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The Domain-Specific Risk Taking Scale for Adult Populations: Item selection and preliminary psychometric properties

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In conducting the research described in this report, the investigators adhered to the policies and procedures set out in the Tri-Council Policy Statement: Ethical conduct for research involving humans, National Council on Ethics in Human Research, Ottawa, 1998 as issued jointly by the Canadian Institutes of Health Research, the Natural Sciences and Engineering Research Council of Canada and the Social Sciences and Humanities Research Council of Canada.

Abstract

In order to fill the need for an individual-difference measure of risk taking in Judgment and Decision Making (J/DM) research and inspired by the psychological risk-return model of risky choice, Weber, Blais, and Betz (2002) developed an instrument to assess risk taking, the Domain-Specific Risk-Taking (DOSPERT) Scale, that allows researchers and practitioners to assess both conventional risk attitudes and perceived-risk attitudes in six commonly encountered content risk domains (i.e., ethical, gambling, health/safety, investing, recreational, and social). Our primary aim here was to document the changes we made to the DOSPERT Scale and present the results of the initial psychometric work we conducted on this revised 48-item version of the instrument, which we hope to present, after further development and validated work, as the most current, updated version of the DOSPERT Scale to be used with broader adult populations (including military ones).

Résumé

Afin de répondre au besoin d'une mesure des différences individuelles pour ce qui est de la prise de risques dans le domaine de la recherche sur les jugements/décisions, Weber, Blais et Betz (2002), inspirés par le modèle psychologique de risque-rendement sur les choix risqués, ont mis au point un instrument pour évaluer la prise de risques, soit la Domain-Specific Risk-Taking Scale (DOSPERT), qui permet aux chercheurs et aux praticiens d'évaluer à la fois les attitudes à l'égard du risque classique et les attitudes à l'égard du risque perçu dans six domaines courants (éthique, jeux de hasard, santé/sécurité, investissement, loisirs et domaine social). Notre premier objectif était de documenter les changements que nous avons apportés à l'échelle DOSPERT et de présenter les résultats du travail psychométrique initial que nous avons effectué sur cette nouvelle version à 48 items de cet instrument. Nous espérons être en mesure de le présenter, après d'autres travaux de mise au point et de validation, comme étant la version la plus récente et à jour de l'échelle DOSPERT pouvant être employée auprès de populations adultes élargies (y compris les militaires).

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Executive summary

The Domain-Specific Risk Taking Scale for Adult Populations: Item selection and preliminary psychometric properties:

Ann-Renee Blais; Elke U. Weber; DRDC Toronto TR 2009-203; Defence R&D Canada – Toronto; December 2009.

Background: In order to fill the need for an individual-difference measure of risk taking in Judgment and Decision Making (J/DM) research and inspired by the psychological risk-return model of risky choice, Weber, Blais, and Betz (2002) developed an instrument to assess risk taking, the Domain-Specific Risk-Taking (DOSPERT) Scale, that allows researchers and practitioners to assess both conventional risk attitudes and perceived-risk attitudes in six commonly encountered content risk domains (i.e., ethical, gambling, health/safety, investing, recreational, and social).

To facilitate the use of the DOSPERT Scale in a broader range of applied settings, we hereby examine a revision of the original Weber et al.'s (2002) DOSPERT Scale. We first re-evaluated the 40 items listed in Study 3 of Weber et al. (2002) on the basis of feedback received from previous users in different cultures. As a result, and mostly based on content and face validity considerations, we deleted 8 items, rewrote 27 of them, and added 16 new ones, resulting into 48 items (see Appendix A).

Our primary aim here was to document the changes we made to the DOSPERT and present the results of the initial psychometric work we conducted on this new 48-item version of the instrument, which we hope to present, after further development and validated work, as the most current, updated version to be used with broader adult populations (including military ones).

Results: We conducted exploratory factor analysis and examined the resulting factor structures. Based on the best-fitting models and their associated factor loadings (in addition to the item-level descriptive statistics and corrected item-total correlations), we selected six items per subscale.

As far as the risk-taking items were concerned, we failed to replicate the theory-based six-factor model. Indeed, most of the Ethical and Health/Safety items loaded on a single factor. The Gambling, Investing, Recreational, and Social risk-taking items showed the anticipated pattern of results, however, clearly loading on distinct (yet correlated) factors. The risk-taking subscale scores were inter-correlated, yet not overly so. Their internal consistency reliability estimates were reasonably high, and the mean risk-taking levels were, in most cases, indicative of risk aversion, a result commonly found at the mean level (Weber et al., 2002).

Now, with respect to the risk-perception items, we did indeed replicate the theory-based six-factor model. However, the sixth factor was not meaningful per se. We, again, observed that most of the Health/Safety items loaded on a factor along with most of the Ethical items. The risk-perception subscale scores were inter-correlated, yet not overly so. Their internal consistency reliability estimates were, again, reasonably high, and the mean risk-perception levels were, in most cases, indicative of perceived riskiness, a result commonly found at the mean level (Weber et al., 2002).

As well, the mean risk-taking and risk-perception subscale scores were, for the most part, significantly and negatively correlated, providing support for the risk-return model of risky choice.

Significance: The current research represents the psychometric review and analysis of a revised version of the DOSPERT Scale, following up on the original work of Weber et al. (2002), inspired by the psychological risk-return model of risky choice. We hope to present this revised version of the instrument as the most current, updated version to be used with broader adult populations, including military ones.

Future plans: In the short term, it will be necessary to write new Health/Safety and Social items and go through another run of development/validation work. In the meantime, however, we suggest researchers in the J/DM research area refer to the current version of the DOSPERT (see Appendix B), as its subscale scores have acceptable internal consistencies. Furthermore, it is the only scale, to our knowledge, that assesses both risk-taking attitudes and risk-perceptions in various domains of life.

In the longer term, we plan to evaluate and compare the risk-taking and risk-perception models via confirmatory factor analysis. Such analysis will allow us to test the theory-based six-factor model and examine whether it is invariant across the risk-taking and risk-perception items. We will also pursue our construct validation work by investigating (among various strategies), for example, the discriminant/convergent validity of the subscale scores with respect to unrelated/related constructs, such as sensation seeking, general risk taking, extraversion, etc.

Sommaire

The Domain-Specific Risk Taking Scale for Adult Populations: Item selection and preliminary psychometric properties:

Ann-Renee Blais; Elke U. Weber; DRDC Toronto TR 2009-203; Defence R&D Canada – Toronto; December 2009.

Contexte : Afin de répondre au besoin d'une mesure des différences individuelles pour ce qui est de la prise de risques dans le domaine de la recherche sur les jugements/décisions, Weber, Blais et Betz (2002), inspirés par le modèle psychologique de risque-rendement sur les choix risqués, ont mis au point un instrument pour évaluer la prise de risques, soit la Domain-Specific Risk-Taking Scale (DOSPERT), qui permet aux chercheurs et aux praticiens d'évaluer à la fois les attitudes à l'égard du risque classique et les attitudes à l'égard du risque perçu dans six domaines courants (éthique, jeux de hasard, santé/sécurité, investissement, loisirs et domaine social).

Afin de faciliter l'utilisation de l'échelle DOSPERT dans un éventail plus vaste de domaines appliqués, nous nous sommes penchés sur une révision de l'échelle DOSPERT originale conçue par Weber et ses collaborateurs (2002). Nous avons d'abord réévalué les 40 items énumérés dans l'étude 3 de Weber et coll. (2002) en nous fondant sur les commentaires reçus de précédents utilisateurs de différentes cultures. Ensuite, en nous fondant principalement sur des considérations de contenu et de validité apparente, nous avons retiré 8 items, en avons reformulé 27 et en avons ajouté 16 nouveaux, ce qui a donné 48 items en bout de ligne (voir l'annexe A).

Notre premier objectif était de documenter les changements que nous avons apportés à l'échelle DOSPERT et de présenter les résultats du travail psychométrique initial que nous avons effectué sur cette nouvelle version à 48 items de l'instrument. Nous espérons être en mesure de le présenter, après d'autres travaux de mise au point et de validation, comme étant la version la plus récente et à jour de l'échelle DOSPERT pouvant être employée auprès de populations adultes élargies (y compris les militaires).

Résultats : Nous avons effectué une analyse factorielle exploratoire et avons étudié les structures factorielles résultantes. En nous fondant sur les modèles les mieux adaptés et sur les poids factoriels (en plus de la statistique descriptive propre aux items et des corrélations item-total corrigées), nous avons choisi six items par sous-échelle.

Pour autant que les items de prise de risques étaient concernés, nous ne sommes pas parvenus à reproduire le modèle théorique à six facteurs. En fait, le poids de la plupart des items « éthique » et « santé/sécurité » allait sur un seul facteur. Les items de prise de risques « jeux de hasard », « investissement », « loisirs » et « domaine social » présentaient le profil de résultats anticipé, mais leur poids allait toutefois nettement sur des facteurs distincts (bien que corrélés). Les scores aux sous-échelles de prise de risques étaient intercorrélés, mais pas de manière excessive. Les estimations de la fiabilité par rapport à la consistance interne étaient raisonnablement élevées, et le niveau moyen de prise de risques indiquait, dans la plupart des cas, une aversion pour le risque, un résultat couramment observé au niveau moyen (Weber et coll., 2002).

Pour ce qui est des items de perception des risques, nous avons en effet reproduit le modèle théorique à six facteurs. Toutefois, le sixième facteur n'était pas significatif en soi. Nous avons encore une fois observé que le poids de la plupart des items de « santé/sécurité » allait sur un facteur, de même que la plupart des items d'« éthique ». Les scores aux sous-échelles de perception des risques étaient intercorrélés, mais pas de manière excessive. Les estimations de la fiabilité par rapport à la consistance interne étaient encore une fois raisonnablement élevées, et le niveau moyen de perception des risques indiquait, dans la plupart des cas, le risque perçu, un résultat couramment observé au niveau moyen (Weber et coll., 2002).

De plus, les scores moyens aux sous-échelles de prise de risques et de perception des risques étaient, en majeure partie, hautement et négativement corrélés, ce qui appuie le modèle de risque-rendement sur les choix risqués.

Importance : Cette recherche est une suite des travaux originaux de Weber et coll. (2002) et consiste en un examen psychométrique et une analyse d'une version révisée de l'échelle DOSPERT inspirée du modèle psychologique de risque-rendement sur les choix risqués. Nous espérons être en mesure de présenter cet instrument comme étant la version la plus récente et à jour de l'échelle DOSPERT pouvant être employée auprès de populations adultes élargies (y compris les militaires).

Plans futurs : À court terme, il faudra reformuler les items de « santé/sécurité » et de « domaine social » et faire une autre série de travaux de mise au point/validation. Entretemps, nous recommandons toutefois aux chercheurs du domaine des jugements/décisions d'utiliser la version actuelle de l'échelle DOSPERT (voir l'annexe B), car les scores de ses sous-échelles ont des consistances internes acceptables. En outre, c'est la seule échelle, à notre connaissance, qui évalue tant les attitudes à l'égard de la prise de risques que la perception des risques dans divers domaines de la vie.

À long terme, nous prévoyons évaluer et comparer les modèle de prise de risques et de perception des risques au moyen d'une analyse factorielle de confirmation. Cette analyse nous permettra de mettre à l'épreuve le modèle théorique à six facteurs et de déterminer s'il est invariant pour les items de prise de risques et de perception des risques. Nous poursuivrons aussi nos travaux de validation de traits en étudiant (parmi diverses stratégies), par exemple, la validité discriminante/convergente des scores des sous-échelles pour ce qui est de traits liés/non liés, comme la recherche de sensations, la prise de risque générale, l'extraversion, etc.

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1 Introduction

1.1 (In)Consistencies in risk taking

In many situations, across all spheres of life, we can attribute the behavior of individuals to their purported risk attitude (i.e., their standing on the continuum from risk aversion to risk seeking). Furthermore, this attitude is often used as a selection tool. For example, start-up companies may look for risk-seeking new employees, while investment firms may try to match up their financial advisors with specific clients based on similarity in risk attitude. These examples show how individual differences in risk attitude can impact professional or personal decisions involving risk or uncertainty and as such, how we should consider them in models of risky choice. Unfortunately, the commonly used measures of risk attitude in Judgment and Decision Making (J/DM) research have proven unsatisfactory for a variety of reasons.

Risky decision-making research has traditionally relied on the expected utility (EU) framework and its variants, including prospect theory (Kahneman & Tversky, 1979; Tversky & Kahneman, 1992). This framework typically defines risk attitude in the form of the degree of risk aversion, that is, the parameter that specifies the utility function that best fits the choices of a given individual. Risk attitude is thus simply a descriptive label for the concavity or convexity of this utility function. One problem with this approach is that different methods of assessing an individual's utility function can lead to different risk-aversion parameters (Slovic, 1964).

This EU-definition of risk attitude also proves to be problematic when one thinks of risk attitude as a stable personality trait, because individuals' risky choices and hence, their associated utility functions, are often inconsistent across different domains and situations, both in laboratory studies and managerial contexts (Schoemaker, 1990). MacCrimmon and Wehrung (1986, 1990) found that, for example, business managers show different degrees of risk taking in gambling, financial investing, business, and personal decisions, and thus appear to have different attitudes when making decisions involving personal versus company money or when evaluating financial versus recreational risks.

Given the inconsistency of EU-based assessments of risk attitude, resulting measurement scales have not had much success in predicting individuals' choices or behaviors across a range of situations (Bromiley & Curley, 1992). In fact, the observed content-specificity of people's responses suggests that choices should not be combined across content domains. Nevertheless, the Choice Dilemma Questionnaire (CDQ; Kogan & Wallach, 1964), a commonly used scale, asks respondents for probability equivalents in 12 choice dilemmas from different domains of life; the researcher then combines the responses into a single score that allegedly represents the individual's risk taking attitude. Regardless of its obvious deficiencies, the scale is still in use, mainly for lack of better alternatives.

1.2 The risk-return framework of risky choice

In order to address some of the problems outlined above, a number of researchers have recently argued that risk attitude may be better 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 consider *perceived risk* as a variable that can differ between individuals and as a function of content and context (Weber, 1998). The decomposition of risk attitude into a trade-off between perceived benefits and perceived risks provides for multiple ways in which various characteristics of the decision maker and/or the situation can affect choices under risk (Weber & Hsee, 1998; Weber & Milliman, 1997). For example, an individual's attitudes in two situations might be different because she or he perceives the risks and benefits associated with the situation to diverge in magnitude in the two domains, whereas her or his *attitude towards perceived risk* (i.e., whether she or he likes or dislikes perceived risk) remains essentially the same.

Empirical investigations have revealed systematic situational, individual, group, and cultural differences in perceptions of the riskiness of risky choice options (Bontempo, Bottom, & Weber, 1997; Slovic, 1997; Weber, 1988) as well as in the perception of their perceived benefits (Johnson, Wilke, & Weber, 2004). However, after accounting for differences in the perception of the risk or returns of choice alternatives, people's *perceived-risk attitude*, or attitudes towards perceived risk, has shown considerable situational consistency, with most people being consistently perceived-risk averse or neutral (Weber, 1998), suggesting that this construct might indeed be a relatively stable personality trait. Weber, Blais, and Betz (2002) and Blais and Weber (2006) have started to investigate this contention with promising results.

Decision domains in which individuals 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 further broken down into smaller categories that differ in associated goals and concerns (Weber, Ames, & Blais, 2005; Weber & Lindemann, 2007), 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) known to affect risk perception (Slovic, Fischhoff, & Lichtenstein, 1986).

1.3 The Domain-Specific Risk-Taking (DOSPERT) Scale

In order to fill the need for an individual-difference measure of risk taking in J/DM research and inspired by the risk-return framework outlined above, Weber et al. (2002) developed an instrument to assess risk taking, the Domain-Specific Risk-Taking Scale (hereafter referred to as the DOSPERT), that allows researchers and practitioners to assess both risk attitudes (i.e., the self-reported degree of risk taking) and perceived-risk attitudes (i.e., the tradeoff between perceived risks and benefits) in six commonly encountered content risk domains (i.e., Ethical, Gambling, Health/Safety, Investing, Recreational, and Social).

Researchers have used and validated the DOSPERT in a wide range of settings, populations, and cultures (see https://decisionsciences.columbia.edu/dospert/). In addition to adequate internal-consistency reliability estimates, Weber et al. (2002) reported moderate test-retest reliability estimates and provided early evidence for the factorial and convergent and discriminant validity of the scores with respect to sensation seeking, dispositional risk taking, intolerance for

ambiguity, and social desirability. They also began to evaluate its construct validity via correlations with the results of a risky gambling task as well as with tests of gender differences.

Zuniga and Bouzas (2005) provided further evidence for its construct validity in 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 DOSPERT 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 DOSPERT 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). Harrison et al. (2005) also commend the DOSPERT for its simultaneous measurement of multiple risk constructs such as risk taking and risk perception, and perceived-risk attitude.

Weber et al. (2002) also used the DOSPERT to support the psychological risk-return model of risky choice. For the great majority of respondents, the relationship between risk attitude and risk perception was negative or neutral, suggestive of a negative attitude towards perceived risk, or perceived-risk aversion.

1.4 The current work

To facilitate the use of the DOSPERT in a broader range of applied settings, we hereby examine a revision of the original Weber et al. (2002) DOSPERT. We had selected the items of the original DOSPERT based on a careful examination of the literature on risk-taking behaviors (e.g., Byrnes, Miller, & Schafer, 1999), including a review of existing measures of risk taking, 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 selection and refinement of items).

To generate a revised version of the scale with items that would be interpretable by a wider range of respondents in different demographic groups, we first re-evaluated the 40 items listed in Study 3 of Weber et al. (2002) on the basis of feedback received from previous users in different cultures. As a result, and mostly based on content and face validity considerations, we deleted 8 items (e.g., "Cheating on an exam," "Plagiarizing a term paper," etc.), rewrote 27 of them, and added 16 new ones (e.g., "Passing of somebody else's work as your own," "Revealing a friend's secret to someone else," etc.). We also modified the rating scale slightly by increasing the number of scale points from 5 to 7 and labelling all of them instead of just the two endpoints in an effort to increase its psychometric quality (Visser, Krosnick, & Lavrakas, 2000). Appendix A shows the resulting 48 items (the risk-taking and risk-perception items are exactly the same; their order and instructions are different, however). For the new version, we assigned 8, 4, 10, 4, 8, and 14 items to the Ethical, Gambling, Health/Safety, Investing, Recreational, and Social scales, respectively.

Our primary aim was to document the changes we made to the DOSPERT and present the results of the initial psychometric work we conducted on this new version of the instrument. We hope to

present these results, after further validation work, as the most current, updated version to be used with broader adult populations (i.e., not just with young adults).

2 Method

2.1 Materials

Note that what we refer to as the *risk-taking* or *risk-attitude* scale of the DOSPERT evaluates the respondents' behavioral intentions, that is, the likelihoods with which they might engage in behaviours originating from six risk domains (i.e., Ethical, Gambling, Health/Safety, Investing, Recreational, and Social) using a 7-point rating scale ranging from 1 (*Extremely Unlikely*) to 7 (*Extremely Likely*).[1] Sample items include "Having an affair with a married man/woman" (Ethical), "Betting a day's income on the outcome of a sporting event" (Gambling), "Engaging in unprotected sex" (Health/Safety), "Investing 10% of your annual income in a new business venture" (Investing), "Taking a weekend sky-diving class" (Recreational), and "Disagreeing with an authority figure on a major issue" (Social). We add item ratings across all items of a given subscale to obtain subscale scores and divide by the number of scale items on that subscale, with greater scores indicative of greater risk taking in the domain of the subscale.[2]

Now, the *risk-perception* scale evaluates the respondents' gut level assessment of how risky each of the same behaviours is on a 7-point rating scale ranging from 1 (*Not at all*) to 7 (*Extremely Risky*). Again, we add ratings across all items of a given subscale to obtain subscale scores and divide by the number of scale items on that subscale, with greater scores suggestive of perceptions of greater risk in the domain of the subscale.

As explained above, to endorse a risk-return approach in assessing apparent risk taking presupposes the involvement of various determinants, that is, perceptions of benefits and risk, as well as a more stable component that represents a person's propensity to favour (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, we were unable to collect perceptions of benefits due to time constraints, so the focus here is exclusively on apparent risk taking, perceived risk, and perceived-risk attitude.

2.2 Participants and procedure

Given that the communalities associated with the DOSPERT items were, on average, below .50 in previous studies (i.e., the common factors explained less than 25% of the variance in the manifest variables), and that the ratio of variables to factors was about 20:3, we aimed for a sample size of

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[1] Most respondents will not have found themselves in every one of the situations described by the scale items or even have the training or background to find themselves in these situations. Nevertheless, they seem to interpret our instructions "*to indicate the likelihood that you would engage in the described activity of behaviour 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 in the described behaviour were both possible or feasible, that is, so that they had a real choice, and to express their preference between the two options.

[2] In short, we refer to the respondents' self-reported likelihood of engaging in risky behaviours as *risk taking*. Similarly, we label their gut level assessment of the riskiness of these behaviours *risk perception*.

at least 200 participants, based on the recommendations of MacCallum, Widaman, Zhang, and Hong (1999). From a total of 467 respondents who completed the study, we eliminated 85 for meeting one or more of the following exclusion criteria, indicative of non-honest or careless responding: providing an invalid postal address, attempting to take the experiment multiple times with different identities, spending less than 1200 seconds (i.e., 20 minutes) on the task, or having an Internet Protocol (IP) address or providing an e-mail address that did not match the country provided in their postal address.

Of the remaining sample of 382 legitimate and careful respondents (178 women, 198 men, and 6 participants of unknown gender), 255 indicated residing in the United States, 101 in Canada, and the others, in a variety of countries (e.g., China, India, Israel, etc.). Perhaps not surprisingly, given that the advertisements for the study were in English, all but 11 of the 382 respondents indicated English as their primary language, and only 2 of the Canadian respondents were French-speaking. Eighty-two respondents were of age 21 years or younger, 223, between the ages of 22 and 35 years, and 71, 36 years or older. The highest achieved educational level ranged from less than high school (7) to a PhD (9), with the majority of respondents reporting having completed a Bachelor's Degree (175). While the largest group of respondents (122) indicated that they were students, there was a broad representation of occupations, ranging from arts/entertainment/publishing (41) to construction/facilities (4), and twelve other job categories.

We recruited potential participants via advertisements on web bulletin boards and list servers. They agreed to complete our survey, including the revised DOSPERT and other scales which we will not discuss further here, for a payment of $9 US. By advertising and posting the study on the world-wide-web, we gained access to a sample of respondents in Canada and the United States that is far more representative of the general population in age, educational level and occupations than most traditional lab-based studies that tend to attract mostly college or university students.

Participants filled out the instruments via a variety of web browsers. After reading an information sheet and providing informed consent in accord with the policies of the Institutional Review Board of Columbia University and the Human Research Ethics Committee of DRDC, they provided demographic background information first and subsequently completed the DOSPERT and other instruments. On average, they completed the task in 56 minutes.

Half of the respondents rated their risk taking on the DOSPERT first and their risk perceptions for the same 48 items (presented in a different random order) last. The other half rated their risk perceptions first, and their risk taking for the same 48 items (presented in a different random order) last, with the other five instruments appearing in the same order as for the other half. At the end of the study, they received information about the payment process through PayPal, an e-commerce business allowing payments and money transfers through the Internet.

3 Results

3.1 Analytical approaches

One can use various approaches to evaluate the quality of generated items and eliminate those proving to be inadequate. These procedures are not mutually exclusive, and, in fact, Wegener and Fabrigar (2004) recommend that one uses some combination of approaches. Most appropriate with respect to the current data are item descriptive statistics, item-total correlations, and factor analysis.

For example, one would discard those items with mean ratings near the endpoints of the rating scale (or little variance), as they are unlikely to differentiate among individuals. Similarly, one would remove those items that fail to show a sizable correlation (.30 in the expected direction; Nunnally & Bernstein, 1994) with the total or corrected total scale score (i.e., the total score except for the item of interest), as they do not distinguish between low and high scorers on the scale.

Exploratory factor analysis (EFA) is extremely useful for constructing measures (Wegener & Fabrigar, 2004). First, EFA indicates how many latent variables (or factors) account for the correlations among manifest variables (or items). Second, it provides information with respect to the magnitude and direction of relationships of the factors with each item (i.e., factor loadings), which also allows for the identification of items with poor psychometric properties. Furthermore, when one uses oblique rotations, an EFA generates a matrix of correlations among the factors that indicates the extent to which factors are distinct from one another.

Confirmatory factor analysis (CFA) has also become increasingly popular in developing measures (Wegener & Fabrigar, 2004). The same underlying mathematical model (i.e., the common factor model, which aims to represent the structure of correlations among items using a small set of factors; Fabrigar, Wegener, MacCallum, & Strahan, 1999) underlies both CFA and EFA, but CFA involves a somewhat different set of procedures.

In a nutshell, EFA assumes one does not have precise a priori knowledge of the underlying structure of items, whereas CFA requires one to specify in advance how many factors exist and which items these factors will (and will not) influence. Wegener and Fabrigar (2004) claim that, when selecting items, EFA is often the best procedure to use, "…because the items being examined are often newly constructed items whose properties are not well established" (p. 154). For example, EFA could identify problems and complexities within the set of items that CFA could not detect.

Note that it is possible to conduct the same sorts of tests and statistical comparisons of models that differ in their number of factors in EFA and CFA, because of their common statistical origin. EFA can verify not only that an item loads on the factor it is intended to load on, but also that it does not load on factors it should not load on (i.e., one can examine possible cross-factor loadings in a much less awkward manner than one does in CFA). In summary, Wegener and Fabrigar (2004) argue for the use of EFA when initially selecting items and replicating the factor structure of a new measure in similar or different populations. CFA should then be used in subsequent

studies to provide precise tests of the underlying structure of the measure (i.e., tests of theory-based measurement models).

Once one has established that EFA is the most appropriate form of analysis to conduct, one must choose a procedure to fit the common factor model to the data (Fabrigar et al., 1999). The most widely used model-fitting methods include Maximum Likelihood (ML) and iterative principal factors. The main advantage of ML is that it allows for the computation of a number of indices of the model's fit, statistical significance testing of factor loadings and correlations among factors, and the calculation of confidence intervals for these parameters. However, its primary drawback lies in its assumption of multivariate normality; using this procedure in the presence of severe non-normality (i.e., skewness >|2|; kurtosis >|7|; West, Finch, & Curran, 1995) may lead to misleading results.

Fabrigar et al. (1999) encourage the use of descriptive indices of fit such as the Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993) in ML factor analysis. One can obtain a sequence of ML solutions for a range of number of factors and then assess the fit of these models using the RMSEA and other fit measures, choosing the number of factors that provides optimal fit to the data without overfitting (Preacher & MacCallum, 2003). RMSEA values less than .05 indicate a good fit to the data, values between .05 and .08, an acceptable fit, values between .08 and .10, a marginal fit, and values greater than .10, a poor fit (Browne & Cudeck, 1993).

In order to arrive at the solution with the best 'simple structure' (i.e., the most easily interpretable, replicable, and meaningful), the factors need to be rotated in multidimensional space. Fabrigar et al. (1999) state the clear advantages of an oblique rotation (i.e., permitting correlations among factors) over an orthogonal rotation (i.e., constraining factors to be uncorrelated) and see little reason for using the latter as the basis for interpretation. They suggest that one then carefully examines the rotated solution for the suggested model to validate its interpretability and plausibility.

Note that, at the item level, factor loadings greater than or equal to .35 (in absolute value) typically indicate a salient loading (Clark & Watson, 1995). Good candidate items are those that have a salient loading on their a priori assigned factor and minimal loadings on other factors, whereas bad items are those that load weakly on the hypothesized factor or cross-load on one or more factors (Simms & Watson, 2007).

Given that the risk-taking items in Weber et al. (2002) differed from those introduced here (i.e., we reworded quite a few and added new ones) and based on our review of the literature as to which approach to use for the evaluation and selection of items, we propose a sequence of obliquely rotated ML solutions for five and six (the hypothesized model) factors. We then assess the fit of these models using the RMSEA, choosing the solution providing optimal fit to the data while remaining parsimonious, interpretable and plausible from a theoretical perspective. We will also examine the item-level descriptive statistics and item-total correlations in order to choose the items with optimal properties.

We examined the univariate distributions of the individual items and, when needed (z > |3.29|, Tabachnick & Fidell, 1996), substituted the next less extreme rating (Kline, 1998). In order to maximize sample size, we inserted sample mean values where individual data points were

missing (Cohen & Cohen, 1983). We use a familywise significance level of .05 (two-tailed) throughout, correcting for multiple tests, unless otherwise noted.

3.2 Risk-taking items

3.2.1 Exploratory factor analyses

As proposed above, we conducted a five- and a six-factor EFA on the 48 initial items (i.e., 8 a-priori assigned Ethical, 4 Gambling, 10 Health/Safety, 4 Investing, 8 Recreational, and 14 Social items) with Comprehensive Exploratory Factor Analysis (CEFA; Browne, Cudeck, Tateneni, & Mels, 1998). As discussed previously, we selected an oblique (i.e., direct oblimin) rotation following a ML extraction method[3]. We report the likelihood ratio statistic and the RMSEA and its 90% confidence interval (CI) as indices of goodness-of-fit of the model to the data.[4]

The RMSEA (90% CI) associated with the five-factor model indicated an acceptable fit to the data, .057 (.054; .061), $\chi^2(898) = 2027.84$. The significant factor inter-correlations ranged from .12 to .53. None of the 90% CIs around the factor inter-correlations contained a value of 1, which offers support for the discriminant validity (i.e., conceptual distinctiveness) between the constructs.

The RMSEA (90% CI) associated with the six-factor model suggested an acceptable fit to the data as well, .052 (.049; .056), $\chi^2(855) = 1752.16$. Surprisingly, the sixth factor only had five salient loadings (most of which were secondary) spread across the hypothesized risk domains. The other five factors showed an almost identical pattern of loadings to the five-factor model. The factor inter-correlations ranged from .03 to .53 (in absolute values). None of the 90% CIs around the factor inter-correlations contained a value of 1.

[3] Prior to running the EFA, we assessed the skewness and kurtosis values of each item and found them to be lower than the respective cut-offs of |2.0| and |7.0| suggested by West et al. (1995) as indicative of severe non-normality.

[4] It is standard procedure to report the likelihood ratio statistic, but it is highly sensitive to sample size (Fabrigar, et al., 1999); we used a significance level of .05 throughout.

Table 1: Descriptive Statistics and Factor Loadings of the Risk-Taking Items (N = 382)

No.	Item	1	2	3	4	5	*M*	*Md*	*Mo*	*SD*	*Sk*	*Kurt*	*Min*	*Max*	*CI-TC*
							Ethical								
7	**Income tax**	**.59**	.03	.05	.20	-.03	3.82	4	5	1.80	0.04	-1.00	1	7	.58
10	**Affair**	**.58**	.04	.01	.09	.10	2.87	2	1	2.02	0.78	-0.73	1	7	.57
11	**Somebody's work**	**.60**	.08	-.24	.16	.08	2.49	2	1	1.75	1.12	0.26	1	7	.61
23	**Friend's secret**	**.65**	.16	.12	-.09	.07	3.27	3	2	1.80	0.45	-0.88	1	7	.49
30	Software	.31	-.03	.18	.15	-.00	4.78	5	6	1.79	-0.58	-0.60	1	7	.34
31	Reporting neighbor	.03	-.05	.18	.24	.04	4.07	4	5	1.73	-0.02	-0.97	1	7	.15
42	**Leave children**	**.53**	.16	-.11	.16	-.01	2.84	2	1	1.86	0.77	-0.50	1	7	.53
44	**Lost wallet**	**.48**	-.02	.01	-.03	.10	3.57	3	1	1.97	0.29	-1.10	1	7	.50
							Recreational								
2	Camping	-.10	**.47**	.29	-.08	.01	5.3	6	7	1.90	-0.90	-0.40	1	7	.50
4	**Swimming**	.15	**.46**	.12	-.05	.11	3.60	3	1	2.05	0.19	-1.31	1	7	.57
12	Traveling	.02	.31	.29	.14	-.07	4.70	5	7	2.01	-0.47	-1.09	1	7	.43
14	**Skiing**	.06	**.61**	-.05	.05	.12	3.8	4	1	2.10	0.04	-1.41	1	7	.62
17	**Whitewater rafting**	-.14	**.64**	.14	.02	-.14	4.2	5	5	1.97	-0.20	-1.21	1	7	.67
26	**Sky diving**	.03	**.77**	-.01	.01	-.08	4.1	5	1	2.18	-0.17	-1.42	1	7	.65
34	**Bungee jumping**	.02	**.77**	-.08	-.01	.04	3.4	3	1	2.16	0.35	-1.34	1	7	.65
35	**Piloting**	.08	**.58**	.02	-.22	-.03	3.7	4	1	2.05	0.10	-1.31	1	7	.60
							Social								
1	Tastes	.02	.06	**.61**	.05	-.15	6.10	7	7	1.28	-1.80	2.92	2	7	.53
8	**Disagreement**	-.03	.06	**.60**	.17	-.00	5.10	5	5	1.54	-0.76	-0.05	1	7	.61
13	Argument	.06	-.01	**.58**	.14	-.10	5.9	6	7	1.32	-1.35	1.28	2	7	.49
16	**Raise**	-.01	-.00	**.49**	.26	.03	4.9	5	5	1.59	-0.61	-0.44	1	7	.53
19	Telling a friend	.13	.13	.21	-.05	.04	3.9	4	5	1.75	-0.03	-1.07	1	7	.32
21	Clothing	.32	.17	.34	-.08	-.04	4.5	5	6	1.92	-0.46	-0.99	1	7	.43
29	**Career choice**	-.12	.07	**.65**	-.14	.04	5.7	6	7	1.48	-1.16	-0.58	1	7	.54
32	**Unpopular issue**	-.03	.02	**.58**	.15	-.01	5	5	5	1.58	-0.73	-0.19	1	7	.59
38	Break up	.19	-.02	**.47**	-.08	-.02	4.4	4	4	1.80	-0.26	-0.89	1	7	.50
40	**Move**	.07	.08	**.56**	.00	-.06	5.5	6	7	1.67	-1.14	-0.29	1	7	.53
41	**New career**	.03	-.05	**.68**	.05	.05	5.4	6	6	1.45	-0.95	-0.48	1	7	.63

43	Early retirement	.15	.05	**.39**	-.07	.22	4.1	4	4	1.70	0.01	-0.87	1	7	.45
46	Rejected proposal	-.06	-.04	**.55**	.12	.05	4.9	5	7	1.67	-0.40	-0.75	1	7	.53
47	Job	.08	.07	**.51**	-.14	.13	4.60	5	5	1.94	-0.40	-1.07	1	7	.52
							Investing								
5	**Mutual fund**	-.03	.08	.15	**.64**	.01	4.8	5	5	1.69	-0.62	-0.42	1	7	.64
15	**Speculative stock**	.12	.03	-.02	**.64**	.22	3.8	4	5	1.91	0.11	-1.15	1	7	.66
20	Conservative stock	-.02	.04	.22	**.53**	.04	5.1	5	5	1.62	-0.83	0.00	1	7	.56
25	**Business venture**	.11	.11	.03	**.57**	.19	3.8	4	5	1.89	0.03	-1.16	1	7	.62
							Gambling								
3	**Races**	-.04	-.01	.05	.05	**.86**	2.78	2	1	2.03	0.81	-0.73	1	7	.81
9	**Poker**	-.01	.04	-.01	.01	**.90**	2.81	2	1	2.08	0.79	-0.79	1	7	.85
18	**Sporting event**	.01	-.01	-.06	.05	**.86**	2.97	2	1	2.14	0.64	-1.10	1	7	.83
28	Casino	.16	.04	-.01	-.03	**.67**	2.34	1	1	1.87	1.23	0.21	1	7	.71
							Health/Safety								
6	**Drinking**	**.46**	.10	.22	-.24	.10	4.40	5	6	2.16	-0.38	-1.30	1	7	.50
22	**Unprotected sex**	**.52**	.05	.05	-.00	.10	3.45	3	1	2.14	0.28	-1.39	1	7	.56
24	**Seat belt**	**.41**	.20	-.08	.03	.09	3.52	3	1	2.18	0.27	-1.40	1	7	.49
27	**Helmet**	.29	.33	-.04	.07	.16	2.76	2	1	2.04	0.87	-0.69	1	7	.56
33	Sunbathing	.34	.23	.10	-.12	.05	4.26	5	5	2.09	-0.26	-1.33	1	7	.48
36	**Walking alone**	.30	.28	.23	-.08	.05	4.24	5	5	2.00	-0.25	-1.27	1	7	.53
37	Unhealthy food	.17	-.09	**.38**	-.10	.18	5.19	6	6	1.63	-0.87	-0.06	1	7	.34
39	**Medication**	**.49**	.11	.08	-.13	.07	3.51	3	5	1.88	0.24	-1.13	1	7	.52
45	Clinical trial	.13	.06	.28	-.06	.19	4.12	4	5	1.85	-0.18	-1.08	1	7	.37
48	Vaccinations	.25	.23	.08	-.11	.10	3.00	2	1	1.99	0.64	-0.94	1	7	.45

Note. M = mean, *Md* = median, *Mo* = mode, *SD* = standard deviation, *Sk* = skewness, *Kurt* = kurtosis, Minimum (*Min*) and maximum (*Max*) ratings are 1 and 7, respectively. *CI-TC* = corrected item-total correlation. We retained those items in boldface typeset. Factor loadings that are in boldface typeset are greater than .35.

Based on parsimony, our inclination was to choose a five- over a six-factor model of risk attitudes, despite its misfit with our theoretical model. Table 1 shows the factor loadings associated with the five-factor model as well as the descriptive statistics for each of the 48 items.

Note that all (except for one) of the corrected item-total correlations, computed on the basis of the initial 48 items and their assignment to their respective a priori defined subscales, were greater than .30, indicative of relatively narrow constructs, that is, constructs that are narrowly conceptualized or defined (especially in the case of the Gambling dimension), albeit not

worrisomely so. This is not entirely surprising given the specificity of the constructs under study and level of detail of the scale items.

3.2.2 Item-level statistics and selection

Six (Items 7, 10, 11, 23, 42, and 44) out of the eight Ethical items had unique salient loadings on an Ethical factor. The two other Ethical items (Items 30 and 31) did not load saliently on any of the five factors. Thus, we suggest the retention of Items 7, 10, 11, 23, 42, and 44[5].

The elimination of Item 28 led to a slight increase in the internal consistency reliability estimate (i.e., Cronbach's alpha) of the Gambling subscale score, from .912 to .914, leading us to keep Items 3, 9, and 18 to form the Gambling subscale.

Interestingly, all of the Health/Safety items that had salient loadings loaded on the Ethical factor (i.e., Items 6, 22, 24, and 39), except for Item 37, which loaded on the same factor as the Social items. When considering the nature of the items in question, we noted that they could all be perceived as having a "moral/ethical" component (e.g., "Drinking heavily at a social function," or "Engaging in unprotected sex"). Nevertheless, on the basis of our original theoretical model, we assigned Items 6, 22, 24, 27, 33, 36, 37, 39, 45, and 48 to a Health/Safety subscale. Again, using various sources of information (i.e., corrected item-total correlations and descriptive statistics), we recommend retaining Items 6, 22, 24, 27, 36, and 39. It is important to note, however, that the Health/Safety subscale in its original format did not come up as expected in the factor analysis. Thus, its validity in adult populations requires further investigation.

Item 20 had the lowest salient factor loading on an Investing factor (as well as the lowest corrected item-total correlation). It also had the greatest mean and lowest standard deviation. All in all, if we were to retain only three Investing items, we recommend keeping Items 5, 15, and 25.

Item 12 did not load saliently on any of the five factors. Of the remaining seven (Items 2, 4, 14, 17, 26, 34, and 35) Recreational items that had their unique salient loadings on a Recreational factor, Item 2 was a candidate for deletion, given it had the lowest corrected item-total correlation and standard deviation and the greatest mean, median, and mode, leaving us with Items 4, 14, 17, 26, 34, and 35 to form the Recreational subscale.

Of the 14 Social items, only two (Items 19 and 21) did not have a salient loading on a Social factor. To select six items out of the remaining 12, we based our judgment on their corrected item-total correlations and descriptive statistics, retaining Items 8, 16, 29, 32, 40 and 41. Item 46 proved to be an acceptable item as well, but it was a new item, and we decided to favor those items that had been successfully used in the past. Of interest, however, is the fact that all of the retained Social items involved some degree of risky "work" behaviors/activities, suggesting that, in adult populations, social risk taking may be tapping, to a large extent, into such behaviors/activities. This requires further investigation, however.

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[5] A minimum of three items per factor is critical, yet a more prudent goal is to have a minimum of four to five items per factor (Velicer & Fava, 1998).

3.2.3 Subscale-level statistics and correlations

We added the scale ratings associated with each of the six retained Ethical, Health/Safety, Recreational, and Social risk items within each of these subscales and divided the totals by 6, leading to minimum and maximum subscale scores of 1 and 7, respectively. We aggregated the scale ratings associated with each of the three retained Gambling and Investing risk items within each of these subscales and divided the totals by 3, also resulting in minimum and maximum subscale scores of 1 and 7, respectively.

We report the descriptive statistics associated with the resulting subscales in Table 2. Note that the Ethical, Gambling, Health/Safety, and Recreational (*ns*) risk items fell below the rating scale mid-point of 4 (*Not Sure*), suggestive of disagreement with the positive risk-taking statements (i.e., showing relatively low levels of risk taking). The Investing (*ns*) and Social risk items fell above the rating scale mid-point, indicative of agreement with the positive risk-taking statements (i.e., suggesting relatively high levels of risk taking).

The acceptable (i.e, above .70; Nunnally & Bernstein, 1994) internal consistency reliability estimates (i.e., Cronbach's alphas) of the scores ranged from .77 to .91. The subscales were inter-correlated, with correlation coefficients ranging from .14 (*ns*) to .66 ($p = .000$). We show the 36 retained items in Appendix B (the risk-taking and risk-perception items are exactly the same; their order and instructions are different, however).

Table 2: Descriptive Statistics and Correlations Among the Risk-Taking Subscales (N = 382)

Subscale	*M*	*SD*	Ethical	Gambling	Health/Safety	Investment	Recreational	Social
Ethical	3.14*	1.32	.80					
Gambling	2.85*	1.92	.52	.91				
Health/Safety	3.65*	1.41	.66	.52	.77			
Investing	4.12	1.53	.40	.51	.36	.78		
Recreational	3.78	1.57	.44	.45	.57	.46	.85	
Social	5.27*	1.09	.16	.14	.28	.31	.36	.80

Note. M = mean, *SD* = standard deviation. Minimum and maximum scores are 1 and 7, respectively. Internal consistency reliability estimates (i.e., Cronbach's alphas) are on the main diagonal. Correlation coefficients greater than .17 are significantly different from 0 at $p < .05$ (two-tailed) in the Bonferroni correction.

*$p < .05$ (two-tailed) in the Bonferroni correction.

3.3 Risk-perception items

3.3.1 Exploratory factor analyses

Again, we conducted five- and six-factor EFAs on the 48 initial items with CEFA. As discussed previously, we selected an oblique (i.e., direct oblimin) rotation following an ML extraction

method.[6] We report the likelihood ratio statistic and the RMSEA and its 90% confidence interval (CI) as indices of goodness-of-fit of the model to the data.

The RMSEA (90% CI) associated with the five-factor model indicated an acceptable fit to the data, .058 (.054; .061), $\chi^2(898) = 2033.06$. The significant factor inter-correlations ranged from .21 to .63. None of the 90% CIs around the factor inter-correlations contained a value of 1.

The RMSEA (90% CI) associated with the six-factor model also suggested an acceptable fit to the data, .054 (.050; .057), $\chi^2(855) = 1803.73$. The sixth factor had eight salient loadings spread across the hypothesized risk domains, but the four Investing items had salient unique loadings on an Investing factor, which was not the case in the five-factor solution. The factor inter-correlations ranged from .09 to .58. None of the 90% CIs around the factor inter-correlations contained a value of 1.

Based on interpretability and theoretical fit, we recommend retaining a six- over a five-factor model of risk perceptions. Table 3 displays the factor loadings associated with the six-factor model as well as the descriptive statistics for each of the 48 items.

Table 3: Descriptive Statistics and Factor Loadings of the Risk-Perception Items (N = 382)

No.	Item	1	2	3	4	5	6	*M*	*Md*	*Mo*	*SD*	*Sk*	*Kurt*	*Min*	*Max*	*CI-TC*
							Ethical									
7	**Income tax**	**.42**	-.03	.17	.25	.05	.09	3.86	4	2	1.64	0.37	-0.85	1	7	.51
10	**Affair**	**.44**	.00	.13	.27	.06	-.24	5.18	5	7	1.61	-0.68	-0.45	1	7	.48
11	**Somebody's work**	**.59**	-.01	-.03	.07	.13	-.08	5.20	5	5	1.47	-0.50	-0.58	1	7	.51
23	**Friend's secret**	**.58**	-.11	.13	.02	.07	.03	4.51	5	5	1.62	-0.05	-0.99	1	7	.52
30	Software	.21	-.01	.15	.07	.10	**.39**	3.00	3	2	1.72	0.87	-0.07	1	7	.51
31	Reporting neighbor	.09	.09	.24	.02	.09	.25	3.58	3	4	1.57	0.32	-0.57	1	7	.43
42	**Leave children**	**.42**	.14	-.03	.12	.07	-.02	4.91	5	7	1.69	-0.44	-0.77	1	7	.44
44	**Lost wallet**	.33	-.02	-.01	.06	.14	**.41**	3.57	3	1	1.97	0.29	-1.10	1	7	.55
							Recreational									
2	Camping	.01	.23	.06	.07	.00	**.64**	2.51	2	2	1.56	1.43	1.60	1	7	.53
4	**Swimming**	**.37**	.30	.09	-.07	.03	.10	4.53	5	5	1.72	-0.20	-0.95	1	7	.55
12	Traveling	.08	.23	.22	.12	.04	.15	3.50	3	2	1.74	0.37	-0.82	1	7	.47
14	**Skiing**	.25	.33	-.11	.00	.14	.19	4.59	5	6	1.66	-0.13	-1.06	1	7	.53
17	**Whitewater rafting**	.13	**.38**	.09	.07	.05	.12	4.24	4	5	1.64	-0.05	-0.90	1	7	.59
26	**Sky diving**	-.13	**.75**	.05	.01	.05	.01	4.05	4	5	1.81	-0.04	-1.00	1	7	.58

[6] We assessed the skewness and kurtosis values of each item and found them to be lower than the recommended cut-offs of |2.0| and |7.0|.

		.12											1.05			
	Bungee			-	-		-					-	-			
34	**jumping**	.03	**.86**	.06	.02	.02	.02	4.70	5	7	1.79	0.31	1.05	1	7	.66
						-						-	-			
35	**Piloting**	.04	**.61**	.15	.12	.07	.00	4.24	4	4	1.73	0.02	0.97	1	7	.59
							Social									
		-														
1	Tastes	.09	.02	.17	.06	.04	**.78**	1.78	1	1	1.37	2.00	3.14	1	6	.73
						-							-			
8	**Disagreement**	.04	.07	**.35**	.21	.02	.23	3.24	3	2	1.59	0.56	0.32	1	7	.62
		-	-			-										
13	Argument	.02	.03	.09	.11	.03	**.83**	1.96	1	1	1.43	1.66	1.85	1	6	.69
		-				-							-			
16	**Raise**	.01	.03	**.42**	.25	.04	.23	3.03	3	2	1.55	0.66	0.19	1	7	.66
	Telling a					-	-					-	-			
19	friend	.21	.12	.27	.12	.05	.01	4.29	4	5	1.63	0.19	0.80	1	7	.42
21	Clothing	.20	.07	.23	.13	.06	.33	2.84	2	2	1.68	0.95	0.04	1	7	.63
	Career	-			-								-			
29	**choice**	.11	.11	**.51**	.01	.03	.24	2.70	2	1	1.69	0.88	0.11	1	7	.64
	Unpopular					-							-			
32	**issue**	.04	.14	**.37**	.04	.04	.26	3.14	3	2	1.62	0.56	0.39	1	7	.62
		-	-				-						-			
38	Break up	.01	.05	**.66**	.04	.02	.05	3.76	4	4	1.78	0.21	0.89	1	7	.55
						-							-			
40	**Move**	.00	.01	**.65**	.03	.04	.14	2.74	2	1	1.71	0.85	0.23	1	7	.68
						-							-			
41	**New career**	.00	.00	**.69**	.04	.01	.06	3.21	3	3	1.67	0.51	0.48	1	7	.68
	Early				-								-			
43	retirement	.15	.05	**.52**	.09	.08	.12	3.65	4	4	1.57	0.40	0.52	1	7	.62
	Rejected	-											-			
46	proposal	.06	.00	**.69**	.02	.03	.05	3.09	3	1	1.77	0.63	0.48	1	7	.65
					-		-					-	-			
47	Job	.07	.13	**.61**	.10	.11	.11	4.11	4	5	1.73	0.04	0.97	1	7	.53
							Investing									
				-												
5	**Mutual fund**	.13	.00	.01	**.55**	.10	.31	2.94	2	2	1.62	0.89	0.07	1	7	.63
	Speculative						-					-	-			
15	**stock**	.08	.11	.02	**.40**	.27	.01	4.21	4	5	1.60	0.17	0.82	1	7	.56
	Conservative	-														
20	stock	.04	.06	.05	**.52**	.12	**.36**	2.60	2	1	1.73	1.10	0.30	1	7	.60
	Business						-					-	-			
25	**venture**	.14	.21	.19	.34	.19	.18	4.45	5	5	1.54	0.20	0.59	1	7	.53
							Gambling									
		-			-							-	-			
3	**Races**	.08	.02	.01	.01	**.89**	.01	4.53	5	7	1.79	0.20	1.05	1	7	.80
		-	-		-		-					-	-			
9	**Poker**	.01	.03	.01	.02	**.94**	.02	4.56	5	7	1.87	0.19	1.28	1	7	.85
	Sporting			-								-	-			
18	**event**	.01	.01	.05	.04	**.87**	.02	4.54	5	7	1.83	0.18	1.22	1	7	.81
					-		-					-				
28	Casino	.28	.02	.06	.03	**.52**	.15	5.51	6	7	1.51	0.92	0.08	1	7	.58
							Health/Safety									
			-										-			
6	**Drinking**	.32	.02	.22	.09	.13	.23	3.58	3	2	1.75	0.46	0.82	1	7	.51
	Unprotected			-			-					-	-			
22	**sex**	**.66**	.05	.01	.05	.03	.09	5.51	6	7	1.61	0.87	0.30	1	7	.55
				-	-							-	-			
24	**Seat belt**	**.57**	.12	.06	.02	.04	.13	4.43	4	7	1.84	0.05	1.26	1	7	.58
				-	-	-	-					-				
27	**Helmet**	**.41**	.32	.02	.18	.02	.02	5.47	6	7	1.55	0.91	0.03	1	7	.50
				-	-								-			
33	Sunbathing	**.38**	.22	.08	.23	.03	**.41**	3.77	4	2	1.76	0.34	0.91	1	7	.56
	Walking				-	-	-					-	-			
36	**alone**	**.35**	.25	.23	.01	.03	.03	4.34	4	5	1.67	0.05	1.01	1	7	.53
37	Unhealthy	.31	-	.29	-	.08	**.38**	3.59	3	2	1.63	0.37	-	1	7	.54

	food		.07		.22								0.66			
39	**Medication**	**.38**	.03	.35	-.05	.02	-.02	4.59	5	6	1.73	-0.21	-1.03	1	7	.54
45	Clinical trial	.17	.18	**.37**	.07	.01	-.04	4.19	4	4	1.65	-0.02	-0.75	1	7	.45
48	Vaccinations	**.47**	.21	.07	-.06	.05	-.02	4.91	5	7	1.74	-0.46	-0.94	1	7	.53

Note. M = mean, *Md* = median, *Mo* = mode, *SD* = standard deviation, *Sk* = skewness, *Kurt* = kurtosis, Minimum (*Min*) and maximum (*Max*) ratings are 1 and 7, respectively. *CI-TC* = corrected item-total correlation. We retained those items in boldface typeset. Factor loadings that are in boldface typeset are greater than .35.

Note that all of the corrected item-total correlations, computed on the basis of the initial 48 items and their assignment to their respective a priori defined sub-scales, were greater than .30, suggestive, again, of relatively narrow constructs (especially in the case of the Gambling dimension), though not worrisomely so.

3.3.2 Item-level statistics and selection

Five (Items 7, 10, 11, 23, and 42) out of the eight original Ethical items had their unique salient loadings on an Ethical factor (the others either did not load saliently on any of the factors or had their unique salient loadings on the sixth factor). Yet, as before, we needed to retain a sixth item in order to have enough items for further data collection/item refinement. Based on its corrected item-total correlation, we selected Item 44. Doing so was also consistent with the risk-taking item selection discussed previously.

The elimination of Item 28 led to a slight increase in the internal consistency reliability estimate (i.e., Cronbach's alpha) of the Gambling subscale score, from .89 to .92, leading us to keep, as before, Items 3, 9, and 18 to form the Gambling subscale.

Interestingly, seven out of the eight Health/Safety items that had salient loadings loaded on the Ethical factor (i.e., Items 22, 24, 27, 33, 36, 39, and 48). Reverting back to our a-priori classification of items, however, we assigned Items 6, 22, 24, 27, 33, 36, 37, 39, 45, and 48 to a Health/Safety subscale. Again, using various sources of information (i.e., corrected item-total correlations and descriptive statistics), we recommend keeping Items 22, 24, 27, 33, 36, and 48. Note that this selection differs somewhat from that of risk-taking Items 6, 22, 24, 27, 36, and 39. The two scales only share Items 22, 24, 27, 36. However, as mentioned before, because most users of the scale are likely to rely primarily on the risk-taking items, we feel the items should be consistent across the two scales and hence, we allowed the risk-taking items to guide our choice, leaving Items 6, 22, 24, 27, 36, and 39 intact. Again, it is important to mention that the Health/Safety subscale in its original format did not come up as expected in the factor analysis.

This time, Item 25 had the lowest salient factor loading on an Investing factor (as well as the lowest corrected item-total correlation). However, Item 20 loaded saliently on both the Investing and sixth factors; its mean, median, and mode were also at the low end of the rating scale (with values of 2.60, 2, and 1, respectively). All in all, Items 5, 15, and 25 still remain the best choices to form the Investing subscale.

Only four (i.e., Items 17, 26, 34, and 35) out of the original eight Recreational items had unique salient loadings on a Recreational factor. However, to reach our goal of six items, and based on their corrected item-total correlations and descriptive statistics, we recommend retaining Items 4 and 14, as we did previously.

Items 8, 16, 29, 32, 38, 40, 41, 43, 46, and 47 had their unique salient loadings on a Social factor (the other items either did not load saliently on any of the six factors or had their unique salient loadings on the sixth factor). Of those, Items 8, 16, 29, 32, 40, 41, and 46 seem to be best, based on their item-total correlations. Items 8, 32, and 46 are the least desirable and could be dropped. However, because Item 46 is new, we prefer to eliminate it from the list, resulting in the same set of items as before.

3.3.3 Subscale-level statistics and correlations

We added the scale ratings associated with each of the six retained Ethical, Health/Safety, Recreational, and Social risk items within each of these subscales and divided the totals by 6, leading to minimum and maximum subscale scores of 1 and 7, respectively. We aggregated the scale ratings associated with each of the three retained Gambling and Investing risk items within each of these subscales and divided the totals by 3, also resulting in minimum and maximum subscale scores of 1 and 7, respectively.

We report the descriptive statistics associated with the resulting subscales in Table 4. Note that the Ethical, Gambling, Health/Safety, and Recreational risk items fell significantly above the rating scale mid-point of 4 (*Not Sure*), suggestive of agreement with the positive risk-perception statements (i.e., showing relatively great levels of perceived risk). The Investing (*ns*) and Social risk items fell below the rating scale mid-point, indicative of disagreement with the positive risk-perception statements (i.e., suggesting relatively low levels of perceived risk).

The internal consistency reliability estimates of the scores, which were acceptable, ranged from .71 to .92. The subscales were significantly inter-correlated, with correlation coefficients ranging from .22 to .68.

The correlations between the risk attitude and perception subscales were, for the Ethical, Gambling, Health/Safety, Investing, Recreational, and Social subscales, respectively, -.03 (*ns*), -.34, -.22, -.17, -.32, and -.10 (*ns*), providing support for the risk-return model of risky choice.

Table 4: Descriptive Statistics and Correlations Among the Risk-Perception Subscales (N = 382)

Subscale	*M*	*SD*	Ethical	Gambling	Health/Safety	Investment	Recreational	Social
Ethical	4.43*	1.10	.75					
Gambling	4.54*	1.69	.47	.92				
Health/Safety	4.65*	1.15	.68	.38	.76			
Investing	3.87	1.26	.49	.50	.44	.71		
Recreational	4.39*	1.24	.50	.34	.62	.42	.82	
Social	3.01*	1.23	.43	.22	.46	.50	.45	.85

Note. M = mean, *SD* = standard deviation. Minimum and maximum scores are 1 and 7, respectively. Internal consistency reliability estimates (i.e., Cronbach's alphas) are on the main diagonal. Correlation coefficients greater than .17 are significantly different from 0 at $p < .05$ (two-tailed) in the Bonferroni correction.

*$p < .05$ (two-tailed) in the Bonferroni correction.

4 Discussion

Our primary aim was to document the changes we made to the DOSPERT and present the results of the initial psychometric work conducted on this new version of the instrument. After further validation work, we hope to present this as the most current, updated version to be used with broader adult populations. To that effect, we conducted EFA and examined the resulting factor structures. Based on the best-fitting models and their associated factor loadings (in addition to the item-level descriptive statistics and corrected item-total correlations), we selected, for now, six items (or three) per subscale, hoping to pursue our development and validation work in the future with an independent sample of participants, which would also include new items in our future analyses.

As far as the risk-taking items were concerned, we failed to replicate the theory-based six-factor model. Indeed, most of the Ethical and Health/Safety items loaded on a single factor, which may be, in fact, a broader factor than we had originally anticipated. It may be that the validity of separate Ethical and Health/Safety subscales does not hold in adult populations. It may also be the case that we need to create new items to clearly distinguish the Ethical from the Health/Safety items. Further work including new, more refined, items is needed to address these issues in depth.

The Gambling, Investing, Recreational, and Social risk-taking items showed the anticipated pattern of results, clearly loading on separate factors. Of interest, however, is the fact that all of the retained Social items had to do with, at least to some degree, risky 'work' behaviors/activities, suggesting that, in adult populations, social risk taking may be tapping into such behaviors/activities. By retaining those items with the best psychometric properties in this sample, we may have attenuated the content validity of this subscale. In future work, we may also consider writing new social items that do not allude to the work domain and examine the resulting factor structure.

In their current state, the risk-taking subscale scores were inter-correlated, yet not overly so. The internal consistency reliability estimates were reasonably high, and the mean risk-taking levels were, in most cases, indicative of risk aversion, a commonly-found result at the aggregate level (Weber et al., 2002).

With respect to the risk-perception items, we did indeed replicate the theory-based six-factor model. However, the sixth factor was not meaningful per se. Although we found separate Gambling and Investment factors, again, we observed that most of the Health/Safety items loaded on a broader factor, along with most of the Ethical items.

In general, the risk-perception items with the best properties matched those risk-taking items we had previously selected. In only a few cases did the solutions disagree, in which instances we went with the risk-taking solution. Our rationale was that most users of the scale will be collecting risk-taking (as it is risk taking in the most common sense of the term) data without necessarily collecting risk-perception data.

The risk-perception subscale scores were inter-correlated, yet not overly so. Their internal consistency reliability estimates were acceptable, and the mean risk-perception levels were, in

most cases, indicative of perceived riskiness, a result commonly found at the mean level (Weber et al., 2002). As well, the mean risk-taking and risk-perception subscale scores were significantly and negatively correlated, providing support for the risk-return model of risky choice. Of course, obtaining benefits ratings would have provided us with additional information. Such data could easily be collected in the future, provided time is not an issue.

In the short term, it will be necessary to write new Health/Safety and Social items and go through another run of development/validation work. In the meantime, however, we suggest researchers in the J/DM research area refer to the current version of the DOSPERT (see Appendix B), as its subscale scores have acceptable internal consistencies. Furthermore, it is the only scale, to our knowledge, that assesses both risk-taking attitudes and risk-perceptions in various domains of life.

In the longer term, we plan to evaluate and compare the risk-taking and risk-perception models via confirmatory factor analysis. Such analysis will allow us to test the theory-based six-factor model and examine whether it is invariant across the risk-taking and risk-perception items. We will also pursue our construct validation work by investigating (among various strategies), for example, the discriminant/convergent validity of the subscale scores with respect to unrelated/related constructs, such as sensation seeking, general risk taking, extraversion, etc.

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Appendix A

Domain-Specific Risk-Taking (Original; Weber et al., 2002) Scale – Risk Taking Items

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:

1. Extremely Unlikely
2. Moderately Unlikely
3. Somewhat Unlikely
4. Not Sure
5. Somewhat Likely
6. Moderately Likely
7. Extremely Likely

1. Admitting that your tastes are different from those of a friend. (Social)
2. Going camping in the wilderness. (Recreational)
3. Betting a day's income at the horse races. (Gambling)
4. Swimming far out from shore on an unguarded lake or ocean. (Recreational)
5. Investing 10% of your annual income in a moderate growth mutual fund. (Investing)
6. Drinking heavily at a social function. (Health/Safety)
7. Taking some questionable deductions on your income tax return. (Ethical)
8. Disagreeing with an authority figure on a major issue. (Social)
9. Betting a day's income at a high-stake poker game. (Gambling)
10. Having an affair with a married man/woman. (Ethical)
11. Passing off somebody else's work as your own. (Ethical)
12. Going on vacation to a third-world country. (Recreational)
13. Arguing with a friend who has a different opinion on an issue. (Social)
14. Going down a ski run that is beyond your ability. (Recreational)
15. Investing 5% of your annual income in a very speculative stock. (Investing)
16. Approaching your boss for a raise. (Social)
17. Going whitewater rafting at high water in the spring. (Recreational)
18. Betting a day's income on the outcome of a sporting event (e.g., baseball, soccer, or football). (Gambling)
19. Telling a friend that his (her) partner or spouse made a pass at you. (Social)
20. Investing 5% of your annual income in a dependable and conservative stock. (Investing)
21. Wearing provocative or unconventional clothes. (Social)
22. Engaging in unprotected sex. (Health/Safety)
23. Revealing a friend's secret to someone else. (Ethical)
24. Driving a car without wearing a seat belt. (Health/Safety)
25. Investing 10% of your annual income in a new business venture. (Investing)
26. Taking a sky-diving class. (Recreational)
27. Riding a motorcycle without a helmet. (Health/Safety)
28. Gambling a week's income at a casino. (Gambling)
29. Choosing a career that you truly enjoy over a prestigious one. (Social)
30. Downloading proprietary software from the Internet. (Ethical)

31. Reporting a neighbor or friend for some illegal activity. (Ethical)
32. Speaking your mind about an unpopular issue in a meeting at work. (Social)
33. Sunbathing without sunscreen. (Health/Safety)
34. Bungee-jumping off a tall bridge. (Recreational)
35. Piloting a small plane. (Recreational)
36. Walking home alone at night in an unsafe area of town. (Health/Safety)
37. Eating high cholesterol foods. (Health/Safety)
38. Leaving an unhappy relationship, although you have children together. (Social)
39. Driving while taking medication that may make you drowsy. (Health/Safety)
40. Moving to a city far away from your extended family. (Social)
41. Starting a new career in your mid-thirties. (Social)
42. Leaving your young children alone at home while running an errand. (Ethical)
43. Taking early retirement with reduced financial benefits. (Social)
44. Keeping a wallet you found that contains $200. (Ethical)
45. Participating in an experimental medical procedure or clinical trial. (Health/Safety)
46. Rejecting a marriage proposal, not knowing whether the "right" one will ever cross your path. (Social)
47. Quitting a job you dislike without having a new one lined up. (Social)
48. Traveling to a third-world country without all recommended vaccinations. (Health/Safety)
49.

Domain-Specific Risk-Taking (Original; Weber et al., 2002) Scale – Risk-Perception Items

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:

1. Not at all Risky
2. Slightly Risky
3. Somewhat Risky
4. Moderately Risky
5. Risky
6. Very Risky
7. Extremely Risky

Refer to the previous 48 statements.

Appendix B

Domain-Specific Risk-Taking (Adult) Scale – Risk Taking Items

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:

1. Extremely Unlikely
2. Moderately Unlikely
3. Somewhat Unlikely
4. Not Sure
5. Somewhat Likely
6. Moderately Likely
7. Extremely Likely

1. Approaching your boss for a raise. (Social)
2. Swimming far out from shore on an unguarded lake or ocean. (Recreational)
3. Betting a day's income at the horse races. (Gambling)
4. Investing 10% of your annual income in a moderate growth mutual fund. (Investing)
5. Drinking heavily at a social function. (Health/Safety)
6. Taking some questionable deductions on your income tax return. (Ethical)
7. Disagreeing with an authority figure on a major issue. (Social)
8. Betting a day's income at a high-stake poker game. (Gambling)
9. Having an affair with a married man/woman. (Ethical)
10. Passing off somebody else's work as your own. (Ethical)
11. Going down a ski run that is beyond your ability. (Recreational)
12. Investing 5% of your annual income in a very speculative stock. (Investing)
13. Going whitewater rafting at high water in the spring. (Recreational)
14. Betting a day's income on the outcome of a sporting event. (Gambling)
15. Engaging in unprotected sex. (Health/Safety)
16. Revealing a friend's secret to someone else. (Ethical)
17. Driving a car without wearing a seat belt. (Health/Safety)
18. Investing 10% of your annual income in a new business venture. (Investing)
19. Taking a skydiving class. (Recreational)
20. Choosing a career that you truly enjoy over a more secure one. (Social)
21. Riding a motorcycle without a helmet. (Health/Safety)
22. Speaking your mind about an unpopular issue in a meeting at work. (Social)
23. Driving while taking medication that may make you drowsy. (Health/Safety)
24. Bungee jumping off a tall bridge. (Recreational)
25. Piloting a small plane. (Recreational)
26. Walking home alone at night in an unsafe area of town. (Health/Safety)
27. Moving to a city far away from your extended family. (Social)
28. Starting a new career in your mid-thirties. (Social)
29. Leaving your young children alone at home while running an errand. (Ethical)
30. Keeping a wallet you found that contains $200. (Ethical)

Domain-Specific Risk-Taking (Adult) Scale – Risk-Perception Items

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 behaviour 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:

1. Not at all Risky
2. Slightly Risky
3. Somewhat Risky
4. Moderately Risky
5. Risky
6. Very Risky
7. Extremely Risky

Refer to the previous 30 statements.

List of acronyms

CDQ	Choice Dilemma Questionnaire
CEFA	Comprehensive Exploratory Factor Analysis
CFA	Confirmatory Factor Analysis
CI	Confidence Interval
DOSPERT	Domain-Specific Risk-Taking Scale
DRDC	Defence Research and Development Canada
EFA	Exploratory Factor Analysis
EU	
J/DM	Judgment and Decision Making
ML	Maximum Likelihood
RMSEA	Root Mean Square Error of Approximation

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(U) In order to fill the need for an individual−difference measure of risk taking in Judgment and Decision Making (J/DM) research and inspired by the psychological risk−return model of risky choice, Weber, Blais, and Betz (2002) developed an instrument to assess risk taking, the Domain−Specific Risk−Taking (DOSPERT) Scale, that allows researchers and practitioners to assess both conventional risk attitudes and perceived−risk attitudes in six commonly encountered content risk domains (i.e., ethical, gambling, health/safety, investing, recreational, and social). Our primary aim here was to document the changes we made to the DOSPERT Scale and present the results of the initial psychometric work we conducted on this revised 48−item version of the instrument, which we hope to present, after further development and validated work, as the most current, updated version of the DOSPERT Scale to be used with broader adult populations (including military ones).

(U) Afin de répondre au besoin d'une mesure des différences individuelles pour ce qui est de la prise de risques dans le domaine de la recherche sur les jugements/décisions, Weber, Blais et Betz (2002), inspirés par le modèle psychologique de risque−rendement sur les choix risqués, ont mis au point un instrument pour évaluer la prise de risques, soit la Domain−Specific Risk−Taking Scale (DOSPERT), qui permet aux chercheurs et aux praticiens d'évaluer à la fois les attitudes à l'égard du risque classique et les attitudes à l'égard du risque perçu dans six domaines courants (éthique, jeux de hasard, santé/sécurité, investissement, loisirs et domaine social). Notre premier objectif était de documenter les changements que nous avons apportés à l'échelle DOSPERT et de présenter les résultats du travail psychométrique initial que nous avons effectué sur cette nouvelle version à 48 items de cet instrument. Nous espérons être en mesure de le présenter, après d'autres travaux de mise au point et de validation, comme étant la version la plus récente et à jour de l'échelle DOSPERT pouvant être employée auprès de populations adultes élargies (y compris les militaires).

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