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Evaluating Risk Propensity Using an Objective Instrument

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Risk propensity is the stable tendency to choose options with a lower probability of success, but greater rewards. Its evaluation has been approached from various perspectives: from self-report questionnaires to objective tests. Self-report questionnaires have often been criticized due to interference from voluntary and involuntary biases, in addition to their lack of predictive value. Objective tests, on the other hand, require resources that make them difficult to administer to large samples. This paper presents an easy-to-administer, 30-item *risk propensity* test. Each item is itself an objective test describing a hypothetical situation in which the subject must choose between three options, each with a different gain function but equivalent in expected value. To assess its psychometric fit, the questionnaire was administered to 222 subjects, and we performed a test of its reliability as well as exploratory factor analysis. The results supported a three-factor model of risk (Sports and Gambling, Long-term Plans, and Loss Management). After making the necessary adjustments and incorporating a global factor of *risk propensity*, confirmatory factor analysis was done, revealing that the data exhibited adequate goodness of fit.
Keywords: risk propensity, objective testing.

La *tendencia al riesgo* es una propensión estable a elegir opciones con menores probabilidades de éxito pero mayores recompensas. Su evaluación se ha abordado desde diferentes perspectivas: mediante cuestionarios de autoinforme y pruebas objetivas. El autoinforme ha sido frecuentemente criticado por la interferencia de sesgos voluntarios e involuntarios, y falta de validez predictiva. Las pruebas objetivas requieren recursos que hacen que sean difíciles de aplicar a grandes muestras de sujetos. Este trabajo presenta un test de *tendencia al riesgo* de treinta ítems de fácil aplicación. Cada ítem es en sí mismo una prueba objetiva que presenta al sujeto una situación hipotética en la que tiene que elegir entre tres opciones, cada una con una función de ganancia diferente pero equivalentes en su esperanza matemática. Para valorar sus bondades psicométricas, se aplicó el cuestionario a 222 sujetos y se realizaron análisis de fiabilidad y de validez factorial exploratorio. Los resultados apoyaron un modelo del riesgo en tres factores (deportes y juegos de azar, planes a largo plazo y prevención de pérdidas). Tras los ajustes necesarios al adoptar este modelo, e incluyendo un factor global de *tendencia al riesgo*, un análisis factorial confirmatorio mostró que los datos presentaban un ajuste adecuado.
Palabras clave: tendencia al riesgo, evaluación objetiva.

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The study of risk has historically been approached from many different perspectives (León, 1987), from game theory, which assumes that subjects make decisions based on rational criteria (Bernoulli, 1954; Neuman & Politser, 1992; Savage, 1954), to trait models, which presume that *risk propensity* is a stable behavioral disposition (Eyseck, 1967, Costa & McCrae, 1995; Zuckerman, 1979).

Risk may also be understood as behavior learned by subjects through interacting with their environment over the course of their lives In other words, they learn through the interaction of internal and situational factors. Lopes's two-factor theory (1987) posits that behavior is organized to be consistent, yet the characteristics of a given situation determine certain behavioral parameters, such as intensity and frequency. Furthermore, given that risk is continually constructed as a function of contingencies, the notion that subjects are able to change their preferences has been put to the test, for example, when subjects receive *feedback* about their behavior (León & Lopes, 1988). Interactive style is an individual's propensity to behave in a certain way in a given situation (Ribes, 1990; Ribes & Sánchez, 1992). Interactive style forms according to previous, interactive experiences, and which behaviors have been reinforced in similar situations in the past, and which have been punished. The *risk propensity* interactive style (Ribes & Sánchez, 1990), then, is one of many factors that depend on one's individual learning history. Subjects' preferences are observable in situations that have a risk component, at least two alternative choices, the same expected value to be gained, and where there is an inverse relationship between probability of success and magnitude of gain (termed open contingencies by Ribes & Sánchez, 1992). Subjects regulate their behavior according to the parameters and dimensions of the situation's contingencies, and as a function of their similar past experiences. Interactive style influences the probability that a subject will respond in a given way. Santacreu, Froján, and Santé (1997, cited by Santé, 1999) found *feedback* to be a crucial variable when evaluating subjects' risk behavior. People modify their behavior according to the knowledge they have gleaned over time about success and failure through repeated practice.

Evaluating Risk Propensity. The primary method used to evaluate personality is the self-report questionnaire, in other words, asking the subject who is being evaluated. However, this hinges on subjects being fully aware of their personalities (Santacreu, Rubio, & Hernández, 2006).

Self-report questionnaires are easy to administer, enable us to classify subjects according their reported level of a given trait, and tend to exhibit adequate concurrent validity with other self-report tests measuring the same trait. However, they may be subject to involuntary bias due to the acquiescence or inexactitude of the language used. Moreover, they may be subject to voluntary response bias on the part of the subject due to social desirability, or using deceit to achieve some objective. In addition, self-report measures have considerable predictive limitations. Critics of this perspective cite low correlations between the traits that supposedly mediate risk behavior, evaluated by these questionnaires, and subjects' self-reported risk behavior (Trimpop, 1994). They have also been criticized for the low correlation between a given trait and itself when it is evaluated in different contexts; it makes it seem that the risk variable is sensitive to situational specificity (Sherman & Fazio, 1983). On another note, objective personality evaluations (including measures of *risk propensity*), according to the assumptions described above, should have certain characteristics (Hernández, Santacreu, & Rubio, 1999):

1. Scores should not be based on self-report and the evaluator should use a priori criteria to quantify the results.
2. The tasks should not require a high level of competency on the part of subjects, so that the results are due to interactive style and not level of ability.
3. Evaluation of each essay or item should not give the participant any *feedback*; that way, subjects cannot learn the "correct" behavior (León & Lopes, 1988). One must avoid a situation where subjects are "on a roll" and behave accordingly.
4. The evaluation's objective should be masked to the fullest extent possible; this avoids distorted responses, both voluntary (Robie, Born, & Schmit, 2001) and involuntary, which are common in personality evaluation (Seiwald, 2002).
5. A degree of control should be had over subjects' motivation to successfully execute the task, so that they express their usual interactive style to the best of their ability.

Objective tests have certain advantages over self-report measures in evaluating *risk propensity*, but they also have certain limitations. First of all, the great majority of these tests are computerized. While it is true that administering tests this way requires little time and resources, especially once the computer is implanted as the usual testing apparatus, for every computer with the right software, only one person at a time can be evaluated. Also, it can be difficult to leave a machine available for this use at all times, and the subject being evaluated has to be displaced to wherever the computer is. An even greater inconvenience posed by using objective tests of *risk propensity* is the specificity of the context in which it is evaluated. Many of these contexts relate to gambling: take for example the *Roulette Test* and the *Betting Dice Test* (Rubio & Santacreu, 1998), where subjects are asked to bet on more or less probable results in exchange for financial gains that are inversely proportional to the probability of success. Another computerized objective instrument is the *Balloon Analogue Risk Task* (BART,Lejuez et al., 2002); in this test, subjects are asked to inflate a balloon of unknown capacity

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and the more they inflate it, the greater the risk it will explode, but also the greater the potential for financial gain. Even when risk and financial gains are not discussed, as in the *Risk of Crossing Test* (Santacreu & Rubio, 1998, cited by Hernández, Santacreu, & Rubio, 1999), measurement consists of repeating the same test over and over. Scores derived from this measurement reflect averages of scores on the same "item" administered over and over again, such that the test's internal consistency loses significance in the classical sense of the word. Also, what is being measured by each test is one's *risk propensity* in only one situation; this is like saying that the propensity (or aversion) toward risk need only be measured in one context, and then using that measurement to extrapolate about other situations. One instrument that poses a variety of simulated conditions to participants, which the present study will also do, is *The Risk Propensity Dilemmas* (RPD, Botella, Narváez, Martínez-Molina, Rubio, & Santacreu 2008) task. For each dilemma, the instrument offers two response alternatives pertaining to the expected value. The first alternative ensures gain. The second offers greater gain than the first alternative in the event that the subject is successful, but less gain in the event of failure. Subjects are presented with each dilemma three times, each time varying the interval of gain and the expected value of the risky alternative, which differs increasingly from that of the safe alternative. The subject's first response conditions the second question, and their response to the second conditions the third. In this way, the value of the risk the subject is willing to accept is estimated by making successive approximations. This is repeated for all the dilemmas presented. These authors posit that *risk propensity* is best understood when it is elicited in morphologically distinctive situations (called domains). The dilemmas address various domains (the majority are financial decisions, but the authors propose that as long as the functional structure remains the same, the contexts can be easily modified). The results indicate a change in subjects' responses as a function of the context, framework of the dilemma, and amplitude of the interval in the risky alternative. Clearly, the tendency to behave in a certain way does not imply a person *is* that way permanently; context affects behavior enormously, and that includes decision-making (Fagley & Miller, 1997).

Santé (1999) posits that rectifying a situation's contingencies may lead the subject to behave one way or another. In other words, the kind of situation is unimportant; what matters is the series of behaviors the subject enacts that leads to either a contingency of reinforcement or punishment. Therefore, the contextual distinction must be made according to functionality, not morphology. Though it is very tempting to adopt this perspective, it is very difficult to identify the contingencies that are reinforcing for an individual, because reinforcement does not have fixed characteristics, it reinforces by exerting a certain impact on behavior (Froján & Santacreu, 1999). Each subject would need to be individually analyzed in the laboratory for a researcher to be able to define which situations are functionally reinforcing for him or her. On the other hand, Doval (1995, cited by Santé, 1999) found subjects behaved consistently in situations that were functionally identical, but morphologically different.

The present research stems from the assumption that differences in risk behavior occur according to the situation, but it does not endeavor to analyze each individual subject's contingency level. The point of interest in evaluating *risk propensity*, then, is the morphological relationship between situations. This article will work from the assumption that individual differences in *risk propensity* may be determined by the context in which it is assessed. In that vein, for our purposes, the term *trait* will be considered equivalent to *interactive style*, which is understood as the propensity toward action, formed through repeated interactions with the environment, and to some extent sensitive to changes in contingent relationships with future contexts.

In light of the above, it would be very practical to find a means of evaluating *risk propensity* that would enable us to determine the construct's multidimensionality while at the same time overcoming the inconvenience posed by both objective tests and self-report questionnaires, that is, an instrument with the following characteristics: (a) enables traits to be measured based on behavioral displays registered by objective tests with open contingencies, (b) covers a variety of contexts in which the risk behavior may occur, (c) can be administered within a reasonable amount of time to a large number of subjects and (d) to administer it requires nothing more than a printed questionnaire and a pen.

The objectives of the present study are the following: (a) To create an objective test to measure *Risk Propenisty* that seeks to overcome the limitations associated with many tests, both objective and self-report. (b) To test said instrument in an initial sample. (c) To assess the test's construct validity through exploratory factor analysis and confirmatory factor analysis.

To achieve these objectives would allow us to test the following hypotheses derived from the theoretical framework described above: (a) An objective test may be created to assess personality (in this case, *risk propensity*) in the form of a self-report questionnaire; (b) Using factor analysis to analyze participants' data will reveal their responses on the items to have a multifactor structure, and (c) this structure will have substantial significance, depending on the morphology of the situations described in each item.

Method

Participants

Due to the fact that this test is designed to evaluate the general population, we sought to obtain the most

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heterogeneous sample possible. Using university students trained to administer the test, a convenience sample was collected consisting of adults to which the students had easy access, mostly relatives and neighbors.

In this way, we collected an initial sample of 222 subjects between the ages of 16 and 68 years-old with an average age of 36.39 and a standard deviation of 12.13 years. Three subjects did not report their age. Of the total sample, 135 were men (60.8% of the total) and 86 were women (38.7% of the total). One subject did not fill in this field. Only one subject had received no formal education, but 12 reported having attended elementary school only (between the two categories, comprising 5.5% of the total sample). Another 64 people had only secondary schooling (28% of the total), and 143 had attended college (64% of the sample). In only two cases did respondents not fill in this field.

Instruments

The first version of the *Factorial Objective Risk Test* (FORT; Sánchez-Iglesias & Sueiro, 2010) includes 30 items, each with three response alternatives. A copy of the test is displayed in the Appendix, and an in-depth description of the procedure used to create it appears in the Procedure section.

Procedure

The test's design was based on the following premise: each item is itself an objective test wherein the subject is presented with a hypothetical situation he or she must resolve. The subject is asked to choose an answer among three response alternatives, each associated with a different gain, as well as a different probability of achieving said gain. The riskiest response alternatives had a greater potential gain, but a lower probability of achieving it. The conservative alternatives, conversely, offer less gain but a higher probability of achieving it. A sample item is displayed in Figure 1.

> You grow corn for a living. Choose from among the following methods to continue being competitive in your field:
>
> a) Continue using traditional agricultural practices, assuring 40 tons of grain.
>
> b) Use imported seeds that, if they take (1/4 chance), will bear 160 tons of grain.
>
> c) Use transgenic seeds that, if they take (1/8 chance), will bear 320 tons of grain.

Figure 1. Sample Questionnaire Item.

To measure subjects' *risk propensity*, it was critical that the response alternatives not be chosen according to rational or logical criteria (as postulated by expected utility theory), that is, there should really not be an optimal answer among the ones presented. To ensure that no answer is better than any other, the mathematical chance (or expected value) of each response option should be the same.

For each item on the questionnaire, gain is the random variable (X) and the probability associated with winning or losing takes on different values according to which response option is chosen. In general:

$$X_{ij} = \{G_{ij1}, G_{ij2}, \ldots, G_{ijk}, \ldots, G_{ijK}\} \qquad (1)$$

where

X_{ij} is the gain the item i offers if option j is chosen

G_{ijk} is the concrete value of gain the item i offers if option j is chosen, given that k occurs

For each option, there is a probability function to describe gain:

$$f(X_{ij}) = \begin{cases} \pi_{ij1} \Leftrightarrow X_{ij} = G_{ij1} \\ \pi_{ij2} \Leftrightarrow X_{ij} = G_{ij2} \\ \cdot \\ \cdot \\ \cdot \\ \pi_{ijk} \Leftrightarrow X_{ijk} = G_{ijk} \\ \cdot \\ \cdot \\ \cdot \\ 1 - \sum_{k=1}^{K-1} \pi_{ijk} \Leftrightarrow X_{ijK} = G_{ijK} \end{cases} \qquad (2)$$

Finally, the expected value of gain (in a given item's response option) will be:

$$E(X) = \sum \pi X \qquad (3)$$

which in the usual, multinomial case is:

$$E(X_{ij}) = G_{ij1}\pi_{ij1} + G_{ij2}\pi_{ij2} + \cdots + G_{ijk}(1 - \sum_{k=1}^{K-1} \pi_{ijk}) \qquad (4)$$

so in the present case with three response options:

$$E(X_{i1}) = E(X_{i2}) = E(X_{i3}) \qquad (5)$$

Bearing in mind the above, all options for each item are rationally equivalent; it may be said that none is better or worse than the others, preventing subjects from

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using mathematical reasoning as the selection criterion. In the sample item in Figure 1, for example, all response alternatives have an expected value of 40 tons of grain.

Though equal in expected value, each item's alternatives differ in variance. Each option's variance relates to *risk propensity* such that the more conservative options are those with 0 variance, while those with a lower probability of success (associated with greater gain to preserve the equality shown in equation (5) have more variance. On objective tests of *risk propensity,* the value of risk expressed in a given option is usually computed as the inverse of that option's probability of success (Arend, Botella, Contreras, Hernández, & Santacreu, 2003). This does not take into account, however, that if unsuccessful, gain other than 0 may be had. Utilizing variance to arrange options according to risk allows one to create items like some of those that appear on this test. Each option's variance is calculated using the formula for variance in random variables:

$$\sigma^2(X) = \sum \pi X^2 - E(X)^2 \qquad (6)$$

In the sample item (Figure 1), the three responses' variance, respectively, are 0, 4,800 and 11,200, organized here according to the values of the risk they entail.

On each item, the alternatives were scored 1 through 3 in order of variance from least to greatest. Per the questionnaire's usual format, subjects do not receive feedback as a result of their choices on each item, thereby preventing them from guiding future responses based on prior results (León & Lopes, 1988).

For lack of any previous theories about what dimensions of *risk propensity* ought to be measured, the items are written in general terms and we tried to include as many situations as possible in a finite number of items. We believe subjects' results on the present form of this instrument will be instructive and help guide researchers in future studies.

The *risk propensity* test is comprised of 30 items, each with three corresponding response options, at least in this pilot version. Any given response to an item adds the value assigned to their chosen response to the subject's point total.

Results

According to the Kolmogorov-Smirnov test, $Z = 0.868$; $p = .438$, scores on the instrument were normally distributed. Also, a good level of discrimination between subjects was observed according to the distribution of their scores. The average score was 53.68 with a standard deviation of 7.45.

Analyses of Elements. Subjects exhibited variability on all items according to the attractiveness of each option presented. Similar to the difficulty index on optimal achievement tests, which have both easy and difficult items to answer correctly, biased attraction toward one extreme of the continuum or the other allows us to better discriminate subjects who possess an extreme (low or high) amount of a trait. Twenty-six items had a corrected index of homogeneity that differed significantly from zero (see Pardo & San Martín, 2001). Item 16 had the weakest correlation with global scores on the test, indicating it contributed the least to corroborating the test's internal consistency, $H_c = .059$. Due to the fact that this study does not aim to create a definitive test which only includes items with high indices of homogeneity, instead we wish to uncover the data's latent factor structure, this item was not eliminated because of its poor correlation with the rest of the test (and if we had done so for that reason, we would have had to eliminate an additional three items). Nevertheless, this item functions differently than the rest of the items included on the test. Due to an error in the item's construction that was not detected until the data had already been processed, the variance of the three response options was identical, making the item ambiguous. If the response were chosen through rational analysis, all options would be equally risky (or conservative). Responses to this item, then, were due to something other than logical decision-making, and to something other than the *risk propensity* interactive style. Subjects may have made their selections for moral or ethical reasons, since the item's content refers to childhood illness, which is a sensitive subject from a social, cultural point of view. What is abundantly clear is that it does not measure *risk propensity*, which explains its low correlation with the overall test. For these reasons, this item was eliminated in subsequent analyses and will not be included in future versions of the instrument.

Indicators of Reliability. Cronbach's alpha coefficient for the 30 items had a value of .712. The full test's reliability coefficient, according to the Spearman-Brown formula for two halves, was found to be .746. Both the alpha coefficient and reliability, calculated using the two halves technique, were over .7, meeting Nunnally's (1981) recommendations for tests in the validation stage.

We also found indications that this test can be applied to participants with low educational levels without affecting reliability. If subjects with low educational levels had not comprehended the test, it would stand to reason that their responses would be purely the result of chance, not risk level, which would significantly reduce the test's reliability (Nunnally, 1981). The Feldt (1980) statistic, however, revealed the test's internal consistency for the complete sample to be no less than the test's internal consistency when participants with a low educational level were excluded, $F(221,6409) = 1.031$, $p = .363$. Therefore, it seems participants' mastery of percentages and fractions gleaned from their everyday lives is adequate for them to understand the questions and complete the test.

Exploratory Factor Analysis. Exploratory factor analysis (EFA) was performed, using the correlations between items to statistically determine their underlying factors. Due to the fact that scores on the items did not constitute interval-

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Table 1
Matrix of Rotated Components. In Bold, Items Assigned to Each Factor as a Function of Their Eigenvalues

	Factor		
Item	1	2	3
05	**.641**	.127	-.066
25	**.614**	.214	.250
17	**.584**	.325	.028
27	**.544**	-.084	-.164
06	**.528**	.170	.238
10	**.491**	.048	.179
18	**.379**	-.200	.146
22	**.372**	**.372**	.203
28	**.344**	-.090	.170
02	**.264**	.120	.229
24	.169	**.580**	.014
26	.082	**.566**	-.149
20	.331	**.465**	.048
19	-.099	**.463**	.274
21	-.085	**.359**	.001
15	.022	**.321**	-.006
14	.180	**.263**	.190
30	.057	**.263**	.262
23	.129	**.211**	.191
09	.041	-.037	**.539**
07	.066	-.098	**.459**
11	.012	.353	**.415**
29	-.001	.028	**.365**
03	.109	.015	**.360**
08	.029	.209	**.311**
12	.217	.110	**.300**
01	.101	-.082	**.262**
13	.038	.222	**.246**
04	.052	.069	**.176**

level measurement, but rather data in ordered categories, EFA was done using a matrix of polychoric correlations (Lancaster & Hamdan, 1964; Olsson, 1979).

Factors were extracted using the principal axis method. Also note that no theoretical assumption was made about the resulting factors being correlated. From the theoretical perspective described in this study, the global *risk propensity* trait is a multi-dimensional construct. Its dimensions, though dependent on the situation presented to the subject, will receive the weighted effect of the global trait. For the above reasons, an orthogonal rotation of the data (Varimax rotation) was performed. A three-factor model was found to be the most parsimonious in terms of goodness of fit: a comparative fit index, the GFI (Global Fitness Index), was greater than 0.90 (Schreiber, Nora, Stage, Barlow, & King, 2006) and RMSR (Root Mean Square Residual) was less than 0.1 (Chau, 1997). To be exact, the indicators were GFI = 0.9168 and RMSR = .0717. The factor solution after rotation (Table 1) revealed the following underlying structure:

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Table 2
Matrix of Correlations between Scale and Subscale Scores

	Sports and Gambling	Long-term Plans	Loss Management	Risk Propensity
Sports and Gambling	1	.288	.274	.749
Long-term Plans		1	.252	.693
Loss Management			1	.699
Risk Propensity				1

All correlations are significant ($p < .01$)

These results tentatively suggest a three-factor model of *risk propensity*. Bearing in mind the substance of the test's items, the three dimensions of *risk propensity* found were termed *Sports and Gambling, Long-term Plans* and *Loss Management.*

Confirmatory Factor Analysis. After examining the language used in the items and in light of the exploratory results, we decided to retain the resulting factor structure, using items' content as the sole criterion in assigning them to factors. Regarding the results of EFA, five items switched factor and 24 remained in the dimension assigned to them by the previous analysis.

In order to determine the new factor structure's fit to the data, we performed Confirmatory Factor Analysis (CFA). CFA specifies the theoretical basis for the model, which is subsequently contrasted with the sample's data (Ruiz, 2000). The original model was suggested by the results of a particular sample, so it is not usually recommended to perform CFA with the same data to avoid capitalizing on chance (whose bias tends toward overestimation). However, these modifications were not made to improve the model's goodness of fit to the sample's data, on the contrary: switching the five aforementioned items' factors actually worsened the data's fit to the factor model. The modifications were based on theory and were not guided by the results of exploratory analysis; that is why we proceeded this way.

Furthermore, although the division into three factors was supported by the items' differences in content, presumably they also share content, that is, choice in situations of uncertainty. Ergo, the model being evaluated posits three dimensions derived from a second-order factor, the global *risk propensity* factor. Figure 2 depicts a representation of the model and the standardized coefficients obtained. The WLSMV method of estimation was employed, a robust estimator of weighted least squares appropriate for use with categorical data (Muthén & Muthén, 2007).

On the whole, the indices of the model's goodness of fit yielded good results. First of all, we used an absolute fit index, expressed by the quotient of the chi-squared statistic over degrees of freedom. A ratio of less than 5 has been proposed to indicate reasonable goodness of fit (Wheaton, Muthén, Alwin, & Summers, 1977). According to this criterion, this model's goodness of fit was generally good (CMIN/DF = 3.694). Next, the CFI (Comparative Fit Index) and the TLI (Tucker- Lewis Index) were used as comparative fit indices. Their values were .861 and .878, respectively. It is typically believed that a reference value of .95 indicates good fit (Schreiber et al., 2006), so the indices for these results were a bit low.

Finally, two residual fit indices were computed, SRMR and RMSEA. SRMR was found to be .088; a value close to .08 is considered good (Schreiber et al., 2006). RMSEA was found to be .038; an RMSEA value less than .05 is generally considered to reflect good fit (Browne & Cudeck, 1993).

In light of these global, comparative and residual fit indices, it was concluded that the theoretical model and the empirical data exhibit adequate goodness of fit to one another.

Please bear in mind that there is no indication in the literature on theory that these factors ought to correlate with one another, they are therefore independent even though they are all derived from the construct of interest to the present research, *risk propensity*. To test this notion, subjects' totals were calculated for each factor (summing scores on a given factor's items), then we computed correlations between their scores. This revealed that even though there is a statistically significant correlation between subscale totals, the importance of that correlation was very small. Using R^2 to measure effect size, we discovered that the highest correlation occurred between Sports and Gambling and Long-term Plans ($r = .288$), indicating that barely 8.3% of variance in one subscale was accounted for by the other ($R^2 = .083$).

This finding led us to continue thinking of the three factors as independent of one another, yet at the same time, explained by a single, global factor. Therefore, the three factors were used as subscales on the test; this way, subtotal scores were easy to calculate. From this perspective, each dimension should be considered a separate scale, so reliability was calculated for each one using the Cronbach's alpha procedure and the two halves technique.

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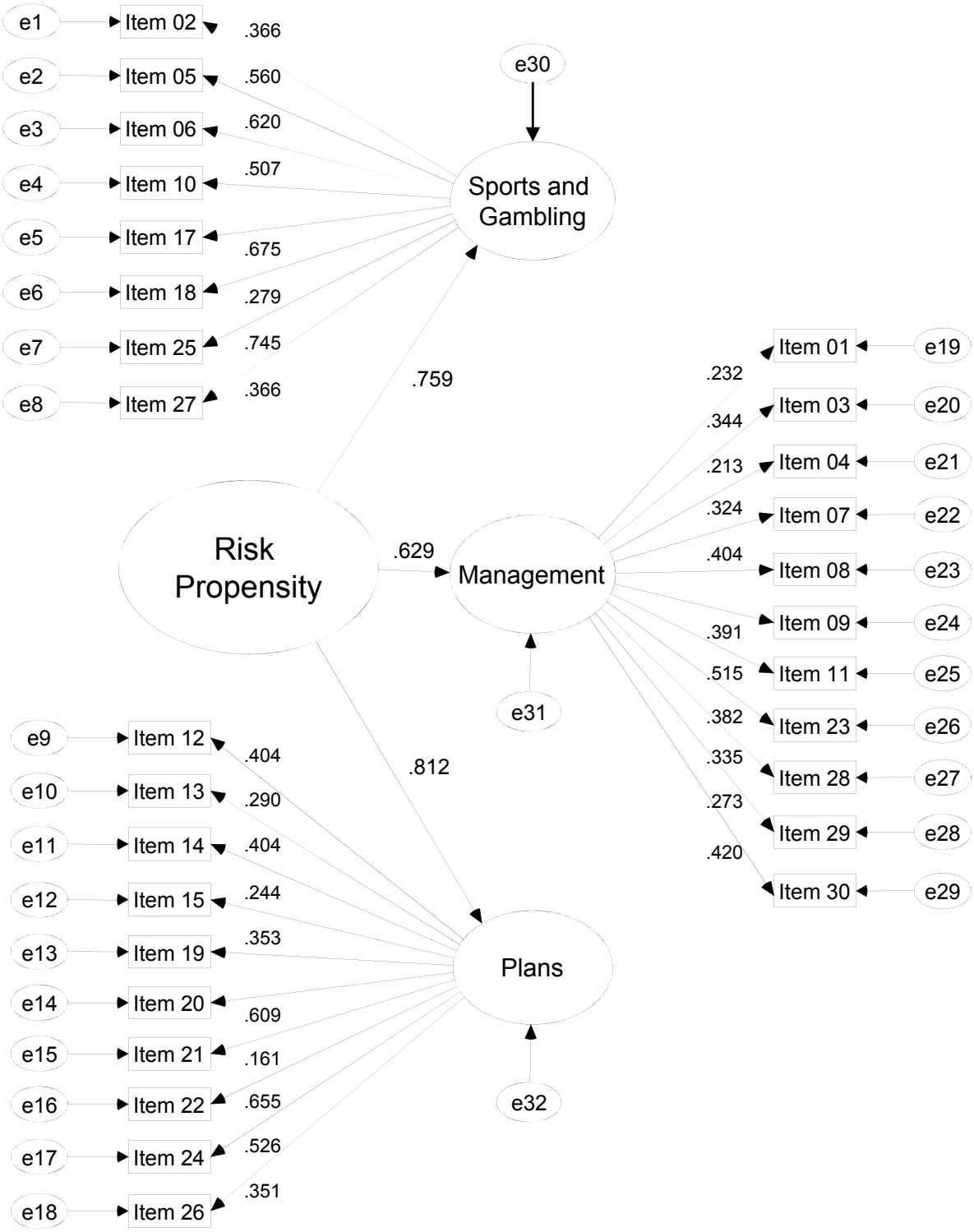

Figure 2. Model of Second-order Factor. Standardized Coefficients.

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First, the Sports and Gambling factor showed an internal consistency of .676, according to Cronbach's alpha value, and a reliability of .688, employing the two halves technique. Second, the Long-term Plans factor had a Cronbach's alpha of .565 and a reliability of .627. As for the Loss Management factor, Cronbach's alpha had a value of .505 and the two halves procedure yielded a value of .509. The fact that the complete instrument's reliability was higher than that of its subscales, and that the model of a second-order factor, *risk propensity*, exhibited goodness of fit to the empirical data, are good indicators that the test ought to be utilized in its entirety.

Discussion

An objective test to evaluate a personality variable, *risk propensity* has been presented. This construct is defined as the "tendency to choose, when various alternatives are available, the option with greatest gain even though it has the lowest probability of occurring." We have worked within the framework of evaluating personality as an interactive style.

The proposed instrument obtained adequate reliability for a pilot version, surpassing Nunnally's (1981) indications. Furthermore, our findings suggest this test can be administered to participants with a low educational level without adversely affecting the test's reliability.

On another note, validating this construct has led us to define *risk propensity* as an interactive style that can be broken down into three dimensions, which are described in terms of the items' content.

Risk propensity shall be understood, then, as the "tendency to choose, among various possible alternatives, the option with greatest gain, yet the lowest probability of occurring." This propensity depends on situational morphological characteristics. The following factors were found to group these different characteristics aptly:

Sports and Gambling. This factor speaks to the level of risk subjects are willing to accept when faced with a gambling or athletic situation in which they may win or lose, and where wagers that put money at risk are made, both in relation to gambling and sports. A subject who scores high on this scale will tend to make risky bets when gambling, in exchange for a greater potential reward, or in sports, to select strategies with a lower probability of success that entail greater potential gain.

Long-term Plans. This factor groups together items whose content involves a long-term time element. Items in this factor include situations where choices are made about politics, mortgages, or agriculture, situations in which the consequences of selection are not immediately apparent. High scores on this scale indicate the subject tends to prefer riskier strategies that have less probability of success with the intention of reaping more benefit from the situation, benefit that will be obtained after a considerable amount of time has lapsed.

Loss Management. The common aspect of the items included within this factor is that in the situations described, a conservative choice would prevent financial or personal losses. A risky choice may save all the resources if one is successful, but it if they fail, it would mean losing resources in greater quantity. This also includes "damage control" situations where losses must be assumed in every option, but one can seek to minimize them with little probability of success (maximizing them if unsuccessful), or assume losses that are greater, but more controlled. Situations included in this category have to do with using machinery to do automatic tasks, controlling contagious disease, or managing human lives in a crisis. A subject who scores high on this scale will tend to seek maximum loss prevention, assuming greater risk in the event they are unsuccessful. On a related note, Tversky and Kahneman (1981) observed the so-called framing effect, where dilemmas presented in terms of gain were associated with more conservative behavior, and dilemmas posed in terms of losses were tied to riskier behavior. This is not to be confused with the factor found in the present research, because the items that comprise that factor are presented differently: positively (the probability of gain is presented), negatively (the probability of loss is presented) and in both ways (the response options report the probability of both winning and losing). Therefore, the grouping of items into this factor can not be attributed to a framing effect in the results. This factor is named as it is due to the situations' shared context.

The present study opens the door to future research that might seek to improve the theoretical model sketched out here: Adopting a *risk propensity* interactive style depends on individual differences in subjects in addition to how the situation is presented, when there is no feedback offered about similar situations and no choices with clear, reinforcing contingencies.

Future studies ought to investigate the temporal stability of these results through a classical test-retest procedure. Seeing as how *risk propensity* is an interactive style, it is presumed to be a stable trait that does not vary, and is not sensitive to the passing of time. Another objective to be pursued in future research is to go into greater depth in validating the test through additional procedures such as calculating convergent-divergent validity (from other sources), predictive validity, etc..

In summary, the present research offers a sketch of a new theoretical model of risk choice behavior. Above all, though, it contributes a new means of assessing *risk propensity*, through easy-to-apply, objective tests where subjects are measured in a variety of contexts quickly and economically.

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APPENDIX A

FORT (FACTORIAL OBJECTIVE RISK TEST). SÁNCHEZ-IGLESIAS Y SUEIRO (2010).

Sexo: □ Varón □ Mujer **Edad**:
Nivel de estudios □Sin estudios □E. primarios □E. secundarios □E. universitarios
Profesión: _____

INSTRUCCIONES

A continuación se le presentarán una serie de situaciones hipotéticas. En cada una de ellas se le describirá un problema ficticio, y tres posibles soluciones. Su labor consiste en escoger para cada problema la solución que le parezca más adecuada.
No hay respuestas correctas ni incorrectas. Tan solo se pretende conocer sus elecciones. No piense demasiado sus respuestas: sencillamente escoja aquella que le parezca más adecuada en cada caso.

1) Una epidemia amenaza la vida de 600 personas. Escoja entre los tres posibles planes de emergencia existentes, el que le parezca más adecuado.

a) Salvar a 200 personas al azar y dejar que el resto muera.
b) 1/3 de posibilidades de que se salven los 600 y 2/3 de que mueran todos.
c) 1/2 de posibilidades de que se salven 400 y 1/2 de que mueran todos.

2) Le ofrecen tres oportunidades de negocio entre las que debe escoger:

a) 1/2 de posibilidades de ganar 1000 €.
b) Ganar 500 con total seguridad.
c) 1/10 de posibilidades de ganar 5000 €.

3) Es necesario enviar 1000 invitaciones urgentes para un evento próximo. Hay tres empresas de transporte entre las que elegir:

a) una que hará llegar 250 invitaciones a tiempo y el resto tarde.
b) una que tiene 1/3 de posibilidades de que 750 lleguen a tiempo y 2/3 de que todas lleguen tarde.
c) una que tiene un 1/4 de posibilidades de que todas lleguen a tiempo y 3/4 de posibilidades de que todas lleguen tarde.

4) Una empresa de conservas ha de comprar maquinaria para envasar dos millones de latas de mejillones. Debe escoger entre tres máquinas:

a) una que tiene ¼ de posibilidades de estropear todas las latas.
b) una que tiene ½ de posibilidades de estropear un millón de latas.
c) una que estropearía medio millón de latas.

5) Se dispone a apostar entre tres posibles jugadas de un juego de azar:

a) ½ de posibilidades de ganar 50 euros y ½ de perder 50.
b) 1/10 de posibilidades de ganar 450 euros y 9/10 de perder 50.
c) 1/100 posibilidades de ganar 4950 euros y 99/100 de perder 50.

6) Usted compite en una competición de esquí y puede escoger entre tres pistas que le dan desiguales oportunidades de victoria:

a) la pista intermedia, en la que tiene ¼ de posibilidades de ganar y en cada victoria recibe 4 puntos.
b) la pista difícil, en la que tiene 1/10 de posibilidades de ganar y en cada victoria recibe 10 puntos.
c) la pista fácil en la que la tiene ½ de posibilidades de ganar y en cada victoria recibe 2 puntos.

7) En una oficina se necesita completar un trabajo urgente, consistente en cumplimentar doce informes. Debe escoger entre tres empleados para encomendarles el trabajo:

a) Uno que completará sin duda los doce informes, pero con ½ posibilidades de hacerlo mal.
b) Uno que completará seis informes y lo hará sin equivocarse.
c) Uno que completará diez informes, pero con un 2/5 de posibilidades de hacerlo mal.

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8) La NASA desea equipar a su nueva sonda espacial con una cámara para tomar fotografías del espacio. Escoja entre los tres modelos de cámaras disponibles según su rendimiento:

a) Una cámara que tiene ¼ de posibilidades de tomar correctamente todas las fotos y ¾ de posibilidades de no tomar correctamente ninguna.
b) Una cámara que toma correctamente la cuarta parte de las fotos.
c) Una cámara que tiene un ½ de posibilidades de tomar correctamente la mitad de las fotos y un ½ de posibilidades de no tomar correctamente ninguna.

9) Una epidemia amenaza el ganado de una granja lechera. Hay 20 vacas enfermas y tres tratamientos veterinarios disponibles:

a) Uno que otorga a cada vaca un 50% de posibilidades de sobrevivir y que puede administrarse a todos los animales.
b) Uno que salvará sin lugar a dudas a todos los animales a los que se administre, pero solo puede suministrarse a 10 vacas.
c) Uno que otorga a cada animal un 83% de posibilidades de sobrevivir y que puede administrarse a 12 vacas.

10) Usted es entrenador de un equipo deportivo y debe elegir entre tres técnicas de juego distintas:

a) Una que garantiza el empate (1 punto).
b) Una que le da un 50% de posibilidades de empate (1 punto), un 16% de posibilidades de victoria (3 puntos) y un 34% de posibilidades de derrota (0 puntos).
c) Una que le proporciona un 33% de posibilidades de victoria (3 puntos) y una 67% de posibilidades de derrota (0 puntos), sin posibilidad de empate.

11) Un coleccionista debe verificar la autenticidad de 20 piezas de arte en un tiempo determinado. Para ello dispone de tres métodos:

a) Uno que en el tiempo disponible le permitiría verificar la autenticidad de 5 piezas, eso sí, con una seguridad del 100%.
b) Uno que en el tiempo disponible le permitiría verificar la autenticidad de 10 piezas, pero con una seguridad del 50%.
c) Uno que en el tiempo disponible le permitiría verificar la autenticidad de las 20 piezas, pero con una seguridad del 25%.

12) Un partido político está preparando su campaña electoral para las próximas elecciones. Escoja entre las tres estrategias siguientes:

a) una que tiene 1/3 de posibilidades de que el voto aumente un 30% y 1/3 de posibilidades de que se mantenga igual.
b) una que garantiza una subida del voto del 10%.
c) una que tiene un ½ posibilidades de el voto aumente un 40% y un ½ de posibilidades de que disminuya un 20%.

13) Una comisaría de policía desea poner en práctica un nuevo plan para prevenir la delincuencia. Hay tres opciones posibles:

a) Un plan que reducirá un 20% el número de delitos.
b) Un plan que tiene ¾ de posibilidades de reducir los delitos un 30% y ¼ de posibilidades de que aumenten un 10% en lugar de reducirse.
c) Un plan que tiene ½ de posibilidades de reducir los delitos un 40% y ½ de posibilidades de que no se reduzcan en absoluto.

14) En la compra de su nueva vivienda, se ve obligado a escoger una de las siguientes opciones hipotecarias:

a) Un interés fijo que le garantiza que usted terminará pagando 200 mil euros de intereses.
b) Un interés variable que tiene un 1/3 de posibilidades de que usted termine pagando 100 mil euros de intereses y 2/3 de posibilidades de acabar pagando 250 mil euros de intereses.
c) Un interés variable que tiene ½ de posibilidades de que usted termine pagando 120 mil euros de intereses y ½ de posibilidades de que termine pagando 280 mil euros de intereses.

15) Se acercan las rebajas y es el momento de comprar un artículo que hace tiempo viene deseando tener:

a) Espera 15 días a que los precios bajen un 50%, sabiendo que hay 1/3 de posibilidades de que ya no pueda encontrar el artículo que quiere.
b) Espera 5 días a que los precios bajen un 33%, sabiendo que encontrará el artículo que desea con total seguridad.
c) Espera 30 días a que los precios bajen un 66%, sabiendo que hay ½ de posibilidades de que ya no pueda encontrar el artículo que quiere.

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16) Dos niños, uno sano y otro débil, necesitan vacunarse para no enfermar. Sólo tenemos un frasco de vacuna. Le daremos:

a) El frasco entero al niño sano, asegurando que seguirá sano, mientras que el niño débil enfermará seguro.
b) El frasco entero al niño débil, para que ambos niños tengan 1/2 de posibilidades de no enfermar.
c) Algo más de la mitad del frasco al niño sano, para que éste tenga 2/3 de posibilidades de no enfermar, y el niño débil al menos 1/3 de posibilidades de no caer enfermo.

17) En el casino, se ve con tres fichas para apostar en la ruleta. Apostará las tres fichas:

a) Al rojo, teniendo ½ de posibilidades de ganar seis fichas.
b) Una combinación de cuatro números, teniendo 1/8 de posibilidades de ganar 24 fichas.
c) A su número favorito, ganando 1 de cada 35 veces la cantidad de 105 fichas.

18) En una escudería de Fórmula 1 desarrollan tres motores experimentales. Usted, como responsable del equipo, le asigna al piloto:

a) El motor más fiable, que asegura el séptimo puesto (2 puntos en la clasificación).
b) Un motor más potente, que tiene 1/2 de posibilidades de romperse en carrera, pero que si aguanta les dará el quinto puesto (4 puntos en la clasificación).
c) El motor más potente, que tiene 3/4 de posibilidades de romperse en carrera, pero que si aguanta les dará el segundo puesto (8 puntos en la clasificación).

19) Como responsable del gobierno, debe promover un plan para luchar contra la corrupción. Se encuentra con tres alternativas:

a) Un plan que tiene un 75% de posibilidades de atrapar a todos los corruptos, pero también un 25% de ser ineficaz y no atrapar a ninguno.
b) Un plan que tiene un 50% de posibilidades de atrapar a todos los corruptos y un 50% de atrapar solo a la mitad.
c) Un plan que garantiza que atrapará a las tres cuartas partes de los corruptos.

20) Usted planea el robo del siglo, que le permita comprarse una isla y retirarse. Debe elegir entre tres posibles objetivos:

a) Un banco donde guardan 6 millones de Euros, y donde usted calcula que hay 1/3 de posibilidades de conseguirlo.
b) Un banco donde guardan 30 millones de Euros, y donde usted calcula que hay 1/15 de posibilidades de conseguirlo.
c) Un banco donde guardan 90 millones de Euros, y donde usted calcula que hay 1/45 de posibilidades de conseguirlo.

21) Le han pillado cometiendo el robo del siglo, y ahora usted planea escapar de la cárcel. Tiene tres opciones de fuga. Escogerá:

a) La ruta fácil, en la que la posibilidad de ser atrapado es escasa (1/6), pero que de fallar aumentaría su condena en 18 meses.
b) La ruta intermedia, en la que la posibilidad de ser atrapado es mayor (1/4), pero que de fallar aumentaría su condena en 12 meses.
c) La ruta difícil, en la que la posibilidad de ser atrapado es la mayor (1/2), pero que de fallar aumentaría su condena en 6 meses.

22) Para seguir siendo competitivo con su cultivo de maíz, decide usar uno de estos tres métodos:

a) Continuar con el cultivo tradicional y asegurar 40 toneladas de grano.
b) Usar semillas importadas, que si arraigan (1/4 de posibilidades) darán 160 toneladas de grano.
c) Usar semillas transgénicas, que si arraigan (1/8 de posibilidades) darán 320 toneladas de grano.

23) Queda una semana para los exámenes finales, y tiene que decidir qué hacer con sus nueve asignaturas:

a) Estudiarlas todas, lo que le dará un 33% de posibilidades de aprobar las nueve. Si no le sale, suspenderá todas.
b) Estudiar la mayoría, teniendo un 50% de aprobar seis, y un 50% de suspender todas.
c) Estudiar las tres que mejor lleva, lo que le asegura aprobar esas tres y suspender las otras seis.

24) Usted es un directivo de una empresa, y ha de elegir la estrategia para el siguiente trienio:

a) No fusionar su empresa, con un 20% de no ganar beneficios, pero con un 80% de ganar 2,00 millones de Euros.
b) Fusionar su empresa con otra, con un 40% de no ganar beneficios, pero con un 60% de ganar 2,67 millones de Euros.
c) Fusionar su empresa con varias más, con un 60% de no ganar beneficios, pero con un 40% de ganar 4,00 millones de Euros.

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25) Escala una montaña, compitiendo con otros equipos, por el premio "Al Filo de lo Difícil". Usará uno de estos tres caminos:

a) El más conocido, que le permitirá llegar tercero con seguridad, ganando así 2.000 €.
b) Uno arriesgado, que en el caso de conseguir atravesarlo (1/2 de las veces) le hará llegar segundo y ganar 4.000 €.
c) El más difícil, que si consigue atravesarlo (1/10 veces) le dará la victoria, y el primer premio de 20.000 €.

26) Las nuevas tecnologías permiten que usted, como doctor, recomiende a sus pacientes una de estas intervenciones para la fecundación in- vitro:

a) El tratamiento que da una posibilidad de 1/2 de tener un bebé y cuesta 6.000 euros.
b) El tratamiento que da una posibilidad de 2/3 de tener un bebé y cuesta 8.000 euros.
c) El tratamiento que da una posibilidad de 1/10 de un bebé y cuesta 1.200 euros.

27) Elija entre estos juegos de azar:

a) FonoLoto: Donde puede ganar 1600 €, con 1% de posibilidades de premio.
b) Riniela: Donde puede ganar 800 €, con un 2% de posibilidades de premio.
c) LeuroMillones: Donde puede ganar 400 €, con un 4% de posibilidades de premio.

28) Se encuentra usted en la guerra y es responsable de la seguridad de 20 soldados. Escoja su estrategia para el siguiente combate:

a) Una que garantiza que morirán cuatro de los soldados (al azar).
b) Una que otorga un 20% de posibilidades de que mueran todos los soldados y un 80% de que no muera ninguno.
c) Una que otorga un 50% de posibilidades de que mueran 8 soldados y un 50% de posibilidades de que no muera ninguno.

29) En una isla desierta, un grupo de supervivientes deben racionar la comida y el agua mientras esperan para ser rescatados. Hay tres posibles estrategias de racionamiento:

a) Una que otorga un 50% de posibilidades a los supervivientes de que sobrevivan todos, pero también un 50% de posibilidades de que todos mueran.
b) Una que otorga un 25% de posibilidades a los supervivientes de que sobrevivan todos y un 75% de posibilidades de sobreviva solo la tercera parte.
c) Una que garantiza que la mitad de los supervivientes estarán vivos cuando llegue el rescate, pero el resto habrá muerto.

30) Una plaga amenaza su cosecha de uvas. Hay tres pesticidas disponibles, de distinta virulencia. Escoja uno:

a) Uno que salvará a las cepas fuertes (la cuarta parte) pero que matará al resto.
b) Uno que tiene ¼ de posibilidades de salvar a todas las cepas y ¾ de matarlas a todas.
c) Uno que tiene ½ de posibilidades de salvar la mitad de la cosecha y ½ de posibilidades de matar a todas las cepas.

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APPENDIX B

FORT (FACTORIAL OBJECTIVE RISK TEST, TRANSLATION FROM THE ORIGINAL IN SPANISH) SÁNCHEZ-IGLESIAS AND SUEIRO (2010).

Sex: □ Male □ Female **Age**:
Educational Level □ None □ Elementary S. □ Secondary S. □ Attended College
Profession: _____

INSTRUCTIONS

A series of hypothetical situations is presented below. Each will describe a fictitious problem and three possible solutions. Your task is to choose the solution that seems best to you in each problem. There are no right and wrong answers. The idea is merely to determine your choices. Do not over-think your answers: simply pick the one that seems best in each case.

1) An epidemic threatens the lives of 600 people. Choose the emergency plan that seems best among the following three options:

a) Save 200 people at random and leave the rest to die.
b) A 1/3 chance of saving 600 people and a 2/3 chance they will all die.
c) A 1/2 chance of saving 400 people and a 1/2 chance that they will all die.

2) You are offered three business opportunities to choose from:

a) A 1/2 chance of winning 1,000 €.
b) Winning 500€ with absolute certainty.
c) A 1/10 chance of winning 5,000 €.

3) You need to send 1,000 urgent invitations to an upcoming event. You must choose between three different delivery companies:

a) One will allow 250 invitations to arrive on time and the rest will be late.
b) One has a 1/3 chance of delivering 750 on time and a 2/3 chance they will all arrive late.
c) One has a 1/4 chance they will all arrive on time and a 3/4 chance they will all arrive late.

4) A Canned goods company must buy a machine to package two million cans of mussels. Choose between the following three machines:

a) One has a 1/4 chance of breaking all the cans.
b) One has a 1/2 chance of breaking a million cans.
c) One will break half a million cans.

5) Bet on one of these three possible plays in a gambling game:

a) A 1/2 chance of winning 50€ and a 1/2 chance of losing 50€.
b) A 1/10 chance of winning 450€ and a 9/10 chance of losing 50€.
c) A 1/100 chance of winning 4,950€ and a 99/100 chance of losing 50€.

6) You participate in a skiing competition and must choose between three hills with unequal opportunities for victory:

a) The intermediate hill, where you have a 1/4 chance of winning and for each victory, you will receive 4 points.
b) The difficult hill, where you have a 1/10 chance of winning and for each victory, you will receive 10 points.
c) The easy hill, where you have a 1/2 chance of winning and for each victory, you shall receive 2 points.

7) An urgent piece of work, completing twelve reports, must be done at the office. Choose among these three employees to assign the work:

a) One will certainly complete twelve reports, with a 1/2 chance of doing the work poorly.
b) One will complete six reports without error.
c) One will complete ten reports, with a 2/5 chance of doing the work poorly.

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8) NASA wants to equip its newest space probe with a camera to take photographs in outer space. Choose among the three available camera models according to their performance:

a) One camera has a 1/4 chance of taking all the photos correctly and a 3/4 chance of not taking any correctly.
b) One camera will take a quarter of the photos correctly.
c) One camera has a 1/2 chance of taking half the photos correctly and a 1/2 chance of not taking any correctly.

9) An epidemic threatens the livestock on a dairy farm. There are 20 sick cows and three available veterinary treatments:

a) One gives each cow a 50% chance of survival and can be administered to all the animals.
b) One will save all the animals to whom it is administered with absolute certainty, but it can only be administered to 10 cows.
c) One gives each animal an 83% chance of survival and can be administered to 12 cows.

10) You are the coach of a sports team and must choose between three different plays:

a) One guarantees a tie (1 point).
b) One gives you a 50% chance of a tie (1 point), a 16% chance of victory (3 points), and a 34% chance of defeat (0 points).
c) One gives you a 33% chance of victory (3 points) and a 67% chance of defeat (0 points), with no chance of a tie.

11) A collector must verify the authenticity of 20 works of art in a limited amount of time. Three methods are available:

a) One, in the time allotted, will allow you to authenticate 5 works with 100% certainty.
b) One, in the time allotted, will allow you to authenticate 10 works, but with only 50% certainty.
c) One, in the time allotted, will allow you to authenticate 20 works, with 25% certainty.

12) A political party is preparing its campaign for the upcoming elections. Choose among the following three strategies:

a) One has a 1/3 chance of boosting voting by 30%, and a 1/3 chance that it will stay the same.
b) One guarantees a 10% boost in voting.
c) One has a 1/2 chance of boosting voting by 40%, and a 1/2 chance of decreasing it by 20%.

13) A police department wants to enact a new plan to prevent delinquency. There are three possible options:

a) One plan will reduce crime by 20%.
b) One plan has a 3/4 chance of reducing crime by 30%, and a 1/4 chance of increasing it by 10% instead.
c) One plan has a 1/2 chance of reducing crime by 40% and a 1/2 chance the crime rate will not be reduced at all.

14) When buying a new home, you must choose between the following mortgage options:

a) A fixed interest rate where you will end up paying 200,000€ in interest.
b) A variable interest rate where there is a 1/3 chance you will end up paying 100,000€ in interest and a 2/3 chance you will end up paying 250,000€ in interest.
c) A variable interest rate where there is a 1/2 chance you will end up paying 120,000€ in interest and a 1/2 chance you will end up paying 280,000€ in interest.

15) Sale season is coming and this is the time to buy the item you have wanted for a long time:

a) Wait 15 days for prices to drop 50%, knowing that by then, there is a 1/3 chance you will not be able to find the item you want.

b) Wait 5 days for prices to drop 33%, knowing you will find the item you want with total certainty.

c) Wait 30 days for prices to drop 66%, knowing by then there is a 1/2 chance you will not be able to find the item you want.

16) Two children, one healthy and one weak, need to get vaccinated so they do not get sick. There is only one dose of the vaccine left. Give:

a) The entire dose to the healthy child, ensuring he or she will continue to be healthy. The weak child will definitely get sick.
b) The entire dose to the weak child so that each child will have a 1/2 chance of not getting sick.
c) A little more than half the dose to the healthy child so he or she will have a 2/3 chance of not getting sick, while the weak child will at least have a 1/3 chance of not getting sick.

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17) At the casino, you have three chips to bet in roulette. You bet the three chips:

a) On red, giving you a 1/2 chance of winning six chips.
b) A combination of four numbers, giving you a 1/8 chance of winning 24 chips.
c) On your favorite number, giving you a 1 in 35 chance of winning 105 chips.

18) In preparation for a NASCAR race, three experimental motors are designed. You are responsible for the team, and you assign the driver:

a) The most reliable motor that assures you will win seventh place (2 points for this ranking).
b) A stronger motor that has a1/2 chance of breaking during the race, but if it holds out, will win fifth place (4 points for this ranking).
c) The strongest motor, which has a 3/4 chance of breaking during the race, but if it holds out will win second place (8 points for this ranking).

19) As head of state, you must promote a plan to fight corruption. You have three alternatives:

a) A plan with a 75% chance of catching all corrupt people but a 25% chance of being ineffective and catching none.
b) A plan with a 50% chance of catching all corrupt people and a 50% chance of only catching half.
c) A plan that guarantees catching three quarters of corrupt people.

20) You are planning the heist of the century that will enable you to buy yourself an island and retire. You must choose among three possible targets:

a) A bank where 6 million € are kept, where you calculate you have a 1/3 chance of success.
b) A bank where 30 million € are held, where you calculate you have a 1/15 chance of success.
c) A bank where 90 million € are kept, where you calculate you have a 1/45 chance of success.

21) You have been caught committing the heist of the century and now you plan to escape from jail. You have three escape options. You choose:

a) The easy route, where there is scarcely any chance of being caught (1/6) but failure to escape would increase your sentence 18 months.
b) The medium route, where there is a greater chance of getting caught (1/4) but failure to escape would increase your sentence 12 months.
c) The difficult route, where you have a greater chance of getting caught (1/2) but failure to escape would increase your sentence only 6 months.

22) You grow corn for a living. Choose among the following methods to continue being competitive in your field:

a) Continue using traditional agricultural practices, assuring 40 tons of grain.
b) Use imported seeds that, if they take (1/4 chance), will bear 160 tons of grain.
c) Use transgenic seeds that, if they take (1/8 chance), will bear 320 tons of grain.

23) You have a week before finals and you have to decide how to prepare for nine exams:

a) Study for all of them, giving you a 33% chance of passing all nine. If not, you will fail them all.
b) Study for the majority of them, giving you a 50% chance of passing six and a 50% chance of failing them all.
c) Study for the three you are best prepared for, ensuring you will pass those three and fail the other six.

24) You are the director of a company and have to choose a three-year plan:

a) Do not merge your company with another, giving you a 20% chance of gaining no benefits and an 80% chance of gaining 2 million €.
b) Merge with another company, giving you a 40% chance of gaining no benefits and a 60% chance of gaining 2.67 million €.
c) Merge with multiple other companies, giving you a 60% chance of gaining no benefits and a 40% chance of gaining 4 million €.

25) You scale a mountain, competing with other teams for the "Edge of Difficulty" prize. Choose one of these three paths:

a) The most familiar, which will ensure you come in third place and win up to 2,000€
b) A riskier path which, if you manage to cross it (1/2 chance), will put you in second place and you will win 4,000€.
c) The most difficult path which, if you manage to cross it (1/10 chance), will bring you victory and a prize of 20,000€.

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26) New technologies have allowed you as a doctor to recommend one of the following in-vitro fertilization methods to your patients:

a) A treatment that gives patients a 1/2 chance of having a baby and costs 6,000€.
b) A treatment that gives patients a 2/3 chance of having a baby and costs 8,000€.
c) A treatment that gives patients a 1/10 chance of having a baby and costs 1,200€.

27) Choose among the following gambling games:

a) FonoLoto: where you have a 1% chance of winning a 1,600€ prize.
b) Riniela: where you have a 2% chance of winning an 800€ prize.
c) LeuroMillones: where you have a 4% chance of winning a 400€ prize.

28) You are in the military in wartime and find yourself responsible for the safety of 20 soldiers. Select a combat strategy:

a) One guarantees that four soldiers will die (at random).
b) One means a 20% chance that all the soldiers will die and an 80% chance that none will die.
c) One means a 50% chance that 8 soldiers will die and a 50% chance that none will die.

29) On a deserted island, a group of survivors must ration out food and water while awaiting their rescuers. There are three possible rationing strategies:

a) One gives the survivors a 50% chance of living, but there is a 50% chance they will all die.
b) One offers a 25% chance all the survivors will live and a 75% chance only a third will live.
c) One guarantees that half the survivors will be alive when the rescue team arrives, but the rest will have died.

30) Contagious disease is threatening a grape crop. There are three pesticides available of variable strengths. Choose one:

a) One will save the root stocks (one quarter of the crop) but will kill the rest.
b) One has a 1/4 chance of saving the stocks and a 3/4 chance of killing them all.
c) One has a 1/2 chance of saving half the crop and a 1/2 chance of killing all the stocks.

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