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DEVELOPMENT OF THE LOSS AVERSION QUESTIONNAIRE

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ABSTRACT

Little is known about individual differences in loss aversion. This is particularly surprising if one considers the strong emphasis on individual differences in both economics and psychology. A Loss Aversion Questionnaire is proposed as an instrument that is capable of measuring interindividual differences in loss aversion. Two studies (N1 = 187; N2 = 455) were conducted to validate the measure. Results support the view that loss aversion can be conceptualized as a measure of interindividual difference. Various groups (students, entrepreneurs, managers, and civil servants) were found to differ significantly in the degree to which they displayed loss aversion. Furthermore, we report on issues of differential validity with other well-known concepts such as risk aversion, impulsivity, and anxiety

INTRODUCTION

Despite the widespread acceptance of prospect theory and its emphasis on loss aversion, little or nothing is known about individual differences in loss aversion. Mohammed and Schwall (2009) note a surprising and consistent reluctance to include individual differences in decision-making studies. This is certainly the case in the study of decisions that involve risk. Individual differences are usually disregarded when interpreting the descriptive/normative gap in risk assessment (Stanovich & West, 1998), and not much has changed since Li and Liu's (2008) warning that individual differences have received too little attention in studies on risk preference.

This gap in the research is particularly surprising if one considers the strong emphasis on individual differences in fields such as economics and psychology. Modern economic theory even puts the concept of heterogeneity at its core (Hommes, 2006). Nobel laureate Kenneth J. Arrow has emphasized that, in microeconomics, heterogeneity of expectations may be the most fundamental starting point. Without heterogeneity, there is no trade (Arrow, 2004). In psychology, cognitive styles, personality, cognitive abilities, and cognitive strategies represent fundamental determinants of individual and organizational behavior that become apparent in individual workplace actions and in organizational systems, processes, and routines (e.g. Sadler-Smith, 2009).

More specifically, it is remarkable how little attention has been paid to interindividual differences with respect to the longstanding concept of loss aversion. The impact on loss aversion of sociodemographic individual characteristics such as age, gender, education, or profession has been investigated in behavioral economics (e.g. Eckel & Grossman, 2003; Gächter, Johnson, & Herrmann, 2007; Haigh & List, 2005; Schmidt & Traub, 2002). However, the interest from personality psychologists has been minimal. Thus far, there are no answers to questions such as: Is loss aversion a personality trait? If it is, how stable is it over time and situations? Is it correlated with personality factors such as trait anxiety or sensation seeking?

Our study is intended to contribute to the loss aversion literature in a number of ways. First, we address the issue of individual differences in loss aversion. Second, with regard to its measurement, we question the current use of mathematical choice dilemmas, and address issues of generalizability, and external and predictive validity. Finally, we propose a new instrument for loss aversion that is capable of measuring individual differences, namely a psychometric scale entitled the Loss Aversion Questionnaire (LAQ).

PROSPECT THEORY AND LOSS AVERSION

Prospect theory (Kahneman & Tversky, 1979) is a model in the field of decision making and risk psychology that effectively describes how individuals differ from normative models in their day-to-day decision making. A central assumption of prospect theory is that the probability weighting function for risk-involved decisions toward gains has greater curvature than the function for losses. This was first described by Kahneman and Tversky (1979) as loss aversion, referring to the fact that “losses loom larger than gains.”

Köbberling and Wakker (2005) suggest that risk attitude includes three separate components: basic utility, probability weighting, and loss aversion. Loss aversion is deemed responsible for the largest part of risk aversion, and it refers to the tendency of people making subjective evaluations to place greater weight on losses than on objective equivalent gains. Outcomes are evaluated as losses (or gains) if they are below (or above) a reference outcome, which can be a status quo or an “aspiration level” (Heath, Larrick, & Wu, 1999). Indeed, one of the fundamentals of prospect theory is that people frame a problem around a reference point (Kahneman & Tversky, 1979), a phenomenon termed reference dependence (Tversky & Kahneman, 1991). In decision choices, loss aversion will play its role if something is framed as a loss rather than a gain relative to the reference point.

Loss aversion is frequently used to explain facts that are often observed, but it lacks a coherent explanation, which is not provided by expected-utility economic theories such as the endowment effect, status quo bias, and the Willingness to Accept–Willingness to Pay (WTA–WTP) gap (Kahneman, Knetsch, & Thaler, 1990). It has also been used to explain a wide array of nonlaboratory phenomena (for an overview, see Holmes, Bromiley, Devers, Holcomb, & McGuire, 2011) such as the behavior of cab drivers, who stop work earlier on days with bad weather, when their number of fares is highest (Camerer, Babcock, Loewenstein, & Thaler, 2000), or the fact that progress made by racial minorities is perceived differently according to group membership (Eibach & Keegan, 2006).

The existence of loss aversion has thus been extensively shown in a vast number of situations and via multiple research methods, ranging from economic and psychological laboratory studies to field studies, and by neurobiological approaches such as measuring skin conductance response (Sokol-Hessner et al., 2009) or pupil dilation and heart rate (Hochman & Yechiam, in press), and the use of fMRI scans (e.g. Rick, in press)

In his review of psychology and economics, Rabin (1998) emphasized the importance of loss aversion as a psychological phenomenon that should be integrated into the field of economics. Although risk and loss aversion are seen as crossovers between economics and psychology, the main body of research still focuses on the economics side. Consequently, measurement is usually in the form of mathematical choice dilemmas. The question arises whether the predictive validity of expected-utility-based assessments of loss aversion is sufficient. Such assessments typically consist of short, novel tasks that require participants simply to select between a provided set of alternatives. This type of task limits choice and restricts behavior, thereby giving personality traits little time to manifest (Mohammed & Schwall, 2009). A loss aversion questionnaire that does not utilize choice dilemmas may thus have better predictive validity. Mathematically formulated questionnaires also impose severe problems in measuring loss aversion among innumerate people. Moreover, even within economics, the predictive validity of such mathematical choices can be called into question. Kusev, van Schaik, Ayton, Dent and Chater (2009) disproved the assumption that decisions involving monetary gambles are predictive of domain-independent risk preferences, and even for same-domain preferences such as finances. In addition, because of their choice dilemma nature, most loss-aversion studies are conducted in laboratories using young, well-educated student subjects (Gächter et al., 2007), thereby limiting possible variation. The general problem of external validity of laboratory experiments raises further methodological issues (Allport, 1968). Lange and Ratan (2010) recently investigated and confirmed this in the case of loss aversion and concluded with a word of caution regarding transferring findings from laboratory experiments to the field. The research field is thus in need of a psychometric tool to measure loss aversion outside the games and decisions framework and the laboratory. This instrument will also enable researchers to relate loss aversion to other individual differences such as cognitive styles or personality.

Although classical decision theory has regarded risk propensity as situational (Kahneman & Tversky, 1979), it has long been acknowledged that individual risk attitude is a key part of personality (for an overview, see Mohammed & Schwall, 2009). We argue that loss aversion differs significantly across individuals, which is supported by the findings of Gächter et al. (2007). They found individual heterogeneity in loss aversion in their experiment: 4.9% of respondents were loss seeking, 7.1% were loss neutral, and 88% were loss averse. More importantly, the 88% loss-averse individuals differed in their degree of loss aversion; among them 10% were even classified as “very strongly loss averse.”

From the abovementioned research, we may infer that individual differences in loss aversion do exist. We propose that they can be measured with a psychometric questionnaire to overcome the issues associated with mathematical choice dilemmas.

Hypothesis 1. Individual differences in loss aversion can be measured with a psychometric questionnaire.

For the relation between loss aversion and personality traits, we can refer to the research into the relation between risk aversion and personality traits. In a study of reported risk taking over several decision domains, risk taking overall was associated positively with extraversion and openness, and negatively with neuroticism, agreeableness, and conscientiousness (Nicholson, Soane, Fenton-O’Creevy, & Willman, 2005). Another study found that risk taking was positively associated with openness and negatively with agreeableness and conscientiousness (Kowert & Hermann, 1997). According to Soane and Chmiel (2005), the research into the relationship between risk and personality has two important ramifications. First, people will avoid (or take) risks consistent with their character. Second, because personality is relatively stable throughout adulthood (McCrae & Costa, 1997), the tendency to avoid (or take) risks may also be robust. In line with their research, we propose that loss aversion is also correlated with stable personality traits.

As stated above, loss aversion is thought to be responsible for the majority of risk aversion (Kobberling & Wakker, 2005); thus, the following hypothesis can be deduced.

Hypothesis 2. Loss aversion is positively related to risk aversion.

It has been suggested by Camerer (2005) that the basis of loss aversion lies in fear. This is supported by the finding by De Martino et al. (2010) that patients with lesions to the amygdala, the brain region associated with fear processing, experienced no loss aversion. In addition, Loewenstein (2001) proposed that, in line with this risk-as-feelings hypothesis, risk-related research should take emotions into account. Considering the neurological basis and support from the risk-as-feelings hypothesis, we will investigate the relationship between loss aversion and fear.

Hypothesis 3. Loss aversion is positively related to anxiety.

It has been suggested that the neural systems responsible for loss aversion are the same as those for impulsive behavior (e.g. Tom, Fox, Trepel, & Poldrack, 2007). Damage to the DA system, for

instance, leads to a diminished sensitivity to loss aversion, but is at the same time responsible for increased impulsivity. We therefore make the following hypothesis.

Hypothesis 4. Loss aversion is negatively related to impulsivity.

METHOD

Constructing the Loss Aversion Questionnaire

We created an initial pool of items based on an extensive study of the loss aversion literature. In addition, a convenience sample of nine adults (mean age = 38.7 yr., five men and four women) were interviewed about their experience of and emotions toward the subject of loss and loss aversion. Sixty items were derived from the literature study and the interviews. Of those 60 items, we selected 20 items, after taking several criteria into account. We aimed to select a wide variety of losses, such as in personal affairs, reputation, status, and identity. Both positively and negatively formulated items were included to avoid acquiescence bias (Billiet & McClendon, 2000). To ensure content validity (Haynes, Richard, & Kubany, 1995; Most & Zeidner, 1995), three experts in the field of decision making judged the content and relevance of the original 60 items. Modifications such as the removal of synonymic items were made and double negations were removed. Feedback from the experts suggested that the items had acceptable face validity. Based on their review, 20 items were retained for use in the first test version of the Loss Aversion Questionnaire.

In the first two preliminary studies the reliability, consistency, and validity were tested.

Preliminary Study 1

In study 1, the 20 items retained based on the expert review were tested for the first time among a random selection of participants.

Sample and Procedure

A survey was conducted of 65 conference attendees from a variety of Belgian organizations. One of the authors of this study was a guest speaker and invited attendees to participate in the study. Ninety paper-and-pencil surveys were distributed and 65 were returned, indicating a response rate of 72%. The questionnaire consisted of English items; all conference attendees were multilingual, because they were attending a conference conducted in the English language. To minimize bias because of social desirability, confidentiality and anonymity were guaranteed. The sample consisted of 37 men (56.90%) and 28 women (43.10%), with a mean age of 41.23 (SD = 9.84), ranging from 24 to 69 yr. The average educational level was high; the majority of people in the sample held a university degree (67.70%), 18.50% a postgraduate degree, and 13.80% a secondary education degree.

Measures and Results

All 20 items were answered on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) to indicate the extent to which the respondent agreed with the statement. Participants were invited to write down qualitative feedback or provide it orally.

Loss Aversion

The 20 items had a Cronbach's α of .62 (Table 1).

Insert Table 1 about here

Preliminary Study 2

Based on qualitative feedback from preliminary study 1, five items were altered to achieve positive wording and less cognitive complexity. Based on previous experience and further theoretical research, five further items were added to improve quality. The following five items were reworded (strikethrough indicates removed words, bold indicates new words).

~~I really don't care~~ **feel awful** if someone talks bad about me behind my back.

~~I don't care~~ **It's horrible** if ~~my~~ **your** boss thinks less of ~~me~~ **you** than ~~I'm~~ **you're** really worth.

~~I wouldn't care if I had~~ **I would have problems with having** to move to a smaller place.

I would ~~never accept~~ **have no problem accepting** a job that has less pay than my previous/current one.

~~I wouldn't like it~~ **would feel very tense** if the company changed our way of working.

In addition, the following five extra items were added.

21. I always save my computer files in different locations.

22. I think I could cope with losing all my belongings in a fire.

23. I think I would go crazy, being locked up in prison.

24. I would be okay with trading my current car (bike) for a cheaper model.

25. I get easily attached to material things (my car, my furniture ...).

Moreover, items from the State-Trait Anxiety Inventory (STAI; Spielberger, 1983) for measuring anxiety were added to the survey to test their reliability for the validation study.

Sample and Procedure

A survey was conducted among 122 participants from a variety of Belgian organizations. Two hundred paper-and-pencil surveys were distributed after a lecture on general management and 122 were returned, indicating a response rate of 61%. The questionnaire consisted of English items; all participants were multilingual, because they had attended a lecture in the English language. To minimize bias because of social desirability, confidentiality and anonymity were guaranteed. The sample consisted of 99 men (81.10%) and 23 women (18.90%), with a mean age of 39.46 ($SD = 11.91$), ranging from 20 to 65 yr. The majority of the sample held a university degree (70.50%), 0.80% held a secondary education degree, and 28.70% a postgraduate degree.

Measures

All items were answered on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) to indicate the extent to which the respondent agreed with the statement. Because of the limited timeframe, the number of scales was limited.

Anxiety

To measure anxiety, the STAI was used. More specifically, the items from the Anxiety scale of the STAI-T were used. The STAI is one of the most frequently used and long-standing measures of anxiety, appearing in more than 3000 studies (Bieling, Antony, & Swinson, 1998). The STAI-T measures a stable inclination to experience anxiety, and perceive stressful situations as threatening. Based on the analysis of Bieling *et al.* (1998), all items of the Anxiety scale with a factor loading above .30 were used. Items were “I worry too much over stuff that doesn’t really matter,” “I have disturbing thoughts,” “I take disappointments so keenly that I can’t put them out of my mind,” and “I get in a state of tension or turmoil as I think over my recent concerns and interests.” Cronbach’s α was .63, indicating acceptable reliability for a four-item scale.

Loss Aversion

In preliminary study 2, the 25 items had a Cronbach’s α of .69.

Results

Table 2 shows the means and standard deviations of the 25 proposed items of the Loss Aversion Questionnaire. The number of missing values was low, ranging from 0% to 0.82% and the distribution of the missing values was considered random (Cohen & Cohen, 1983). The means of all items ranged from 2.43 to 3.87. All standard deviations exceeded 0.50, indicating adequate variability (Stumpf, Colarelli, & Hartman, 1983).

Insert Table 2 about here

A positive relationship was predicted between the Loss Aversion Questionnaire and the STAI, measuring anxiety, which was confirmed and significant ($r = .298, p < .01$).

Study 3

In study 3, the questionnaire was tested with a large number of participants in various positions. The 18 items with the highest item total correlation and greatest contribution to the overall reliability of the scale from the preliminary studies were retained for larger-scale testing.

Sample and Procedure

A survey was conducted among 479 participants. Six hundred paper-and-pencil surveys were distributed after a lecture on general management for managers (Belgium), a lecture for entrepreneurs (Belgium), a class of first-grade economics students (Belgium), and a congress for civil servants (the Netherlands). The response rate was 79%. The questionnaire consisted of English items; all participants were multilingual, because the congress and lectures were in the English language. To minimize bias because of social desirability, confidentiality and anonymity were guaranteed. The sample consisted of 296 men (61.80%) and 180 women (37.60%), with a mean age of 35.34 ($SD = 14.22$), ranging from 19 to 68 yr. Of the respondents, 0.40% held a primary school degree, 45.50% a secondary education degree, 41.50% a university degree (41.50%), and 4.00% a postgraduate degree. The sample consisted of 45 managers (9.40%), 55 entrepreneurs (11.50%), 204 students (42.60%), and 173 civil servants (36.10%).

Measures

All items were answered on a five-point Likert scale (1 = strongly disagree, 5 = strongly agree) to indicate the extent to which the respondent agreed with the statement. To select the items from the scales, relevance to the current study as well as high factor loadings in previous validation studies were taken into account. Where necessary, small adjustments were made to the items so that they would fit the response scale.

Impulsiveness

Impulsiveness was measured by a selection of four items of the Barratt Impulsiveness Scale (BIS; Barratt, 1959). More specifically, items were selected from a pool of 30 items from the BIS-11, a self-report scale designed to measure general impulsiveness (Patton, Stanford, & Barratt, 1995). Items were: "I act on impulse," "I say things without thinking," "I act on the spur of the moment," and "I do things without thinking." Cronbach's α was .80.

Anxiety

Anxiety was measured using the same items as in study 2, from the State-Trait Anxiety Inventory (STAI; Spielberger, 1983). Cronbach's α was .68.

Risk Aversion

To measure risk aversion, items were used from the DOSPERT scale (Weber, Blais, & Betz, 2002). The DOSPERT scale was developed by Weber *et al.* (2002) to measure individual differences in attitude towards risk and is the only psychometric scale available for measuring risk aversion. From the original 40-item scale, 10 items were selected and adapted so that they could be answered on our Likert scale. An example item is "I would dare to invest 10% of my annual income in a very speculative stock." Cronbach's α was .56.

Loss Aversion

Eighteen items with the highest item-total correlation and highest contribution to the overall reliability from the scale from the preliminary studies were retained for larger-scale testing. Cronbach's α was .82.

Results

Table 3 shows the means and standard deviations of the 18 items of the Loss Aversion Questionnaire. The number of missing values was low, ranging from 0% to 0.40% and the distribution of the missing values was considered random (Cohen & Cohen, 1983). The means of all items ranged from 2.48 to 3.94. All standard deviations exceeded 0.50, indicating adequate variability (Stumpf *et al.*, 1983). Cronbach's α supports hypothesis 1, which states that individual differences in loss aversion can be measured with a psychometric questionnaire.

Insert Table 3 about here

Based on an exploratory principal axis analysis with Oblimin rotation, the DOSPERT scale was removed because of low reliability and low factor loadings. Moreover, items 4 and 17 of the Loss Aversion Questionnaire were deleted because of a strong wording effect. BIS (impulsivity) loaded on a single factor and had no confounding characteristics with the items of the Loss Aversion Questionnaire. We then repeated the exploratory principal axis analysis with Oblimin rotation with the loss aversion and anxiety scales on two factors (Table 3). We chose Oblimin rotation given the correlation between the two scales. Only the items with a factor loading above .40 on the second factor (loss aversion), with no significant loadings (<.30) on the first factor (anxiety) were retained to form the final version of the Loss Aversion Questionnaire. This final version consists of seven items (in bold in Table 4) with a Cronbach's α of .72. We then performed a confirmatory factor analysis with AMOS 19 containing three factors for the final loss aversion scale (LAQ), the impulsivity scale (BIS) and the anxiety scale (STAI), respectively. Modification indices indicated that covariance should be added between the error terms of LAQ 5 and LAQ 8. An examination of the items suggests that this is theoretically justifiable because both deal specifically with "coping." Good fit is traditionally indicated by a nonsignificant Chi-square measure of absolute fit. However, this measure is often significant with a large sample size (Hu & Bentler, 1999). Therefore, other indices that are less susceptible to the effects of sample size are used. Good fit is indicated by a relative likelihood ratio (RLR; χ^2/df) < 5 or 3 (Wheaton, Muthen, Alwin, & Summers, 1977), a comparative fit index (CFI) > .9, and a root mean square error of approximation (RMSEA) < .06 (Hu & Bentler, 1999). The results indicated a good fit (χ^2 (100) = 221, 398, p < .001; RLR: 2.21; RMSEA = .05; and CFI = .921).

Insert Table 4 about here

Sociodemographic Variables

Gender.—Men and women did not differ significantly in their score on loss aversion ($F = 4.361, p = .102$) or impulsivity ($F = .158, p = .125$). They did, however, differ significantly in their score on anxiety ($F = .374, p = .003$) with women scoring higher on anxiety (mean = 2.82) than men (mean = 2.62).

Educational level.—Participants differed significantly according to their educational level in their score on loss aversion ($F = 80.457, p < .001$) and anxiety ($F = 17.836, p < .001$), and the difference was marginally significant in their score on impulsivity ($F = 2.211, p < .10$). Having a university or postgraduate degree ($N = 198$, mean = 2.82) significantly reduced displayed loss aversion ($F = .018, p < .000$) compared with secondary education ($N = 207$, mean = 3.44). The number of people with only primary school education ($N = 2$) was insufficient to draw valid conclusions. Similarly, people holding a university or postgraduate degree ($N = 198$, mean = 2.48) had significantly lower scores on anxiety ($F = .852, p < .000$) compared with those with only secondary education ($N = 216$, mean = 2.96). A university or postgraduate degree ($N = 198$, mean = 2.58) also meant a decreased impulsivity score ($F = 9.519, p < .05$) compared with secondary education alone ($N = 207$, mean = 2.76).

Employment type.—Participants also differed significantly according to their employment type in their scores on loss aversion ($F = 80.399, p < .001$), anxiety ($F = 19.891, p < .001$), and impulsivity ($F = 5.678, p < .001$). Students displayed the highest average score on loss aversion (mean = 3.46) and anxiety (mean = 2.97), and entrepreneurs displayed the highest average score on impulsivity (mean = 2.79). The lowest average score on impulsivity (mean = 2.30) was displayed by managers, as well as the lowest average score on anxiety (mean = 2.43). The lowest average score on loss aversion (mean = 2.78) was for the civil servants group.

Age.—Participants scored differently according to their age on loss aversion ($F = 5.574, p < .000$) and anxiety ($F = 2.519, p < .000$). To further explore the shape of these relations, we performed a median split according to age (median age = 36). Those who scored below the median ($N = 228$) displayed greater loss aversion (mean = 3.38) than those who scored above the median ($N = 233$, mean = 2.85; $F = .015, p < .000$). Similarly, those who scored below the median ($N = 237$) scored higher on anxiety (mean = 2.89) than those who scored above the median ($N = 237$, mean = 2.51; $F = 2.091, p < .000$).

Related Variables

Hypothesis 2 predicted a positive relationship between loss aversion, measured by the Loss Aversion Questionnaire, and risk aversion, measured by the DOSPERT scale. However, because of the low reliability of the DOSPERT scale in this study, the hypothesis cannot be tested. Similarly, hypothesis 3 predicted a positive relationship between the Loss Aversion Questionnaire and the State-Trait Anxiety Inventory, measuring anxiety, which was confirmed and significant ($r = .290$, $p < .01$). A negative relationship was predicted in Hypothesis 4 between impulsivity, as measured by the Barratt Impulsiveness Scale, and loss aversion, as measured by the Loss Aversion Questionnaire. However, the relation was not significant ($r = .087$, $p = .09$). Means, standard deviations, and correlations of the scales are given in Table 5.

Insert Table 5 about here

DISCUSSION

The present study aimed to contribute to the loss aversion literature by focusing on individual differences, which is a consistent gap in behavioral research (Li & Liu, 2008; Mohammed & Schwall, 2009; Stanovich & West, 1998).

It was argued that loss aversion is subject to individual differences and can be seen as a personality trait. The question remained concerning how to measure effectively those differences. We argued that the current measurement methods have limitations and that loss aversion can be measured more effectively by using a psychometric questionnaire. Loss aversion as a personality trait is supported by a wide array of research results, ranging from laboratory experiments (e.g. Gächter et al., 2007) to neuroscientific research (e.g. Tom et al., 2007). So far, measurements of loss aversion are usually conducted in laboratories in the format of mathematical choice dilemmas. It was argued that the predictive validity of expected utility-based assessments of loss aversion is questionable, because such assessments typically limit choice and restrict behavior, thereby giving personality traits little time to manifest (Mohammed & Schwall, 2009). Issues with external validity, limited individual variety, and applicability for innumerate people were discussed. To measure loss aversion in a more valid way, a psychometric questionnaire was proposed—namely, the Loss Aversion Questionnaire (LAQ).

The internal consistency of the scales was acceptable, with Cronbach's α ranging from .68 to .82. An exception to the case was the DOSPERT scale with a Cronbach's α of .56. The full version of the DOSPERT scale has been validated and normally shows acceptable internal consistency and construct reliability, ranging from .70 to .84 (Weber et al., 2002). Although the reason for our low Cronbach's α remains unclear, a low reliability for the DOSPERT scale has been found before (Brown, 2011).

We predicted and found a significant positive relationship between loss aversion and risk aversion, and between loss aversion and anxiety. Although we predicted a negative relationship between impulsivity and loss aversion, the results show a significant positive relationship. The reason for this remains unclear.

The finding that people differ significantly in their degree of displayed loss aversion according to educational level, employment level, and age was unexpected. Higher education seems to reduce the amount of displayed loss aversion, which was also noticed by Gächter *et al.* (2007). They refer to the findings from neuroscience (Tom et al., 2007), primate research (Chen, Lakshminarayanan, & Santos, 2006), and young children (Harbaugh, Krause, & Vesterlund, 2001), which suggest that loss aversion is deeply rooted, and requires learning and experience to overcome. Following the same

reasoning, age should also reduce displayed loss aversion. This was confirmed by our study, with people below the median age scoring significantly higher on loss aversion than people above.

Limitations and Future Research

Because of the rather low reliability score on the DOSPERT scale, the hypothesis concerning risk aversion could not be tested. The correlation between impulsivity and loss aversion was not significant; the reason remains unclear.

Our study aimed at a large target audience, instead of focusing on well-educated young people, as is the case with laboratory experiments. Although we reached a broad audience with regard to age (range 19–68 yr.), the educational level of respondents remained quite high with 45.5% holding a high school qualification and 49.3% a university or postgraduate degree. Further research should seek to include people with lower educational attainment.

Likewise, future research should test the Loss Aversion Questionnaire with a longitudinal design, which would test for the stability of loss aversion as a personality trait.

This paper has contributed to the loss aversion literature by shedding light on the psychological side of the phenomenon and highlighting the importance of individual differences in loss aversion. The LAQ promises to be a useful and valid questionnaire for measuring loss aversion on a large scale without the need to resort to mathematical choice dilemmas or other forced-choice laboratory tasks.

REFERENCES

- Allport, G. W. (1968). The historical background of modern psychology. In G. Lindzey & E. Aronson (Eds.), *The handbook of social psychology* (Vol. 1): Reading, Mass.: Addison-Wesley.
- Arrow, K. J. (2004). In D. Colander, R. P. F. Holt & J. B. Rosser (Eds.), *The Changing Face of Economics. Conversations with Cutting Edge Economists*. Ann Arbor: The University of Michigan Press.
- Barratt, E. S. (1959). Anxiety and impulsiveness related to psychomotor efficiency. *Perceptual and Motor Skills*, 9, 191 - 198.
- Bieling, P. J., Antony, M. M., & Swinson, R. P. (1998). The State-Trait Anxiety Inventory, Trait version: Structure and context re-examined. *Behavior Research and Therapy*, 36, 777 - 788.
- Billiet, J. B., & McClendon, M. J. (2000). Modeling acquiescence in measurement models for two balanced sets of items. *Structural Equation Modeling*, 7, 608 - 628.
- Brown, A. B. (2011). The relationship of expected value-based risky decision making tasks to attitudes toward various kinds of risks Retrieved September 13, 2011, from <http://etd.ohiolink.edu/send-pdf.cgi/Brown%20Andrew%20B.pdf?ucin1304448647>
- Camerer, C. (2005). Three cheers - psychological, theoretical, empirical – for loss aversion. *Journal of Marketing Research*, 42(2), 129 - 133.
- Camerer, C., Babcock, L., Loewenstein, G., & Thaler, R. (2000). Labor supply of New York City cab drivers: one day at a time. *The Quarterly Journal of Economics*, 112(2), 407 - 441.
- Chen, M. K., Lakshminarayanan, V., & Santos, L. R. (2006). How basic are behavioral biases? Evidence from Capuchin monkey trading behavior. *Journal of Political Economy*, 114(3), 517 - 537.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences* (2 ed.): Hillsdale, NJ: Erlbaum.
- demartino, B., Camerer, C., & Adolphs, R. (2010). Amygdala damage eliminates monetary loss aversion. *Proceedings of the National Academy of Sciences of the United States of America*, 107(8), 3788 - 3792.
- Eckel, C. C., & Grossman, P. J. (2003). Forecasting risk attitudes: An experimental study of actual and forecast risk attitudes of women and men. Department of Economics, Virginia Tech.

- Eibach, R., & Keegan, T. (2006). Free at last? Social dominance, loss aversion, and white and black Americans' differing assessments of racial progress. *Journal of Personality and Social Psychology*, 90(3), 453 - 467.
- Gächter, S., Johnson, E. J., & Herrmann, A. (2007). Individual-level loss aversion in riskless and risky choices. CeDEx Discussion Paper. University of Nottingham.
- Haigh, M. S., & List, J. A. (2005). Do professional traders exhibit myopic loss aversion? An experimental analysis. *The Journal of Finance*, 60(1), 523 - 534.
- Harbaugh, W. T., Krause, K., & Vesterlund, L. (2001). Are adults better behaved than children? Age, experience, and the endowment effect. *Economic Letters*, 70(2), 175 - 181.
- Haynes, S. N., Richard, D. C. S., & Kubany, E. S. (1995). Content validity in psychological assessment: a functional approach to concepts and methods. *Psychological Assessment*, 7(238 - 247).
- Heath, C., Larrick, R. P., & Wu, W. (1999). Goals as reference points. *Cognitive psychology*, 38, 79 - 109.
- Hochman, G., & Yechiam, E. (in press). Loss aversion in the eye and in the heart: The autonomic nervous system's response to losses. *Journal of Behavioral Decision Making*.
- Holmes, R. M., Bromiley, P., Devers, C. E., Holcomb, T. R., & McGuire, J. B. (2011). Management theory applications of prospect theory: Accomplishments, challenges, and opportunities. *Journal of Management*, 37(4), 1069 - 1107.
- Hommel, C. (2006). Heterogeneous agent models in economics and finance. In K. L. J. In L. Tesfatsion (Ed.), *Handbook of computational economics, agent-based computational economics* (pp. 1109 - 1186): Amsterdam: Elsevier.
- Hu, L., & Bentler, P. M. (1999). Cutoff criteria in fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1 - 55.
- Kahneman, D., Knetsch, J. L., & Thaler, R. H. (1990). Experimental tests of the endowment effect and the Coase Theorem. *The Journal of Political Economy*, 98(6), 1325 - 1348.
- Kahneman, D., & Tversky, A. (1979). Prospect Theory: an analysis of decision under risk. *Econometrica*, 47(2), 263 - 291.

- Kobberling, V., & Wakker, P. P. (2005). An index of loss aversion. *Journal of Economic Theory*, 122(1), 119 - 131.
- Kowert, P. A., & Hermann, M. G. (1997). Who takes risks? Daring and caution in foreign policy making. *Journal of Conflict Resolution*, 41(5), 611 - 637.
- Kusev, P., Schaik, P. v., Ayton, P., Dent, J., & Chater, N. (2009). Exaggerated risk: Prospect theory and probability weighting in risky choice. *Journal of Experimental Psychology*, 35(6), 1487 - 1505.
- Lange, A., & Ratan, A. (2010). Multi-dimensional reference-dependent preferences in sealed-bid auctions – How (most) laboratory experiments differ from the field. *Games and Economic Behavior*, 68, 634 - 645.
- 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*, 11(5), 673 - 686.
- Loewenstein, G. (2001). Risk as feelings. *Psychological Bulletin*, 127(2), 267 - 286.
- McCrae, R. R., & Costa, P. T. (1997). Personality trait structure as a human universal. *American Psychologist*, 52(5), 509 - 516.
- Mohammed, S., & Schwall, A. (2009). Individual differences and decision making: What we know and where we go from here. In G. P. H. J. K. Ford (Ed.), *International Review of Industrial and Organizational Psychology* (Vol. 24, pp. 249 - 312): John Wiley & Sons.
- Most, R. B., & Zeidner, M. (1995). Constructing personality and intelligence instruments: methods and instruments. In D. H. S. M. Zeidner (Ed.), *International handbook of personality and intelligence* (pp. 457 - 503). New York: Plenum Press.
- Nicholson, N., Soane, E., Fenton-O’Creevy, M., & Willman, P. (2005). Domain specific risk taking and personality. *Journal of Risk Research*, 8(2), 157 - 176.
- Patton, J. H., Stanford, M. S., & Barratt, E. S. (1995). Factor structure of the Barratt Impulsiveness Scale. *Journal of Clinical Psychology*, 51(6), 768 - 774.
- Rabin, M. (1998). Psychology and Economics. *Journal of Economic Literature*, 36, 11 - 46.

Rick, S. (in press). Losses, gains, and brains: Neuroeconomics can help to answer open questions about loss aversion. *Journal of Consumer Psychology*.

Sadler-Smith, E. (2009). A duplex model of cognitive style. In L. F. Zhang & R. J. Sternberg (Eds.), *Perspectives on the nature of intellectual styles* (pp. 3 – 28): Heidelberg: Springer.

Schmidt, U., & Traub, S. (2002). An experimental test of loss aversion. *The Journal of Risk and Uncertainty*, 25(3), 233 - 249.

Soane, E., & Chmiel, N. (2005). Are risk preferences consistent? The influence of decision domain and personality. *Personality and Individual Differences*, 38, 1781 - 1791.

Sokol-Hessner, P., Hsu, M., Curley, N. G., Delgado, M. R., Camerer, C., & Phelps, E. A. (2009). Thinking like a trader selectively reduces individuals' loss aversion. *Proceedings of the National Academy of Sciences*, 106(13), 5035 - 5040.

Spielberger, C. D. (1983). *Manual for the State-Trait Anxiety Inventory STAI (form Y)*: Palo Alto, CA: Mind Garden.

Stanovich, K. E., & West, R. F. (1998). Individual differences in rational thought. *Journal of Experimental Psychology*, 127(2), 161 - 188.

Stumpf, S. A., Colarelli, S. M., & Hartman, K. (1983). Development of the career exploration survey (CES). *Journal of Vocational Behavior*, 22, 191 - 226.

Tom, S. M., Fox, C. R., Trepel, C., & Poldrack, R. A. (2007). The neural basis of loss aversion in decision-making under risk. *Science*, 315(5811), 515 - 518.

Tversky, A., & Kahneman, D. (1991). Loss aversion in riskless choice: A reference-dependent model. *Quarterly Journal of Economics*, 106, 1039 - 1061.

Weber, E. U., Blais, A.-R., & Betz, N. E. (2002). A domain-specific risk-attitude scale: Measuring perceptions and risk behaviors. *Journal of Behavioral Decision Making*, 15, 263 - 290.

Wheaton, B., Muthen, B. O., Alwin, D., & Summers, G. (1977). Assessing reliability and stability in panel models. In D. R. Heise (Ed.), *Sociological Methodology* (pp. 84 - 136). San Francisco: Jossey-Bass.

TABLE 1

Means and Standard Deviations of Initial Pool of Items of study 1 (N = 65)

Item	Mean	SD
1. If I lose a sweater at home, I keep on searching until I find it.	3.40	1.44
2. I really don't care if someone talks bad about me behind my back. (R)	3.55	1.15
3. I would feel very down if I got fired, even if I know I will find a similar job.	3.48	1.23
4. I would hate it if a colleague thought that I'm not as good in my job now as I was before.	3.74	0.96
5. In marriage, a woman should keep her own last name.	3.75	1.11
6. In a relationship, I would hate not having my separate group of friends.	3.45	1.07
7. Losing your house to a fire is bad, but I would manage. (R)	2.30	1.15
8. I think eventually I could cope with losing the ability to walk. (R)	3.68	1.23
9. I tend to keep old stuff around.	2.89	1.19
10. If my reputation in the company takes a blow, I wouldn't want to come to work anymore.	2.75	1.21
11. If I can't find the documents I'm looking for, I get real nervous.	3.58	1.05
12. Once I've acquired a position in the company, I wouldn't want to take a step back.	3.69	1.07
13. I would feel very emotional if my car (bike) would be stolen.	2.97	1.40
14. I don't care if my boss thinks less of me than I'm really worth. (R)	3.74	1.18
15. I don't like throwing away stuff.	3.11	1.19
16. I wouldn't care if I had to move to a smaller place. (R)	3.00	1.25
17. I'd rather quit than get fired.	4.02	1.09
18. I would never accept a job that has less pay than my previous/current one.	2.36	1.02
19. I wouldn't like it if the company changed our way of working.	2.46	1.03
20. I don't care what people would think if I was suddenly unemployed. (R)	3.11	1.32

TABLE 2

Means and Standard Deviations of Initial Pool of Items of study 2 (N = 122)

Item	Mean	SD
1. If I lose a sweater at home, I keep on searching until I find it.	3.43	1.13
2. I really don't care if someone talks bad about me behind my back. (R)	3.82	0.98
3. I would feel very down if I got fired, even if I know I will find a similar job.	3.61	1.10
4. I would hate it if a colleague thought that I'm not as good in my job now as I was before.	3.71	0.90
5. In marriage, a woman should keep her own last name.	3.77	1.03
6. In a relationship, I would hate not having my separate group of friends.	3.06	0.99
7. Losing your house to a fire is bad, but I would manage. (R)	2.43	0.88
8. I think eventually I could cope with losing the ability to walk. (R)	3.33	1.16
9. I tend to keep old stuff around.	3.36	1.15
10. If my reputation in the company takes a blow, I wouldn't want to come to work anymore.	2.48	0.83
11. If I can't find the documents I'm looking for, I get real nervous.	3.37	0.90
12. Once I've acquired a position in the company, I wouldn't want to take a step back.	3.47	1.07
13. I would feel very emotional if my car (bike) would be stolen.	3.18	1.14
14. It's horrible if your boss thinks less of you than you're really worth.	3.87	0.88
15. I don't like throwing away stuff.	3.30	1.16
16. I would have problems with having to move to a smaller place.	2.98	1.04
17. I'd rather quit than get fired.	3.58	1.14
18. I would have no problem accepting a job that has less pay than my previous/current one. (R)	3.09	1.03
19. I would feel very tense if the company changed our way of working.	2.50	0.91
20. I don't care what people would think if I was suddenly unemployed. (R)	3.18	1.05
21. I always save my computer files on different locations.	3.40	1.32
22. I think I could cope losing all my belongings in a fire. (R)	3.17	1.08
23. I think I would go crazy, being locked up in prison.	3.67	1.16
24. I would be okay with trading my current car (bike) for a cheaper model. (R)	2.99	1.12
25. I get easily attached to material things (my car, my furniture, ..).	3.07	1.07

TABLE 3

Means and Standard Deviations of Items of study 3 (N = 479)

Item	Mean	SD
1. It's horrible if your boss thinks less of you than you're really worth.	3.94	0.86
2. I get easily attached to material things (my car, my furniture, ..).	2.97	1.10
3. I would have problems with having to move to a smaller place.	2.98	1.12
4. I tend to keep old stuff around.	2.88	1.07
5. I think eventually I could cope with losing the ability to walk. (R)	3.32	1.18
6. I go crazy if I lose something, even when it's not that important.	2.65	1.11
7. Once I've acquired a position in the company, I wouldn't want to take a step back.	3.52	1.04
8. I think I could cope losing all my belongings in a fire. (R)	3.23	1.15
9. I would feel very down if I got fired, even if I know I will find a similar job.	3.33	1.04
10. I don't care what people would think if I was suddenly unemployed. (R)	3.13	1.07
11. I don't like throwing away stuff.	2.95	1.11
12. I would feel very emotional if my car (bike) would be stolen.	3.11	1.15
13. I feel awful if someone talks bad about me behind my back.	3.60	1.01
14. I would hate it if a colleague thought that I'm not as good in my job now as I was before.	3.49	0.91
15. Losing your house to a fire is bad, but I would manage. (R)	2.49	0.98
16. I would feel very tense if the company changed our way of working.	2.50	0.88
17. I would have no problem accepting a job that has less pay than my previous/current one. (R)	3.26	1.02
18. I would be okay with trading my current car (bike) for a cheaper model. (R)	2.74	1.03

TABLE 4a – 4b – 4c – 4d

Principal axis analysis with Direct Oblimin rotation (STAI & LAQ)

<i>4a. Communalities</i>		
	Initial	Extraction
I worry too much over something that really doesn't matter.	.388	.450
I get in a state of tension or turmoil as I think over my recent concerns and interests.	.195	.168
I have disturbing thoughts.	.304	.301
I take disappointments so keenly that I can't put them out of my mind.	.355	.417
It's horrible if your boss thinks less of you than you're really worth.	.270	.178
I get easily attached to material things (my car, my furniture, ..)	.251	.249
I would have problems with having to move to a smaller place.	.166	.138
I think eventually I could cope with losing the ability to walk.	.291	.239
I feel awful if someone talks bad about me behind my back.	.253	.200
I go crazy if I lose something, even when it's not that important.	.331	.322
I think I could cope losing all my belongings in a fire.	.428	.270
Once I've acquired a position in the company, I wouldn't want to take a step back.	.265	.206
Losing your house to a fire is bad, but I would manage.	.454	.333
I would hate it if a colleague thought that I'm not as good in my job now as I was before.	.338	.221
I would feel very down if I got fired, even if I know I will find a similar job.	.286	.251
I don't care what people would think if I was suddenly unemployed.	.303	.293
I would feel very tense if the company changed our way of working.	.242	.238
I would have no problem accepting a job that has less pay than my previous/current one.	.294	.299
I would be okay with trading my current car (bike) for a cheaper model.	.341	.395
I would feel very emotional if my car (bike) would be stolen.	.251	.214

4b Pattern Matrix		
	Factor	
	1	2
I worry too much over something that really doesn't matter.	.699	-.061
I get in a state of tension or turmoil as I think over my recent concerns and interests.	.447	-.096
I have disturbing thoughts.	.594	-.115
I take disappointments so keenly that I can't put them out of my mind.	.637	.017
It's horrible if your boss thinks less of you than you're really worth.	.230	.261
I get easily attached to material things (my car, my furniture, ..)	.066	.465
I would have problems with having to move to a smaller place.	-.009	.375
I think eventually I could cope with losing the ability to walk.	.029	.474
I feel awful if someone talks bad about me behind my back.	.419	.052
I go crazy if I lose something, even when it's not that important.	.470	.164
I think I could cope losing all my belongings in a fire.	.055	.491
Once I've acquired a position in the company, I wouldn't want to take a step back.	.027	.440
Losing your house to a fire is bad, but I would manage.	.159	.483
I would hate it if a colleague thought that I'm not as good in my job now as I was before.	.389	.136
I would feel very down if I got fired, even if I know I will find a similar job.	.406	.157
I don't care what people would think if I was suddenly unemployed.	.333	.296
I would feel very tense if the company changed our way of working.	.351	.209
I would have no problem accepting a job that has less pay than my previous/current one.	-.096	.587
I would be okay with trading my current car (bike) for a cheaper model.	-.120	.678
I would feel very emotional if my car (bike) would be stolen.	.254	.284
Eigenvalue	5.005	1.783
Percentage of total variance accounted for	25.025%	8.916%

<i>4c. Structure Matrix</i>		
	Factor	
	1	2
I worry too much over something that really doesn't matter.	.669	.275
I get in a state of tension or turmoil as I think over my recent concerns and interests.	.401	.119
I have disturbing thoughts.	.539	.171
I take disappointments so keenly that I can't put them out of my mind.	.646	.324
It's horrible if your boss thinks less of you than you're really worth.	.355	.371
I get easily attached to material things (my car, my furniture, ..)	.289	.496
I would have problems with having to move to a smaller place.	.171	.371
I think eventually I could cope with losing the ability to walk.	.257	.488
I feel awful if someone talks bad about me behind my back.	.445	.254
I go crazy if I lose something, even when it's not that important.	.549	.390
I think I could cope losing all my belongings in a fire.	.292	.518
Once I've acquired a position in the company, I wouldn't want to take a step back.	.239	.453
Losing your house to a fire is bad, but I would manage.	.392	.560
I would hate it if a colleague thought that I'm not as good in my job now as I was before.	.454	.323
I would feel very down if I got fired, even if I know I will find a similar job.	.481	.352
I don't care what people would think if I was suddenly unemployed.	.476	.456
I would feel very tense if the company changed our way of working.	.452	.378
I would have no problem accepting a job that has less pay than my previous/current one.	.187	.541
I would be okay with trading my current car (bike) for a cheaper model.	.206	.620
I would feel very emotional if my car (bike) would be stolen.	.390	.406

<i>4d. Factor Correlation Matrix</i>		
Factor	1	2
1	1.000	.481
2	.481	1.000
Extraction Method: Principal Axis Factoring. Rotation Method: Oblimin with Kaiser Normalization.		

TABLE 5

Means, Standard Deviations and Intercorrelations (N = 479)

Scale	Mean	SD	LAQ	BIS	STAI	DOSPERT
LAQ	3.07	0.65	.82			
BIS	2.65	0.74	.078	.80		
STAI	2.70	0.72	.290**	.237**	.68	
DOSPERT	2.75	0.44	.322**	.001	.259**	.56

** $p < .01$; Cronbach's α in bold on diagonal