

# A Domain-Specific Risk-Taking (DOSPERT) scale for adult populations

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## Abstract

This paper proposes a revised version of the original Domain-Specific Risk-Taking (DOSPERT) scale developed by Weber, Blais, and Betz (2002) that is shorter and applicable to a broader range of ages, cultures, and educational levels. It also provides a French translation of the revised scale. Using multilevel modeling, we investigated the risk-return relationship between apparent risk taking and risk perception in 5 risk domains. The results replicate previously noted differences in reported degree of risk taking and risk perception at the mean level of analysis. The multilevel modeling shows, more interestingly, that within-participants variation in risk taking across the 5 content domains of the scale was about 7 times as large as between-participants variation. We discuss the implications of our findings in terms of the person-situation debate related to risk attitude as a stable trait.

Keywords: risk attitude, risk perception, risk taking, personality, psychometric scale.

## 1 Introduction

People differ in the way they resolve decisions involving risk and uncertainty, and these differences are often described as differences in risk attitude. In the expected utility framework and its variants, including prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992), such apparent differences in risk attitude are modeled by utility functions that differ in shape, with different degrees of concavity (convexity) to explain risk aversion (seeking). Risk attitude is the parameter that differentiates between the utility functions of different individuals (e.g., Pratt, 1964) and is intended as nothing more than a descriptive label for the concavity or convexity of the utility function. Popular interpretations of risk attitude, however, often consider it to be a personality trait (Weber, 1998).

The consideration of risk attitude as a personality trait has undergone a similar development as that of personality traits in general. While traits were initially defined as stable (i.e., situation-invariant) personality characteris-

tics (Allport & Allport, 1921) that were assumed to be the result of biological differences or early childhood experiences (Eysenck & Eysenck, 1985), the empirical observation of low correlations between trait-related behavior in different situations has given rise to more complex definitions that acknowledge the situational determinants of behavior while preserving generality in the way personality traits shape the pattern of behavior across situations (Mischel & Shoda, 1995).

The following two observations have been problematic for the simple expected-utility definition of risk attitude as a personality trait. First, different methods of measuring people's utility functions (and thus risk attitudes) have been shown to result in different classifications of individuals (Slovic, 1964). More importantly, even when using the same assessment method, individuals have not shown themselves to be consistently risk seeking (averse) across different domains and situations, both in laboratory studies (Schoemaker, 1990) and managerial contexts. MacCrimmon and Wehrung (1986, 1990) showed, for example, that managers have different risk attitudes when making decisions involving personal versus company money or when evaluating financial versus recreational risks. These problems limit the predictive validity of expected-utility based assessments of risk attitude.

Given the lability of expected-utility based assessments of risk attitude, it should not be surprising that measurement scales based upon them have not had much success in predicting people's choices or behaviors across a range of situations (Bromiley & Curley, 1992). The ob-

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served content-specificity of responses suggests that they should not be combined across content domains. Nevertheless, the Choice Dilemma Questionnaire (Kogan & Wallach, 1964), a commonly used scale, asks people for probability equivalents in twelve choice dilemmas from different domains of life, which are then combined into a single score that purportedly represents a person's risk attitude. Despite its obvious deficiencies the scale is still in use, primarily for lack of better alternatives.

Some researchers have recently argued that risk attitude may be more usefully conceptualized in the risk-return framework of risky choice imported from finance, for example, the Capital Asset Pricing Model (Markowitz, 1959) and its variants and generalizations (see Bell, 1995; Jia & Dyer, 1997; Sarin & M. Weber, 1993). Psychological risk-return models treat perceived riskiness as a variable that can differ between individuals and as a function of content and context (Weber, 1998). They decompose observed behavior (i.e., apparent risk taking) into an evaluation of benefits and risks as well as a trade-off between perceived benefits and perceived risks, with a person-specific willingness to trade off units of returns for units of risk (i.e., attitude towards perceived risk) that is assumed to be relatively stable across situations and domains (Weber & Hsee, 1998; Weber & Milliman, 1997). This provides for multiple ways in which characteristics of the decision maker and/of the situation can affect choices under risk. Apparent risk taking by the same person in two situations might differ, for example, because the decision maker perceives the risks and benefits to differ in magnitude in the two domains (e.g., in a recreational vs. a financial decision), while his or her attitude towards perceived risk is basically the same for both domains (Weber & Hsee, 1998; Weber & Milliman, 1997).

Empirical investigations have shown systematic individual, group, and cultural differences in perceptions of the riskiness of risky choice options (Bontempo, Bottom, & Weber, 1997; Slovic, 1998; Weber, 1988). A smaller number of studies have also documented group differences in the perception of perceived benefits (e.g., Johnson, Wilke, & Weber, 2004). After accounting for differences in the perception of the risk or returns of choice alternatives, however, people's perceived-risk attitude — defined as their willingness to trade off units of perceived risk for units of perceived return — has shown considerable cross-group and cross-situational consistency (Weber, 1998, 2001). The domain-specificity of risk taking thus seems to arise primarily from differences in the perception of the risks (and possibly benefits) of choice alternatives in different content domains, while the trait (or true attitude towards risk) that shows consistency across situations lies in the evaluation of risk (as it is perceived) as something that is either desirable (i.e., worth giving

up units of return for) or undesirable (i.e., something that needs to be compensated by units of return) (Weber, 2001).

Decision domains in which respondents have shown different degrees of risk taking and different perceptions of risks and benefits include gambling, financial investing, business decisions, and personal decisions (MacCrimmon & Wehrung, 1986, 1990). Personal decisions can be broken down into smaller categories that differ in associated goals and concerns (Weber, Ames, & Blais, 2005; Weber & Lindemann, in press), such as health/safety (e.g., seatbelt usage, smoking), social (e.g., confronting one's coworkers or family members), and ethical decisions (e.g., cheating on an exam, terminating a comatose family member's life support). One can expect to find differences in the perception of risks and benefits in these different domains of decisions because decisions in these domains score differently on the psychological risk dimensions (e.g., dread, familiarity, controllability) identified by Slovic, Fischhoff, and Lichtenstein (1986) that are known to affect risk perception. Affective reactions to risk in these different domains differ as the result of factors such as differential familiarity and controllability. Given recent evidence about the prominence of affective reactions in perceptions of risk (e.g., Slovic *et al.*'s affect heuristic, 2002; Loewenstein *et al.*'s risk-as-feelings framework, 2001), individual and domain differences in subjective perceptions of riskiness should not come as a surprise.

Based on these insights about the diverse set of determinants of decisions under risk, Weber, Blais, and Betz (2002) developed a risk-taking scale, the Domain-Specific Risk-Taking (DOSPERT) Scale, that allows researchers and practitioners to assess both conventional risk attitudes (defined as the reported level of risk taking) and perceived-risk attitudes (defined as the willingness to engage in a risky activity as a function of its perceived riskiness) in five commonly encountered content domains, i.e., ethical, financial (further decomposed into gambling and investment), health/safety, social, and recreational decisions.

The scale has been used and validated, and its factor structure replicated in a wide range of settings and populations (see <https://decisionsciences.columbia.edu/dospert/index.htm>). In addition to adequate internal-consistency reliability estimates, Weber *et al.* (2002) reported moderate test-retest reliability estimates and provided evidence for the factorial and convergent/discriminant validity of the scores with respect to constructs such as sensation seeking, dispositional risk taking, intolerance for ambiguity, and social desirability. Construct validity was also assessed via correlations with the results of a risky gambling task as well as with tests of gender differences.

Further evidence for the DOSPERS Scale's construct validity was provided by Zuniga and Bouzas (2005), who found that scores on the health/safety and recreational risk-taking subscales significantly predicted estimated blood alcohol concentrations in Mexican high-school students. Also, Hanoch, Johnson, and Wilke (2006) used the DOSPERS Scale to show that individuals selected to exhibit high levels of risk taking in one content area (e.g., bungee jumpers taking recreational risks) can be quite risk averse in other risky domains (e.g., financial decisions).

A recent review of a large number of instruments that measure risk propensity in healthcare decisions (Harrison, Young, Butow, Salkeld, & Solomon, 2005) describes the DOSPERS Scale as one of three that are "relevant to a clinical environment as they directly measure risk propensity across a number of everyday situations, including the propensity to take health-related risks" (p. 10). The DOSPERS Scale is additionally commended for its simultaneous measurement of multiple risk constructs such as risk taking, risk perception, and perceived-risk attitude.

Weber *et al.* (2002) also used the DOSPERS Scale to provide evidence for the psychological risk-return model of risky choice. They found that, for a given participant, the level of apparent risk taking varied across risk domains, yet his (her) domain-specific levels of perceived risk and benefits together explained a significant proportion of this variability, and for the great majority of respondents, the relationship between apparent risk taking and risk perception across domains was negative or neutral, suggesting perceived-risk aversion. Johnson *et al.* (2004) obtained similar findings at the aggregate, or mean, level across respondents with a sample of young German adults.

To facilitate the use of the DOSPERS Scale in a broader range of applied settings, the current paper provides a revision of the original scale by Weber *et al.* (2002) that had been developed and validated for American college undergraduates. The revised scale is both shorter (i.e., 30 vs. 40 items) and applicable to respondents from a broader set of age groups, cultures, and educational levels. The revised DOSPERS Scale was administered to groups of English- and French-speaking North Americans and by doing so, we also contributed a French translation of the scale to the literature. Although the DOSPERS Scale has been translated into several languages (German, Italian, Dutch, and Spanish) and validated in cultures speaking these languages (e.g., Johnson *et al.*, 2004; Zuniga & Bouzas, 2005), a French version was not available yet.

As explained above, to endorse a risk-return approach in assessing apparent risk taking presupposes the involvement of various determinants, that is, perceptions of ben-

efits and risk, as well as a more stable component that represents a person's propensity to favor (or shy away from) an option that he (she) perceives as being risky, which is referred to as a person's perceived-risk attitude (Weber *et al.*, 2002; Johnson *et al.*, 2004). Unfortunately, in the present study, perceptions of benefits could not be collected due to time constraints, so the focus here is exclusively on apparent risk taking, perceived risk, and perceived-risk attitude.

More specifically, we hypothesize the following, derived primarily from the risk-return model of risky choice, including cross-cultural comparisons (Weber & Hsee, 1998) and the work of Weber *et al.* (2002): (1) there exists considerable variability in apparent risk taking within and between individuals; (2) more importantly, controlling for perceived risk at the within-individuals (i.e., domain) level results in a significant reduction in this variability and allows for within-individuals consistency in perceived-risk attitude; (3) individuals are perceived-risk averse or neutral across both cultures, even though risk perception and risk taking and possibly degree of perceived-risk aversion may differ between cultures.

While our goal is to replicate and extend the findings reported by Weber *et al.* (2002), we are taking a very different analytic approach by using multilevel modeling to investigate the relationship between apparent risk taking and perception. To our knowledge, it is the first time this technique is used in the context of psychological risk-return models of risky choice and in the study of the domain-specificity of apparent risk taking in general. One of the compelling reasons for using multilevel modeling is that it allows for the decomposition of the total variance in risk taking into various components, and for the quantification and explanation of both within- and between-individuals variation in apparent risk taking.

## 2 Method

### 2.1 Materials

The items of the original DOSPERS Scale had been selected based on a careful examination of the literature on risk-taking behaviors (e.g., Byrnes, Miller, & Schafer, 1999), including a review of existing risk-taking measures, in an attempt to cover a broad range of risks of different sorts that might be encountered by young adults in Western cultures or people around them (see Weber *et al.*, 2002, for more detail regarding the development of the scale).

To generate a short version of the scale with items that would be interpretable by a wider range of respondents in different demographic groups, the 40 items of the original scale were revised, utilizing feedback received from previous users of the scale in different cultures, and eight

new items were added. For example, “Disagreeing with an authority figure on a major issue,” now replaces “Disagreeing with your father on a major issue.” Similarly, “Passing off somebody else’s work as your own,” becomes a more general version of “Plagiarizing a term paper.” The response scale was modified slightly by increasing the number of scale points from 5 to 7 and by labeling all of them instead of just the two endpoints in an effort to increase its psychometric quality (Visser, Krosnick, & Lavrakas, 2000).

Most respondent will not have found themselves in every one of the situations described by items of the scale or even have the training or background to find themselves in all situations. Nevertheless, they seem to interpret our instructions to “indicate the likelihood that you would engage in the described activity or behavior if you were to find yourself in that situation” as implying (in either a real or counterfactual fashion) that they should think of themselves as being in the situation in a way in which engaging or not engaging in the described behavior were both possible or feasible.

The new set of 48 items was administered to 372 English- and 394 French-speaking respondents. Each of the two groups was randomly split into two sub-groups. Data from one of the sub-groups in each culture were analyzed in an exploratory manner and resulted in a reduced number of items (Blais & Weber, 2003; Blais, Montmarquette, & Weber, 2003). Confirmatory factor analyses were conducted on the remainder of the data to investigate the psychometric properties of the revised scale in North American English- and French-speaking adult populations and to establish whether the hypothesized measurement models fit the data within and across groups. Interested readers are referred to Blais and Weber (2006) for more detail.

The risk-taking scale of the 30-item version of the revised DOSPERT Scale evaluates behavioral intentions, that is, the likelihood with which respondents might engage in risky behaviors originating from five domains of life (ethical, financial, health/safety, social, and recreational risks) using a 7-point rating scale ranging from 1 (*Extremely Unlikely*) to 7 (*Extremely Likely*).<sup>1</sup> Sample items include “Having an affair with a married man/woman” (Ethical), “Investing 10% of your annual income in a new business venture” (Financial), “Engaging in unprotected sex” (Health/Safety), “Disagreeing with an authority figure on a major issue” (Social), and “Taking a weekend sky-diving class” (Recreational). Item ratings are added across all items of a given subscale to obtain subscale scores. Higher scores indicate greater risk taking in the domain of the subscale.

For simplicity sake, we refer to the respondents’ self-

reported likelihood of engaging in risky behaviors as “risk taking.” Similarly, their gut level assessment of the riskiness of these behaviors is alluded to as “risk perception.” Finally, we refer to the language in which the participants completed the DOSPERT by using the label “group” (i.e., the English vs. the French DOSPERT group).

The risk-perception scale evaluates the respondents’ gut level assessment of how risky each behavior is on a 7-point rating scale ranging from 1 (*Not at all*) to 7 (*Extremely Risky*). Ratings are again added across all items of a given subscale to obtain subscale scores, with higher scores suggesting perceptions of greater risk in the domain of the subscale.

The French version of the DOSPERT Scale was developed for this study using the method of back-translation, where an instrument is translated from the source to the target language, is then independently translated back into the source language, and finally the two versions of the instrument are compared until all discrepancies in meaning are resolved (Brislin, 1970). Both the English and French versions of the complete risk-taking scale and the instructions and rating scale associated with the risk-perception scale are shown in the Appendix.

## 2.2 Participants and procedure

The group completing the DOSPERT Scale in English (i.e., the “English” group) consisted of 172 respondents; most of these participants were aged 22-35 and had completed a college degree. Sharing similar demographic characteristics, the group completing the DOSPERT Scale in French (i.e., the “French” group) consisted of 187 respondents residing in Quebec. A frequency distribution of ages and educational levels is provided in Table 1. Chi-square tests showed that the two groups did not differ significantly in gender, age, or educational levels.

The participants in the English group were contacted by advertisements on web bulletin boards and list servers; they completed the web-based survey for 8 USD. The participants in the French group were recruited via e-mail; they filled-out the computer-based survey in a laboratory, in groups of about 10-12, for 10 CAD. All of the participants provided demographic background information first and subsequently completed the scales; they performed the task in about 60-90 minutes.<sup>2</sup>

<sup>1</sup>The six financial items can be split into three gambling and three investment items, resulting in narrower constructs.

<sup>2</sup>In each group, half of the participants completed the risk-taking scale first, whereas the other half completed the risk-perception scale first; the other half of the participants did so in the opposite order. No order effects were found.

Table 1: Demographic characteristics

| Variable        | Characteristic           | English<br>( <i>n</i> = 172) | French<br>( <i>n</i> = 187) | Total<br>( <i>n</i> = 359) |
|-----------------|--------------------------|------------------------------|-----------------------------|----------------------------|
| Gender          | Male                     | 90                           | 101                         | 191                        |
|                 | Female                   | 82                           | 86                          | 168                        |
| Age             | 18–21                    | 38                           | 51                          | 89                         |
|                 | 22–35                    | 102                          | 124                         | 226                        |
|                 | > 35                     | 32                           | 12                          | 44                         |
| Education level | Less than college degree | 50                           | 50                          | 100                        |
|                 | College degree           | 84                           | 80                          | 164                        |
|                 | Postgraduate degree      | 38                           | 57                          | 95                         |

### 3 Results

#### 3.1 Overview of the data analytic technique

Given the nature of the data, that is, repeated measurements on individuals, multilevel modeling (Goldstein, 1995) was utilized to distinguish within- from between-individuals variability in apparent risk taking. Multilevel models contain variables measured at different levels of a hierarchy that consist of lower-level observations nested within higher level(s). Examples include individuals nested within groups, employees within organizations, students within schools, or, like in the present study, repeated measurements within individuals. Kreft and De Leeuw (1998) provide an excellent introduction to multilevel modeling that includes a comparison with traditional regression models.

Multilevel modeling is a type of regression model particularly suitable for hierarchical data. In contrast to conventional OLS regression models, the equation defining the multilevel model contains more than one error term: one for each level of the hierarchy (e.g., within and between schools). The basic notion in multilevel modeling is that the outcome variable — located at the lowest, most detailed, level — has an individual as well as a group component, as do(es) the predictor variable(s).

In the current study, the first level of analysis is at the repeated-measures level, that is, respondents' reported apparent risk taking, with five such measures per participant for a total of 1795 data points; the second level of analysis is at the level of the individual respondent ( $N = 359$ ). In the models reported below, apparent risk taking is the outcome variable, risk perception is a first-level, within-individuals, predictor, and group membership is a second-level, or between-individuals, predictor.

Three nested models are presented here and in Table 3 that specifically address the three hypotheses outlined previously. Model 1 is the baseline model and pro-

vides an estimate for the grand risk-taking mean across domains and individuals, as well as a baseline for the estimation of the variance components in comparisons with more complex models. In this model, risk taking at the individual level is expressed by the sum of the (a) grand risk-taking mean (called "Intercept" in Table 3), (b) within-individuals variation around the individual's mean ("Within-individuals variance"), and (c) between-individuals variation around the grand mean ("Between-individuals variance/Intercept").

In Model 2, the first-level variable risk-perception is added to Model 1 as a predictor of risk taking.<sup>3</sup> The regression slope coefficient is specified as random to reflect between-individual differences in the relationship between risk taking and perception. Thus Model 2 also provides estimates of the mean regression slope across individuals (named "Risk perception" in Table 3) and of the between-individuals variation around it ("Between-individuals variance/Slope 'Risk perception'").

Lastly, Model 3 adds the dichotomous group (called "Group" in Table 3) and group-by-perception ("Group-by-perception") variables for an explanation of the variability in the intercept and in the risk-perception slope among individuals.

The multilevel models were fit to the data using MLwiN 1.10.0007 (Rasbash, Browne, Ealy, Cameron, & Charlton, 2001). The likelihood-ratio (named "Deviance" in Table 3) test is used to evaluate the improvement in fit between the nested models (Snijders & Bosker, 1999). Each multilevel parameter estimate is divided by its standard error (reported in parenthesis in the results; *SE* in Table 3) to assess its significance; the resulting value approximates a *z*-distribution (Snijders & Bosker, 1999).

<sup>3</sup>The risk-perception variable was centered around its grand mean in order for its zero value to be meaningful (i.e., the average risk-perception value across individuals; Kreft & De Leeuw, 1998)

### 3.2 Descriptive statistics and group differences

The items were summed across their respective scales to obtain the scale scores and to compute the descriptive statistics shown in Table 2.<sup>4</sup> The internal consistency estimates (i.e., Cronbach's alphas) associated with the 30-item English risk-taking scores ranged from .71 to .86, and those associated with the risk-perception scores, from .74 to .83. The scale intercorrelations varied from .08 to .60 and .19 to .66, for the risk-taking and risk-perception scores, respectively. Weber *et al.* (2002) reported comparable reliability estimates and scale intercorrelations with a sample of undergraduate students suggesting that the scores associated with the revised, shorter scale were, in this sample at least, as internally consistent as those of the original, longer scale.<sup>5</sup>

A 2 X (5) (Group X Domain) mixed within-subjects factorial analysis of variance showed that the mean (i.e., across individuals) risk-perception level varied significantly between domains,  $F(3.66, 1307.73) = 360.53$ ,  $\eta_p^2 = .50$ . The greatest mean level was found in the health/safety area ( $M = 28.15$ ,  $SD = 5.94$ ; or a value of 4.02 on the 7-point scale), whereas the lowest was found in the social domain ( $M = 17.01$ ,  $SD = 5.93$ ; or 2.43). Across domains, the participants in the French group reported a greater mean level of perceived risk than did their English counterparts,  $F(1, 357) = 17.06$ ,  $\eta_p^2 = .05$ . Post-hoc tests revealed this difference to be significant in the financial domain ( $t(306.60) = 3.38$ , with an effect size of  $d = .36$ ), health/safety domain ( $t(318.57) = 3.42$ ,  $d = .36$ ), and recreational domain ( $t(320.51) = 3.87$ ,  $d = .41$ ).<sup>6</sup>

As shown by a similar analysis of variance, the mean risk-taking level also varied significantly between domains,  $F(3.63, 1295.21) = 352.70$ ,  $\eta_p^2 = .50$ , with the greatest mean level being in the social area ( $M =$

32.58,  $SD = 5.69$ ; or 4.65/7) and the lowest, in the ethical domain, ( $M = 16.92$ ,  $SD = 6.59$ ; or 2.42). Across domains, the groups' mean risk-taking levels were significantly different,  $F(1, 357) = 7.16$ ,  $\eta_p^2 = .02$ , yet a significant domain-by-group interaction effect,  $F(3.63, 1295.21) = 2.74$ ,  $\eta_p^2 = .01$ , qualified this main effect. Indeed, post-hoc tests revealed that, in the social area, the respondents in the French group reported being more likely to engage in risky behaviors than did the English group respondents (note, however, the small magnitude of this difference). The converse was true in the other four domains, but this difference was significant only in the ethical,  $t(357) = 2.92$ ,  $d = .31$ , and health/safety,  $t(357) = 2.88$ ,  $d = .31$ , domains.

### 3.3 Multilevel analyses

The previous analyses of variance showed between-domains differences in mean risk taking and perception levels, yet, given that these analyses do not consider the between-domain differences at the individual level, we now turn to multilevel analyses to specifically address our hypotheses.

Test of the main hypothesis that there exists considerable variability in apparent risk taking within and between individuals. Model 1 yielded an estimate of 22.49 (0.27) for the grand mean intercept, corresponding to a value of 3.75 on the 7-point scale (see Table 3). In other words, across both domains and individuals, risk taking was relatively low, that is, below the rating scale midpoint of 4. The baseline model revealed, as predicted, a significant between-individuals variation around this mean risk taking level, yet a substantial proportion (87%) of the total variation in the mean degree of risk taking was found at the within-individuals level.<sup>7</sup> This illustrates that the respondents were more similar to others (i.e., the grand mean) than they were to themselves (i.e., their own individual mean) in their level of risk taking across domains.

We tested the hypothesis that controlling for perceived risk at the within-individuals (i.e., domain) level results in a significant reduction in this variability and allows for within-individuals consistency in perceived-risk attitude. As shown by a significant deviance test,  $\Delta\chi^2_3 = 1182.29$ , model fit was much improved by adding the random "Risk perception" slope. Indeed, risk perception was, across domains and individuals, a significant predictor of

<sup>4</sup>Univariate outliers were defined as  $z$ -scores greater than 3.29 ( $p < .001$ , two-tailed; Tabachnick & Fidell, 1996) and were replaced with the next less extreme rating, as recommended by Kline (1998). For all of the scale items, skewness was smaller than 3.0 and kurtosis was smaller than 7.0, thus scores transformations were not required (Kline, 1998). Finally, in order to maximize sample size, sample mean values were inserted whenever individual data points were missing (i.e., < 1% of the individual data points; Cohen and C. Cohen, 1983). The significance level was set at  $p < .05$  (two-tailed), except when otherwise noted.

<sup>5</sup>The internal consistency estimates associated with the 30-item French risk-taking scores, varied from .57 to .82 (see Table 2), while those associated with the risk-perception scores ranged from .62 to .68. Some of these values fall below the recommended .70 cut off point for research purposes which suggests that the scales may need additional work (Nunally, & Bernstein, 1994). The subscale intercorrelations ranged from .05 to .53 and .14 to .50.

<sup>6</sup>The alpha level was set at  $p < .05/10 = .005$  (two-tailed) to evaluate the significance of the post-hoc  $t$ -tests to correct for multiple tests. Cohen's  $d$  is a measure of the effect size; values of 0.20, 0.50, and 0.80 tentatively define "small," "medium," and "large" effects, respectively (Cohen, 1988).

<sup>7</sup>The variance at this level includes measurement error. Although the internal consistency reliability of the risk-taking score was acceptable (i.e., close to 1.00 across participants and .71 across domains), we induced measurement error (i.e., with variance ranging from 0.10 to 1.00) in the score to investigate its potential effect on the within-individuals variance estimate (i.e., 72.80 in Table 3) and re-ran Model 1. The resulting within-individuals variance estimates ranged from 72.02 to 72.93, suggesting that bias due to measurement error was indeed fairly small.

Table 2: Descriptive statistics.

| DOSPERT score    | Overall ( $n = 359$ ) |      |          | English ( $n = 172$ ) |      |          | French ( $n = 187$ ) |      |          |
|------------------|-----------------------|------|----------|-----------------------|------|----------|----------------------|------|----------|
|                  | $M$                   | $SD$ | $\alpha$ | $M$                   | $SD$ | $\alpha$ | $M$                  | $SD$ | $\alpha$ |
| Risk perception  |                       |      |          |                       |      |          |                      |      |          |
| 1. Ethical       | 27.39                 | 6.59 | .67      | 26.70 <sub>a</sub>    | 6.40 | .74      | 28.03 <sub>a</sub>   | 4.84 | .62      |
| 2. Financial     | 26.53                 | 7.73 | .78      | 25.34 <sub>a</sub>    | 7.36 | .83      | 27.64 <sub>b</sub>   | 5.24 | .68      |
| 3. Health/Safety | 28.15                 | 7.43 | .70      | 27.03 <sub>a</sub>    | 6.62 | .74      | 29.17 <sub>b</sub>   | 5.04 | .62      |
| 4. Recreational  | 27.17                 | 9.14 | .75      | 25.84 <sub>a</sub>    | 6.94 | .79      | 28.39 <sub>b</sub>   | 5.34 | .68      |
| 5. Social        | 17.01                 | 5.69 | .76      | 16.42 <sub>a</sub>    | 6.70 | .83      | 17.56 <sub>a</sub>   | 5.07 | .66      |
| Risk taking      |                       |      |          |                       |      |          |                      |      |          |
| 1. Ethical       | 16.92                 | 6.59 | .68      | 17.97 <sub>a</sub>    | 7.16 | .75      | 15.96 <sub>b</sub>   | 5.87 | .61      |
| 2. Financial     | 19.61                 | 7.73 | .80      | 20.67 <sub>a</sub>    | 8.51 | .83      | 18.64 <sub>a</sub>   | 6.81 | .77      |
| 3. Health/Safety | 20.63                 | 7.43 | .66      | 21.80 <sub>a</sub>    | 7.84 | .71      | 19.56 <sub>b</sub>   | 6.88 | .61      |
| 4. Recreational  | 22.43                 | 9.14 | .84      | 23.01 <sub>a</sub>    | 9.40 | .86      | 21.90 <sub>a</sub>   | 8.89 | .82      |
| 5. Social        | 32.58                 | 5.69 | .70      | 32.42 <sub>a</sub>    | 6.44 | .79      | 32.72 <sub>a</sub>   | 4.92 | .57      |

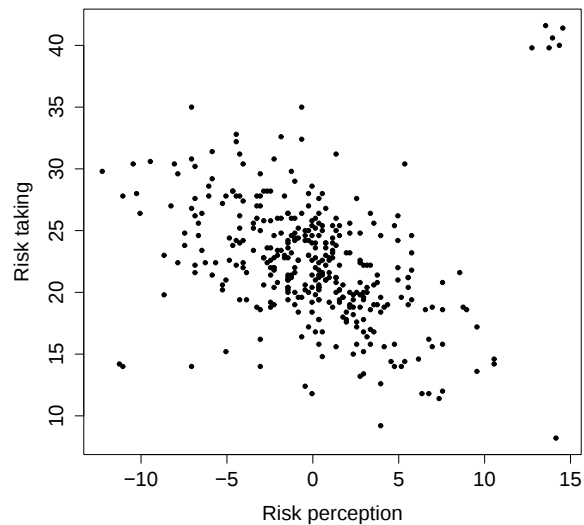
Note: Minimum and maximum scores are 6 and 42, respectively. Means with different subscripts differ significantly at  $p < .005$  (two-tailed).

risk taking,  $B_1 = -.87$  (0.03),  $\beta = -.70$ , and its addition to the model resulted in a sizeable reduction (59%) in the within-individuals variation in risk taking, as expected.<sup>8</sup> The slope variance, .14 (.02), suggested that the individuals' (i.e., across domains) slopes varied significantly about the mean (i.e., across domains and individuals) slope (see Figure 1 for a scatterplot of the individuals' risk taking and perception values across domains). In other words — and not surprisingly — the relationship between risk taking and perception (i.e., perceived-risk attitude) differed significantly among individuals. Approximately 95% of the respondents had slopes between  $-0.12$  to  $-1.62$ , which suggest that most of them were perceived-risk averse, albeit to various degrees.

In simple terms, at the individual level, the slope estimate shows how much an individual's judged level of perceived risk decreases his (her) likelihood of engaging in risky behaviors across domains, reflected by a negative value. Essentially, it represents, for this individual, the impact of perceived risk on risk taking and gets multiplied with his (her) judged level of perceived risk associated with the behaviors. This impact of perceived risk on risk taking is what we refer to as perceived-risk attitude, and according to the risk-return model of risky choice, it is a stable individual characteristic.

We now turn to the test of the hypothesis that individuals are perceived-risk averse or neutral across both cultures (even though risk perception and risk taking

Figure 1: The relationship between risk taking and risk perception at the individual level.



and possibly degree of perceived-risk aversion may differ between cultures). As shown by a significant deviance test,  $\Delta\chi^2_2 = 39.05$ , model fit was improved by adding the group variable predictor and the group-by-perception interaction variable. Group was not a significant predictor of risk taking, yet the interaction variable was,  $B_3 = -.32$  (0.06),  $\beta = -.17$ . This significant group-by-perception interaction indicates that the effect

<sup>8</sup>For each predictor variable, we show its regression coefficient ( $B$ ), the standard error of  $B$  in parentheses, and the standardized regression coefficient ( $\beta$ ).

Table 3: Summary of multilevel analyses.

|                              | Model 1  |              | Model 2  |              |         | Model 3  |              |         |
|------------------------------|----------|--------------|----------|--------------|---------|----------|--------------|---------|
|                              | <i>B</i> | <i>SE(B)</i> | <i>B</i> | <i>SE(B)</i> | $\beta$ | <i>B</i> | <i>SE(B)</i> | $\beta$ |
| Fixed Effect                 |          |              |          |              |         |          |              |         |
| Intercept                    | 22.49    | 0.27         | 22.22    | 0.24         |         | 21.98    | 0.34         |         |
| Risk perception              |          |              | −0.87    | 0.03         | −.70    | −0.72    | 0.04         | −.58    |
| Group                        |          |              |          |              |         | 0.64*    | 0.47         | .04     |
| Group-by-perception          |          |              |          |              |         | −0.32    | 0.06         | −.17    |
| Random Effect                |          |              |          |              |         |          |              |         |
| Within-individual variance   | 72.80    | 2.72         | 30.06    | 1.24         |         | 30.00    | 1.23         |         |
| Between-individuals variance |          |              |          |              |         |          |              |         |
| Intercept                    | 10.78    | 1.97         | 12.66    | 1.51         |         | 12.10    | 1.46         |         |
| Slope “Risk perception”      |          |              | 0.14     | 0.02         |         | 0.12     | 0.02         |         |
| Deviance                     | 12989.34 |              | 11807.05 |              |         | 11768.00 |              |         |

Note: The fixed effects represent the average intercept and slopes, as in conventional OLS regression analysis. The random effects signify the within-individual, intercept, and slope variances. For each predictor variable, we show its regression coefficient (*B*), the standard error of *B*, and the standardized regression coefficient ( $\beta$ ). \*  $p > .05$ .

of risk perception on risk taking was stronger (i.e., had a larger negative slope) for the French group than the English group, as confirmed by post-hoc simple slope comparisons (Aiken & West, 1991) and shown in Figure 2. In other words, completing the DOSPERT Scale in French, as opposed to English, was associated with a significantly stronger relationship between risk taking and perception,  $B = -1.04$  (0.14),  $\beta = -.83$ , versus  $B = -.72$  (0.04),  $\beta = -.58$ . The inclusion of these two variables in the model resulted in small reductions in between-individuals variations around the grand risk-taking mean (about 4%) and mean risk-perception slope (13%), suggesting that they explained some of the variation in risk taking among respondents.

Because we previously found a tendency for the French group to report, on average, a significantly greater level of risk perception for some risk domains, one might conclude that the two groups differed in both the impact and perceived magnitude of risk at least in some domains. Post-hoc OLS multiple regression analyses were conducted that replicated Model 3 within each risk domain.<sup>9</sup> The results of these five regression analyses showed that the group-by-perception interaction was consistently significant (see Table 4). It thus appears that, in three out

of the five risk domains, the French group perceived the magnitude of the risk involved to be significantly greater than did their English-speaking counterparts and gave it significantly greater weight as well. For the other behaviors, they only showed a significantly stronger impact of perceived risk on risk taking (i.e., had a more risk-averse perceived-risk attitude) than did the respondents completing the English DOSPERT Scale.

## 4 Summary and conclusions

The paper provides a revised version of the Weber *et al.* (2002) DOSPERT Scale that is 25% shorter while remaining stable in terms of its psychometric properties. In addition, it consists of items that are applicable to respondents from a broader range of ages, cultures, and educational levels.

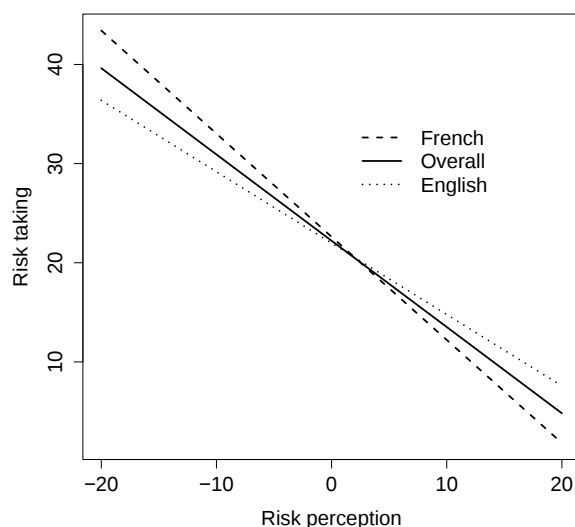
Despite the less-than-ideal internal consistency of some of its scores, the French DOSPERT Scale proves to be, overall, a valuable instrument to be used with French-speaking populations (see Blais & Weber, 2006, for more detail). We might consider, in the future, retaining a few core items but also incorporate new items to the French DOSPERT Scale as a way to increase the reliability and validity of its scores. In any case, the scale could be of benefit to personality psychologists working with French populations in that it allows them to assess different components contributing to differences in apparent risk taking behavior (i.e., perceived risk, perceived-risk attitude, and

<sup>9</sup>The alpha level was set at  $p < .10/15 = .0067$  (two-tailed) to evaluate the significance of the post-hoc multiple regression analyses to correct for multiple tests. The familywise significance level was set at  $p < .10$ , because the power required to detect interaction effects in multiple regression analysis is generally low, due to reductions in parameter reliability (Aiken & West, 1991).

Table 4: Coefficients for the effect of (a) risk perception on risk taking for the French (left) and English (right) groups, and (b) the group-by-perception interaction variable. (\*  $p > .05$ .)

| Variable                | <i>B</i> | <i>SE(B)</i> | $\beta$ | <i>B</i> | <i>SE(B)</i> | $\beta$ |
|-------------------------|----------|--------------|---------|----------|--------------|---------|
| (a) Risk perception     |          |              |         |          |              |         |
| 1. Ethical              | −0.71    | 0.09         | −.61    | −0.09*   | 0.09         | −.08    |
| 2. Financial            | −0.66    | 0.10         | −.55    | −0.32    | 0.09         | −.27    |
| 3. Health/Safety        | −0.92    | 0.09         | −.74    | −0.28    | 0.09         | −.22    |
| 4. Recreational         | −1.17    | 0.10         | −.80    | −0.54    | 0.10         | −.37    |
| 5. Social               | −0.49    | 0.08         | −.51    | −0.22    | 0.07         | −.22    |
| (b) Group-by-perception |          |              |         |          |              |         |
| 1. Ethical              | 0.62     | 0.12         | .42     |          |              |         |
| 2. Financial            | 0.34     | 0.12         | .23     |          |              |         |
| 3. Health/Safety        | 0.64     | 0.12         | .40     |          |              |         |
| 4. Recreational         | 0.63     | 0.13         | .33     |          |              |         |
| 5. Social               | 0.27     | 0.10         | .22     |          |              |         |

Figure 2: The relationship between risk taking and risk perception as a function of group membership.



possibly, perceived benefits) in five risk domains.

Our results replicate past research by documenting significant between-domains differences in the degree of apparent risk taking and perceived risk at the mean level of analysis. The multilevel modeling shows, more interestingly, that within-participants (i.e., individual-level) variation in risk taking across the five content domains of the scale was about seven times as large as between-participants variation.

The relationship between apparent risk taking and perception explained a considerable portion of the within-

individuals variability in apparent risk taking. Across domains, respondents were, for the most part, perceived-risk averse or neutral, with some between-individuals variability in perceived-risk attitude. Finally, completing the DOSPERS Scale in French explained some of this variability among respondents, as it was associated with a significantly stronger (i.e., more negative) relationship between apparent risk taking and risk perception across domains.

In summary, we replicated and extended the findings reported by Weber *et al.* (2002), using a shorter and more broadly applicable scale and a more sophisticated analysis and modeling approach: (1) the level of apparent risk taking varied for a given participant across the five risk domains; (2) this within-individuals variability was, to a great extent, explained by a corresponding within-individuals variability in the degree of perceived risk; (3) for the great majority of respondents, the relationship between apparent risk taking and risk perception across domains was negative or neutral.

A potential concern with the results of this study is that they are inflated by the presence of common source variance. Because both apparent risk taking and perception were self-reported (using rating scales), one may question whether the relationship between these variables is spuriously inflated, yet this is a well-known limitation, common to all survey research. Similarly, like all such correlational results, the associations should not be interpreted as causal effects, despite our use of causal language (e.g., “predictor”).

Responses and scores on subscales of the DOSPERS scale may well be related to other constructs. Our theoretical starting point, the risk—return framework, assumes that risk taking is a function of perceived risk

(which is a function of both uncertainty and aversiveness of consequences) and perceived benefits, which can and do seem to vary between domains. With respect to the reasons for why perceptions of risk or benefit might differ between domains, we are agnostic and encourage additional work on that topic.<sup>10</sup> Previous work suggests that both differences in material and psychological consequences will be involved, leaving room for both consequentialist reasoning and affective reactions.

While self-reports of the likelihood of risk taking in hypothetical decision situations on subscales of the DOSPERT scale have been found to correlate with real-world risk taking in a variety of settings (Hanoch *et al.*, 2005; Zuniga & Bouzas, 2005), it will be interesting to see how such domain-specific self-reports of risk taking, risk and benefit perceptions, and inferred perceived-risk attitude compare to recent behavioral measures of risk taking and risk attitude, such as the Balloon Analogue Risk Task (BART) developed by Wallsten, Pleskac, and Lejuez (2005).

We urge care in the interpretation of differences in the two cultural groups, reported in this paper. We did not attempt to explain why the groups differed in risk perception, risk taking, and perceived-risk attitude when they did, as we felt such explanations were not warranted given the exploratory nature of the comparison. The two groups might differ simply because of methodological or procedural differences in the data collection process. For example, the French group completed the study in a more controlled laboratory setting, whereas the English group took part in an on-line, web-based, study.

Ultimately, the most important finding is that the two groups appeared to be perceived-risk averse or neutral, in line with the prediction derived from the risk-return framework of risky choice. More extensive and theory-based cross-cultural comparisons, such as the ones reported in Johnson *et al.* (2004) realized with a sample of Germans participants and the comparison between Chinese and American respondents reported by Weber and Hsee (1998) are necessary to establish whether individuals from different cultures and/or speaking different languages differ in apparent risk taking and its various components, and if so, why.

The final important contribution of this study is made by its data analytic approach. In addition to replicating and extending previous results by Weber *et al.* (2002), the multilevel analysis allowed us to differentiate between and differentially explain within-individuals (i.e.,

domain) and between-individuals variability in apparent risk taking. The fact that almost 90% of the total variance in risk taking existed at the domain level is striking, and a result that has not been quantified before, as past research has not separated these sources of variability in risk taking. This result lends additional support to the importance of studying domain-specific or situational influences on apparent risk taking. Person and situation effects can be modeled in an integrated multilevel framework, and future research should utilize such analyses in an effort to integrate situational explanations for within-individuals variability in apparent risk taking into the more complex personality trait approach advocated by Mischel and Shoda (1995).

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<sup>10</sup>In Weber *et al.* (2002), we found, for example, that the impression management subscale score of the Paulhus' (1988) social desirability scale was significantly correlated with the Ethics and Health/Safety Risk-Behavior subscales,  $r_s = -0.51$  and  $-0.34$ , respectively. That is, the desire to present oneself in a positive way was associated with lower reported likelihoods to engage in risky ethics and health/safety behaviors.

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Table A: Scales used in DOSPERT.

| Risk taking, English     |                         |                    |                    |                 |                      |                      |
|--------------------------|-------------------------|--------------------|--------------------|-----------------|----------------------|----------------------|
| 1                        | 2                       | 3                  | 4                  | 5               | 6                    | 7                    |
| Extremely Unlikely       | Moderately Unlikely     | Somewhat Unlikely  | Not Sure           | Somewhat Likely | Moderately Likely    | Extremely Likely     |
| Risk perception, English |                         |                    |                    |                 |                      |                      |
| 1                        | 2                       | 3                  | 4                  | 5               | 6                    | 7                    |
| Not at all Risky         | Slightly Risky          | Somewhat Risky     | Moderately Risky   | Risky           | Very Risky           | Extremely Risky      |
| Risk taking, French      |                         |                    |                    |                 |                      |                      |
| 1                        | 2                       | 3                  | 4                  | 5               | 6                    | 7                    |
| Extrêmement Peu Probable | Modérément Peu Probable | Assez Peu Probable | Incertain(e)       | Assez Probable  | Moyennement Probable | Extrêmement Probable |
| Risk perception, French  |                         |                    |                    |                 |                      |                      |
| 1                        | 2                       | 3                  | 4                  | 5               | 6                    | 7                    |
| Pas Du Tout Risquée      | Très Peu Risquée        | Peu Risquée        | Modérément Risquée | Risquée         | Très Risquée         | Extrêmement Risquée  |

## A Appendix

### A.1 Domain-Specific Risk-Taking (Adult) Scale — RT scale

For each of the following statements, please indicate the likelihood that you would engage in the described activity or behavior if you were to find yourself in that situation. Provide a rating from *Extremely Unlikely* to *Extremely Likely*, using the following scale: [Scales are shown in Table A.]

1. Admitting that your tastes are different from those of a friend. (S)
2. Going camping in the wilderness. (R)
3. Betting a day's income at the horse races. (F)
4. Investing 10% of your annual income in a moderate growth mutual fund. (F)
5. Drinking heavily at a social function. (H/S)
6. Taking some questionable deductions on your income tax return. (E)
7. Disagreeing with an authority figure on a major issue. (S)
8. Betting a day's income at a high-stake poker game. (F)
9. Having an affair with a married man/woman. (E)
10. Passing off somebody else's work as your own. (E)
11. Going down a ski run that is beyond your ability. (R)
12. Investing 5% of your annual income in a very speculative stock. (F)

13. Going whitewater rafting at high water in the spring. (R)
14. Betting a day's income on the outcome of a sporting event (F)
15. Engaging in unprotected sex. (H/S)
16. Revealing a friend's secret to someone else. (E)
17. Driving a car without wearing a seat belt. (H/S)
18. Investing 10% of your annual income in a new business venture. (F)
19. Taking a skydiving class. (R)
20. Riding a motorcycle without a helmet. (H/S)
21. Choosing a career that you truly enjoy over a more secure one.<sup>11</sup> (S)
22. Speaking your mind about an unpopular issue in a meeting at work. (S)
23. Sunbathing without sunscreen. (H/S)
24. Bungee jumping off a tall bridge. (R)
25. Piloting a small plane. (R)
26. Walking home alone at night in an unsafe area of town. (H/S)
27. Moving to a city far away from your extended family. (S)
28. Starting a new career in your mid-thirties. (S)
29. Leaving your young children alone at home while running an errand. (E)
30. Not returning a wallet you found that contains \$200. (E)

Note. E = Ethical, F = Financial, H/S = Health/Safety, R = Recreational, and S = Social.

## A.2 Domain-Specific Risk-Taking (Adult) Scale — RP subscale

People often see some risk in situations that contain uncertainty about what the outcome or consequences will be and for which there is the possibility of negative consequences. However, riskiness is a very personal and intuitive notion, and we are interested in **your gut level assessment of how risky** each situation or behavior is.

For each of the following statements, please indicate **how risky you perceive** each situation. Provide a rating from *Not at all Risky* to *Extremely Risky*, using the following scale:

## A.3 French Domain-Specific Risk-Taking (Adult) Scale — RT subscale

Pour chacune des phrases suivantes, veuillez indiquer la **probabilité** que vous preniez part à l'activité spécifiée ou que vous adoptiez le comportement spécifié si vous vous retrouviez dans la situation décrite.

Veuillez choisir l'une des possibilités qui vont d'*Extrêmement peu probable* à *Extrêmement probable* en vous servant de l'échelle suivante:

1. Avouer que vos goûts sont différents de ceux d'un ami.
2. Aller camper en pleine nature.
3. Parier une journée de salaire aux courses de chevaux.

<sup>11</sup>We modified this item by replacing "prestigious" by "secure" in order to reflect the trade-off between enjoyment and security. We would like to thank an anonymous reviewer for this suggestion.

4. Investir 10% de vos revenu annuels dans un fonds mutuel à croissance modérée.
5. Boire abondamment lors d'une activité sociale.
6. Tricher par un montant important dans votre déclaration d'impôt.
7. Être en désaccord avec un symbole d'autorité sur une question importante.
8. Parier une journée de salaire lors d'une partie de poker à enjeu important.
9. Avoir une aventure avec un homme ou une femme marié(e).
10. Présenter le travail de quelqu'un d'autre comme étant le vôtre.
11. Descendre une pente de ski exigeant une habileté plus grande que la vôtre.
12. Investir 5% de vos revenus annuels dans des titres très spéculatifs.
13. Faire de la descente en eau vive au printemps, quand le niveau de l'eau est élevé.
14. Parier une journée de salaire sur le résultat d'un événement sportif.
15. Avoir des relations sexuelles sans protection.
16. Révéler le secret d'un ami à un autre ami.
17. Conduire une voiture sans porter de ceinture de sécurité.
18. Investir 10% de vos revenus annuels dans une nouvelle entreprise.
19. Suivre un cours de parachutisme.
20. Conduire une motocyclette sans casque protecteur.
21. Choisir une carrière qui vous plaît vraiment plutôt qu'une carrière sécuritaire.
22. Dire votre opinion sur une question controversée lors d'une réunion au travail.
23. Vous faire bronzer sans écran solaire.
24. Effectuer un saut à l'élastique (? bungee ?) à partir d'un pont élevé.
25. Piloter un petit avion.
26. Rentrer chez vous à pied le soir dans un quartier peu sécuritaire.
27. Déménager dans une ville éloignée de votre famille.
28. Entreprendre une nouvelle carrière au cours de la mi-trentaine.
29. Laisser vos enfants seuls à la maison pendant que vous faites une course.
30. Ne pas retourner un portefeuille trouvé contenant 200\$.

#### A.4 French Domain-Specific Risk-Taking (Adult) Scale — RP subscale

Les gens perçoivent souvent des risques dans les situations qui comportent de l'incertitude quant à leur conclusion ou à leurs conséquences et pour lesquelles il existe une possibilité de conséquences négatives. Cependant, le degré de risque est un concept très personnel et intuitif, et nous sommes intéressés par **votre évaluation intuitive du niveau de risque** de chacun des situations et des comportements suivants. Pour chacune des phrases suivantes, veuillez indiquer **le niveau de risque que vous percevez** pour chacune des situations.

Veuillez choisir l'une des possibilités qui vont de *Pas du tout risqué* à *Extrêmement risqué* en vous servant de l'échelle suivante :