Risk Perception Assessment in Argentina: An Overall Model of Structural Equation Model

Isabel María Mikulic PhD.

Romina Caballero

Phd. Melina Crespi

University of Buenos Aires
Faculty of Psychology
Argentina

Abstract

The purpose of this study is to analyze the perception of risk conceived as experience-based/subjective belief context interpretation (Rohrmann, 2005) by applying the statistical technique known as Structural Equation Modeling, SEM. The original contribution consists in proposing the use of SEM models in order to confirm theoretical relations in the subjective evaluation of risks. Participants were selected from the same groups proposed by Rohrmann (1994) in his international study in order to duplicate the cross-cultural research design of the author. In this study the intentional sample was composed by students of Psychology, Geography, Environmental Sciences, Engineering, and by members of feminist organizations. The administration of the Risk Perception Questionnaire of Rohrmann showed risk perception in different social groups, as well as the various constructs linked to risk perception. Study results show correspondence with those reported by Rohrmann (1994) when testing the same theoretical model in Australia and other countries.

Keywords: Risk perception - Cross-cultural psychology -Structural equation models -Assessment, Students

1. Introduction

The study of risk has a relevant place in the debates of today's society because it is closely connected to the very existence of individuals, of organizations, and societies. In their everyday lives, most people expose themselves to dangerous situations, and this motivates the scientific community to produce studies addressing the phenomenon of risk and its perception. Although the concept of risk has been defined in different ways, many authors have conceptualized risk as the likelihood for a person to experience a danger and its consequences (Short, 1984). An overview of the different approaches leads to identifying some commonality, i.e. differentiating between reality and probability - the likelihood of an adverse event and any consequences has now been introduced. Douglas and Wildavasky (1982) noted that the connotation of the word "risk" has changed in time. Originally introduced in the 17th Century in the context of game, risk meant the likelihood of a fact ocurring in combination with the magnitude of losses and gains. At the time, the notion had a neutral value. Today, risk tends to be associated to results or outcomes that are negative or adverse.

Slovic and Weber (2002) uphold that risk is associated to sundry conceptions, of which four are the most frequent: risk as danger, probability, consequence, and threat. Following these authors, risk may be defined as the physical, social, and/or financial likelihood of some sort of harm, damage, and/or loss in a given context due to the presence of a danger. In turn, danger refers to a real situation, event, or substance which may be harmful to people, Nature, or facilities built by man. Danger is conceived as a physical entity, whereas risk is an inference made by people regarding the consequences of a danger to which they are exposed (Drottz-Sjoeberg, 1991; Fischhoff, Watson & Hope, 1984; Renn, 1992, Rohrmann, 1998; Yates & Stone, 1992; Slovic, 1997). Strictly speaking, risks are theoretical schemes, estimated or construed according to varying contexts. There is a large number of studies showing that risk estimation tends to be a complex process. Same depends on factors such as the context where risk information is presented, as well as the individual and cultural characteristics of those perceiving it (Cassullo, 2012). Other intervening factors are the level of acceptability, risk benefits, and the degree of control.

Early research (Starr, 1969; Sowby, 1965) already stated that society seemed to take risks in the presence of resulting benefits. In this connection, persons tended to be more willing to accept activities such as smoking, driving vehicles, and using public transportation, but they were less willing to live close to nuclear plants. There is a tendency to tolerate substantially more when the person commits voluntarily -a perception of greater control over personal behaviors. According to McKenna (1993), a person who perceives himself/herself as under control, will tend to perceive a lesser degree of risk - for example, when driving a vehicle versus being a passenger. The acceptability and benefit factors above are constitutive elements of Slovic's (2010) experiential system, which brings emotion and affection into risk assessment. People not only judge a risk based on what they think about it but also on what they feel. The results of a piece of research performed in our country, with students from different courses of studies, demonstrate the relationship between emotional intelligence and risk assessment, highlighting the emotional component present in the latter (Mikulic et al, 2011). Also, the perception of risk has become a relevant scientific topic the study of which has generated a prosperous area for expanding research on the subject.

At present, theoretical reviews studying risk perception state that such a construct may be approached from three different paradigms: the axiom-measuring paradigm, the sociocultural paradigm, and the psychometric paradigm (Sjoberg, 2000; Slovic & Weber, 2002). Many authors agree that psychometric is the most relevant approach to study this variable (Rohrmann, 1994). Slovic, Fischhoff, and Lichtenstein (1982), the most representative authors in this approach, were the first to describe that how people perceive risks differs from probabilistic assessments, and it generally shows little correspondence with epidemiological results or accident statistics.

From this perspective, Rohrmann (2008) defines the perception of risk as judgments and assessments made by people in connection with the dangers they meet with, or might meet with, or their assets and/or environments. Risk perceptions are interpretations of the world based on experiences and/or beliefs (Rohrmann, 1998). Since there is no universally shared way to interpret social reality, risk perception implies considering people beliefs, judgments, and feelings, as well as any values and social attitudes people adopt regarding any dangers and any benefits thereof (Prades Lopez & Gonzales Reyes, 1996)

According to the psychometric approach, risk judgments are sensible to factors such as catastrophic potential, threat to future generations, fear, knowledge of consequences, among others. A study by Alhakami and Slovic (1994), renowned names in this approach, confirmed that the relationship between risk and the perceived benefit of an activity or technology is strongly associated to the positive or negative affection aroused thereby. If people like an activity, they will tend to judge it as low risk and high benefit, and if, conversely, they dislike it, they will judge it in the opposite way, as high risk and low benefit.

More recently, Slovic (2010) generated a new perspective with risk feelings. Whenever persons assess risks and their benefits, first they resort to feelings, which act as guidance and lead to the judgment of related risks.

Fischhoff (2011) upholds that emotions are involved in risk appraisal in various ways. Emotions may warn us of danger signs and prevent us from getting involved in not so right situations, or, conversely, they may generate a certain distortion in our interpretation of reality.

Structural Equation Models Psychological and sociological studies on the factors underlying risk perception have evidenced that there are multiple factors affecting the way in which people perceive, assess, and manage risks. Current studies on risk perception have perused this aspect, pointing out the significance of including multivariate analysis when researching such a construct. This is why the present paper has considered it extremely relevant to apply the methodology of Structural Equation Modeling, SEM, in the assessment of risk perception, for it may show the relationship among different, directly observed or non-observed (latent) variables. Such as several other authors have pointed out, in order to use this method it is necessary to previously formulate a theoretical model specifying explicitly the effect of certain variables on other variables (Ruiz, 2000; Corral-Verdugo, 2002). In formulating them, two important steps are to be considered, involving the measurement model and the structural model. The former corresponds to confirmatory factor analysis; the latter estimates relationships among the factors obtained with the measurement model (Corral-Verdugo, 2002).

The characteristic that distinguishes this technique from other multivariate statistical methods is that most of these methods are exploratory in nature as they look for the general patterns defined by their own data. Instead, SEM models are of a confirmatory nature, i.e. the design of variable relations must be determined a priori on the basis of theoretical expectations.

This model allows estimating the multiple relationships and the interrelated dependence among the variables proposed, as well as representing non observed concepts in such relations, and the measure of error in the estimation process. The above distinctive characteristics make this technique particularly appropriate to assess theoretical models using empirical data (Ruiz, Pardo & San Martin, 2010).

Body of Research on Risk Perception using Structural Equation Modeling. Risk perception studies carried out in different countries by applying the SEM model provide knowledge on the general and specific factors involved in subjective risk assessment.

A transcultural piece of research on the variability of environmental risk perception in connection with social, cultural, and political systems among university students in the US and China revealed the presence of differences in risk perception; the SEM model was applied using the following variables of risk perception: social trust, social value, and risk experience. Results showed that both groups of students perceived that social value and risk experience have a significant impact on environmental risk perception. The difference between both groups was expressed by the fact that American students, unlike Chinese, also considered that social trust is a factor in the perception of risk (Hongxia Duan, 2005).

In Norway, Ulleberg &Rundmo (2003) studied the mechanisms underlying young drivers' risk¬-taking in traffic, analyzing personality traits such as aggression, altruism, and anxiety. The results of the SEM model suggested that the relationship between risky driving and personality traits was attitude-mediated, i.e. that personality characteristics had an indirect influence on risky driving behaviors via the personal attitudes.

In Hong Kong, Ishizaka, Matsui, &Anaka (2007) studied the relevant factors implied in accepting and perceiving the risk of municipal landfills for city dwellers. The SEM model encompassed variables like acceptance, risk perception, trust in technology and in citizens. Results showed that trust in citizens bears a strong relationship with trust in technology, and trust in technology has a positive impact on landfill acceptance.

In China, Zheng, Shi & Li (2009) built a study focused on Beijing residents perception of social dangers, in particular, over periods of social economic transition. The SEM model analyzed the relationship between government support, trust in government, and social justice, as connected to the mechanism of social risk perception. Results highlighted that government support and social justice may directly influence social risk perception. In turn, government support appears as a moderating variable between trust in government and the perception of social risk.

1.1 Rohrmann's Risk Perception Model (1994). Structural Equation Modeling

One of the most renowned models in risk assessment research is the one proposed and validated by Rohrmann (1994) in Australia. This model has been duplicated in various countries, for example, Germany, New Zealand, Chile, Brazil and China, and in all of the cases very good results were seen in connection with how well the model adjusts to empirical data. In this framework, the central variables for risk assessment are: Ecological Attitude, Adverse Impacts, Risk as a Threat, Technology Benefits and Risk Acceptance. Ecological attitude is defined by the author as the attitude that has a deliberate implication on environmental protection and quality, characterized by maximizing protection and reducing environmental deterioration to a minimum. Adverse Impacts means the concern for technology impacts on personal lives, where technological dangers are considered threats, and threats include the probability of dying and a concern for harming health. Risk as a Threat is defined as the magnitude of risk associated to potential dangers, any negative consequences, and the catastrophic potential linked to the development of certain activities. Technology Benefits is conceptualized as the usefulness and benefits that some activities bring to society at large, including any possible advantages associated to same. Risk Acceptance is defined as the degree to which society at large is willing to accept the negative consequences of activities that may cause accidents or deteriorate health.

Considering these various variables, Rorhmann (1994) developed an explanatory risk perception model, illustrated in Figure 1.

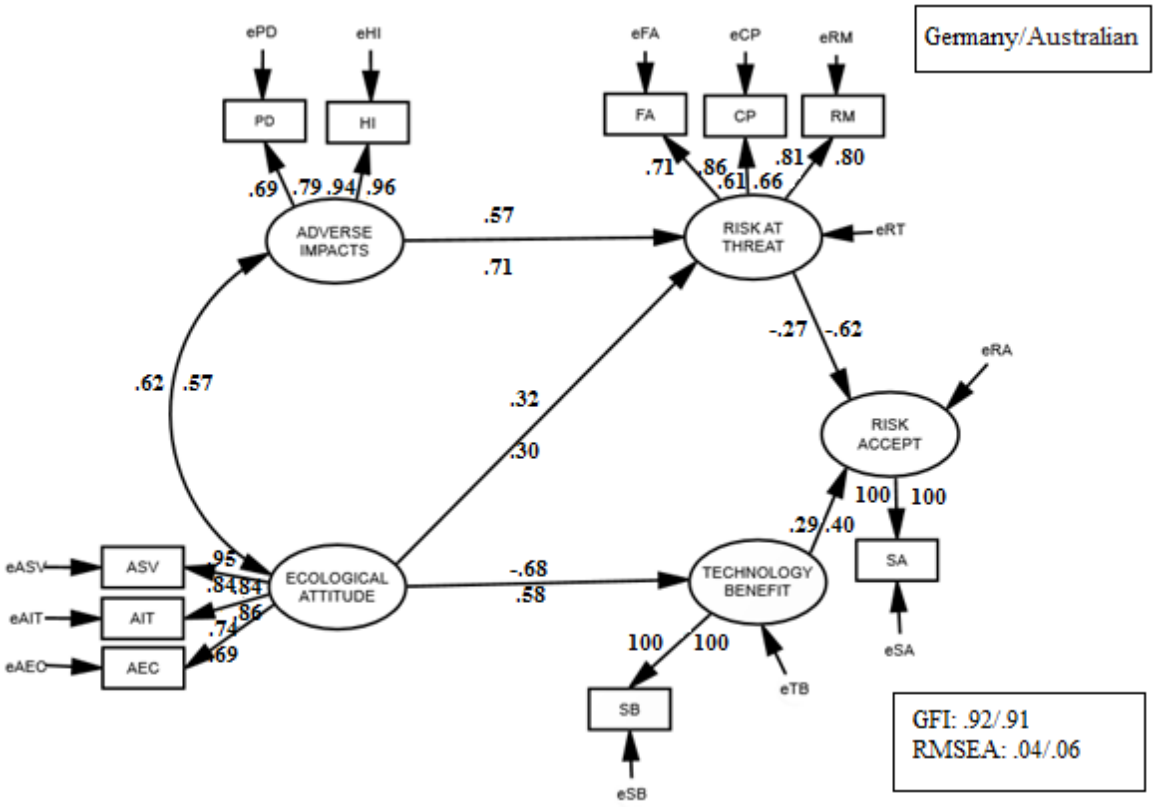

Figure 1. *Rohrmann Risk Perception Structural Modeling (1994).Figure taken from Rohrmanns', B. (1994). Risk perception of different societal groups: Australian findings and cross-national comparisons. Australian Journal of Psychology, 46, 150-163, with the author's permission. PD = (Assumed) probability of dying; HI = (Danger of) health impact; FA = Feelings of anxiety about risk; APA = Attitude toward environmental problems; CP = Catastrophic potential; RM = Overall risk magnitude rating; SA = Societal risk acceptance; SB = Social benefit (of activity); ASV = Attitude towards Social Value Orientations; AIT = Attitude towards Modern Technology Impacts; AEC = Attitude towards Environmental concern.*

The proposed Model hypothezises that risk perception may be characterized by the presence of multiple variables – exogenous (which are always independent variables), and endogenous (which are affected by other variables) which correspond to Risk as a Threat, Risk Acceptance, and Technology Benefits.

It is assumed that the variable Ecological Attitude has an effect over other characteristics of the studied risk sources. A direct effect is observed on Risk as a Threat and on Technology Benefits. Through these two variables, Ecological Attitude also has an incidence on Risk Acceptance Results contributed by Rohrmann (1994) in connection with the SEM model highlight psychological factors such as negative associations or critical attitudes towards technology and its environmental and social consequences, contributing to the intuitive conceptualization of risk that persons apply when assessing dangers.

1.2. Purpose of this study

- Assessing risk perception among different social groups based on the application of the Structural Equation Model (SEM).
- Validating in our environment the explanatory theoretical risk perception model proposed by Rohrmann (1994).

1.3. Hypotheses

Taking the theoretical Risk Perception model proposed by Rohrmann, the following hypotheses are posited:

• Ecological Attitude has a positive incidence on the variables Risk as a Threat and Technology Benefits.

• The variable Adverse Impact of Technology has an incidence on the Perception of Risk as a Threat and on Risk Acceptance.

2. Method

2.1. Participants

The intentional sample was constituted from465 university students (41 % males and 59 % females), all of whom are residents of the Autonomous City of Buenos Aires and of the Province of Buenos Aires, Argentina Age.s ranged from 19 to 65 (M = 29.57; SD = 9.20).

2.2. Instruments

- Sociodemographic Questionnaire especially designed to consider the personal data relevant for this study
- Hazard Evaluation Questionnaire (Rohrmann, 2005, Argentine Adaptation: Mikulic, 2009). It comprises 18 sub-scales, with 26 items in the majority and one numerical response scale from 1 to 10, with specific cues for each one of the sub-scales detailed below: Opinion on the Magnitude of Risk, Social Benefits, Individual Benefits, Appeal of the Activity, Social Acceptance of Risk, Individual Acceptance of Risk, Likelihood of Dying, Danger of Harming Health Financial/Economic Consequences, Expected Number of Casualties, Anxiety Feelings, Need for Risk Regulation by the Authority, Personal Exposure to Danger, Environmental Problem Ranking, Attitude toward Modern Technology Impacts, Attitude toward Social Value Orientations, and Attitude toward Risk Situations.

Following Rohrmann (2005), all primary scales in this research have been merged into secondary scales defined by same as main variables of the risk perception structural model proposed. Such scales are: Ecological Attitude, Adverse Impacts, Technology Benefits, Risk as a Threat, and Risk Acceptance.

2.3. Procedure

For data collection, different public educational institutions and organizations of the City of Buenos Aires were contacted. Participants received information on the general purpose of the risk perception study and they were invited to participate voluntarily. Informed consent was requested, ensuring anonymity and confidentiality of results. Total administration time ranged between 45 minutes and 1 hour. A report of the results was offered to those requesting same.

2.4. Data analysis

In the first place, an exploratory analysis of the data was carried out in order to detect the lost (missing) and the extreme values. Thus, the analysis of missing values pattern showed that no item had more than 5% missing data, which were distributed at random. Based on the above, it was decided to impute the missing values according to the expectation-maximization method. Then, the existence of atypical univariate cases was analyzed by means of the standard scores calculation, and the cases with z scores greater than + 3.29 (Tabachnick & Fidell, 2001) were considered atypical. The presence of atypical multivariate cases was also analyzed using Mahalanobis' distance ($p < .001$). After these analyses, six cases were eliminated from the initial 471 cases; the final sample being made up of the 465 cases described above.

In order to estimate an overall model to explain risk perception, risk perception was assessed by applying the SEM model. In this study, the use of the SEM methodology made it possible to compare one of the, previously developed, explanatory theory-based risk perception models proposed and validated by Rohrmann (1994) in Australia. In Argentina, the estimations of the applied model were calculated using the AMOS procedure of the SPSS, Version 23.0.

Finally, for assessing whether the data obtained support the tested theoretical model, the following indices of goodness were used: a) Goodness of Fit Index (GFI), b) Comparative Fit Index (CFI), c) Adjusted Goodness of Fit Index (AGFI) and, d) Root Mean Square Error of Approximation (RMSEA). Though the literature lacks consensus regarding the best goodness of fit indicators to be reported, this paper has opted for those reported by Prof. Rohrmann in his study so as to strengthen the comparison with the model validated by him.

3. Results

Overall model of risk perception in Argentinian

Below is the explanatory theoretical model of risk perception proposed and validated in our country.

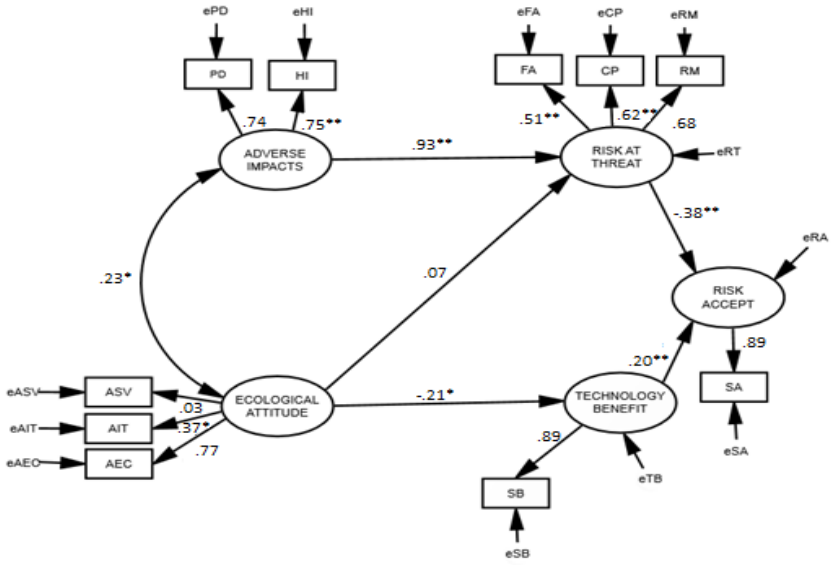

Figure 2. *Structural Equation Modeling: Risk Perception Argentina sample (n = 465), with standardized path coefficients. PD = (Assumed) probability of dying; HI = (Danger of) health impact; FA = Feelings of anxiety about risk; APA = Attitude toward environmental problems; CP = Catastrophic potential; RM = Overall risk magnitude rating; SA = Societal risk acceptance; SB = Social benefit (of activity); ASV = Attitude towards Social Value Orientations; AIT = Attitude towards Modern Technology Impacts; AEC = Attitude towards Environmental concern.*

As shown in Figure 2, the proposed theoretical model includes two exogenous variables: Adverse Impacts and Ecological Attitude (associated with technology). The variable Adverse Impacts is measured by the indicators of Probability of dying and Impact on health. The Ecological Attitude is saturated by the indicators of Attitude towards environmental problems, Attitude towards Modern Technology Impacts and Attitude towards Social Value Orientations. Also, the model comprises three endogenous variables: Risk as a Threat, Risk Acceptance and Technology Benefits. Exogenous variable Adverse Impacts has a direct effect on Risk as a Threat, and a negative indirect effect on Risk Acceptance. So, the greater the negative impact on the life of persons attributed to technology (greater likelihood of dying and/or negative effects on health), the greater the risk as a threat (magnitude of risk associated to potential dangers), and the lesser the acceptance of social risk. Even though the exogenous variable Ecological Attitude does not bear any significant direct effects on Risk Perception as a Threat and on the variable Technology Benefits, said variable has been taken into account for the sake of evidencing cross-cultural differences.

Table 1. Goodness-of-Fit Measuresof the risk perception model in Argentina.

Model	
Relative-Normed-Chi square	2.82
RMSEA	.06
CFI	.93
GFI	.97
AGFI	.94

As may be observed in Table 1, the values obtained for the fit indices used were acceptable according to the criteria reported by Hu and Bentler (1999). This aspect evidences an optimal model fit. In general terms, the results obtained when assessing risk perception in our sociocultural environment applying SEM methodology, match the ones reported by Rohrmann (1994) when testing the same conceptual model in Australia and in other countries (e.g., Germany and New Zealand).

4. Discussion

The purpose of this study was assessing risk perception validating in our own environment the explanatory theoretical model of risk perception put forward by Rohrmann (1994).

Applying the SEM model, relationships were estimated among the variables Adverse Impacts, Ecological Attitude, Risk Perception as a Threat, Technology Benefit, and Risk Acceptance.

The results obtained reveal that, in general terms, the proposed model has good fit to the empirical data. This aspect matches previous studies reporting on the existence of multiple factors affecting risk perception (Loewenstein, 2001; Hongxia Duan, 2005; Sjoberg, 2007; Pidgeon & Fischhoff, 2011).

This paper offers interesting, relevant observations on certain psychological variables involved in risk perception in the studied social groups. The relationships found in the model indicate that the greater the negative impact attributed to technology, the greater the perception of risk as a threat, and the lesser the acceptance of same. These data corroborate what was reported by Rohrmann (1994) in his theoretical model, evidencing that when a risk is perceived as a factor which may cause significant negative consequences on health or on one's own psychophysical integrity, the magnitude of the danger assigned to it is greater, and thus, the degree of acceptance of same is decreased. In consonance with the above, several studies have pointed out that the perception of risk consequences and the perception of personal vulnerability to the latter, are two of the cognitions that most extensively influence the decision of not getting involved in risk-taking behavior, or engaging in risk preventive and protective action (Becker & Maiman, 1975; Puyal Español, 2001). On the same line, one of the theoretical assumptions of the psychometric risk perception approach focuses precisely on the affirmation that personal risk judgments are sensitive to factors such as catastrophic potential, fear, aroused feelings of anxiety, and knowledge of risk outcomes (Slovic, Fischhoff & Lichtenstein, 1982). Such factors may be involved in the risk magnitude perceived as well as in the degree of risk acceptance.

Contrary to what Rohrmann (1994) reported in his research in Australia and Germany, Ecological Attitude as a variable positively influencing the assessment of Risk as a Threat, has not demonstrated to have the same value in the social group this study has analyzed. In the model applied in our environment, Ecological Attitude did not show significant effects on the assessment of Risk as a Threat, but it did show a negative effect on the variable Technology Benefits. These results evidence the significance of carrying out cross-cultural studies to verify whether there are "etic" and "emic" aspects among the studied variables – as has been the case in this study by applying a SEM model, which made it possible to test relationships formulated theoretically.

In the light of the results obtained, it is necessary to further study the problem at hand, as well as the existing relationships among the proposed variables. It is important to note that the conclusions reached in connection with the tested theoretical model may vary when including other participants, so that they may not be deemed definitive or generalizable.

Despite the fact that the endpoint of this research paper has been duplicating and validating in our own socio-cultural context the explanatory theoretical risk perception model proposed by Rohrmann (1994), it is necessary to enlarge the study of this complex phenomenon considering other social groups and extending the number of participants. Likewise, it would be recommendable to confirm the proposed model implementing other indicators for the various variables, to find other instruments which make the same variables operational, as well as new constructs identified by current scientific literature as relevant to the understanding of the phenomenon under study. Worthy of notice in this sense are the recent contributions that authors like Slovic (2010) and Fischhoff (2011) have produced, including the incidence of emotions and feelings as a significant factor in the assessment of risk perception. Despite the described limitations, this study is particular in its approach of risk perception from the perspective of multivariate analysis. Although several pieces of research on risk perception have been carried in our environment, few have been based on this type of methodology.

Also, this paper may effectively orient future psychological research to analyze more in depth the relationships among the constructs approached here, thus contributing to improving understanding of risk perception and with it, to designing effective prevention programs aimed to sundry danger sources.

References

Alhakami, A.S.,& Slovic, P. (1994). A psychological study of the inverse relationship between perceived risk and perceived benefit. *Risk Analysis*, 14(6), 1085-1096.doi: 10.1111/j.1539-6924.1994.tb00080.x

Becker, M.H.,& Maiman, L.A. (1975). Sociobehavioral determinants of compliance with and medical recommendations.*Medical Care*, 13, 10-24.[Online] Available: http://journals.lww.com/lww-medicalcare/Abstract/1975/01000/Sociobehavioral_Determinants_of_Compliance_with.2.aspx

Cassullo, G.L. (2012). *Ser adolescente en el siglo XXI. Aportes a la evaluación psicológica del autocontrol percibido frente al riesgo*. Cúspide: Buenos Aires, Argentina.

Corral-Verdugo, V. (2002). Structural equation modeling. In Bechtel, R.B. & Churchman, A. (Eds.), *Handbook of environmental psychology*(pp. 256-271). NuevaYork: Plenum.

Douglas, M.,& Wldavasky, A. (1982). *Risk and Culture.* Berkeley: University of California Press.

Drottz-Sjoeberg, B. (1991). Risk perceptions and definitions of risk. In B. Drottz-Sjoeberg (Ed.), *Perceptions ofRisk*(pp. 163¬214). Stockholm: Center for Risk Research.

Fischhoff, B. (2011). *The Emotions of Nuclear Experts. Bullletin of the Atomic Scientists*. [Online] Available: http://www.thebulletin. org/web-edition/features/the-emotions-of-nuclear-experts.

Fischhoff, B., Watson, R.S.,& Hope, C. (1984). Defining risk. *Policy Science*, 17, 123-139.[Online] Available: http://link.springer.com/article/10.1007/BF00146924

Hongxia Duan, M.S. (2005). *Social process of environmental Risk perception, preferences of Risk management and public Participation in decision making: a Cross-cultural study between the United States and China*(doctoral thesis, Ohio State University). [Online] Available: http://ohioseagrant.osu.edu/_documents/publications/TD.

Hu, L.,& Bentler, P.M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, 6, 1-55. doi 10.1080/10705519909540118

Ishizaka, K., Matsui, Y.,&Tanaka, M. (diciembre, 2007). *Structural Model of Risk Perception on Landfill Site for Municipal Solid Waste*.Paper presented at the International Conference on Siting of Locally Unwanted Facilities: Challenges and Issues, Hong Kong.

Loewenstein, G.F. (2001). Risk as Feelings. *Psychological Bulletin*, 127(2), 267-286.

McKenna, F.P. (2003). It won't happen to me: Unrealistic optimism or illusion of control? *British Journal of Pschology*, 84, 39-50. doi: http://dx.doi.org/10.1037/0033-2909.127.2.267

Mikulic, I., Cassullo, G., Albornoz, O., Marconi, A., Fernández, G., Ojeda, G.,& Caruso, A. (2009). Psicología Ambiental y Evaluación Psicológica: Aportes de las Técnicas Psicométricas a la Evaluación de la Percepción del Riesgo. *Memorias del I Congreso Internacional de investigación y Practica Profesional en Psicología*(pp. 511-513). Buenos Aires, Argentina: Secretaría de Investigaciones Universidad de Buenos Aires.

Mikulic, I.M., Cassullo, G., Caruso, A., Elmasian, M.,& Crespi, M. (2011). Comparación transcultural de la percepción de riesgo en diferentes grupos sociales y culturales: aportes de la Evaluación Psicológica a la Psicología Ambiental. *Anuario de lnvestigaciones*, XVIII, 1, 409-418.[Online] Available: http://www.scielo.org.ar/scielo.php?pid=S1851-16862011000100045&script=sci_arttext

Mikulic, I.M., Cassullo, G., Torcassi, V., Fernández, G. L., Paolo, A. M., Caballero, R.,& Aruanno, Y. (2011). Aportes de la evaluación psicológica a la psicología ambiental. Estudio de la percepción de riesgo en distintos grupos sociales. *Memorias del III Congreso Internacional de Investigación y Práctica Profesional en Psicología*(pp. 70-74). Buenos Aires, Argentina: Secretaría de Investigaciones Universidad de Buenos Aires.

Pidgeon, N.,& Fischhoff, B. (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change*, 1, 35-41. doi:10.1038/nclimate1080

Prades López, A., & González Reyes, F. 1996. La percepción social del riesgo: algo más que discrepancias entre expertos y público . In A. Padres López (Ed.) Energía, tecnología y sociedad (56-62). Ediciones Torre. Madrid, España.

Puyal Español, E. (2001). La conducta humana frente a los riesgos laborales: determinantes individuales y grupales.*Acciones e investigaciones sociales*, 12, 157-184.[Online] Available: https://papiro.unizar.es/ojs/index.php/ais/article/view/199

Renn, O. (1992). Concepts of Risk: A classification. In S. Krimsky & D.Golding (Eds.), *Social theories of risk* {pp. 53-82). London: Praeger.

Rohrmann, B. (1994). Risk perception of different societal groups: Australian findings and cross-national comparisons. *Australian Journal of Psychology*, 46, 150-163.[Online] Available: http://www.rohrmannresearch.net/pdfs/rohrmann-rpa.pdf

Rohrmann, B. (1998). The risk notion: Epistemological and empirical considerations. In M.G. Steward & R.E. Melchers (Eds.), *Integrated risk assessment: Applications and regulations* (pp. 39-46). Rotterdam: Balkama.

Rohrmann, B. (2005). *Risk Attitude Scales: Concepts, Questionnaires, Utilizations.* Australia: University of Melbourne.[Online] Available: http://rohrmannresearch.net/pdfs/rohrmann-racreport.pdf

Rohrmann, B. (july, 2006). *Cross-cultural comparison of risk perceptions: Research, results, relevance*. Paper presented at SIDEWALK / SRA, University of Melbourne.

Rohrmann, B. (june, 2008). *Risk perception, risk attitude, risk communication, risk management: A conceptual appraisal*. Paper presented at the International Emergency Management Society TIEMS, University of Melbourne.

Ruiz, M. (2000). *Introducción a los Modelos de Ecuaciones Estructurales*. Madrid: UAM.

Ruiz, M., Pardo, A.,& San Martin, R. (2010). Modelo de Ecuaciones Estructurales. *Papeles del Psicólogo*, 31(1), 34-45.[Online] Available: http://www.papelesdelpsicologo.es/pdf/1794.pdf

Short, J.F. (1984). The social fabric of risk. *American Sociological Review* 49, 711-25.[Online] Available: http://www.papelesdelpsicologo.es/pdf/1794.pdf

Sjoberg, L. (2000). Factors in Risk perception. *Risk Analysis*, 20(1), 1-11.[Online] Available: http://dynamit.com/lennart/wpontent/uploads/downloads/2013/07/factors _in_rp_risk_analysis.pdf

Sjoberg, L. (mayo, 2007). *Emotions and risk perception.*Paper presented at a workshop on risk perception, attitudes and behavior. University of Barcelona.[Online] Available: http://www.dynamit.com/lennart/pdf/Emotions%20and%20risk%20perceptio1%20noc.pdf.

Slovic, P. (1997). *Trust, Emotion, Sex, Politics and Science: Surveying the Risk Assessment*. Battlefield: The University of Chicago Legal Forum.

Slovic, P. (2010). *Feelings of Risk. New perspective in Risk Perception*. Earthscan: Londres.

Slovic, P., Fischhoff, B.,& Lichtenstein, S. (1982). Why study risk perception? *Risk Analysis,2,* 83-93.[Online] Available: http://sds.hss.cmu.edu/risk/articles/WhyStudyRiskPercep.pdf

Slovic, P.,& Weber, E.U. (2002). *Perception of risk posed by extreme events*. Paper presented at the conference: Risk Management strategies in an uncertain World. Palisades: Nueva York.

Sowby, F.D. (1965). Radiation and other risks. *Health Physics* 11, 879-887.[Online] Available: http://journals.lww.com/health-physics/Abstract/1965/09000/Radiation_ and_ Other_Risks.8.aspx

Starr, C. (1969). Social benefit versus technological risk. What is our society willing to pay for safety? *Science*, 165, 1232-1238.

Ulleberg, P.,& Rundmo, T. (2003). Personality, attitudes and risk perception as predictors of risky driving behaviour among young drivers. *Safety Science*, 41, 427-443. doi:10.1016/S0925-7535(01)00077-7

Yates, J.F.,& Stone, E.R. (1992). The Risk construct. En J.F. Yates (Ed.). *Risk Taking Behavior* (pp. 1-25). Chichester: John Wiley & Sons.

Zheng, R., Shi, K.,& Li, S. (2009). The influence Factors and Mechanism of Societal Risk Perception. *Complex*, 2, 2266-2275. Recovored from http://link.springer.com/ chapter/10.1007/978-3-642-02469-6_104