Determinants of coping strategies in two types of natural hazards: Flash floods and costal flooding

Oscar Navarro, Diego Restrepo-Ochoa, Luz Adriana Muñoz-Duque, Katia Zapa-Perez, Anaïs Ameline, Denis Mercier, Ghozlane Fleury-Bahi

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Oscar Navarro (Corresponding autor), Laboratoire de Psychologie des Pays de la Loire, University of Nantes, France. BP 81227-44312 NANTES Cedex 3 - France oscar.navarro@univ-nantes.fr

Diego Restrepo-Ochoa, CES University, Colombia, drestrepo@ces.edu.co

Luz Adriana Muñoz-Duque, University of Antioquia, Colombia, luza.munoz@udea.edu.co

Katia Zapa-Perez, National University, Colombia, klzapap@unal.edu.co

Anaïs Ameline, University of Nantes, France, anais.ameline@univ-nantes.fr

Denis Mercier, Sorbonne University, ENeC laboratory, France, denis.mercier@paris-sorbonne.fr

Ghozlane Fleury-Bahi, University of Nantes, France, ghozlane.fleury-bahi@univ-nantes.fr

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Abstract

Over recent decades, the effects of the intensity of natural disasters, especially hydro-meteorological phenomena, have increased significantly, especially in countries with rapidly-growing economies. Accordingly, it is necessary to identify the coping strategies individuals use and, in particular, their willingness to act. Cognitive and affective variables explain the presence or absence of behavioral intention. The aim of this study was to formulate and empirically test an explanatory model of coping strategies in response to two natural disaster risks: coastal flooding and flash floods. A total of 608 individuals living in Colombia, exposed to these phenomena, participated in our study (257 exposed to flash flooding and 351 to coastal flooding). Structural equation modeling allowed us to establish that although place attachment and personal involvement are constants in determining coping strategies focused on problem solving, the role of risk perception differs significantly according to the risk under study. In the case of flash floods, the longer a person has lived in a place, the more they tend to develop coping strategies to manage stress, while in the case of coastal flooding, risk perception negatively determines strategies based on emotion regulation and avoidance. These findings are discussed in the light of the literature in this field.

Key words: risk perception; coping strategies; place attachment; coastal flooding risk; flash flood risk; structural equation modeling.

1. INTRODUCTION

One of the greatest challenges currently facing the world's societies is that of the environmental disasters associated with the changing meteorological conditions generated by global warming. Natural disasters and the human, economic, material, cultural, psychological and historical loss and damage related to their successive occurrences have increased over the last four decades, especially those associated with hydro-meteorological events (CRED, 2018). Over recent decades, the impact of the intensity of the occurrence of natural phenomena has grown steadily and notably (Cardona, Bertoni, Gibbs, Hermelin & Lavell, 2010; CRED, 2018). Studies have evidenced a significant increase in the risk of disasters derived from natural hazards, especially in low -and middle- income countries with fast-growing economies (Yamin, Ghesquiere, Cardona, Ordaz & Mundial, 2013).

Climate change is the result ofa significant, enduring evolution of weather conditions. The group of experts on the evolution of climate change (IPCC, 2014) predicted multiple meteorological and geological occurrences that would generate catastrophic events, such as rising sea levels, land movements, droughts, erosion and heavy rain. In addition to natural hazards, there is the pressure of urban development, which increases the vulnerability of certain settlements, such as those in coastal regions, and exposes them to the risk of flooding (Idier et al., 2013; Poumadère et al., 2015).

Coastal flooding can be defined as a temporary invasion of coastal areas by sea (Chaumillon, Bertina, Fortunato, et al., 2017). The vulnerability of coastal areas is the result of spatial inequalities, housing characteristics, the level of urban development, and the growth rates and economic vitality of the different regions (Cutter et al., 2003). A flash flood is a type of phenomenon characterized by the rapid flow of a chaotic mixture of solid materials and water that can move at high speeds (Caballero, 2011) and typically occurs in mountain basins. The relation between climate change and its effects on the stability of natural slopes remains an open debate. However, there is now a consensus regarding the relation between the modification of rainfall and drought regimes generated by climate change (changes in the duration and amounts of rainfall) and the presence of flash floods (Avioli et al., 2018; Spizzichino et al., 2015).

Broadly speaking, these events will occur more frequently and, in some cases, will have a growing impact on the exposed populations, making it necessary to elaborate coping (or at least protective) strategies that integrate the assessment individuals make of the risk and their willingness to take protective and/or adaptive action accordingly. A number of studies have demonstrated a direct relation between preventive action and risk perception (Bonaiuto,

Alves, De Dominicis, & Petruccelli, 2016; Bonaiuto & De Dominicis, 2011; De Dominicis, Fornara, Ganucci Cancellieri, Twigger-Ross& Bonaiuto, 2015). Cognitive and affective variables may have a role in explaining this relation (Terpstra, 2011), and even in the absence of intention to act. Regarding to affective variables, we mean psychological variables which are fundamentally marked by an affective dimension that is to say by an emotional state, by modifications or fluctuations of the emotional state related to risks and environment. An example of this dimension would be the fear within the risk perception and the place attachment which indicate a positive emotional connection with a place.

Regarding to cognitive variables, we mean cognitive dimension that determines coping strategies, particularly the evaluative aspect that includes the judgment, memory, meanings and treatment of risk information.

These two dimensions, affective and cognitive, determine decisions and actions.

2. PROPOSAL OF THEORETICAL COPING PATH MODEL

The aim of this study is to formulate and empirically test an explanatory model of coping strategies in response to the risks of natural phenomena. The study focuses on two types of hazards, differentiated by their potential for destruction: coastal flooding and flash floods (Flanquart, 2012; Idier et al., 2013; Wagner, 2007).

Our hypothesis is that risk assessment and the psychological variables determining the development of coping strategies by individuals exposed to one or the other of these risks might differ depending on the characteristics and the potential for destruction of each natural phenomenon. For example, the literature shows that inhabitants of areas at risk of coastal flooding tend to underestimate the risks involved (Michel-Guillou & Meur-Ferec, 2017). In contrast, in the case of flash flood risk, there is apparently greater fear due to the characteristics of this hazard, and especially its potential for destruction. Indeed, flash floods tend to be highly deadly, with major socio-economic costs, making them one of the most feared of natural hazards (Wagner, 2007).

In light of the above, it is of interest to identify the factors that best explain the use of different coping strategies in response to the risks related to coastal flooding and flash floods. It would also be interesting to determine whether there is an effect of the type of event that could explain the differences in these determinants. If that is the case, it would mean that the strategies and policies designed to protect populations should not be managed in the same way for both risks.

2.1. Coping Strategies

Many populations live their daily lives under the threat of certain hazards and must therefore build psychological and social strategies to cope with them. Research in this area focuses on identifying a series of cognitive and affective mechanisms which influence the intention to act in order to protect oneself from these dangers (Siegrist, Gutscher, & Earle, 2005; Terpstra, 2011; Corral et al., 2003). For example, according to Terpstra (2011), in the case of flood risk, the reduction of perceived likelihood of flooding (cognitive aspect) and fear (affective aspect) explain reduced intentions for flood preparedness. Lazarus and Folkman (1984, p. 141) suggest that *coping* is the collection of "*the cognitive and behavioral efforts made to master, tolerate, or reduce external and internal demands and conflicts among them*". This process refers to an individual's acts and thoughts in response to a dangerous or stressful situation, constituting a factor that enables them to adapt psychologically in difficult circumstances. Coping is thus the result of an individual's assessment of their cognitive and effective competencies in response to a threatening situation. The literature identifies two types of coping meta-strategies (Bruchon-Schweitzer, 2002; Lazarus & Folkman, 1984; Moos & Billings, 1986): strategies focused on problem-solving and strategies centered on managing negative emotions. The former are considered to generate a state of alertness in response to the hazard while the latter are thought to promote avoidance (Homburg et al., 2017; Suls & Fletcher, 1985). In the case of environmental risks, there is no clear consensus on which type of coping strategies tend to be used, as there appears to be an effect of the type of event (natural or anthropic) (Lopez-Vazquez & Marvan, 2003). It seems that certain situational factors such as spatial and temporal closeness to the hazard as well as other dispositional factors such as risk perception, assessment of one's personal involvement and attachment to place of residence, play a different role depending on the type of risk.

2.2. Risk perception

Risk perception is the most widely studied of the dispositional factors in coping strategies (Sjöberg, 2000; Slovic, 1987). Several studies underline the predictive value of this dimension in the assessment of the impact of certain hazards and the protective behaviors in response to these. Research in this line began in the 1940s, when Gilbert White published his thesis on human adaptations to flooding in the United Kingdom (Kellens, Terpstra & De Maeyer, 2013). Later, Slovic (1987, 2000) suggested that risk perception was a significant determinant of decisions and actions in response to hazards.

Risk perception refers to the assessment of the severity of impact (destructive potential of an event) and the likelihood of a phenomenon occurring (Slovic, Finucane, Peters & MacGregor, 2004). In other words, it corresponds to the assessment a person makes of the danger level of natural or technologically derived risks or other activities considered as hazards (Corral, Frías & González, 2003). This assessment is determined by the fear of being affected (likelihood of being affected by the event), the uncontrollability of the phenomenon and the immediacy of the consequences (Slovic, Fischhoff & Lichtenstein, 1980). Negative emotions associated with this assessment are considered a factor that may influence the behaviors adopted in such situations (protection, adaptation).

Risk perception is an individual, subjective construct influenced by social and physical context, the experience (Lupton, 1999; Masuda & Garvin, 2006; Siegrist et al., 2006), memory and communication (Kasperson et al., 1988; Pidgeon, Kasperson & Slovic, 2003). Risk perception is also considered to be affected by factors such as an individual's sense of involvement in the source of the risk (Navarro & Michel-Guillou, 2014), and the sense of attachment to their place of residence, given that environmental risk, is by definition, place-related (Fleury-Bahi, 2008; Moser, 1998).

There is no consensus on the causal relation between risk perception and coping strategies in the case of people exposed to environmental risks. A number of studies show that individuals exposed to these risks and who present high levels of risk perception tend rather to use strategies focused on managing their negative emotions rather than on problem-solving, especially when confronted to industrial risks (Lopez-Vazquez & Marvan, 2003). In contrast, those exposed to natural risks tend to use more problem-focused strategies (Lopez-Vazquez, 2001; Lopez-Vazquez & Marvan, 2012), as do those confronted by risks considered to be highly likely to occur (Bernardo, 2013). In sum, the literature reveals that both the type and origin of the hazard, as well as the likelihood of its occurrence, determine the type of coping strategy individuals leverage.

2.3. Personal involvement

Personal involvement refers to the distance between the individual and the risk, which works as an indicator of the possibility of action and the relevance and effectiveness of such action, that is, the individual's willingness to act (Flament & Rouquette, 2003). Studies in the field of environmental risk consider involvement to be a mediating variable between social

representations towards the risk and preventive or protective actions (Baggio & Rouquette, 2006; Gruev-Vintila & Rouquette, 2007). Personal involvement is defined by three independent dimensions (Flament & Rouquette, 2003; Demarque, Lo Monaco, Apostolidis & Guimelli, 2011): risk valuation, which assesses the importance attributed to the problem; identification, which refers to the extent to which an individual identifies with the risk; and the perception of the possibility of acting, which describes the individual's sense of control of the situation and their personal effectiveness, in the sense that perceived effectiveness refers to the level of influence people believe they have over the event (Nuissier, 1994). Thus, the greater an individual's personal involvement, the more likely it is that their repertoire of actions in response to the risk is activated (Baggio & Colliard, 2007; Bertoldo & Bousfield, 2011). In other words, a strong sense of personal involvement determines the development of problem-solving coping strategies rather than emotional or avoidance strategies (Navarro et al. 2016; Zapa-Pérez, Navarro & Rendón-Rivera, 2017).

2.4. Place attachment

Place attachment is considered as a variable that affects risk perception and coping strategies (Ruiz & Hernández, 2014; Mishra et al., 2010). High place attachment may explain underestimation or even acceptance of a risk (Armas, 2006; Billig, 2006; Donovan et al., 2012). Place attachment refers to the subjective relationship between a person and a certain context or place (Moser, 2009). Attachment implies a positive, affective link between an individual and a place (Shumaker & Taylor, 1983; Low & Altman, 1992; Jorgensen & Steadman, 2001). This positive connection leads an individual to feel comfortable and safe. Consequently, the individual tries to remain close, spatially and temporally, to the place to which they feel attached (Bowlby, 1980; Hidalgo & Hernández, 2001).

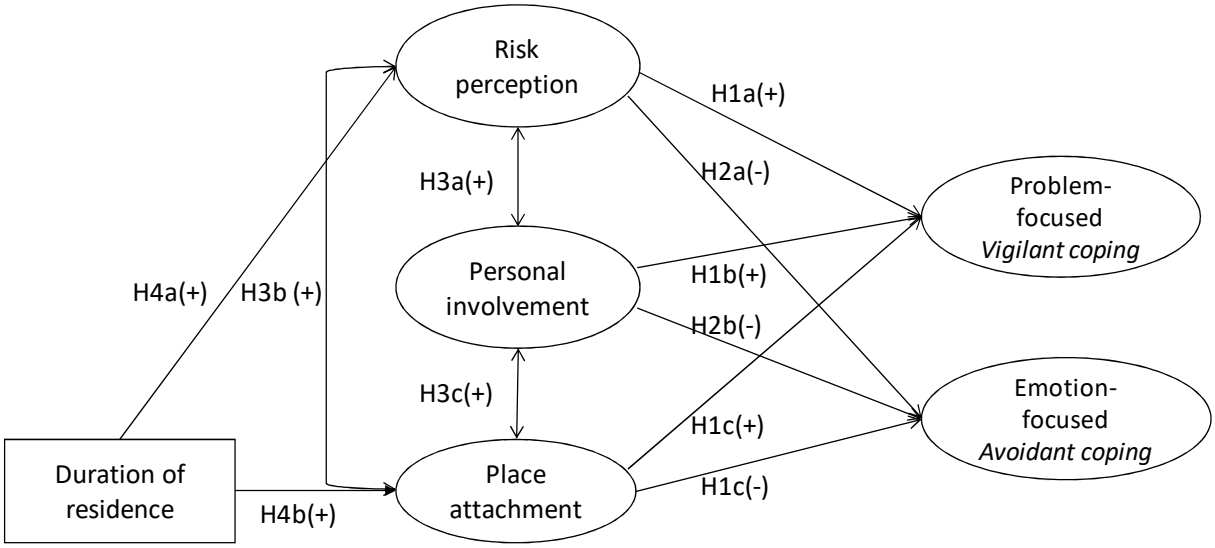
In the case of coastal flooding, studies show that people who feel a strong sense of place attachment have a feeling of control over events in their environment and thus feel invulnerable to threats of coastal flooding (Michel-Guillou, Krien & Meur-Ferec, 2016). Studies have shown that strong place attachment generates high risk perception but only in individuals who live in low flood-risk areas (Bonaiuto & De Dominicis, 2011). Place attachment is considered to be a factor that moderates adaptive attitudes and behaviors in the face of risks as, in certain cases, the more an individual feels attached to a place, the more they try to adapt it to the hazard, and, thus, avoid leaving or moving away from the place (Zhang et al., 2010; Silver & Grek-Martin, 2015). Consequently, place attachment is related to resistance to moving home (Weiss, Colbeau-Justin & Marchand, 2006), or a desire to return

to places considered as presenting a hazard (Pirta, Chandel & Pirta, 2014; Boon, 2014; Chamlee-Wright & Storr, 2009). Among the factors favoring the place attachment identified within the literature, residence time seems the most important (Hidalgo & Hernández, 2001). Actually, the more we live in a place, and regardless of age, the more we tend to create emotional ties with these places. In that sense, there's no correlation observed between age and place attachment.

2.5.Hypothesis and aim

This study is based on the hypothesis that the use of one of the two previously described coping meta-strategies will depend on the role played by the variables mentioned: risk perception, personal involvement and place attachment.

Drawing on the knowledge presented in the literature, we developed a general, explanatory model of each of the coping strategies, applicable to two conditions of exposure to natural hazards: flash floods and coastal flooding. The aim was to empirically test the relevance of this general explanatory model of coping strategies for natural disasters on the assumption that problem-solving coping strategies would be positively related to risk perception (H1a), personal involvement (H1b) and place attachment (H1c). In turn, emotion-focused coping strategies would be negatively related to the same variables (H2a, H2b and H2c) (Fig. 1).



Note: Each relation comprises a hypothesis. The positive or negative valence of the relation for each hypothesis is indicated in brackets. Oval variables reflect latent variables; rectangular variables reflect observed or manifested variables.

Figure 1: Theoretical coping path model for natural hazards

Furthermore, the aim was to verify whether these three predictive variables correlate equally with one another: risk perception would correlate with personal involvement (H3a) and place attachment (H3b), and these two variables (involvement and attachment) would correlate with each other (H3c).Finally, the duration of residence was included as a situational variable, which, hypothetically, would positively relate to both risk perception (H4a) and place attachment (H4b).

3. METHOD

3.1.Sample and Procedures

As stated, the aim of this study was to empirically test the theoretical model on two conditions of exposure to natural risks. We made the choice of these two phenomena as they are little studied within the risk perception and coping strategies literature. Floods, seismic or volcanic hazards are generally the most studied phenomena within the literature.

The first condition is that of flash flood risk. The study was conducted in the summer of 2015 in the Aburrá Valley town of Bello, located in the Department of Antioquia, in northeast Colombia, an area that is highly exposed to flash flood risk (Caballero, 2011). Specifically, the area chosen was that of the basin of the Barro stream, which is officially considered an area of flash flood risk. This area has witnessed flash floods such as that of October 2005, in which 39 people died and 20 houses were destroyed, generating extreme panic among at least 250,000 residents of the area (Rendón, Henao & Osorio, 2017). The study sample comprised 257 adults, 54.9% of whom were women. The mean duration of residence in the neighborhood was 9.36 years (*SD* = 8.21) (Table 1).

As regards the condition of coastal flooding, we questioned people exposed to this risk during the summer of 2016. The sample comprised 351 participants, 56% of whom were women. All were inhabitants of areas in the city of Cartagena de Indias, located on the Caribbean coast of Colombia, officially declared at risk of coastal flooding (Rojas, Blanco & Navarrete, 2012). The mean duration of residence in the neighborhood was 29 years (*SD*=17) (Table 1). This risk is widely recognized in the city, given the multiple occurrences of what is locally known as *mares de leva*, or sea swells: these events have generated material losses and damaged the road infrastructure, but have not caused, in general, the loss of human life. Each year, there are « *mar de leva* » phenomena. The most recent one causing severe damages is the one of November 2010, where 2500 families have been impacted, which represents 12 000 people, and where 3 persons died. Economic loss represents 500 000 dollars.

Table 1. Description of the sample

		Flash flood risk (N=257)		Coastal flooding risk (N=351)	
	Characteristics	n	%	n	%
Gender	Male	116	45.1	152	43.3
	Female	141	54.9	198	56.4
Age	18 – 24	71	27.6	55	15.7
	25 – 35	44	17.1	102	29.1
	36 -49	83	32.3	90	25.6
	50 – 60	34	13.2	65	18.5
	61 +	25	9.7	39	11.1
Socio-professional categories	Working	152	59.2	169	48.1
	Students	37	14.4	41	11.7
	Unemployed	17	6.6	30	8.5
	Homemakers	39	15.2	84	23.9
	Retired	12	4.7	24	6.8
	Others			2	.6
Level of education	No education	10	3.9	7	2.0
	Only primary	47	18.3	58	16.5
	Secondary	110	42.8	116	33.0
	Vocational training	61	23.7	120	34.2
	Undergraduate studies	17	6.6	46	13.1
	Postgraduate studies	12	4.7	4	1.1

In both cases, the survey was carried out using face-to-face interviews. The participants were debriefed (by informing them of the aims of the study) and their informed consent to participate was obtained. The mean duration for completing the questionnaire was 25 minutes.

3.2.Measures

In order to operationalize our theoretical variables, the following scales were used for both conditions of exposure to natural hazards:

- *The environmental risk coping scale* (López & Marván, 2004, 2012). The original version identifies two dimensions: problem-focused (α= .79) and emotion-focused (α=.76) coping strategies. For every item, the participants were asked to indicate a frequency (from never to always) on a five-point scale. Regarding the current sample, this two-factor structure was confirmed: problem-focused (α = .88 for flash floods and α= .75 for coastal flooding)

and emotion-focused (α = .70 for flash floods and α = .72 for coastal flooding) (see appendix 1).

- *Coastal Flooding Risk Perception* (CFRP) (Lemée, Fleury-Bahi, Navarro, et al., 2018). This 14-item scale measures risk perception of coastal flooding. For every item, the participants were asked to express their degree of agreement on a five-point scale. The scale has good internal reliability (α = .72, and α = .78 for the current sample).
- *Flash Flood Risk Perception* (FFRP) (Zapa-Pérez, Navarro & Rendón-Rivera, 2017). This 14-item scale measures risk perception of flash floods. For every item, the participants were asked to express their degree of agreement on a five-point scale. The scale has good internal reliability (α = .74, and α= .74 for the current sample).
- *Risk Implication* (RI) (Navarro et al., 2016). This 7-item scale was first validated for the study of flood risk. For every item, the participants were asked to express their level of agreement on a five-point scale. The scale has good internal reliability (α = .84, and for the current sample, α = .78 for flash flood and α= .68 for coastal flooding).
- *Place Attachment scale* (Hernández, Hidalgo, Salazar-Laplace & Hess, 2007; Hidalgo & Hernández, 2001). For every item (for a total of 9 items), the participants were asked to express their degree of agreement on a five-point scale. The original version has a high reliability index (α = .94 and α = .92 for flash floods and α = .87 for coastal flooding for the current sample).
- The duration of residence in the municipality was measured by the number of years and months indicated by the participants.

3.3.Data analysis

After verifying the internal reliability and validity of the measures, structural equation modeling (SEM) was used to test the proposed model. The maximum likelihood method was used to analyze the relations between the variables. The software used was AOS21®. The goodness of fit of the model was assessed by means of various indicators such as X^2, the root mean square error of approximation (RMSEA), the root mean square residual (RMR), the adjusted goodness of fit (AGFI), the Tucker-Lewis index (TLI) and the comparative fit index (CFI). In order to validate the model, it is suggested that X^2 should be non-significant, and that the X^2/df–ratio should be below 3. The indices of AGFI, TLI and CFI should be above.90. The RMSEA and RMR should ideally be below .05 (Arbuckle, 2008; Schumacker & Lomax, 2004), although a value between .05 and .08 is considered acceptable (Hu & Bentler, 1999).

We used bootstrapping with 1000 replications and confidence intervals (CIs) of 95% for the indirect effects (Shrout & Bolger, 2002).

4. RESULTS

4.1. Descriptive and reliability statistics

Table 2 shows the descriptive data used for the scales in each of the contexts, depending on the risks studied.

Table 2: Descriptive statistics

	Flash flood risk (N=257)					Coastal flooding risk (N=351)				
Variable	M	SD	Asymmetry	Kurtosis	α	M	SD	Asymmetry	Kurtosis	α
Problem-focused (vigilant) Coping	3.32	.762	-.326	.140	.88	3.56	.730	-.289	-.387	.75
Emotion-focused (avoidant) Coping	2.88	.611	.247	.148	.70	2.82	.940	.034	-.62	.72
Risk Perception	3.14	2.082	-.150	-.050	.74	3.54	.778	-.552	-.021	.78
Personal Involvement	3.29	1.428	-.304	.215	.78	3.71	.420	-.512	.799	.68
Place Attachment	3.62	.988	-.355	-.543	.92	4.11	.745	-1.746	2.805	.87

In terms of the internal reliability of the scales, all the dimensions yielded acceptable levels (Loewenthal & Lewis, 2015). The results appear to be consistent in both conditions. Nonetheless, to ensure greater confidence and validity, the scales were gender-controlled (see table 3). The results confirm the model's validity, given that there is no significant difference in flash flood risk perception. Coastal flooding risk perception neither presented gender-related differences. There is no significant difference either for problem-focused coping, emotion-focused coping, risk perception, personal involvement and place attachment.

Table 3: Scales validity control: Average comparison according to gender

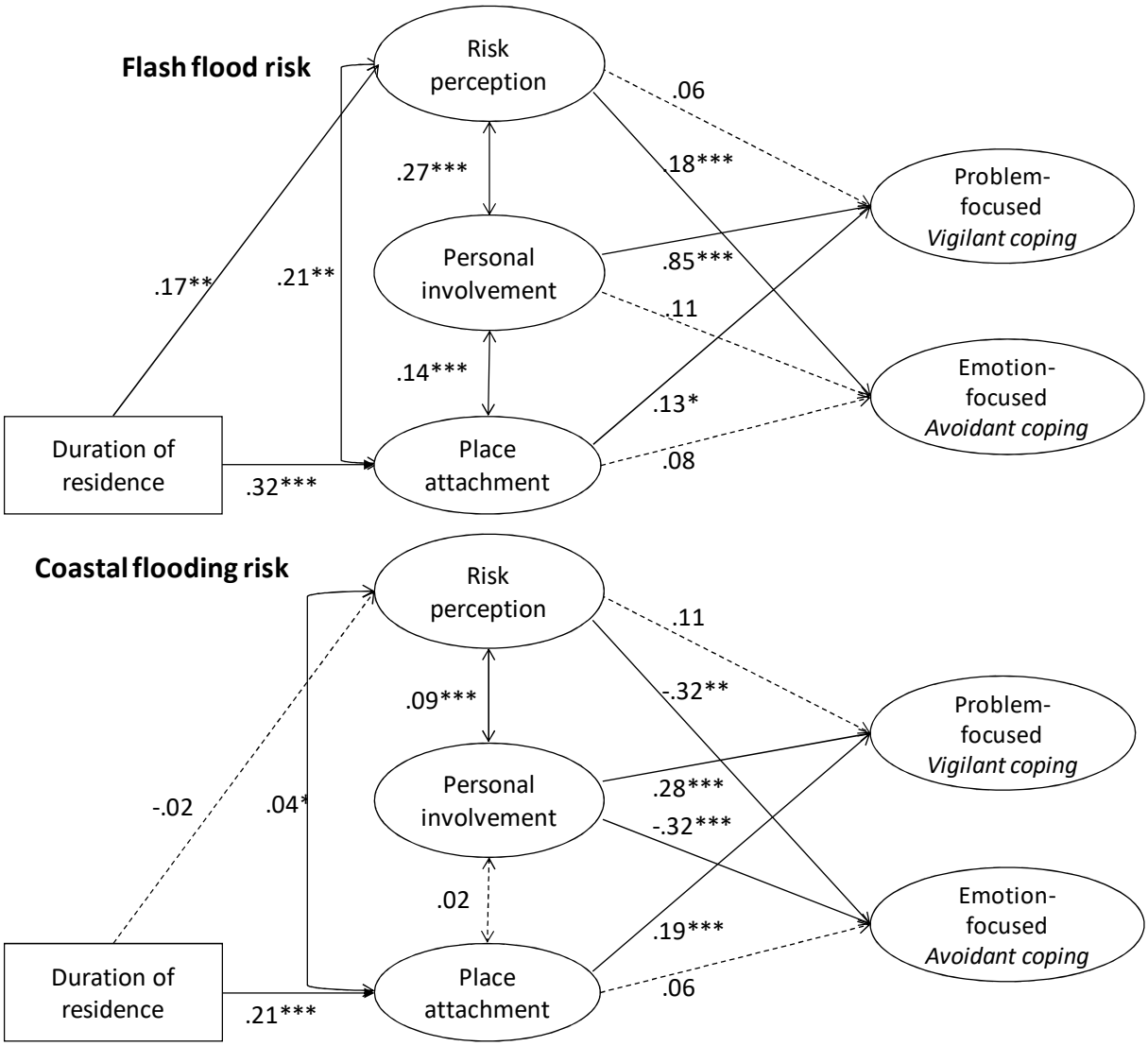
	Flash flood risk (N=257)						Coastal flooding risk (N=351)					
Variable	M_{man}	SD	M_{woman}	SD	t	p	M_{man}	SD	M_{woman}	SD	t	p
Problem-focused (vigilant) Coping	3.30	.70	3.34	.83	.46	.64	3.57	.76	3.54	.70	.30	.76
Emotion-focused (avoidant) Coping	2.90	.59	2.85	.62	.73	.46	2.88	.88	2.78	.98	.95	.33
Risk Perception	3.24	.62	3.35	1.42	1.26	.20	3.67	.39	3.73	.44	-1	.14
Personal Involvement	3.30	.69	3.28	.78	.20	.83	3.48	.76	3.57	.75	-1	.29
Place Attachment	3.67	.91	3.55	.92	1.02	.30	4.16	.72	4.07	.76	1.08	.77

This lack of difference between men and women on studied variables, confirm stability of our measurement scales. However it maybe that it seems contrary to some results of the existing literature. Actually, there's no consensus, on the role of this variable, neither on other demographic variables as the age, to explain the risk perception and coping strategies faced to some risks as flood for example (Navarro et al., 2016). However, the lack of researches on flash floods or coastal flooding risk, prevent us proposing an hypothesis on that way

We can only observe that regarding to our sample, differences are not observed. This gives stability to our analysis.

4.2.Path model for coping strategies

The structural equation modeling of coping strategies revealed an adequate goodness of fit index for the two conditions: for flash flood risk, X^2 = 1.39, p = .24; RMSEA = .03; RMR = 1.11; AGFI = .97; TLI = .98; CFI = .99; for coastal flooding risk, X^2= .799, p = .32; RMSEA = .00; RMR = .008; AGFI = .98; TLI = .99; CFI= 1.00. The model has a good fit in both conditions given that all the indicators are adequate, except for the RMR applied to flash flood risk, which is high. However, careful reading of each model reveals that the type of risk has an effect on the model, and that some differences emerge according to the hypothesis proposed. The first constant found is that duration of residence explains place attachment, which in turn explains problem-focused coping, confirming the proposed hypothesis. Thus, the longer individuals have lived in a place, the more attached they are to it and the more they tend to solve the risk-related problems so as to reduce the stress it generates. However, the attachment variable does not explain emotion-focused coping, with this association being non-significant in both conditions, thus confirming the trend. Problem-focused coping is also explained by personal attachment, thus further confirming the hypothesis proposed in our model. Our expectations of finding a negative association between personal involvement and emotion-focused coping were confirmed in the case of coastal flooding, but not, however, in that of flash flood risk.



*Note: The reported numbers are standardized regression coefficients (β) indicating direct effects *p<.05, **p<.01, ***p<.001. Non-significant associations are marked by a broken line.*

Figure 2: Coping path model

One of the hypotheses was that of a correlation between attachment and involvement. This was only confirmed in the case of flash flood risks, while the correlation was non-significant for coastal flooding risks. A hypothesis was also proposed on a correlation between attachment and risk perception. This was confirmed under both conditions, demonstrating that high attachment and high-risk perception are related. This variable is precisely the one that differs the most between the two cases under study. In the case of flash floods, perceived risk is not only determined by duration of residence as proposed in the hypothesis, but also explains emotion-focused coping strategies. In the coastal flooding condition, perceived risk is not explained by duration of residence. However, this risk perception negatively explains

emotion-focused strategies, confirming our hypothesis. This result allows us to argue a hypothesis of a difference within the model according to the type of event, particularly the catastrophic character distinguishing them. Actually, concerning people exposed to flash floods risks, risk considered as suddenly and deadly, their risk perception is determined by the time of residence within the sector, which is not the case for people living in more exposed zones to flooding costal risk. This let us think to a more accurate vulnerability feelings for the first ones as they consider themselves having less control or possibility to protect themselves. This is why they will more implement avoidant coping. In neither condition does risk perception explain problem-focused strategies, in contrast with the hypothesis proposed in the model.

In short, although a constant is observed in the role played by place attachment and personal involvement, given that both factors determine problem-focused coping, the role of risk perception is markedly different under the two conditions. In the case of flash floods, the longer a person has lived in a place, the more likely they might be to develop avoidance strategies so as to manage stress and negative emotions. Feeling personally involved in the problem and feeling attachment to where one lives might explain why an individual is more likely to take action to solve the problem. In the case of coastal flooding, risk perception negatively determines the use of emotion-focused or avoidant coping strategies to manage the stress generated by the situation. Moreover, although risk perception does not directly explain problem-focused coping strategies, it may do so indirectly, mediated by personal involvement and place attachment.

5. DISCUSSION

Our results support the hypothesis of an effect of the type of event or risk on the factors determining coping strategies, and especially on the role of risk perception. Indeed, the theoretical model fits the empirical data in both cases, but is restated according to the nature or characteristics of the threat. In the case of flash floods, a risk which is associated with high destructive potential, resulting in significant material and human losses, the perceived risk typically generates emotional and cognitive avoidance strategies to prevent stress and negative emotions. In the case of coastal flooding, which tends to present lower destructive potential compared to flash floods, and which generates fewer losses, especially of human lives, risk perception, together with the other variables, determine a tendency to develop

action-focused strategies rather than avoidant strategies. This suggests that, by means of action, individuals resolve the feeling of stress generated by the possibility of the risk.

These results allow the formulation of a series of hypotheses that seek to explain the strategies generated by individuals to confront the risk of natural disasters such as coastal flooding and flash floods. It should be noted that this study, in its current version, does not aim to verify the effective use of these behaviors, but to identify the psychological coping strategies individuals consider before taking action. The two types of strategies determine different actions in response to a risk as they are focused on different cognitive-emotional efforts (Moos & Billings, 1986 ; Lopez-Vazquez & Marvan, 2003; Ruiz & Hernández, 2014). They generate different processes, which are more internal in the case of emotion-focused coping, and more external regarding problem-focused coping. In this sense, the relation with action will also differ, with problem-solving strategies being more likely to lead to action. Slovic (1987, 2000) proposed the idea that risk perception significantly affects individuals' decisions and actions. Emotions such as fear are a factor that may influence risk perception and, indirectly, the behavior adopted in order to cope with the risk.

Risk perception changes according to an individual's assessment of the likelihood of an impact on their own well-being (Fleury-Bahi et al., 2013). Indeed, the capacity to protect oneself from a risk is not equal across human societies (Beck, 2001).Whether it be about intact individual (cognitive or effective) or collective strategies, their use and effectiveness depend on unequal conditions between people in societies (Navarro, 2017).

Thus, the aim is not to compare the benefits of one strategy over the other, since each represents a specific modality of stress management. It is the adaptive quality of each strategy that is to be examined, depending on the social and environmental context, and in relation to the type of hazard. Identifying each of these strategies allows crisis situations to be managed more appropriately, and may even help prepare the corresponding preventive policies (IPCC, 2014). One aspect that has not been addressed, and is thus a limitation of the present study, is the investigation of the factors that favor the shift from emotion-focused coping strategies to strategies focused on problem-solving. Communicating about the risk, where the quality of the message and the legitimacy of the source are understood, might also play an important role in encouraging this shift in strategy.

To conclude, addressing only risk perception or studying it in isolation from other factors, does not allow protective behaviors to be explained. Other psychological, situational and contextual factors in conjunction explain the use of a certain coping strategy in response to a hazard, and broadly speaking, the willingness to take protective action. Developing one or another type of coping strategy in response to the risk of a natural disaster is associated with the characteristics of the hazard and the nature of the phenomenon. Hence, communication about the event must include this aspect and be specifically adapted to it. Each natural phenomenon involves different experiences, sensations and behavior. These aspects open up perspectives for future lines of research in the field.

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APPENDIX 1: Scales.

The Environmental Risk Coping Scale

	Problem-focused coping
1	I analyze the circumstances to know what to do
2	I seek information from those who know
3	I consult with professionals about the problem
4	I modify my surroundings to avoid a disaster.
5	I state my objectives and redouble my efforts
6	I participate more in citizen protection activities
7	I meditate on what strategies I can use
8	I have a prevention plan and I follow it
9	I try to change my habits according to the problem
	Emotion-focused coping
1	I reject the idea of the situation being serious
2	I act as if the risk did not exist
3	I try not to think about the problem
4	I try not to feel anything

Coastal Flooding or Flash Flood Risk Perception

1	Future generations will be exposed to increasing (coastal flooding or flash flood) risk.
2	In the future, Guadeloupe will be exposed to increasing risk of (coastal flooding or flash flood).
3	Due to climate change, (coastal flooding or flash flood) risk will increase substantially.
4	People living in (coastal flooding or flash flood) risk areas will be exposed to increasing risk of flooding.
5	I experience living near the (sea or mountain) as a threat for my safety.
6	The (coastal flooding or flash flood) risk I am exposed to worries me.
7	When I think of (coastal flooding or flash flood) risk, I get anxious feelings.
8	It is necessary to adapt the building to the (coastal flooding or flash flood) risk.
9	Above all, it is necessary to strengthen protection infrastructures.
10	To reduce the (coastal flooding or flash flood), it is necessary to apply regulations.
11	Experts know exactly when protection against is no longer effective.
12	To people like me, the (coastal flooding or flash flood) risk in the region is well-known.
13	I can estimate the chance of (coastal flooding or flash flood) risk.
14	To experts, (coastal flooding or flash flood) risk is very well-known.

Risk Implication

1	(coastal flooding or flash flood) are a real problem
2	(coastal flooding or flash flood) are irreversible
3	For me, (coastal flooding or flash flood) are a major topic
4	I feel seriously concerned about (coastal flooding or flash flood)
5	At my level, I can take action to reduce the problems related to (coastal flooding or flash flood)
6	I believe that by my knowledge of the problems related to (coastal flooding or flash flood), I am able to act to solve them

Place Attachment Scale

1	I feel “my neighborhood” is a part of me.

2	“my neighborhood” is very special to me.
3	I identify strongly with “my neighborhood”.
4	I am very attached to “my neighborhood”.
5	Visiting “my neighborhood” says a lot about who I am.
6	“my neighborhood” means a lot to me.
7	“my neighborhood” is the best place for what I like to do.
8	No other place can compare to “my neighborhood”.
9	I get more satisfaction out of visiting “my neighborhood” than any other.
10	Doing what I do at “my neighborhood” is more important to me than doing it in any other place.
11	I wouldn't substitute any other area for doing the types of things I do at “my neighborhood”.
12	The things I do at “my neighborhood” I would enjoy doing just as much at a similar site.