond et al. 1987, Betsch and Kunz 2008). States refer to a temporary changes in the psychological

process over time, which can be induced by external factors. Traits, on the other hand, refer to the stable, consistent, and enduring disposition of the individual. In other words, traits present the tendency of an individual to constantly think, feel and behave in a certain way (Allport and Odbert 1936, Spielberger and Sydeman 1994). For example, an individual could be temporarily induced into an intuitive-emotional mindset (i.e. state) even though they generally tend not to have an intuitive-emotional character (i.e. trait). Such state-trait interaction effects of processing on decision making are of obvious importance when trying to understand certain behavior, but are also of interest to core economics questions, such as the stability of preferences and the effectiveness of interventions in policy making.

Studies exploring the influence of intuitive versus deliberative decision states on risk taking focus primarily on manipulations of decision speed, with mixed results (Ben Zur and Breznitz 1981, Chandler and Pronin 2012, Young et al. 2012, Kocher et al. 2013, Kirchler et al. 2017; Persson et al. 2018). For example, Kirchler et al. (2017) find that time pressure, as compared to time-delay, increases the reflection effect (subjects becoming more risk averse for gains and more risk seeking for losses) and has no effect on loss aversion. In contrast, Kocher et al. (2013) find that time pressure, compared to an unconstrained choices, has no effect on risk taking in the gain domain, but increases risk aversion in the loss domain as well as increasing loss aversion and gain-seeking in mixed gambles. These causal effects should be interpreted with caution because some people will violate the time constraints leading to a selection problem when excluded from the analysis (Kocher et al. 2018, Tinghög et al. 2013). Our manipulation of decision states circumvents the issue of selection bias by directly instructing participants to either rely on their emotions or their reason during the decision process (Horstmann et al. 2010; Levine et al. 2018).

Studies exploring the relation between intuitive versus deliberative traits and risk taking also have mixed results (Kowert and Hermann 1997, Fernandez-Duque & Wifall 2007, Miller et al. 2009). For example, Fernandez-Duque & Wifall (2007) find that an intuitive trait was associated with more risk taking in the gain domain. However, Kowert and Hermann (1997) find no evidence of an effect of intuitive trait on risk taking in the loss domain. Moreover, some studies find no association whatsoever between intuitive traits and risk taking (Miller et al. 2009). A possible explanation for these inconsistent findings is that studies exploring the role of intuitive versus deliberative trait do not take into account the situational state that the individual is currently experiencing.

In this paper we simultaneously induce intuitive states and measure traits in a large representative sample making risky choices in incentivized monetary gambles. This enables us

to examine how state and trait jointly interact in determining risky choices. More specifically, based on research in social psychology, we predict that the effect of a state on risky decision making is more pronounced when it "fits" with the individual trait. That is, an induced intuitive mindset will have its biggest effect on already intuitive individuals. Conversely, an induced deliberative mindset will have its biggest effect on deliberative individuals. This prediction is in line with regulatory fit theory (Higgins 2005), which suggests that when there is a fit, people engage more strongly in what they are doing and "feel right" about it. Thus, a fit of state and trait may encourage individuals to process according to their own decision making trait, enhancing individual differences. A misfit, on the other hand, may decrease the likelihood that individuals will rely on their trait at the point of decision making, thereby reducing individual differences.

To induce intuitive versus deliberative states, participants were randomly assigned to one of three treatments in which they were instructed to either rely on emotions or reason when making decisions. We also include a control condition where no such instructions are given. To measure intuitive versus deliberative traits, we use the Unified Scale to Assess Individual Differences in Intuition and Deliberation (USID; Pachur and Spaar 2015). Our findings show that there is a significant and robust relationship between decision-making traits and risk preferences. Individuals who rely more on intuition when making decisions are more risk taking, while individuals who rely more on a deliberation are less risk taking. Instructing people to rely on their emotions or on their reason has no main effect on risk preferences. However, our evidence shows that an intuitive decision making trait is less important in determining risk preferences when subjects face potential losses and when subjects are instructed to rely on their emotions. This suggest that individual decision-making traits primarily affect risk taking when the decision state is not characterized by the same processing type, rather than a fit between trait and state enhancing the importance of the trait.

The remainder of the paper is organized as follows. Section 2 describes the experimental design and procedure. Section 3 states the hypotheses. Section 4 presents the results of manipulation checks and section 5 discusses potential issues of rationality violations. Section 6 presents the main results of our experiment. Section 7 discusses the results and draws a conclusion, including implications for future research and policy making.

2. Experimental Design and Procedure

2.1 Procedure

We collected data from 1,832 individuals through an survey that was sent to a representative sample of the Swedish population through the survey company CMA Research in April and May of 2017. Four subjects violated the age restrictions of the experiment and are excluded from the sample, leaving a sample of 1,828 individuals.[1] We causally identify the effect of emotion- and reason-inducing states on risk taking in a (3 X 1) between-subject design. Individual decision-making traits are elicited through a questionnaire that was randomly placed before or after the economic decisions. At the end of the experiment, a questionnaire elicited a set of variables that may affect risk preferences and that we will use as control variables in our main analysis (Dohmen et al. 2011), such as gender, age, parental background, marital status, having children in the household, education, employment status, and income. We further elicited self-reported risk taking in real-life decisions. Subjects received a fixed payment for participation and an additional payment based on one, randomly chosen decision from the experiment.[2] The experimental instructions, translated from Swedish into English, can be found in the Appendix Part C.[3] We slightly oversample individuals who are older, more educated, have a higher wage and are female (see Appendix Part A, Tables A1 and A2, for descriptive statistics and the representativeness of our sample for the Swedish population). All experimental methods follow the ethical guidelines of the Swedish research council concerning the Ethical Review of Research Involving Humans (SFS 2003:460), which outline that the research in this study does not require approval from an ethics committee.

2.2 Risk preference measures

Risk preferences are elicited in a set of incentivized, binary choices between a lottery, which is the same in all options, and a safe amount of money, which varies across options (cf. Holt and Laury 2002). Because risk preferences may differ across the gain and the loss domain (Kahneman and Tversky 1979), we elicited risk preferences of all subjects in the gain and the loss domain. In each domain subjects made seven choices between a 50/50-gamble with the

[1] The data collection was restricted to participants of age 18 or above. Nevertheless, two participants report to be younger than 18. Moreover, two participants report to be 117 years old (being born in 1900), which exceeds the current maximum age in Sweden. These subjects are excluded from the sample.

[2] All economic decisions were incentivized. The only exception is the task that elicits intertemporal preferences, because, unfortunately, it was not possible to make delayed payments. Participants were asked to imagine that the intertemporal decisions are incentivized.

[3] This study is part of a larger project that elicits other economic preferences within the same sample. The order of the economic decisions was randomized on the individual level.

chance of gaining (losing) SEK 100 (about $11), and a certain gain (loss) that varied between SEK 35 and 65 (about $4-7). The decisions in the loss domain are additive inverses of the decisions in the gain domain. An initital endowment of SEK 100 was provided in the task in the loss domain.[4] The order of the decisions was randomized within each domain and each decision was presented on a separate screen. The gain domain was always elicited before the loss domain (see Appendix Part A, Table A3, for a list of all decisions).

2.3 Treatments: Emotion- and reason-inducing states

Our experimental design manipulates the decision state by randomly assigning subjects to one of three direct instructions treatments. The *baseline* condition presented all decisions without any information about the desired decision processing. The *emotion treatment* directly instructs subjects to rely on their emotions when making choices in the experiment. In contrast, the *reason treatment* instructs subjects to rely on their reason. The exact wording of our treatment is based on Levine et al. (2018).[5] In particular, subjects read the following before making the risky choices:

> *Sometimes people make decisions by using reason and relying on their brains. Other times, people make decisions by using emotion and relying on their hearts.*
>
> *Many people believe that the heart [brain] is the part of our body that is most connected with good decision-making. When we feel with our hearts [think with our brains], rather than think with our brains [feel with our hearts], we make emotionally [rationally] satisfying decisions.*
>
> *In this part of the experiment,* ***please make your decisions by relying on your heart [brain],*** *rather than your brain [heart].*

A number of manipulation checks are put in place to corroborate that our treatments affect decision processing. In four questions, subjects self-report how much they relied on deliberation, intuition and emotions as well as how much the instructions made them think more about their decisions on 5-point Likert scales.[6] We also elicit behavioral outcomes that are expected to depend on processing. First, we elicit responses to the Jellybean task (Denes-Raj and Epstein 1994; Kirkpatrick and Epstein 1992; Peters et al. 2006). Second, we elicit

[4] If individuals integrate the endowment into the decision making problem, then decisions in the loss domain are equivalent to decisions in the gain domain with an additional loss frame.

[5] In a recent meta study by Rand (2016), the experiments by Levine et al (2018) were reported to produce the largest effect on decision making in the context of cooperation, making it a viable candidate for an intervention to decision processing.

[6] Note that the terms intuition and deliberation have not been used in the decision state manipulation or the decision-making traits elicitation.

individual time preferences in a multiple price list design, which gives subjects a set of choices between immediate and delayed payments (Andersen et al. 2008). Third, we elicit actual decision times.

2.4 Elicitation of decision-making traits

Individual decision-making traits are elicited using the Unified Scale to Assess Individual Differences in Intuition and Deliberation (USID; Pachur and Spaar 2015). The USID addresses weaknesses and unifies previously used measures of intuitive and deliberative decision-making traits, such as the Preference for Intuition and Deliberation scale (PID, Betsch 2004) and the Rational-Experiential Inventory (REI, Pacini and Epstein 1999). Subjects rated 32 statements according to how well they describe their own decision-making in life in general on a 5-point scale from "completely false" to "completely true". A preference for an intuitive decision making mode is measured in statements that describe an affective and spontaneous approach to decision making. A preference for a deliberative decision making mode is measured in statements that describe a planful and knowledge-based approach to decision making. The two scales are expected to have a positive but small correlation with each other (Pachur and Spaar 2015). Thus, individuals can prefer to rely on input from their intuition and their deliberation when making a decision. Accordingly, we construct three measures of decision-making traits: (i) a score that measure the individual tendency to rely on intuition in decision making, (ii) a score that measure the individual tendency to rely on deliberation in decision making, and (iii) an indicator for whether an individual relies primarily on intuition (intuition score > deliberation score) or deliberation (deliberation score ≥ intuition score) when making decisions.

Decision-making traits, like any personality trait, may vary across domains of outcomes (Pachur and Spaar 2015). We believe that a general measure of traits is both a natural and economical first step at our research question (USID questions can be added to larger surveys), however, domain-specificity may lead to an underestimation of the size of the true relations.

3. Hypotheses

Relying more on intuition when making risky choices can theoretically be linked to a stronger curvature of the utility function. A decision maker with an S-shaped utility function according to prospect theory (Kahneman and Tversky 1979) would be less risk taking in the gain domain and more risk taking the loss domain when applying more intuition. We do not elicit a measure

for the curvature of a utility function, but assuming an S-shaped function, we can derive the following hypotheses for the association between the processing type and risky choices.

Hypothesis 1*:* Subjects take less (more) risk in the gain (loss) domain when in the emotion treatment rather than the reason treatment.

Hypothesis 2: A more intuitive (deliberative) decision making trait is associated with less (more) risk taking in the gain domain, and more (less) risk taking in the loss domain.

We form hypotheses on the interaction effects between states and traits based on regulatory fit theory (Higgins, 2005). Accordingly, we expect subjects to experience a "decisional fit" if their preferred strategy matches the state and a "decisional misfit" if their preferred strategy does not match the state (see Table 1 for an overview for our case).

Table 1. Predictions according to regulator fit theory

		Situation (state)	
		Emotion treatment	Reason treatment
Person (trait)	Intuitive	Fit	Misfit
	Deliberative	Misfit	Fit

We predict that the association between risk preferences and a decision making trait is stronger if the decision state matches the trait, than if it does not match. For instance, primarily intuitive subjects should take the least (most) risk in the gain (loss) domain when in the emotion treatment, while primarily deliberative subjects should take the most (least) risk in the gain (loss) domain when in the reason treatment.

Hypothesis 3*:* The relation between an intuitive (deliberative) decision making trait and risk taking is stronger (weaker) in the emotion than the reason treatment.

4. Manipulation checks

Table 2 gives an overview over the results of our manipulation checks. Individuals are significantly more likely to report that they have relied on their intuition and emotions, and significantly less on their deliberation, in the emotion treatment than the reason treatment. We

find no strong evidence that the treatments affect how much the instructions made subjects think about their decisions. We find a significantly lower share of rational choices in the Jellybean task in the emotion treatment compared to the reason treatment. Intertemporal decisions are also more impatient in the emotion treatment than the reason treatment, but differences are not significantly different from zero. Lastly, we find that choices in our risk task are made significantly faster in the emotion treatment than the reason treatment.

These findings suggest that the emotion treatment compared to the reason treatment promotes intuitive, fast and nonrational choices. Thus, our manipulation checks provide strong evidence that our treatments in fact affected individual decision processing.

Table 2. Manipulation checks

		Treatments		Difference
	Baseline	Emotion	Reason	Emotion - Reason
Relied on intuition	3.23	3.51	3.02	0.485 ($p < 0.001$)
Relied on emotions	3.10	3.53	2.69	0.837 ($p < 0.001$)
Relied on deliberation	3.84	3.66	3.95	-0.289 ($p < 0.001$)
Instructions: thought more	3.46	3.42	3.50	-0.082 ($p = 0.216$)
Jellybean task: rational choices	0.68	0.63	0.70	-0.069 ($p = 0.010$)
Share of impatient choices				
- today vs. 6 months	0.56	0.61	0.58	0.30 ($p = 0.164$)
- 6 months vs. 12 months	0.58	0.62	0.59	0.035 ($p = 0.100$)
RT in gain domain	1.67	1.65	1.71	-0.054 ($p = 0.039$)
RT in loss domain	1.70	1.71	1.77	-0.067 ($p = 0.041$)

Notes: Averages are estimated using full sample. The last columns presents *p*-values of two-sided *t*-tests and *Chi-squared* tests, respectively. *Relied on intuition* measures the answer to "I relied on my intuition when making the decisions in this experiment." *Relied on emotions* measures the answer to "I relied on my emotions when making decisions in this experiment." *Relied on deliberation* measures the answer to "I relied on my deliberation when making the decisions in this experiment." *Instructions: thought more* measures the answer to "The instructions in this experiment made me think more about my decisions." on a 5-point Likert scale. *Jellybean task* reports the share of rational (non-dominated) choices in the jellybean task. *Share of impatient choices* measures the share of impatient choices in the elicitation of time preferences with multiple price lists (today vs. six months from today; six months from today vs. twelve months from today). *RT* is the natural logarithm of the average time taken to make a choice between the gamble and a certain option.

5. Transitivity violations

Risk preferences were elicited in binary choices that were presented on separate screens and in randomized order. We find that 31.56% of subjects have several switching points in either the gain domain (10.83% of subjects) or the loss domain (26.81% of subjects), or both. Subjects are slightly more likely to violate transitivity in the emotion treatment than the reason treatment, however, differences are not significantly different from zero (34.15% vs. 30.63%, $X^2 = 1.721$, $p = 0.190$). Table 3 shows that an intuitive decision making trait significantly and positively correlated with the likelihood that transitivity is violated. There is no significant association between a deliberative trait and transitivity violation, but we find that primarily intuitive decision makers are significantly more likely to violate transitivity than primarily deliberative decision makers.

For our main analysis, we omit all subjects who violate the rationality assumption from the data, leaving a sample of 1,251 subjects (see Appendix Part A, Table A4, for an overview of exclusions). Robustness checks that include subjects who violated transivity are presented along with the results.

Table 3. Transitivity violations and decision-making traits

OLS regressions. Dependent variable: Transitivity violated in risk task (Indicator)				
	(1)	(2)	(3)	(4)
Intuitive trait	0.038***	0.036***		
	(0.011)	(0.011)		
Deliberative trait	-0.017	-0.017		
	(0.011)	(0.011)		
Primarily intuitive			0.065***	0.061**
			(0.023)	(0.024)
Controls included	no	yes	no	yes
Constant	0.316***	0.323***	0.293***	0.295***
	(0.011)	(0.065)	(0.013)	(0.065)
Observations	1,828	1,828	1,828	1,828
Adjusted R-squared	0.006	0.010	0.004	0.008

Notes: Robust standard errors in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The variables measuring decision-making traits are standardized to take mean zero and standard deviation one. *Primarily intuitive* is an indicator for whether the intuiton score is higher than the deliberation score. Control variables are age, an indicator for gender and marital status, an indicator for having a working class parental background, indicators for educational attainment, an indicator for whether the individual is unemployed, an indicator for whether the individual is self-employed and indicator variables for income quintiles.

6. Results

6.1 Effects of decision states on risky choices

Table 4 reports the share of risky choices in each outcome domain across treatments.[7] On average, subjects in the baseline condition are more, but not significantly more, risk seeking in the loss domain ($M = 0.56$, $SD = 0.38$) than the gain domain ($M = 0.54$, $SD = 0.41$; $t = 1.125$, $p = 0.213$).[8] We do not find a significant difference in average risk taking across the emotion and the reason treatment in the gain domain ($p = 0.308$) or the loss doman ($p = 0.674$). Confidence intervals around the treatment effects show that we can rule out even small-sized effects given our sample size. These results hold up when comparing behavior in the emotion and reason treatments, respectively, to the baseline treatment.[9] The results of Table 4 are robust to using a binary risk variable and to including subjects that violated rationality, with the latter resulting in even narrower confidence intervals due to the larger sample size (see Appendix Part B, Table B1). Thus, we find no support for hypothesis 1.

> ***Result 1:*** There is no significant effect of emotion- and reason-inducing decision states on risk taking.

6.2 Decision-making traits as determinants of risky choices

We standardize our trait measures for both the intuition scale ($M = 3.30$, $SD = 0.61$, Cronbach's $\alpha = 0.88$) and the deliberation scale ($M = 3.55$, $SD = 0.64$, Cronbach's $\alpha = 0.91$), using the full sample. We also construct an indicator variable for the primary trait (35.18% of individuals are primarily intuitive; see Figure A1 in the Appendix for an illustration).

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[7] We find no effects of the order of the risk elicitation task relative to the other economic decisions. There is no significant effect of the order of the risk and the decision making trait elicitation.

[8] Relating our risk measure to self-reported real-world behavior, we find that being more risk taking in the gain domain is significantly and positively correlated with the likelihood of having traded risky financial assets at least once within the last twelve months ($\beta = 0.093$, $p = 0.006$). On the other hand, we find no significant correlations between being more risk taking and whether an individual has smoked within the last twelve months ($\beta = 0.032$, $p = 0.348$) or engaged in regular physical activity ($\beta = 0.038$, $p = 0.274$). This suggests that our measure of risk preferences primarily picks up individual differences in financial risk taking rather than risk taking in other domains, such as health behavior.

[9] Comparing to the baseline condition, we find no significant effects of introducing the emotion treatment (gains: 0.54 vs. 0.55, t = -0.492, p = 0.623, 95% confidence interval: [-0.07, 0.0.04]; losses: 0.56 vs. 0.57, t = -0.164, p = 0.869, 95% confidence interval: [-0.06, 0.05]) or the reason treatment (gains: 0.54 vs. 0.52, t = 0.533, p = 0.594, 95% confidence interval: [-0.04, 0.07]; losses: 0.564 vs. 0.557, t = 0.267, p = 0.790; 95% confidence interval: [-0.04, 0.06]) on risk taking.

Table 4. Mean share of risky choices across treatments

	Baseline	Emotion treatment	Reason treatment	Emotion vs. Reason *t*-tests 95% confidence intervals
Gain domain	0.54 (0.41)	0.55 (0.42)	0.52 (0.39)	$t = 1.021$ $p = 0.308$ [-0.03, 0.09]
Loss domain	0.56 (0.38)	0.57 (0.40)	0.56 (0.38)	$t = 0.421$ $p = 0.674$ [-0.04, 0.07]
Number of observations	429	403	419	

Notes: Excluding subjects who violated transitivity. Mean share of gambles chosen across outcome domains and treatments. Standard deviations in parentheses.

Table 5 reports the results of OLS regressions that regress the share of risky options chosen on the individual decision-making traits.[10] All regressions control for a set of other, confounding variables that have previously been identified as determinants of individual risk preferences (Dohmen et al. 2011), including age, gender, parental background, marital status, children in the household, educational levels, employment status and income quintiles; as well as interaction terms between these potential confounds and the treatment indicator variables.

The relation between decision-making traits and risk taking in the baseline condition is reported in rows 1-3 of Table 5. An intuitive decision making trait is significantly and positively associated with higher risk taking in the gain domain. An increase in the intuitive decision making trait by one standard deviation is associated with an increase in risk taking in the gain domain by about 19% of a standard deviation in the risk taking variable. In contrast, we can no longer detect a significant relation between risk taking and the intuitive trait in the loss domain and the correlation coefficient is significantly smaller in the loss domain than in the gain domain (OLS regression with interaction terms: $\beta = -0.049$, $p = 0.045$). A deliberative decision making trait is negatively related to risk taking with an effect size of about 9% of a standard deviation in risk taking. The correlation coefficient for the deliberative trait is not significantly different across the gain and the loss domain (OLS regression with interaction terms: $\beta = -0.014$, $p = 0.538$).[11]

[10] There are no significant effects of the order of the decision making trait questionnaire and the economic decisions. We also find no significant effect of having induced decision states beforehand on the average decision making trait scores.

[11] One may argue that our results may pick up a spurious negative relation between risk taking and a higher intuitive decision making trait score (lower deliberative decision making trait scores) if fast subjects merely prefer to always

Table 5. Main effects of traits and interaction effects of states and traits on risky choices

OLS regressions. Dependent variable: Share of risky choices	Gain domain		Loss domain	
	(1)	(2)	(3)	(4)
Intuitive trait	0.078***		0.029	
	(0.021)		(0.022)	
Deliberative trait	-0.037*		-0.051**	
	(0.021)		(0.021)	
Primarily intuitive		0.127***		0.083**
		(0.043)		(0.040)
Emotion treatment	-0.339**	-0.330*	0.199	0.206
	(0.173)	(0.174)	(0.172)	(0.172)
Int. trait X Emotion treatment	-0.047*		-0.004	
	(0.028)		(0.029)	
Del. trait X Emotion treatment	0.002		0.031	
	(0.030)		(0.030)	
Prim. Int. X Emotion treatment		-0.066		-0.046
		(0.062)		(0.060)
Reason treatment	0.260	0.242	0.337*	0.328*
	(0.178)	(0.177)	(0.176)	(0.172)
Int. trait X Reason treatment	0.009		0.033	
	(0.029)		(0.029)	
Del. trait X Reason treatment	0.010		0.043	
	(0.028)		(0.028)	
Prim. Int. X Reason treatment		-0.011		-0.009
		(0.061)		(0.059)
Controls included	yes	yes	yes	yes
Constant	0.599***	0.559***	0.365***	0.339***
	(0.129)	(0.130)	(0.127)	(0.126)
Observations	1,251	1,251	1,251	1,251
Adjusted R-squared	0.060	0.046	0.030	0.023
Difference Emotion-Reason treatment interaction terms				
Intuitive trait	-0.056		-0.037	
F(1,1206)-statistic	4.11		1.91	
p-value	0.043		0.168	
Deliberative trait	-0.008		-0.012	
F(1,1206)-statistic	0.09		0.17	
p-value	0.763		0.676	
Prim. intuitive		-0.055		-0.037
F(1,1206)-statistic		0.79		0.34
p-value		0.375		0.560

Notes: Robust standard errors in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The variables measuring linear decision-making traits are standardized to take mean zero and standard deviation one. Primarily intuitive is an indicator for whether the individual scores higher on the intuition than the deliberation scale. Control variables are age, an indicator for gender and marital status, an indicator for having a working class parental background, indicators for educational attainment, an indicator for whether the individual is unemployed, an indicator for whether the individual is self-employed and indicator variables for income quintiles; as well as interaction variabless between each individual characteristic and the treatment indicators.

choose the right-hand side option (the gamble), rather than to engage in the task. Contradicting such a claim, we find that decision times of participants that chose the gamble in all decisions are not faster, and in fact somewhat slower, than decision times of participants that always chose the safe option (logarithm of decision times in seconds; gains: 1.65 vs. 1.57, $t = 1.431$, $p = 0.154$; losses: 1.61 vs. 1.50, $t = 1.477$, $p = 0.141$).

In line with the linear effects, our binary measure of traits shows that primarily intuitive decision makers are significantly more risk taking than primarily deliberative decision maker. The effect is sizeable with about 31% of a standard deviation in the risk-taking variable and smaller, but not significantly smaller in the loss than the gain domain (OLS regression with interaction terms: β = -0.044, p = 0.323). All reported effects are robust to using non-linear specifications, in particular, a logit regression of an indicator variable for risk-seeking and an ordered logit regression, as well as to including subjects who violated transitivity (see Appendix Part B, Tables B2-B4). Thus, we reject hypothesis 2.

> ***Result 2*:** An intuitive decision making trait is positively correlated with risk taking in the gain domain but not in the loss domain. A deliberative decision making trait is negatively correlated with risk taking in the gain and the loss domain.

6.3 Interaction effects on risky choices: Decision-making traits and states

Interaction effects between states and traits on risk taking are reported in the OLS regressions in Table 5. The reported interaction terms show the differences in the association between decision-making traits and risk taking across the baseline condition and the emotion and reason treatment, respectively. Statistics in the bottom rows of Table 5 report the differences in the interaction effects across the emotion and the reason treatment.

We find that the association between an intuitive trait and risk taking is significantly smaller in the emotion treatment than the reason treatment (column 1, bottom rows). This effect is robust to allowing for non-linearity in the regression (Table B3), but not to measuring risk taking at extensive margin (Table B2) or to including subjects that violated transitivity (Table B4). We find that the smallest correlation coefficient for the intuitive trait when choices are made in the loss domain in the emotion treatment (column 3; difference to interaction term in gain domain: OLS regression full model with three-way interactions β = 0.043, p = 0.181).

Differences in the effect of the deliberative decision making trait on risky choices are small and not significantly different across treatments (columns 1 and 3, bottom rows). Splitting subjects by their relative scores on the two trait measures, we find that the difference in risk taking between primarily intuitive and primarily deliberative e subjects is smaller, but not significantly smaller, in the emotion treatment than the reason treatment (columns 2 and 4).

Adding to our results from section 6.2, these findings suggest that a very emotional decision state (emotion treatment, loss domain) lowers the association between an intuitive trait and risk taking. Rather than increasing the effects of decision-making traits, a decisional fit may

actually decrease the association between the trait and risky choices. Thus, we fail to find support for hypothesis 3.

> ***Result 3:*** We observe a weaker association between an intuitive decision making tait and risk taking in the emotion treatment than the reason treatment when choices are made in the gain domain but not when made in the loss domain. No such differences in association across treatments are found for the deliberative decision making trait.

7. Discussion and Conclusion

We study the effects of dual processing differences, both in individual traits and decision states, on risky choices using an incentivized task over monetary outcomes. We find that preferences for an intuitive decision making trait increase risk taking, while preferences for a deliberative decision making trait decrease risk taking. We also show that direct instructions interventions that aim at fostering the use of intuitive and deliberative processing, respectively, have no effect on risk taking in this task. Analyzing the interaction of decision-making traits and states in our experiment shows a trend towards an intuitive trait being less important in determining risk preferences in the loss domain and when subjects are instructed to rely on their emotions.

Our findings are in line with Schunk and Betsch (2008), who suggest that a more intuitive decision making trait amplifies the curvature of the utility function while a more deliberative decision making trait leads to more linear function, if utility functions for our task tend to be convex. Different from previous studies on the relation between decision-making traits and risk taking, we provide results from a large representative sample and control for both understanding and socioeconomic differences. Thus, we can with some confidence rule out that our findings on the relation between decision-making traits and risk taking are driven by other individual differences that are related with both traits and risky choices. Our results suggest that differences in the type of decision processing that individuals prefer to rely on partly explain individual differences in risk taking beyond potential confounds.

In line with the study by Kocher et al. (2018), who manipulate decision processes through time pressure, we find that our manipulation of processing has no effect on risk preferences over gains. Different from their study, we cannot find an effect of direct instructions in the loss domain either. However, this is not a failure to successfully manipulate states, as our manipulation checks suggest that participants paid attention to the manipulation and they report compliance. This suggests that appeals which require introspection do not easily alter risk

behavior. These results shed some doubt on whether campaigns that aim to affect risky choices through direct appeals to emotions or analytical thinking can in fact influence behavior beyond any effects of providing pure information or drawing attention.

The study of interactions between decision-making traits and states can teach us about the process with which individuals make decisions involving risk. Our results suggest that individual differences in the tendency to rely on deliberation are a rather stable determinant of risk preferences across situations. Individual differences in the tendency to rely on intuition when making decisions, on the other hand, only significantly determine risky choices when the decision state is not emotionally laden. If the state is emotionally laden, e.g. when facing the potential to lose money or in our emotion treatment, individual differences in the trait no longer determine risk taking. These findings are not in line with what we predicted following regulatory fit theory (Higgins 2005). Regulatory fit theory suggests that a fit between trait and state would increase the predictive power of that trait. Rather, we find that individuals predominantly rely on their intuitive trait when a situational cue for intuitive and emotion-based decision making is absent. Thus, our results suggest a novel explanation for the interaction between intuitive states and traits in risky choice: When a situational cue is present, traits matter less.

The reason that we find interaction effects only for the tendency to rely on intuition but not for the tendency to rely on deliberation may be due to our risk elicitation task itself, which may make one type of processing more suitable than another (see Rusou et al. 2013 for a discussion). This study elicited risk preferences with the method most commonly used in the literature, which asks subjects to make a number of choices about monetary gambles. Our task relies on description, numbers and probabilities, which could make a more deliberative and a less intuitive processing more suitable. Some real-life economic decisions, such as pension investments and insurance purchases, have such explicit numeric features. However, risky choices in other domains may be inherently more intuitive. For instance, health risks such as smoking and speeding are more likely to be characterized by a spontaneous and intuitive decision situation (besides also having quantifiable economic consequences). Our results clearly suggest that the affect elicited by the decision itself, the situational cues to use deliberation or intuition, and intuitive versus deliberative decision-making traits all contribute to how risky choices are made. It remains open how the importance of decision processing differs for risky choices in other domains.

References

Allport, G. W. & Odbert, H. S. (1936). Trait-names: A psycho-lexical study. *Psychological Monographs*, 47(1), i-171., http://dx.doi.org/10.1037/h0093360

Andersen, S., Harrison, G.W., Lau, M.I., & Rutström, E., (2008). Eliciting risk and time preferences. *Econometrica* 76 (3), 583–618.

Ben Zur, H. & Breznitz, S. J. (1981). The effect of time pressure on risky choice behavior. *Acta Psychologica*, 47(2), 89–104.

Betsch, C. (2004). Präferenz für Intuition und Deliberation. Inventar zur Erfassung von affect- und kognitionsbasiertem Entscheiden [Preference for intuition and deliberation (PID): An inventory for assessing affect- and cognition-based decision-making]. *Zeitschrift für Differentielle und Diagnostische Psychologie*, 25, 179–197.

Betsch, C. & Kunz, J.J. (2008). Individual Strategy Preferences and Decisional Fit. *Journal of Behavioral Decision Making*.

Cahlikova, J. & Cingl, L. (2017). Risk preferences under acute stress. *Experimental Economics*, 20(1), 209–236.

Chandler, J. J. &Pronin, E. (2012). Fast thought speed induces risk taking. *Psychological Science*, 23(4), 370–374.

Denes-Raj, V. & Epstein, S. (1994). Conflict between intuitive and rational processing: When people behave against their better judgment. *Journal of Personality and Social Psychology*, 66, 819–829.

Dohmen, T., Falk, A., Huffman, D., Sunde, U., Schupp, S. & Wagner, G.G.; Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences, *Journal of the European Economic Association*, Volume 9, Issue 3, 1 June 2011, Pages 522–550.

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, 49(8), 709–724.

Epstein, S., Pacini, R., Denes-Raj, V. & Heier, H. (1996). Individual differences in intuitive–experiential and analytical–rational thinking styles. *Journal of Personality and Social Psychology*, 71(2), 390-405.

Fernandez-Duque, D. & Wifall, T. (2007). Actor/observer asymmetry in risky decision making. *Judgment and Decision Making*, Vol. 2, No. 1, February 2007, pp. 1–8.

Freeman, N. and Muraven, M. (2010). Self-Control Depletion Leads to Increased Risk Taking. *Social Psychological and Personality Science*. Vol 1, Issue 2, pp. 175 – 181. https://doi.org/10.1177/1948550609360421.

Hammond, K. R., Hamm, R. M., Grassia, J., & Pearson, T. (1987). Direct comparison of the efficacy of intuitive and analytical cognition in expert judgment. *IEEE Transactions on Systems, Man, and Cybernetics*, 17, 753–770.

Higgins, E.T. (2005). Value From Regulatory Fit. *Current Directions in Psychological Science*, 14(4), 209–213.

Holt, C.A. & Laury, S.K. (2002). Risk aversion and incentive effects. *American Economic Review*, 92(5), 1644–1655.

Horstmann, N., Hausmann, D. & Ryf, S. (2010). Methods for inducing intuitive and deliberative processing modes. In: Glöckner, A; Witteman, C. *Foundations for Tracing Intuition: Challenges and Methods.* 0: Psychology Press, UK, 219-237.

Kahneman, D. & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk, *Econometrica*, 47(2), pp. 263-291.

Kahneman, D. (2011). Thinking, fast and slow. New York: Farrar, Straus and Giroux.

Kandasamy, N., Hardy, B., Page, L., Schaffner, M., Graggaber, J., Powlson, A. S., Fletcher, P. C., Gurnell, M. & Coates, J. (2014). Cortisol shifts financial risk preferences. *Proceedings of the National Academy of Sciences*, 111(9), 3608–3613.

Kirchler, M., Andersson, D., Bonn, C., Johannesson, M., Sørensen, E., Stefan, M., Tinghög, G. & Västfjäll, D. (2017). The effect of fast and slow decisions on financial risk taking. *Journal of Risk and Uncertainty* 54: 37-59.

Kirkpatrick, L. A. & Epstein, S. (1992). Cognitive-experiential self-theory and subjective probability: Further evidence for two conceptual systems. *Journal of Personality and Social Psychology*, 63, 534–544.

Kocher, M. G., Pahlke, J. & Trautmann, S. T. (2013). Tempus fugit: Time pressure in risky decisions. *Management Science*, 59(10), 2380–2391.

Kocher, M.G., Schindler, D., Trautmann, S.T. & Xu, Y. (2018) Risk, time pressure, and selection effects. *Exp Econ*. https://doi.org/10.1007/s10683-018-9576-1

Koppel, L., Andersson, D., Morrison, I., Posadzy, K., Västfjäll, D. & Tinghög, G. (2017). The effect of acute pain on risky and intertemporal choice. *Experimental Economics*. DOI: 10.1007/s10683-017-9515-6

Kowert P. A. & Hermann, M. G. (1997). Who Takes Risks? Daring and Caution in Foreign Policy Making. *The Journal of Conflict Resolution*, Vol. 41, No. 5 (Oct., 1997), pp. 611-637.

Levine, E. E., Barasch, A., Rand, D., Berman, J. Z., & Small, D. A. (2018). Signaling emotion and reason in cooperation. *Journal of Experimental Psychology: General*, 147(5), 702-719. http://dx.doi.org/10.1037/xge0000399

Li, S. & Liu, C.-J. (2008). Individual differences in a switch from risk-averse preferences for gains to risk-seeking preferences for losses: can personality variables predict the risk preferences? *Journal of Risk Research*, Vol. 000, No. 000, pp. 1–14.

Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. Psychological Bulletin, 127(2), 267-286.

Miller, P.M., Fagley, N.S. & Casella, N.E. (2009). Effects of problem frame and gender on principals' decision making. *Soc Psychol Educ*, 12, pp. 397–413.

Pachur, T. & M. Spaar (2015). Domain-specific preferences for intuition and deliberation in decision making, *J. Appl. Res. Memory Cogn.,* 4 (3) (2015), pp. 303-311.

Pacini, R. & Epstein, S. (1999). The relation of rational and experiential information processing styles to personality, basic beliefs, and the ratio-bias phenomenon. *Journal of Personality and Social Psychology*, 76(6), 972-987.

Persson, E., Asutay, E., Hagman, W., Västfjäll, D. & Tinghög, G. (2018). Affective Response Predicts Risky Choice for Fast, but Not Slow, Decisions. *Journal of Neuroscience, Psychology, and Economics*, in press.

Peters, E., Västfjäll, D., Slovic, P., Mertz, C. K., Mazzocco, K. & Dickert, S. (2006). Numeracy and decision making. *Psychological Science*, 17, 407–413.

Porcelli, A. J. & Delgado, M. R. (2009). Acute stress modulates risk taking in financial decision making. *Psychological Science*, 20(3), 278–283.

Rand, D.G. (2016): Cooperation, Fast and Slow. *Psychological Science*, Vol 27, Issue 9, pp. 1192 – 1206.

Schunk, D. & Betsch, C. (2006). Explaining Heterogeneity in Utility Functions by Individual Differences in Decision Modes. *Journal of Economic Psychology*. 27. 386-401.

Slovic, P. (2010). The feeling of risk: New perspectives on risk perception. London: Earthscan.

Spielberger, C. D., & Sydeman, S. J. (1994). State-Trait Anxiety Inventory and State-Trait Anger Expression Inventory. In M. E. Maruish (Ed.), The use of psychological testing for treatment planning and outcome assessment (pp. 292-321). Hillsdale, NJ, US: Lawrence Erlbaum Associates, Inc.

Spiliopoulos, L. & Ortmann, A. (2018). The BCD of response time analysis in experimental economics. *Experimental Econonomics* (2018) 21: 383. https://doi.org/10.1007/s10683-017-9528-1.

Tinghög, G., Andersson, D., Bonn, C., Böttiger, H., Josephson, C., Lundgren, G., Västfjäll, D., Kirchler, M. & Johannesson, M.. (2013). Intuition and cooperation reconsidered. *Nature.* 498. E1-2; discussion E2. 10.1038/nature12194.

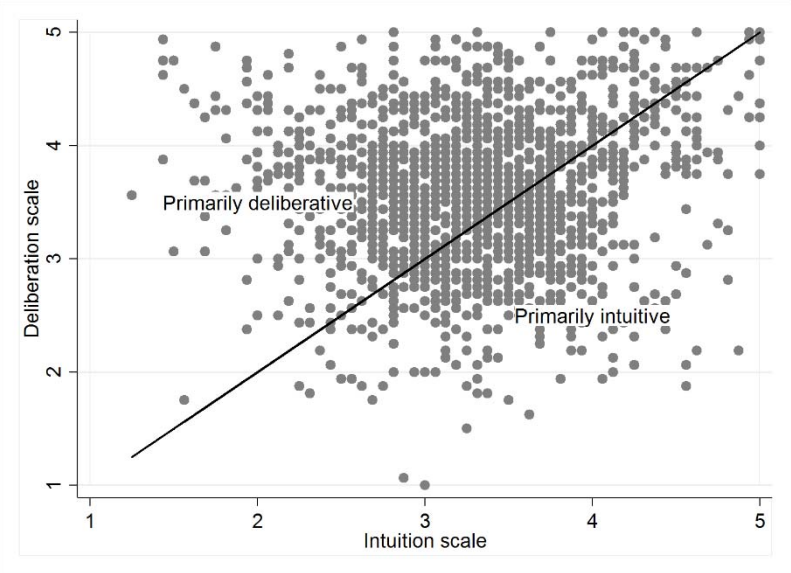
Västfjäll D., Slovic P., Burns W.J., Erlandsson A., Koppel L., Asutay E. & Tinghög G. (2016) The Arithmetic of Emotion: Integration of Incidental and Integral Affect in Judgments and Decisions. *Frontiers in Psychology.* 7:325. doi: 10.3389/fpsyg.2016.00325.

Young, D. L., Goodie, A. S., Hall, D. B., & Wu, E. (2012). Decision making under time pressure, modeled in a Prospect Theory framework. *Organizational Behavior and Human Decision Processes*, 118, 179–188.

Appendix

Part A

Figure A1. Scatterplot of decision making trait scales (N = 1,828)



Notes: The figure shows one scale for preferences for intuition in decision making (M = 3.30, SD = 0.61, Cronbach's α = 0.88) and one scale for preferences for deliberation in decision making (M = 3.55, SD = 0.64, Cronbach's α = 0.91), which were created by taking the mean of all statement ratings for each individual. The scales have a positive and small correlation (ρ = 0.11, p < 0.001). 64.82% of individuals make decisions primarily based on deliberation and 35.18% of individuals make decisions based primarily on intuition.

Table A1. Descriptive statistics

	Mean	*SD*	*Min*	*Max*
Age	47.33	15.98	18.00	82.00
Female	0.52	0.50	0.00	1.00
Married or live-in partner	0.62	0.49	0.00	1.00
Children	0.84	0.36	0.00	1.00
Primary education	0.08	0.27	0.00	1.00
High School	0.46	0.50	0.00	1.00
Tertiary education	0.46	0.50	0.00	1.00
Self-employed	0.05	0.23	0.00	1.00
Unemployed	0.09	0.29	0.00	1.00
Income (log)	11.11	3.81	0.00	21.98
Working class parental background	0.39	0.49	0.00	1.00
Risk preferences:				
- Share of risky choices in gain domain	0.53	0.38	0.00	1.00
- Share of risky choices in loss domain	0.54	0.35	0.00	1.00
Intuitive trait scale	3.30	0.61	1.25	5.00
Deliberative trait scale	3.55	0.64	1.00	5.00
Primarily intuitive	0.35	0.48	0.00	1.00
Observations	1,828			

Notes: The total sample are 1,832 subjects. Subjects that report to be younger than 18 (2 subjects) or older than the current maximum age in Sweden (2 subjects) are excluded from the sample. All variables are self-reported measures from the survey.

Table A2. Representativeness of sample

	Sample		Population		X^2-*test/ t*-test	
	M	*SD*	*M*	*SD*	X^2/ *t*	*p*
Age	47.33	47.33	46.31	15.98	2.751	0.006
Female	0.52	0.52	0.49	0.50	4.892	0.027
Primary School	0.08	0.08	0.15	0.27	67.243	< 0.001
High School	0.46	0.46	0.46	0.50	0.058	0.810
Tertiary education	0.46	0.46	0.39	0.50	33.147	< 0.001
Income (log)	11.11	3.81	11.48	2.94	-5.409	< 0.001

Note: Sample size is N = 1,828. Participants that report to be younger than 18 (2 participants) or older than 110 year (2 participants) are excluded from the sample. Population values (except for income) are obtained from Statistics Sweden for the year 2016. The average age and share of women refer to all individuals 20-75 years old (N = 6,840,654). Educational levels are averages for the population ages 20-74 years old (N = 6,642,823). Individual labor income elicited in the survey is compared to the population values of the logarithm of labor and capital income in 2010 (N=6,684,887).

Table A3. Measures of risk preferences

Total number of risky options chosen	Certain alternative (switching point)	Lottery option 1	Lottery option 2	CRRA lower bound	CRRA upper bound
Gain domain					
7	-	0	100	$-\infty$	-0.609
6	65	0	100	-0.609	-0.357
5	60	0	100	-0.357	-0.159
4	55	0	100	-0.159	0
3	50	0	100	0	0.132
2	45	0	100	0.132	0.244
1	40	0	100	0.244	0.340
0	35	-	-	0.340	∞
Loss domain					
7	-	0	-100		
6	-35	0	-100		
5	-40	0	-100		
4	-45	0	-100		
3	-50	0	-100		
2	-55	0	-100		
1	-60	0	-100		
0	-65	-	-		

Table A4. Transitivity violations in the risk elicitation tasks

	Number of subjects	Share of total sample
Switching mistake in gain domain	198	10.8%
Switching mistake in loss domain	490	26.8%
Total	577	31.6%

Part B – Robustness checks

Table B1. Risky choices across treatments

	Baseline	Emotion treatment	Reason treatment	Emotion vs. Reason
Share of risk-seeking subjects (4 or more risky choices), only rational choices				
Gain domain	0.50 (0.50)	0.55 (0.50)	0.51 (0.50)	$X^2 = 1.498$ $p = 0.221$
Loss domain	0.57 (0.50)	0.58 (0.49)	0.57 (0.50)	$X^2 = 0.132$ $p = 0.717$
Number of observations	429	403	419	
Mean share of risky choice, full sample				
Gain domain	0.53 (0.39)	0.54 (0.39)	0.52 (0.37)	$t = 0.711$ $p = 0.477$ [-0.03, 0.06]
Loss domain	0.55 (0.35)	0.55 (0.36)	0.54 (0.35)	$t = 0.667$ $p = 0.505$ [-0.03, 0.05]
Number of observations	612	612	604	

Notes: Standard deviations in parentheses.

Table B2. Main effects of traits and interaction effects of states and traits on risky choices (binary)

Logit regressions. Dependent variable: Share of risk-seeking subjects				
	Gain domain		Loss domain	
	(1)	(2)	(3)	(4)
Intuitive trait	0.431***		0.091	
	(0.115)		(0.119)	
Deliberative trait	-0.233**		-0.299**	
	(0.111)		(0.119)	
Primarily intuitive		0.685***		0.363
		(0.222)		(0.221)
Emotion treatment	-1.586*	-1.470*	0.633	0.718
	(0.886)	(0.884)	(0.883)	(0.873)
Int. trait X Emotion treatment	-0.255*		0.027	
	(0.153)		(0.156)	
Del. trait X Emotion treatment	0.095		0.205	
	(0.155)		(0.160)	
Prim. Int. X Emotion treatment		-0.472		-0.310
		(0.320)		(0.318)
Reason treatment	1.727*	1.648*	0.907	0.883
	(0.959)	(0.933)	(0.966)	(0.936)
Int. trait X Reason treatment	-0.061		0.132	
	(0.161)		(0.162)	
Del. trait X Reason treatment	0.062		0.256	
	(0.153)		(0.160)	
Prim. Int. X Reason treatment		-0.173		-0.002
		(0.317)		(0.322)
Constant	0.248	0.026	-0.225	-0.345
	(0.645)	(0.634)	(0.657)	(0.637)
Controls included	yes	yes	yes	yes
Observations	1,251	1,251	1,251	1,251
Difference Emotion-Reason treatment interaction terms				
Intuitive trait	-0.194		-0.105	
$X^2(1)$-statistic	1.66		0.50	
p-value	0.198		0.479	
Deliberative trait	0.033		-0.051	
$X^2(1)$-statistic	0.05		0.12	
p-value	0.827		0.733	
Prim. intuitive		-0.299		-0.308
$X^2(1)$-statistic		0.85		0.88
p-value		0.356		0.347

Notes: Robust standard errors in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The variables measuring linear decision-making traits are standardized to take mean zero and standard deviation one. Primarily intuitive is an indicator for whether the individual scores higher on the intuition than the deliberation scale. Control variables are age, an indicator for gender and marital status, an indicator for having a working class parental background, indicators for educational attainment, an indicator for whether the individual is unemployed, an indicator for whether the individual is self-employed and indicator variables for income quintiles; as well as interaction variabless between each individual characteristic and the treatment indicators.

Table B3. Main effects of traits and interaction effects of states and traits on risky choices (intervals)

Ordered logit regressions. Dependent variable: Share of risky choices				
	Gain domain		Loss domain	
	(1)	(2)	(3)	(4)
Intuitive trait	0.351***		0.146	
	(0.104)		(0.103)	
Deliberative trait	-0.151		-0.234**	
	(0.102)		(0.101)	
Primarily intuitive		0.603***		0.381**
		(0.204)		(0.189)
Emotion treatment	-1.701**	-1.627*	0.861	0.854
	(0.861)	(0.849)	(0.893)	(0.887)
Int. trait X Emotion treatment	-0.229*		-0.032	
	(0.136)		(0.138)	
Del. trait X Emotion treatment	-0.001		0.100	
	(0.146)		(0.150)	
Prim. Int. X Emotion treatment		-0.345		-0.146
		(0.297)		(0.295)
Reason treatment	1.302	1.219	1.843*	1.755*
	(0.899)	(0.880)	(0.944)	(0.912)
Int. trait X Reason treatment	0.057		0.168	
	(0.142)		(0.143)	
Del. trait X Reason treatment	0.019		0.206	
	(0.132)		(0.140)	
Prim. Int. X Reason treatment		0.006		-0.003
		(0.284)		(0.281)
Controls included	yes	yes	yes	yes
Observations	1,251	1,251	1,251	1,251
Difference Emotion-Reason treatment interaction terms				
Intuitive trait	-0.286		-0.200	
$X^2(1)$-statistic	4.78		2.22	
p-value	0.029		0.136	
Deliberative trait	-0.020		-0.106	
$X^2(1)$-statistic	0.02		0.52	
p-value	0.885		0.473	
Prim. intuitive		-0.351		-0.143
$X^2(1)$-statistic		1.43		0.22
p-value		0.231		0.641

Notes: Robust standard errors in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Constants not printed in table. The variables measuring linear decision-making traits are standardized to take mean zero and standard deviation one. Primarily intuitive is an indicator for whether the individual scores higher on the intuition than the deliberation scale. Control variables are age, an indicator for gender and marital status, an indicator for having a working class parental background, indicators for educational attainment, an indicator for whether the individual is unemployed, an indicator for whether the individual is self-employed and indicator variables for income quintiles; as well as interaction variabless between each individual characteristic and the treatment indicators.

Table B4. Main effects of traits and interaction effects of states and traits on risk preferences (full sample)

OLS regressions. Dependent variable: Share of risky choices				
	Gain domain		Loss domain	
	(1)	(2)	(3)	(4)
Intuitive trait	0.065***		0.024	
	(0.017)		(0.016)	
Deliberative trait	-0.031*		-0.036**	
	(0.016)		(0.015)	
Primarily intuitive		0.103***		0.073**
		(0.034)		(0.030)
Emotion treatment	-0.199	-0.195	0.045	0.050
	(0.134)	(0.136)	(0.128)	(0.128)
Int. trait X Emotion treatment	-0.036		-0.005	
	(0.023)		(0.021)	
Del. trait X Emotion treatment	0.005		0.008	
	(0.023)		(0.021)	
Prim. Int. X Emotion treatment		-0.045		-0.039
		(0.047)		(0.043)
Reason treatment	0.066	0.054	0.175	0.178
	(0.134)	(0.135)	(0.128)	(0.127)
Int. trait X Reason treatment	0.004		0.025	
	(0.023)		(0.022)	
Del. trait X Reason treatment	0.011		0.035*	
	(0.022)		(0.021)	
Prim. Int. X Reason treatment		-0.024		-0.061
		(0.047)		(0.044)
Controls included	yes	yes	yes	yes
Constant	0.590***	0.556***	0.414***	0.393***
	(0.099)	(0.100)	(0.093)	(0.092)
Observations	1,828	1,828	1,828	1,828
Adjusted R-squared	0.038	0.027	0.015	0.009
Difference Emotion-Reason treatment interaction terms				
Intuitive trait	-0.040		-0.030	
F(1,1206)-statistic	3.29		1.61	
p-value	0.070		0.204	
Deliberative trait	-0.006		-0.027	
F(1,1206)-statistic	0.06		2.12	
p-value	0.804		0.146	
Prim. intuitive		-0.021		0.022
F(1,1206)-statistic		0.21		0.24
p-value		0.645		0.625

Notes: Robust standard errors in parentheses with *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. The variables measuring linear decision-making traits are standardized to take mean zero and standard deviation one. Primarily intuitive is an indicator for whether the individual scores higher on the intuition than the deliberation scale. Control variables are age, an indicator for gender and marital status, an indicator for having a working class parental background, indicators for educational attainment, an indicator for whether the individual is unemployed, an indicator for whether the individual is self-employed and indicator variables for income quintiles; as well as interaction variabless between each individual characteristic and the treatment indicators.

Part C – Experimental Instructions

General Instructions

Welcome!

Thank you for participating in our study. The experiment in this study serves research that aims to understand how people make decisions. This research is being conducted by Manja Gärtner at Linköping University. She may be reached at manja.gartner@liu.se for questions or to report a research-related problem.

All decisions throughout this experiment are anonymous. The researchers do not know the identity of the respondents and no other participant will know who you are, nor will you know who other participants are.

This study will take about 20 minutes to complete.

The following experiment consists of several parts. You will be asked to make decisions that involve money and you have the chance to receive an additional payment. You will also be asked to answer questions about yourself.

Throughout the experiment there will be instructions that guide you through each part. Please read the instructions carefully.

Press next to start with the experiment.

Economic Games *(in random order)*

In this part of the experiment we ask you to make a number of decisions involving money. After the experiment, one of your decisions will be chosen at random and you will receive a payment according to that decision. CMA research AB will make sure that you will receive this payment within six weeks after the study ends, on top of the amount that you receive for participating.

Note that, because some of the payments depend also on the decisions of other participants, you will not get to know directly after finishing the survey how much money you will receive. We promise that the information in this survey is truthful. We do not use deception and you will interact with other, real participants.

Treatment *(randomized)*

Before you start this part, we would like you to reflect on how one can make decisions.

Sometimes people make decisions by using reason and relying on their brains. Other times, people make decisions by using emotion and relying on their hearts.

Many people believe that the brain [heart] is the part of our body that is most connected with good decision-making. When we think with our brains [feel with our hearts], rather than feel with our hearts [think with our brains], we make rationally [emotionally] satisfying decisions.

In this part of the experiment, **please make your decisions by relying on your brain [heart],** rather than your heart [brain].

Please press next to start with the first question.

Dictator game

In the following question, we ask you how to allocate 60 SEK between yourself and another participant. For this, you are paired randomly with another participant in this study. After the experiment, one of you is selected at random and that person's decision will determine the extra payments for you and the other participant.

We will make sure that all payments reach the other participant.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

How much of the 60 SEK would you like to give to yourself and how much to another participant in this study?

- To myself: ____
- To other participant: ____

Charity

In each of the following two questions, we ask you how to allocate 60 SEK between yourself and an organization, The Red Cross and unicef. The Red Cross is the world's leading organization in helping people affected by armed conflict and disasters in conflict zones. Unicef defends the rights of children around the world, helping them to survive and develop.

We will make sure that all payments reach the respective organization.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Press next to start to make the decision.

How much of the 60 SEK would you like to give to yourself and how much to the Red Cross?

- To myself: ____
- To Röda Korset: ____

How much of the 60 SEK would you like to give to yourself and how much to unicef?

- To myself: ____
- To unicef: ____

Public goods game

In the following, you randomly assigned to interact with 3 other participants in this experiment. All of you receive this same set of instructions.

Each person in your group is given 40 SEK for this interaction. You each decide whether to KEEP the 40 SEK for yourself, or to CONTRIBUTE it to the group.

If you CONTRIBUTE, 80 SEK goes into the group's common project, and is then evenly divided among the 4 group members. Thus, for every group member that chooses CONTRIBUTE, each group member receives 20 SEK.

If everyone chooses CONTRIBUTE, everyone's money will double: each of you will earn 80 SEK.

But if everyone else chooses CONTRIBUTE, while you KEEP the 40 SEK, you will earn 100 SEK, while the others will earn only 60 SEK. That is because if you CONTRIBUTE, you only get 20 SEK back.

Thus you personally lose money if you CONTRIBUTE, no matter what the others choose.

Please make sure that you understand the instructions above.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Press next to start making the decision.

Do you choose to KEEP the 40 SEK for yourself or CONTRIBUTE 80 SEK to the group?

KEEP the 40 SEK for yourself

CONTRIBUTE 80 SEK to the group

The next two items are meant to assess your understanding of the decision making task you just participated in.

Which choice alternative in the previous screen did earn the highest monetary payoff for the group as a whole?

KEEP the 40 SEK for yourself

CONTRIBUTE 80 SEK to the group

Which choice alternative in the previous screen did earn the highest monetary payoff for you personally?

KEEP the 40 SEK for yourself

CONTRIBUTE 80 SEK to the group

Prisoner's dilemma games

In this interaction you are matched with another person. You will be Person A, and your partner will be Person B.

Both of you start with 30 SEK. If one of the questions is randomly selected for payment, you will receive the money you have at the end.

You and Person B will both make a choice: Whether or not to transfer your 30 SEK to the other person, in which case they will get 60 SEK. If you both choose to transfer, you each get 60 SEK. If neither of you transfer, you each get 30 SEK.

But if you transfer while the other person does not, you get 0 SEK while the other person gets 90 SEK. And if you do not transfer while the other person does, you get 90 SEK while the other person gets 0 SEK.

Please make sure that you understand the instructions above. In the following four different decisions based on the above.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Press next to start making the four decisions.

If Person A and Person B choose at the same time, I choose:

Knowing that Person B transferred 30 SEK, I choose:

Knowing that Person B did not transfer 30 SEK, I choose:

If Person B gets to know whether or not I transferred 30 SEK before making her/his choice, I choose:

Transfer 30 SEK/ Do not transfer 30 SEK

The next two items are meant to assess your understanding of the decision making task you just participated in.

How many SEK do person Person A och Person B get if both choose to transfer 30 SEK? (30 SEK each; 60 SEK each; Person A gets 0 SEK and Person B gets 90 SEK; Person A gets 90 SEK and Person B gets 0 SEK)

How many SEK do Person A och Person B get if Person A chooses to transfer 30 SEK but Person B does not transfer any SEK? (30 SEK each; 60 SEK each; Person A gets 0 SEK and Person B gets 90 SEK; Person A gets 90 SEK and Person B gets 0 SEK)

Risk elicitation

In the following, you can either choose a fixed amount of money that you will receive for sure or to play. If you choose to play, we will flip a fair coin and you will receive 100 SEK if the head comes up on top, but you will receive 0 SEK if tails comes up on top. Thus, you have a 50% chance to win 100 SEK when you choose to flip the coin.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Each time you press next, you will get to the next question. Press next when you are ready to start.

Do you prefer (…) SEK for sure or to flip the coin for 100 SEK? *(randomized order)*

35 SEK for sure – flip the coin for 100 SEK

40 SEK for sure – flip the coin for 100 SEK

45 SEK for sure – flip the coin for 100 SEK

50 SEK for sure – flip the coin for 100 SEK

55 SEK for sure – flip the coin for 100 SEK

60 SEK for sure – flip the coin for 100 SEK

65 SEK for sure – flip the coin for 100 SEK

In the following, we give you a starter cash of 100 SEK. However, some of this money may be lost. You will face seven decisions on the following screens in which you can choose between losing a certain amount for sure and a lottery. If you choose the lottery, we will flip a fair coin and you lose nothing (0 SEK) if the head comes up on top, but you will lose 100 SEK if tails comes up on top. Thus, you have a 50% chance to loose nothing when you choose the lottery.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Press next to start making the seven decisions.

Do you prefer to lose (…) SEK for sure or to flip the coin for losing 100 SEK? *(randomized order)*

Lose 65 SEK for sure – Flip the coin for losing 100 SEK

Lose 60 SEK for sure – Flip the coin for losing 100 SEK

Lose 55 SEK for sure – Flip the coin for losing 100 SEK

Lose 50 SEK for sure – Flip the coin for losing 100 SEK

Lose 45 SEK for sure – Flip the coin for losing 100 SEK

Lose 40 SEK for sure – Flip the coin for losing 100 SEK

Lose 35 SEK for sure – Flip the coin for losing 100 SEK

Time discounting

In the following, we ask you to imagine that you win 1000 SEK. However, you can choose between receiving the 1000 SEK at a specific point in time or being paid a larger amount six months later.

You will face twelve decisions. These decisions will not be selected for payment, but we ask to imagine that you could receive these payments for real.

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Press next to start making the decisions.

Which option do you prefer? *(randomized order)*

1000 SEK today	1025 SEK in six months
1000 SEK today	1075 SEK in six months
1000 SEK today	1125 SEK in six months
1000 SEK today	1175 SEK in six months
1000 SEK today	1225 SEK in six months
1000 SEK today	1275 SEK in six months
1000 SEK in six months	1025 SEK in twelve months
1000 SEK in six months	1075 SEK in twelve months
1000 SEK in six months	1125 SEK in twelve months
1000 SEK in six months	1175 SEK in twelve months
1000 SEK in six months	1225 SEK in twelve months
1000 SEK in six months	1275 SEK in twelve months

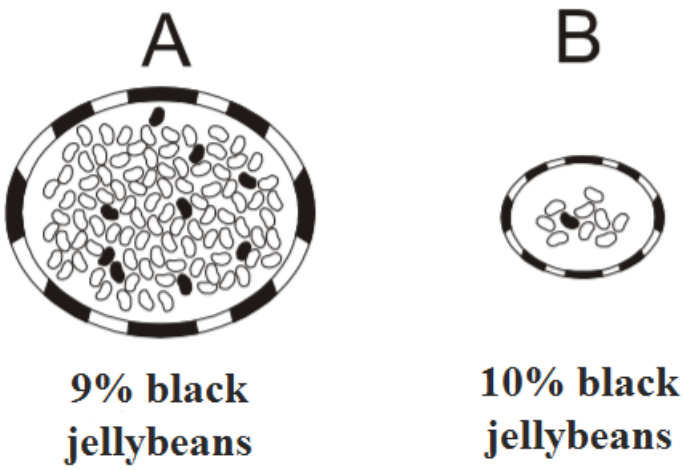
Jellybean task

On the next screen you will see two bowls filled with jellybeans. Bowl A has 100 jellybeans, Bowl B has 10 jellybeans. You will be asked to choose one of the two bowls. Please imagine that once you have selected a bowl, you will select a bean from that bowl (without looking at the bowl).

This decision will not be selected for payment, but imagine that if you selected a black bean, you would win SEK 100. Would you select a bean from Bowl A or Bowl B?

Remember to **make your decisions by relying on your brain [heart]**, rather than your heart [brain]. Press next to start to make the decision.

Press next to make your decision.



Which bowl would you prefer if a colored bean wins 100 SEK? (Bowl A, Bowl B)

Manipulation check questions

Please rate the following statements according to how well they describe you when answering the questions in the last part of this experiment. (5-point scale: 1 completely false to 5 completely true)

The instructions in this experiment made me think *more* about my decisions.

I relied on my intuition when making the decisions in this experiment.

I relied on my deliberation when making the decisions in this experiment.

I relied on my emotions when making decisions in this experiment.

Decision-making traits (USID)

Imagine how you make decisions in life *in general*. Please rate each statement according to how well the statement describes you. (5-point scale: 1 completely false to 5 completely true)

(Intuition scale)

When I make a decision, it is more important for me to feel the decision is right than to have a rational reason for it.

When I make a decision, I trust my inner feeling and reactions.

With most decisions it makes sense to completely rely on your feelings.

I prefer drawing conclusions based on my feelings, my knowledge of human nature, and my experience of life.

Using my gut feelings usually works well for me in figuring out problems in my life.

I believe in trusting my hunches.

I hardly ever go wrong when I listen to my deepest gut feelings to find an answer.

I tend to use my heart as a guide for my actions.

I generally make snap decisions.

I make quick decisions.

I am often aware of how to decide even before I review all aspects.

I've had enough experience to just know what I need to do most of the time without trying to figure it out every time..

The right way to decide usually comes to mind almost immediately.

I typically figure out the way to decide swiftly.

I quickly do the right thing when deciding because I've often faced almost the same thing before.

I rarely need to mull things over; how to decide usually becomes quickly apparent.

(Deliberation scale)

Developing a clear plan is very important to me.

I like detailed action plans.

I prefer well-prepared meetings with a clear agenda and strict time management.

I make definite engagements, and I follow up meticulously.

When I make decisions, I proceed step-by-step.

Before making decisions I usually think about the goals I want to achieve.

I prefer making detailed plans rather than leaving things to chance.

I usually have clear, explainable reasons for my decisions.

I want to have a full understanding of all problems.

I like to analyze problems.

I study every problem until I understand the underlying logic.

I have no problem thinking things through carefully.

I enjoy intellectual challenges.

I enjoy solving problems that require hard thinking.

I prefer complex problems to simple problems.

I enjoy thinking in abstract terms.

Maximizing Tendency scale

No matter what it takes, I always try to choose the best thing.

I don't like having to settle for "good enough".

I am a maximizer.

No matter what I do, I have the highest standards for myself.

I will wait for the best option, no matter how long it takes.

I never settle for second best.

I am uncomfortable making decisions before I know all of my options.

Whenever I'm faced with a choice, I try to imagine what all the other possibilities are, even ones that aren't present at the moment.

I never settle.

Questionnaire

In this last part of the experiment, we ask you to answer a number of questions about yourself. Please read the questions carefully and answer them as honestly as possible.

Press next to start with the questions.

Please rate how often you have engaged in the following activities ***within the last 12 months.*** (5-point scale: Never, Once, More Than Once, Often, Very often)

I have given money to a charity (other than during this study).

I have given money to a stranger who needed it (or asked me for it).

I have donate goods or clothes to charity.

I have done volunteer work for a charity.

I have donated blood.

I have taken active steps to reduce my contribution to carbon emissions (the so called "CO2 emissions footprint"), such as buying carbon offsets with flights, signing up for green energy, taking the train instead of flying, or other.

I have paid my bills in time.

I have saved money every month.

I have saved towards a long-term goal such as buying a car, education or an apartment.

I have traded bonds, stocks or fonds.

I have done physical exercise.

I have smoked.

Please answer the following questions about ***your life in general.***

Have you made an active choice of pension fund? (Never, Once, More than once)

Would you like to donate your organs after death? (yes/no/don't know)

Did you register as organ donor? (yes/no)

Which party would you vote for if there were to be an election today? (Centerpartiet, Feministiskt initiativ, Liberalerna (f.d. Folkpartiet), Kristdemokraterna, Miljöpartiet, Moderaterna, Socialdemokraterna, Sverigedemokraterna, Vänsterpartiet, Other party, Would leave a blank vote, Would not vote, Don't know / Don't want to answer)

How much economic redistribution do you want in society? No redistribution means that the state does not influence the income distribution at all. Full redistribution means that everyone earns the same amount after taxes and subsidies. (Scale from 1 No redistribution to 10 Full redistribution)

What is your gender? (man/woman)

Which year were you born?

What is your highest level of education? (1. Primary school 2. Secondary school 3. University, at most 3 years. 4. University, more than 3 years.)

What is your current occupation? (Employed in the public sector, Employed in the private sector, Own business, Unemployed, Student, Retired)

What is approximately your annual income (of you, not your household) before taxes in the last year (2016)? Annual income refers to wage income, capital income and pensions before taxes. It does not include transfers.

What is approximately your household before taxes in the last year (2016)? Annual income refers to wage income, capital income and pensions before taxes. It does not include transfers.

Which country were you born in? (Sweden/Other. Please specify)

Are you married or living with a partner? (yes/no)

Do you have children? (no, yes: 1,2,3, more than 3)

Which country were your parents born in? (Mother/Father: Sweden/Other and specify)

How would you primarily classify your social background during your upbringing? (1. Working class 2. Lower middle class 3. Middle class 4. Upper middle class. 5. Upper class)

What is/was your father's highest education? (1. Primary school 2. Secondary school 3. University, at most 3 years. 4. University, more than 3 years)

What is/was your mother's highest education? (1. Primary school 2. Secondary school 3. University, at most 3 years. 4. University, more than 3 years)

How would you primarily classify your current social standing? (1. Working class 2. Lower middle class 3. Middle class 4. Upper middle class. 5. Upper class)