



The better the bond, the better we cope. The effects of place attachment intensity and place attachment styles on the link between perception of risk and emotional and behavioral coping

Alexandra Stancu^{a,*}, Silvia Ariccio^a, Stefano De Dominicis^b, Uberta Ganucci Cancellieri^c, Irene Petrucci^d, Corina Ilin^e, Marino Bonaiuto^a

^a Sapienza University of Rome, Via dei Marsi 78, 00185, Roma, Italy

^b University of Copenhagen, AB-bygningen, Nørre Allé 55, 2200, København N, Denmark

^c University for Foreigners "Dante Alighieri" of Reggio Calabria, Via del Torrione, 95, 89125, Reggio Calabria, RC, Italy

^d Universitas Mercatorum, Piazza Mattei, 10, 00186, Roma, RM, Italy

^e West University of Timisoara, Bulevardul Vasile Pärvan 4, Timișoara, 300223, Romania

ABSTRACT

The general aim is to advance the understanding of the role of both place attachment intensity and place attachment styles for adaptive coping strategies with flood risk. Place attachment styles are operationalized as secure, preoccupied, and fearful-avoidant. Risk coping strategies are conceptualized as emotional (i.e., distress), and behavioral coping strategies (i.e., positive, negative, and avoidant).

Two main cross-sectional studies were conducted in both high and low-risk areas: one study in Italy (N = 100) and one study in Romania (N = 391). The first study aims to test the moderating effect of place attachment intensity and place attachment styles both on the relation between perception of risk and distress; and on the relation between perception of risk and positive, avoidant and negative behavioral coping. The second study tests the effects of place attachment styles on the relation between the objective risk level and both emotional and behavioral coping.

Results show that, in the high-risk context, people with a higher place attachment or having a secure bond with the place, are more likely to feel distress, and less likely to use avoidant coping strategies when the perceived risk is high. As for the low-risk context, people having a fearful-avoidant bond are more inclined to choose avoidant coping when the perceived risk is high. When taking into account the actual risk level, and not the perceived risk, people with a secure bond will more likely choose positive coping, as opposed to people with a fearful-avoidant place attachment when exposed to a higher risk. Place attachment style can thus be a relevant variable affecting strategies of environmental risk coping, at both emotional and behavioral level: specifically, a secure place attachment style, though favoring psychological distress, can improve a more constructive and adaptive behavioral strategy in face of higher perceived or objective flood risk.

1. Introduction

1.1. Background

The environmental disasters caused by climate change, such as floods, will require more and more mitigation and adaptation strategies, due to the increase in their occurrence and severity [1]. The present research focuses on psychological aspects of people exposed to floods, having the purpose to improve their adaptation to flooding. Adaptation to climate change is defined as "the process of adjustment so that expected or actual negative impacts of climate change can be reduced or

avoided" [1]. Adaptive behaviors at individual level refer to preventive actions, risk communication and information related actions, direct interventions (i.e. evacuating homes), and supporting climate adaptation policies. There is a lot of interest from governments in identifying what factors motivate the engagement in adaptive behaviors [2]. As a recent meta-analysis shows [3], perception of risk and negative affect positively predict the intention to adapt. Also, there are several strong psychological constructs predicting adaptive behavior, such as descriptive social norms, negative affect, and perceived efficacy of adaptive actions. Factors such as experience, knowledge, place attachment, and trust play only, but still significant, marginal roles in adaptation. The

* Corresponding author.

E-mail addresses: alexandra.docea@uniroma1.it, alexandra.docea@yahoo.com (A. Stancu), silvia.ariccio@uniroma1.it (S. Ariccio), sdd@nexs.ku.dk (S. De Dominicis), ganucci@unistrada.it (U.G. Cancellieri), irene.petrucci@unikore.it (I. Petrucci), corina.ilin@e-uvt.ro (C. Ilin), marino.bonaiuto@uniroma1.it (M. Bonaiuto).

¹ Present address: Str. Oituz, nr. 57C, Chisoda 307221, Jud. Timis, Romania.

<https://doi.org/10.1016/j.ijdr.2020.101771>

Received 13 January 2020; Received in revised form 19 May 2020; Accepted 12 July 2020

Available online 28 July 2020

2212-4209/© 2020 Elsevier Ltd. All rights reserved.

meta-analytical study also proves that there are not enough studies on how different psychological factors are interrelated and jointly lead to adaptation behavior, and this is the direction in which the current study brings a contribution.

1.1.1. Risk perception and risk coping: the main variables studied for adaptation

Risk coping refers to the behaviors and actions that people adopt when facing a risky situation. It is essential to understand how people make decisions as they attempt to cope with risk [4]. Previous studies show that risk perception plays an important role in adaptive or preventive risk coping. For example, Harries' study [5] shows that flood risk perceptions and beliefs about the effects of protective action were significantly associated with protective behavior. The effect of previous experience on perception of risk and intention of evacuation is generally positive, and people with (vs. without) previous experience are generally found to perceive more risk and being more willing to cope with it [6,7], but some authors suggests the existence of moderators that affect this effect [8]. In a study about hurricane evacuation, for instance, Demuth and colleagues [9] found that, even though the relationship between previous experience, perception of risk and intention of evacuation is generally positive, if self-efficacy is low (for instance because of the emotional impacts of previous evacuations), previous experience can diminish the intention of evacuation. Moreover, according to some studies, even when the number of previous hazard events increases risk perception, the longer time passes after an event the more risk perception decreases [8].

The link between perception of risk and risk coping is considered to be affected by various biases [10,11]. The most commonly studied biases are the availability and representativeness of information [12], and the optimism bias [13]. Consistently, various studies find that previous experience affects evacuation behavior mainly via a sort of habit or behavioral schema leading those who have evacuated from previous disasters to be more likely to evacuate in response to future natural hazards. Those who never performed an evacuation, instead, are likely to keep on not performing it [14,15]. The existence of these biases contribute to the idea that risk coping is not only the result of a rational analysis of the situation and the risk, but rather the result of a complex interaction of cognitive elements (e.g., risk perception, trust), behavioral schemas (e.g., past evacuation experience), and affective evaluations (e.g., affiliative behavior, place attachment).

1.1.2. Place attachment and its importance in coping with risk

Place attachment is an affective evaluation, referring to the bond people develop over time with their place: this bond can change how people perceive the risk or how they cope with it. For example, when the source of attachment (person or place) is also the source of risk, risk perception might be reduced in order to avoid the risk of separation and the related stress [16] and continue considering the attachment source as a "safe haven" [17,18].

Place attachment intensity refers to the strength of emotional bonds to places and it was first measured with a psychometric instrument by Williams and Roggenbuck [19], and applied in a public survey to visitors of places like national parks, forests, and tourist destinations. Research in environmental psychology continued to focus on measuring the strength of residents and community attachments [20–22].

In the literature there are inconsistent findings linking place attachment intensity with risk coping, or with risk perception [4]. For example, some studies prove that people with a strong attachment to their place, or sense of place, show better disaster preparedness [23]. While other studies prove that a strong attachment to the place could negatively affect coping with threat or the perception of threat [24–26]. One possible explanation may rest on the role place attachment may play not directly on coping but rather on the relation between perception and coping. For example, De Dominicis and his colleagues [27] show that place attachment intensity can be a barrier for enacting

preventive behavior to cope with flood risk when the perceived risk is high, for people living in high risk areas - an effect which may provide a psychological shield for protecting one's own place and social identity from the threat represented by the environmental risk. Another explanation may rest on the fact that in the literature there is not a clear understanding on individual differences in defensive strategies to cope with threat [4].

A possible way of improving the knowledge of the individuality of coping mechanisms is by looking to the interpersonal attachment literature, where there is a clear understanding of individual differences, i.e., in terms not simply of attachment intensity but rather in terms of attachment styles, which lead towards a certain coping mechanism (i.e., proximity-seeking of the attachment figure, avoidance of it, or anxiety about it) when facing a relational threat (i.e., separation from, or loss of, an attachment figure) [28]. In studies about adolescents and adults, attachment research generally focused on a person's attachment style—the systematic pattern of relational expectations, emotions, and behaviors that results from internalization of a particular history of attachment experiences [28,29]. Initially, research was based on Ainsworth, Blehar, Waters, and Wall's [30] three-category typology of attachment styles in infancy — secure, anxious, and avoidant — and Hazan and Shaver's [31] conceptualization of similar adult styles in the romantic relationship domain. Subsequent studies [32,33] revealed, however, that attachment styles are more appropriately conceptualized as regions in a two-dimensional space: attachment avoidance and attachment anxiety [34]. Therefore following the two-dimensional space and the internal working model of self and others, four attachment styles emerge, according to Feeney [35]: secure, preoccupied, dismissive, and fearful-avoidant attachment.

A similar concept has been developed regarding people attachment to a place, rather than a person. Starting from the attachment framework, Brown and Perkins [36] define place attachment as "the overall feelings, bonds, thoughts, and behavioral intentions that people develop over time in relation to their social-physical environment". Some authors, such as Scannell & Gifford [37], raised questions about the existence of place attachment styles similar to those from the interpersonal attachment literature, and about the similarities between place attachment intensity and place attachment styles. Therefore, styles of attachment become now a relevant issue that has been mostly neglected by past studies on place attachment so far, with very few and recent exceptions, such as McBain [38], Scannell [39], Scrima [40], Quinn [41], Sullivan and Young [42], and Stancu [43].

The operationalization of place attachment styles - analogue to interpersonal attachment styles - represents an attempt to capture how the pre-existing bond with a place could contribute to the particular resilience capabilities people will enact when facing a threat. McBain [38] and Scannell [39] developed measures for place attachment styles by referring to anxiety and avoidance as dimensions which stand at the root of what drives individual differences in people-place bonds.

Using the place attachment styles proposed by Lewicka [44], Quinn and his colleagues [41] suggest a conceptual model for how sense of place² interacts with other processes, such as risk perception, and what this may mean for how communities experience and manage social and environmental change.

As previous studies show [39], place attachment provides similar benefits as interpersonal attachment does (e.g., belonging, relaxation, positive emotions, comfort—safe haven, self-esteem, self-growth, freedom—control, and meaning). McBain [38] adapted the Relationship Questionnaire [32] to assess place attachment style and found that place attachment styles were positively correlated to interpersonal attachment styles. Scrima [40] also proves the existence of place attachment styles

² Sense of place is an overarching term for a number of different approaches and terms describing people's relationship with their environment [44,45], i.e., place attachment.

applied to the organizational context (i.e., attachment to building, office, green spaces), by verifying the discriminant validity of the Workplace Attachment Scale [46], compared with two other instruments assessing types of attachment at work [47,48].

Place attachment styles differ from the concept of place attachment intensity, bringing a more nuanced understanding on the type of pre-existing people-place bond (before a potential hazard). According to the literature on the formation of attachment styles [17,18,49], the bond differs according to the type of response provided by the attachment figure, in terms of fostering safety and ensuring survival when a threat was present. Therefore, we assume that place attachment styles carry the understanding of past experiences in the place, while place attachment intensity is a concept used to describe the present strength of people-place bond, and not the developmental aspects of the bond.

The general goal of this research is to develop an understanding on the individual differences in terms of place attachment which can affect the link between the cognitive interpretation of a threat and the emotional and behavioral response to it. The individual differences of place attachment are formulated as place attachment styles, in terms of analogue of the adult attachment styles [33,35]: secure, preoccupied, dismissive, and fearful-avoidant attachment styles. The risk coping strategies are conceptualized in the current contribution as cognitive (i.e., perception of risk), emotional (i.e., distress), and behavioral coping. Behavioral coping refers to the behavioral strategies discussed in the attachment literature [50], namely proximity-seeking, hyper-activation, and deactivation, operationalized in the current research as positive (i.e., seeking support, active coping), avoidant (i.e., humor, venting of emotions) or negative coping (i.e., substance abuse, behavioral disengagement).

1.2. Structure of the empirical studies

Two main cross-sectional studies were conducted to reach the research's aims, one in Italy and one in Romania.

Starting from the research done by De Dominicis et al. [27], the first study wants to test the effect of place attachment intensity on the relation between perception of risk and distress – an emotional coping mechanism; and between perception of risk and positive, avoidant and negative behavioral coping. Consistently with De Dominicis and colleagues [27], a negative moderation is expected in the high risk areas, especially for behavioral coping, proving that place attachment may function as a barrier for enacting positive behavior to cope with flood risk when the perceived risk is high, especially within high risk areas. The study also explores the understanding on the way each place attachment style moderates the relation of perception of risk with both distress and behavioral coping, considering both high and low flood risk contexts.

The second study retests the effect of place attachment style on the relation of risk with both emotional and behavioral coping. Moreover, while in the first study perceived risk was used as independent variable, here the focus goes on the official risk level. Risk level of flood was used here in order to check if place attachment styles have the same impact on coping strategies independent of the perception of risk.

2. Study 1

On the basis of previous studies which showed that high (vs. low) place attachment intensity can negatively moderate the relation among perception of risk and coping [27], the present study aims to replicate the negative moderation of place attachment intensity on the relationship between perception of risk and coping behavior, including a wider spectrum of coping measures. More specifically, measures of both emotional and behavioral coping will be employed; also the effect of each place attachment style on the relation between perception of risk and coping will be innovatively assessed.

The aims of the study defined for people living in high and low flood

risk areas in Italy, can be expressed as follows:

- **Aim 1** intends (Fig. 1): *a*) to investigate the effect of place attachment intensity on the relation between perception of risk and distress; *b*) to investigate the effect of place attachment intensity on the relation between perception of risk and positive/avoidant/negative coping.
- **Aim 2** intends (Fig. 2): *a*) to explore the effects of secure/dismissive/preoccupied/fearful-avoidant place attachment on the relation between perception of risk and distress; *b*) to explore the effects of secure/dismissive/preoccupied/fearful-avoidant place attachment on the relation between perception of risk and positive/avoidant/negative coping.

2.1. Method

2.1.1. Participants

One hundred Italian participants, fifty from high flood risk areas and fifty from a low flood risk area, completed a paper and pencil questionnaire. In the high risk group, the mean age of participants was $M = 46,84$ ($S.D. = 16,14$), and twenty six were men. In the low risk group the mean age was $M = 44,30$ ($S.D. = 14,75$), and twenty five were men.

Participants' past flood experience was assessed: in the high-risk area 8% had experienced more than two floods, 82% one or two floods, and 10% had no flood experience. In the low risk area nobody experienced more than two floods, 56% experienced one or two floods, and 44% had no flood experience. Past experience is consistent with the level of risk in the selected areas, showing that on the whole people from high risk areas experienced more floods than people from low risk areas.

Data were gathered on field, by trained interviewers. No incentives were received by the participants for completing this task. Participants were approached in public places or door-by-door. The response rate for the questionnaire was around 60%. The areas of high and low flood risk were initially selected on the basis of official documents, provided by local authorities (in line with previous similar studies on the same areas [27,51,52]). Therefore, the areas of high flood risk for this study are Vibo Marina, Bivona, Porto Salvo; and the area of low flood risk is Vibo Valentia (as shown in Figs. 3 and 4).

2.1.2. Materials

The questionnaire included the following scales:

- Perception of risk: eleven five-point Likert-type items - adapted from Brewer and colleagues [53], and De Dominicis and colleagues [27]. Five items were removed from further analysis in order to improve the reliability of the scale (from $\alpha = 0,56$ to $\alpha = 0,63$);
- Place attachment intensity: four five-point Likert-type items (adapted from Fornara and colleagues [54], with $\alpha = 0,75$);
- Place attachment styles: thirty seven seven-point Likert-type items - adapted from Scannell [39]. For the current research, first a qualitative analysis of items was performed, labeling each item into one of the four place attachment styles. Principal axis factoring analysis confirmed only two factors comprising eighteen items representing secure place attachment (23% explained variance, $\alpha = 0,88$) and fearful-avoidant place attachment (respectively 11% of variance, $\alpha = 0,83$). Dismissive and preoccupied place attachment styles will not be considered for this study, because the factors associated with these dimensions had too low Eigen values (below one). *Secure place attachment* refers to an image of place as an environment that is accepting, comforting, providing a sense of stability. *Fearful-avoidant place attachment* is characterized by an avoidance of the formation of any relationship with place due to a fear of loss, a sense of insecurity in place, or an inability to recognize and appreciate the level of comfort and stability afforded by place.

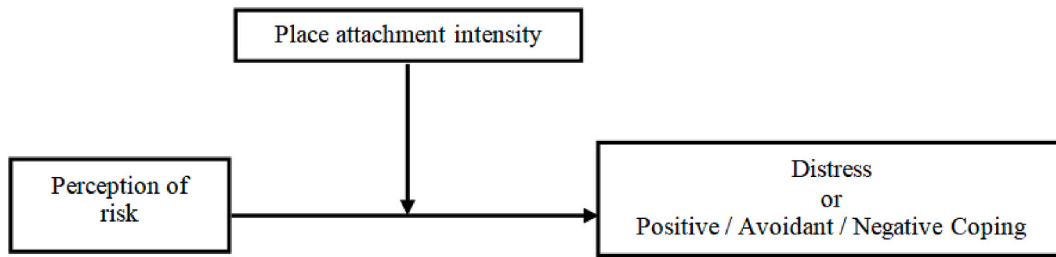


Fig. 1. Graphic representation for the first aim of Study 1.

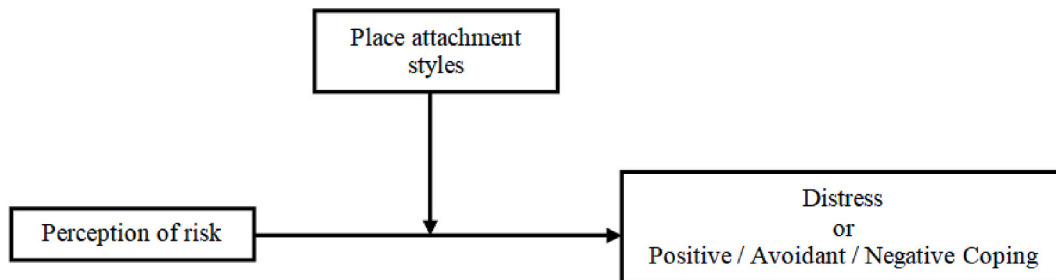


Fig. 2. Graphic representation for the second aim of Study 1.

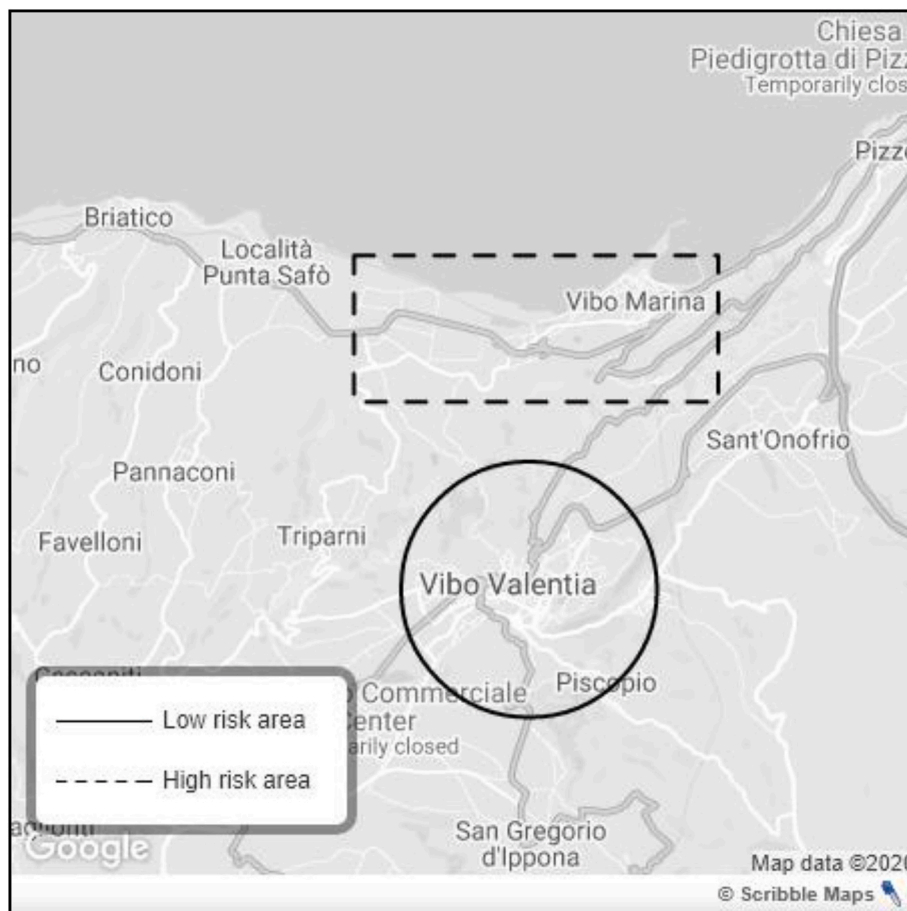


Fig. 3. Location maps for the Italian high and low flood risk areas.

- Distress: twelve five-point Likert-type items - adapted from Weiss and Marmar [55]. Two items were removed from further analysis in order to improve the reliability of the scale (from $\alpha = 0.85$ to $\alpha = 0.92$);
- Coping styles: twenty eight four-point Likert-type items - adapted from Carver [56]. Factor analysis revealed three factors, labeled as negative coping (explaining 23% of variance, $\alpha = 0.66$), positive coping (explaining 15% of variance, $\alpha = 0.70$) and avoidant coping



Fig. 4. Map representation for the Italian areas in which the study was conducted.

(explaining 12% of variance, $\alpha = 0.63$). *Negative coping* was the primary factor, being composed by the initial subscales substance abuse, behavioral disengagement, and self-distraction; *positive coping* is composed by the initial scales use of emotional and instrumental support, and positive reframing; *avoidant coping* is composed by the initial scales venting and humor.

Each participant was asked to indicate what his/her place of attachment is. This was later referred to as “my place” and all questions were intended to refer to this place.

2.1.3. Procedure

The data were gathered on field, between February and March 2015, by trained students of Social Sciences of the Foreigners University “Dante Alighieri” in Reggio Calabria, through a paper and pencil questionnaire. Data were collected in public spaces from the selected high and low Italian flood risk areas. A criterion for participation was that the respondents’ actual living place to be within the selected areas. Participants agreed to voluntarily participate in a survey on the subject “people-environment relationships” and gave consent to use their answers for the purpose of this study and related publications.

2.2. Analyses

The main objective of study 1 is to test the moderating effect of place attachment intensity (Aim 1) and place attachment styles (Aim 2) on the relation between perception of risk and distress; and on the relation between perception of risk and positive, negative, and avoidant behavioral coping. Hierarchical multiple regression analyses (separately for each of the two contexts, high and low flood risk areas) are performed to test increases in variance when place attachment (intensity or

style) and its interaction with perception of risk are added to the simple one-way regression model (perception of risk predicting emotional or behavioral coping variables). Thus, regression models are tested using the product variable approach suggested by Baron and Kenny [57]. To avoid potentially problematic high multi-collinearity with the interaction term, the variables are centered and an interaction term between perception of risk and place attachment is created [58]. The significant moderations are also represented in Appendix by simple slope analyses, which determine how the effect of X on Y is statistically significant at particular values of Z . The slope analyses represent a longitudinal trend line for the same group (high or low risk group), proving how different levels of risk perception impact coping, at different values of place attachment intensity/styles.

Participants which did not experience any flood did not complete the distress scale. The analyses including the distress variable were done on $N = 45$ in the high risk group, and $N = 28$ in the low risk group.

2.3. Results

The correlation coefficient between variables, the mean and standard deviation for the two risk groups are presented in Table 1.

2.3.1. Aim 1: effects of place attachment intensity

Results of hierarchical regression analyses revealed partial support for Aim 1.

In the high risk area, distress was positively predicted by the interaction term between perceived risk and place attachment intensity, as shown in Table 2 and Fig. A1 (Appendix).

The Johnson-Neyman technique [59], testing the conditional effects of the perception of risk at multiple levels of place attachment intensity, shows that the relationship between perception of risk and distress is

Table 1
Descriptive statistics and inter-correlations of the variables (Pearson's *r*) for the Italian subjects exposed to high and low flood risk.

	1	2	3	4	5	6	7	8	<i>M</i>	<i>SD</i>
<i>High risk group</i>										
1 Secure Place Attachment	1.00								5.00	1.66
2 Fearful-Avoidant Place Attachment	0.24	1.00							2.78	1.27
3 Place Attachment (intensity)	0.62**	0.15	1.00						5.30	1.67
4 Perception of risk	0.09	0.29*	0.11	1.00					3.55	1.31
5 Positive Coping	0.27*	-0.00	0.15	0.00	1.00				2.62	0.76
6 Avoidant Coping	-0.10	0.03	-0.13	-0.23	0.24	1.00			2.05	0.78
7 Negative Coping	0.07	0.28*	-0.05	0.11	0.15	0.19	1.00		1.71	0.66
8 Distress	0.21	0.18	0.11	0.40**	0.03	-0.15	0.12	1.00	1.94	1.02
<i>Low risk group</i>										
1 Secure Place Attachment	1.00								5.32	1.31
2 Fearful-Avoidant Place Attachment	0.17	1.00							3.38	1.38
3 Place Attachment (intensity)	0.14	0.01	1.00						5.60	1.65
4 Perception of risk	-0.10	-0.01	0.25*	1.00					3.74	1.15
5 Positive Coping	0.27*	0.05	0.01	-0.02	1.00				2.68	0.68
6 Avoidant Coping	-0.16	-0.05	0.06	0.26*	0.16	1.00			2.14	0.76
7 Negative Coping	0.18	0.18	-0.18	-0.09	0.34	0.08	1.00		1.81	0.63
8 Distress	0.07	0.09	-0.13	0.05	-0.01	0.08	0.12	1.00	2.09	1.19

Note: **p* < .05; ***p* < .01.

Table 2
Results of hierarchical regression analyses for Distress, Positive coping, Avoidant coping, and Negative coping.

Independent variables	Distress	Positive coping	Avoidant coping	Negative coping
High risk area				
Step 1: Independent effects				
Perceived risk	.40**	-.01	-.22	.12
Place attachment intensity	.07	.15	-.10	-.06
<i>R</i> ²	.17	.02	.06	.02
<i>F</i>	4.73*	.52	1.60	.39
Step 2: Moderation				
Perceived risk	-.51	.62	.74	.75
Place attachment intensity	-.64	.64	.65	.44
Perceived risk * Place attachment intensity	1.24*	-.86	-1.31*	-.87
<i>R</i> ²	.24	.06	.14	.05
ΔR^2	.07	.04	.08	.03
ΔF	4.26*	1.67	4.26*	1.69
Low risk area				
Step 1: Independent effects				
Perceived risk	.09	-.02	.26	-.05
Place attachment intensity	-.16	.01	.00	-.16
<i>R</i> ²	.03	.00	.07	.03
<i>F</i>	.61	.01	1.65	.83
Step 2: Moderation				
Perceived risk	.63	-1.21	.03	-2.06**
Place attachment intensity	.37	-1.15	-.22	-2.12**
Perceived risk * Place attachment intensity	-.89	1.88	.35	3.16**
<i>R</i> ²	.04	.08	.07	.26
ΔR^2	.01	.08	.00	.23
ΔF	.79	4.01	.14	14.14**

Note: **p* < .05; ***p* < .01.

significant when place attachment intensity is higher than .11 (*p* < .001) standard deviations above the mean, but it turns to be non-significant with lower values of place attachment intensity (*p* > .05). Avoidant coping was negatively predicted by the interaction term, as shown in Table 2 and Fig. A2 (Appendix). The relationship between perception of risk and avoidant coping is significant when place attachment intensity is higher than .09 standard deviations above the mean (*p* = .01) but it is non-significant with lower values of place attachment intensity (*p* > .05). In high risk area, positive coping and negative coping were not

significantly predicted by the interaction term.

In the low risk group, distress, positive coping and avoidant coping were not significantly predicted by the interaction term between perceived risk and place attachment intensity (Table 2). However, negative coping was positively predicted by all the independent variables, including the interaction term, as shown in Table 2 and Fig. A3 (Appendix). In this case, the relationship between perception of risk and negative coping is significant when place attachment intensity is lower than .08 standard deviations below the mean (*p* < .01), or 0.09 standard deviations above the mean (*p* = .01), but it is non-significant for the mean values of place attachment intensity (*p* > .05).

2.3.2. Aim 2: effects of place attachment styles

Aim 2 was partially fulfilled, since the analysis of the Place attachment styles scale confirmed only two factors: secure and fearful-avoidant place attachment.

2.3.2.1. Secure place attachment. In the high risk area, distress was positively predicted by the interaction term between perceived risk and secure place attachment, as shown in Table 3 and Fig. A4 (Appendix).

The Johnson-Neyman technique [59], testing the conditional effects of the perception of risk at multiple levels of secure place attachment, shows that the relationship between perception of risk and distress is significant when secure place attachment is equal or higher than .10 standard deviations from the mean (*p* = .01) and above the mean (*p* < .01), but it is non-significant with lower values of secure place attachment. Avoidant coping was negatively predicted by the interaction term, as shown in Table 3 and Fig. A5 (Appendix). The relationship between perception of risk and avoidant coping is significant when secure place attachment is higher than .08 standard deviations above the mean (*p* = .01), but it is non-significant with lower values of secure place attachment (*p* > .05). In high risk area, positive coping and negative coping were not significantly predicted by the interaction term.

In the low risk group, distress, positive coping, avoidant coping, and negative coping were not significantly predicted by the interaction term between perceived risk and secure place attachment (Table 3).

2.3.2.2. Fearful-avoidant place attachment. In the high risk group, distress, positive coping, avoidant coping, and negative coping were not significantly predicted by the interaction term between perceived risk and fearful-avoidant place attachment (Table 3).

In the low risk group, avoidant coping was positively predicted by the interaction term, as shown in Table 3 and Fig. A6 (Appendix). The relationship between perception of risk and avoidant coping is

Table 3
Results of hierarchical regression analyses for Distress, Positive coping, Avoidant coping, and Negative coping.

Independent variables	Distress	Positive coping	Avoidant coping	Negative coping
Secure place attachment				
High risk area				
Step 1: Independent effects				
Perceived risk	.39**	-.02	-.22	.11
Secure place attachment	.17	.27	-.08	.06
R ²	.19	.07	.06	.02
F	5.57**	1.85	1.50	.39
Step 2: Moderation				
Perceived risk	-.86*	.61	.69	.82
Secure place attachment	-.91*	.82	.71	.68
Perceived risk * Secure place attachment	1.76**	-.90	-1.30*	-1.01
R ²	.34	.11	.14	.06
ΔR ²	.15	.04	.08	.04
ΔF	10.11**	1.95	4.21*	2.35
Low risk area				
Step 1: Independent effects				
Perceived risk	.06	.01	.24	-.08
Secure place attachment	.08	.27	-.14	.17
R ²	.01	.07	.08	.04
F	.22	1.89	2.18	.89
Step 2: Moderation				
Perceived risk	-.21	.51	-.84	-.18
Secure place attachment	-.15	.70	-1.06	.08
Perceived risk * Secure place attachment	.34	-.63	1.36	.12
R ²	.01	.08	.12	.04
ΔR ²	.00	.01	.04	.00
ΔF	.11	.41	1.99	.02
Fearful-avoidant place attachment				
High risk area				
Step 1: Independent effects				
Perceived risk	.38**	.00	-.26	.03
Fearful-avoidant place attachment	.07	-.00	.11	.27
R ²	.17	.00	.06	.08
F	4.72*	.00	1.60	2.02
Step 2: Moderation				
Perceived risk	.43	-.55	-.37	.33
Fearful-avoidant place attachment	.13	-.86	-.07	.74
Perceived risk * Fearful-avoidant place attachment	-.13	1.17	.24	-.63
R ²	.17	.05	.06	.09
ΔR ²	.00	.05	.00	.01
ΔF	.02	2.48	.10	.77
Low risk area				
Step 1: Independent effects				
Perceived risk	.06	-.02	.26	-.09
Fearful-avoidant place attachment	.09	.05	-.05	.18
R ²	.01	.00	.07	.04
F	.25	.08	1.72	1.02
Step 2: Moderation				
Perceived risk	-.03	-.77	-.50	-.55
Fearful-avoidant place attachment	-.02	-.93	-1.04*	-.41
Perceived risk * Fearful-avoidant place attachment	.13	1.27*	1.27*	.77
R ²	.01	.09	.15	.07
ΔR ²	.00	.09	.08	.03
ΔF	.04	4.34*	4.67*	1.55

Note: **p* < .05; ***p* < .01.

significant when fearful-avoidant place attachment is higher than .09 standard deviations above the mean (*p* = .01), but it is non-significant with lower values of fearful-avoidant place attachment (*p* > .05). In the low risk group, distress, positive coping and negative coping were

not significantly predicted by the interaction term.

2.4. Discussion

The first aim of study 1 was to test the effect of place attachment intensity on the relation between perception of risk and coping, considering both emotional (operationalized as distress) and behavioral coping (operationalized as positive, avoidant, and negative coping). Previous research proved that place attachment negatively moderates the relationship between perception of risk and coping (intention and action) in a context of high flood risk [27], due to possible place-specific biases, such as the optimistic bias applied to environmental perception of risk [60–62]. Results show that, in the high risk context, place attachment intensity has a significant and positive effect on the relation between perception of risk and the emotional coping variable, distress, and a negative significant effect on the relation between perception of risk and avoidant coping. Therefore, place attachment intensity might facilitate the feeling of distress and hinder avoidant coping strategies for people experiencing high objective and subjective risk. In the low flood risk context, place attachment intensity has a significant positive effect on the relation between perception of risk and negative coping. This seems to indicate that place attachment intensity has an adaptive role, increasing people’s tendency to enact distress - an adaptive emotional coping strategy [63], while decreasing the likeliness of the non-adaptive avoidant coping. It might also be noticed how people feeling a high risk and a strong attachment are more likely to focus on emotional adaptive coping (distress), if they live in high risk areas, and on behavioral coping (negative), if they live in low risk areas. This seems to suggest how people living in low risk areas might feel more self-efficacy and thus try to operatively deal with the risk, while people living in high risk areas focus on dealing with the risk’s emotional consequences [51,64].

The second aim of study 1 was to test the effect of place attachment style on the relation between perception of risk and coping, considering both emotional and behavioral coping. Results show that, in the high risk context, secure place attachment had a positive effect on the relation between perception of risk and distress, and a negative effect on the relation between perception of risk and avoidant coping. Previous studies in the interpersonal attachment literature [16,50,65] show that the activation of the attachment system takes place in several steps. First there is the appraisal of threat (here, perception of risk), and then the appraisal of availability of attachment figure in offering support (here, the place as attachment object). If the attachment figure cannot offer support, people have to cope with the felt insecurity. Therefore, results from the present study prove that, similarly with the secure attachment, people with a secure bond with their place are expressing distress more, when the perceived risk is high, and are less likely to use deactivating coping strategies, such as avoidant coping. Insecure place attachment (operationalized as fearful-avoidant place attachment) has a significant effect on the relation between perception of risk and two of the dependent variables only in the low risk context. Fearful-avoidant place attachment has a positive effect on the relation between perception of risk and positive and avoidant coping. Positive coping might be easily enacted in the absence of a real threat. In the case of avoidant coping, these results support the pattern of deactivation strategies used by fearful-avoidant persons [35,50].

Study 1 brings evidence of the moderating effects of place attachment intensity and place attachment styles on the relation between perception of risk and emotional or behavioral coping strategies, proving that both place attachment intensity and place attachment styles have a common ground in explaining risk coping strategies, but also some differences nuanced by the specific styles of place attachment. Study 2 was therefore subsequently developed to build upon these results, by testing the generalizability of the effects of place attachment styles on risk coping in a different context. Study 2 also wishes to bring more practical implications (e.g., implications for planning adaptation strategies) regarding the individual differences in place attachment

within a flood risk context, by analyzing their influence on the relation between the objective risk, rather than perceived risk, and coping strategies.

3. Study 2

The main objective of study 2 is to replicate the results of Study 1, by focusing on the moderating effects of place attachment styles on the relation of the objective risk level with both distress (Aim 1) and behavioral coping – positive, avoidant and negative coping (Aim 2). In other words, results from the previous study in the high risk context are expected to replicate in the current study, where perceived risk is replaced with the objective risk level.

Environmental risk and people's responses to environmental disasters, such as floods, have been at the center of research in many EU initiatives, though the psychological contributions to this issue have been largely discounted [66,67]. Recent contributions have demonstrated the role of place attachment in fostering, or damaging, effective coping strategies in the face of environmental risk [27]. The aim of study 2 is to extend these directions, and to bring something new, namely to test the moderating effect of place attachment styles on the relation of the risk level with both emotional and behavioral coping.

Another argument for the importance of including risk level in the analysis of study 2 is the fact that such findings will be useful for implementing preventive societal actions, more easily than the actions in which perceived risk is measured through self-report instruments. If risk level brings similar results as the perceived risk, complications from the risk perception self-report measures [68] will no longer count, and more clear directions for preventive actions can be drawn by simply considering the objective risk level to which people are exposed.

3.1. Method

3.1.1. Participants

Around 450 citizens completed the paper pencil questionnaire, of which $N = 391$ entered the final sample (59 respondents were excluded from the analysis for incomplete participation). Purposive area sampling was used to ensure that those at high- and low-risk were sampled. The sample was stratified by gender and age within the two areas. In the high risk group ($N = 237$), the mean age of participants was $M = 45,02$ ($S.D. = 16,64$), and one hundred nineteen were women. In the low risk group ($N = 154$) the mean age was $M = 39,60$ ($S.D. = 14,75$), and ninety one were women.

Participants' past flood experience was also assessed: in the high risk area 34.2% experienced more than two floods, 53.6% experienced one or two floods, and 12.2% had no flood experience, one of the main reasons being they moved in the area after the flood happened. In the low risk area 7.1% have experienced more than two floods, 24.7% one or two floods, and 66.2% having no flood experience. Past experience is consistent with the level of risk in the selected areas, showing that on the whole people from high risk areas experienced more floods than people from low risk areas.

Data were gathered on field, by trained interviewers. No incentives were received by the participants for completing this task. Participants were approached in public places or door-by-door. The response rate for the questionnaire was around 70%. The areas of high and low flood risk were initially selected on the basis of official documents, provided by local authorities: The "Romanian Waters" National Administration and the Inspectorate for Emergency Situations "Banat" Timis County. Therefore the main areas of high flood risk for this study are from the regions Banat (Gataia, Ionel, Manastire, Otelec, Fizes, Berecuta) and

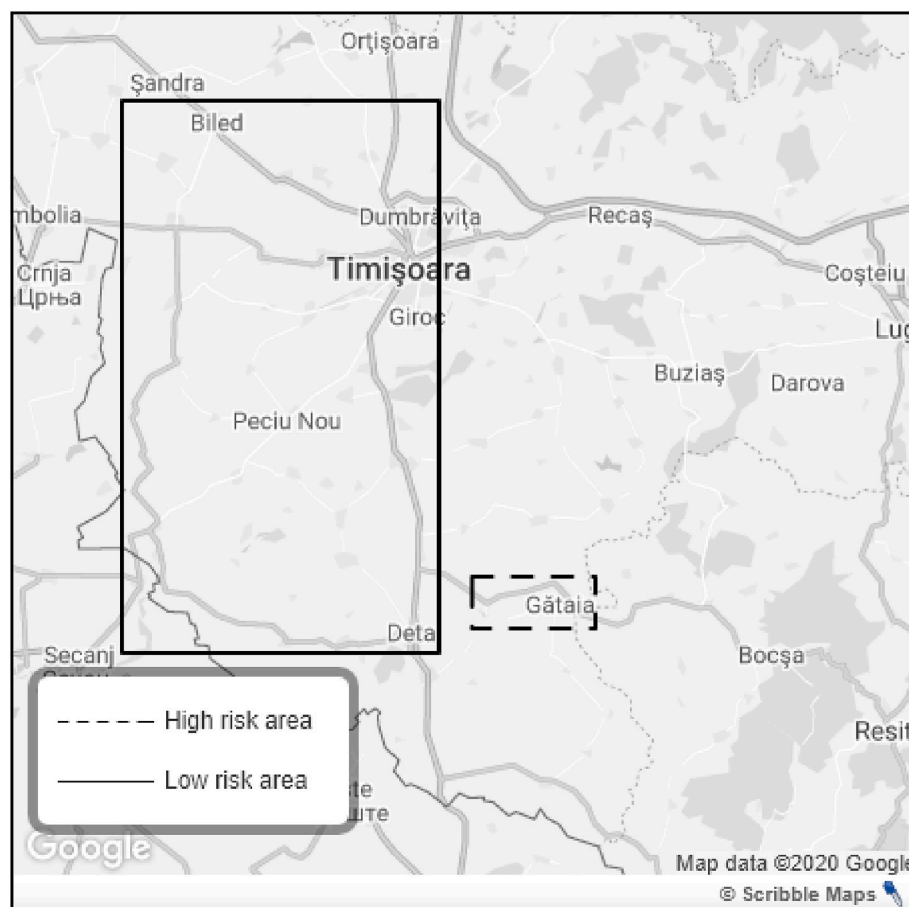


Fig. 5. Location maps for the Romanian high and low flood risk areas from Banat region.

Maramures (Poienile de Sub Munte); and the areas of low risk are from Banat region only (Deta, Dolat, Cenei, Chisoda, Sculea, Pesac, PeciuNou, OteluRosu, Jebel, Giroc, Ghiroda), as shown in Figs. 5–7.

High risk areas are defined on the basis of the historical extreme floods happening in the area. In Timis County, at the time of the research, the most recent extreme floods happened in the years 2000, 2005, 2006, and 2010. In Maramures County, the most recent floods were dated in 2001, 2006, and 2008. The level of risk was assessed by considering the number of people affected by floods, and by assessing the vulnerability of objects exposed to flood risk. Also, the level of water and the impact of disaster on people and objects exposed to flooding were taken into account (more on the assessment of flood risk can be found on the web page of the Romanian Ministry of Environment: www.mmediu.ro).

3.1.2. Materials

The following materials were used for the variables of the study included in the questionnaire:

- Place attachment styles: the same scale and analysis of items as in Study 1 was used. Principal axis factoring analysis confirmed three factors representing secure place attachment (explaining 17% of variance, $\alpha = 0.65$), preoccupied place attachment (explaining 13% of variance, $\alpha = 0.66$), and fearful-avoidant place attachment (explaining 6% of variance, $\alpha = 0.60$). Dismissive place attachment style will not be considered for this study because the factor associated with this dimension had too low Eigen values (below one); Preoccupied place attachment refers to the people who are overly reliant upon place, exhibiting a dependence on place for a sense of comfort, stability, or well-being.

- Distress: the same scale as in Study 1 was used. All twelve items of the scale were included in the analysis ($\alpha = 0.82$).
- Coping styles: the same scale and analysis of items as in Study 1 was used. Factor analysis revealed three factors, labeled as negative coping (explaining 18% of variance, $\alpha = 0.61$), positive coping (explaining 10% of variance, $\alpha = 0.71$) and avoidant coping (explaining 8% of variance, $\alpha = 0.64$).

Each participant was asked to indicate what his/her place of attachment is. This was later referred to as “my place” and all questions were intended to refer to this place.

3.1.3. Procedure

Data were gathered on field, between March and April 2015, by trained students of the West University of Timisoara, Romania, through a paper and pencil questionnaire. Each participant had been contacted individually, door-to-door, and asked to participate in a survey on the subject “people-environment relationships”. Participants were randomly selected from high and low flood risk areas. A criterion for participation was that the respondents’ actual living place to be in the selected areas. Participants which did not experience any flood did not complete the distress scale. Participants which did not experience any flood did not complete the distress scale. The analyses on distress were done on $N = 257$.

3.1.4. Analyses

As in study 1, hierarchical multiple regression analyses were performed to test increases in variance when a place attachment style and its interaction with risk level are added to the simple one-way regression model. The significant moderations are represented in Appendix by

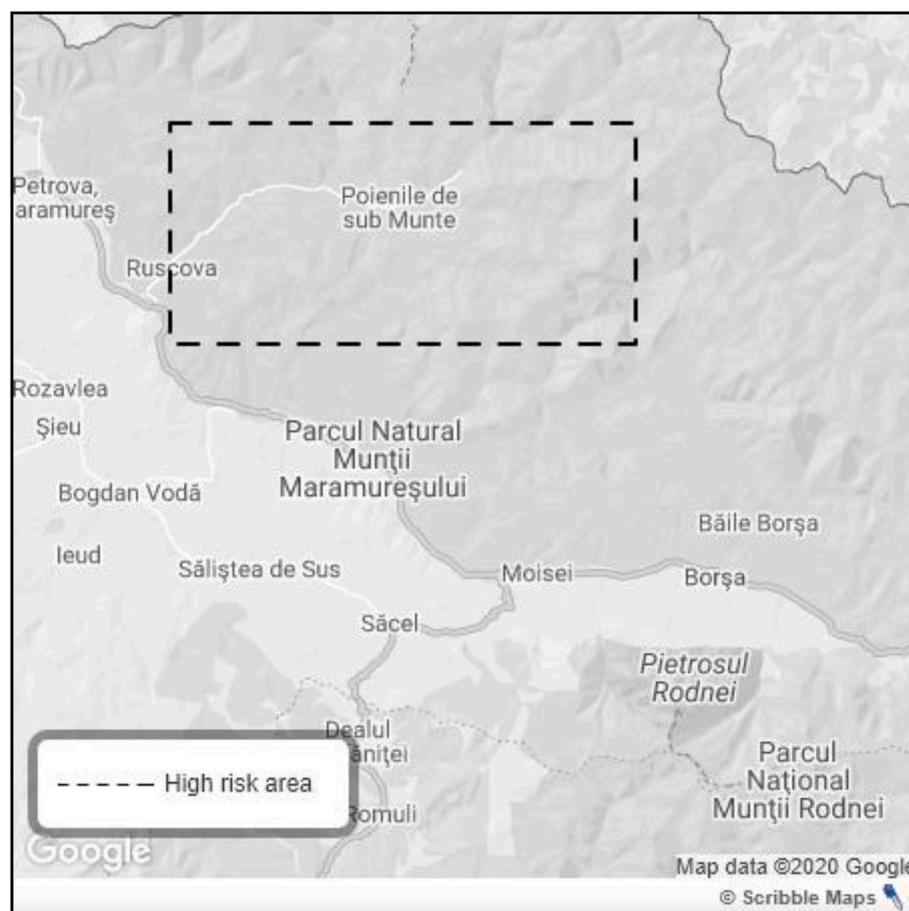


Fig. 6. Map for the Romanian high flood risk area from Maramures region.

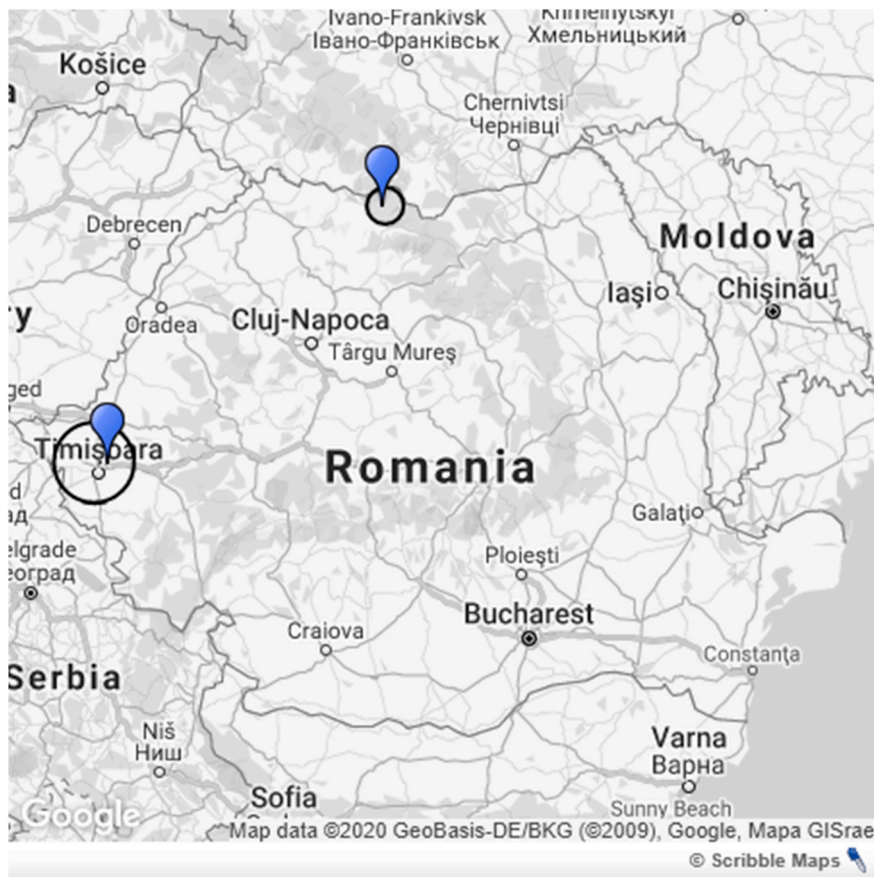


Fig. 7. Map representation for the Romanian areas in which the study was conducted.

simple slope analyses, which determine how the effect of *X* on *Y* is statistically significant at particular values of *Z*. In study 2 the graphical representation of the moderation (slope analyses) shows the differences between two groups (high and low risk groups).

3.2. Results

The correlation coefficient between variables, the mean and standard deviation for the total sample are presented in Table 4.

The objective of study 2 is to test the moderating effects of secure/preoccupied/fearful-avoidant place attachment style on the relation between: a) the risk level and distress (Aim 1); b) the risk level and positive/avoidant/negative coping (Aim 2).

Hierarchical multiple regression analyses (Table 5) are performed using the product variable approach suggested by Baron and Kenny [57]. The analysis of the Place attachment styles scale confirmed three

factors: secure, preoccupied and fearful-avoidant place attachment.

3.2.1. Secure place attachment

3.2.1.1. Aim 1. After controlling for demographic variables, both risk level and secure place attachment had significant effects on distress ($\beta = -0.13, p < .05$, respectively $\beta = .27, p < .00$), but the interaction term did not significantly predict distress (Table 5).

3.2.1.2. Aim 2. After controlling for demographic variables, positive coping was positively predicted by the interaction term between risk level and secure place attachment, as shown in Table 5 and Fig. B1. The Johnson-Neyman technique [59], testing the conditional effects of risk level at multiple levels of secure place attachment, shows that the relationship between risk level and positive coping is significant when secure place attachment is higher than .10 standard deviations above the

Table 4
Descriptive statistics and inter-correlations of the variables (Pearson's *r*) for the Romanian sample.

		1	2	3	4	5	6	7	8	<i>M</i>	<i>SD</i>
1	Secure Place Attachment	1.00								5.38	1.14
2	Preoccupied Place Attachment	.24**	1.00							5.54	1.22
3	Fearful-Avoidant Place Attachment	-.14**	-.10*	1.00						2.63	1.12
4	Risk level of flood	.18**	.14**	-.06	1.00					1.6	0.49
5	Positive Coping	.11*	.33**	-.06	.06	1.00				2.93	0.76
6	Avoidant Coping	.04	.06	-.08	-.04	.12*	1.00			2.49	0.86
7	Negative Coping	-.12**	-.06	.20**	.01	-.13*	.07	1.00		1.44	0.61
8	Distress	.24**	.03	.06	-.08	.03	.05	-.10	1.00	2.34	0.91

Note: * $p < .05$; ** $p < .01$.

Table 5
Results of hierarchical regression analyses for Distress, Positive coping, Avoidant coping, and Negative coping.

Independent variables	Distress	Positive coping	Avoidant coping	Negative coping
Secure place attachment				
Step 1: Demographic variables				
Gender	-.08	.15**	-.11*	-.20**
Age	-.04	.03	-.04	-.06
Education	.00	-.13*	.18**	-.08
R ²	.01	.04	.05	.05
F	.89	5.30**	6.12**	6.05**
Step 2: Independent effects				
Gender	-.08	.16**	-.11*	-.20**
Age	-.03	.02	-.04	-.07
Education	.02	-.11*	.19**	-.10
Risk level	-.13*	.03	-.02	.01
Secure place attachment	.27**	.08	.08	-.14**
R ²	.08	.05	.05	.07
ΔF	15.02**	1.51	1.28	3.77*
Step 3: Moderation				
Gender	-.08	.15*	-.11*	-.20**
Age	-.03	.03	-.03	-.07
Education	.02	-.11*	.18**	-.10
Risk level	-.44	-.49*	-.40	.19
Secure place attachment	.05	-.27	-.17	-.02
Risk level * Secure place attachment	.42	.68*	.49	-.24
R ²	.09	.06	.06	.07
ΔR ²	.01	.01	.01	.00
ΔF	1.87	4.89*	2.54	.62
Preoccupied place attachment				
Step 1: Demographic variables				
Gender	-.08	.15**	-.11*	-.20**
Age	-.04	.03	-.04	-.06
Education	.00	-.13*	.18**	-.08
R ²	.01	.04	.05	.05
F	.89	5.30**	6.12**	6.05**
Step 2: Independent effects				
Gender	-.08	.14**	-.12*	-.20**
Age	-.04	-.03	-.06	-.05
Education	-.01	-.10	.18**	-.09
Risk level	-.09	.01	-.02	-.01
Preoccupied place attachment	.06	.30**	.13*	-.05
R ²	.02	.13	.06	.05
ΔF	1.90	18.10**	3.04*	.46
Step 3: Moderation				
Gender	-.09	.14**	-.12*	-.20**
Age	-.04	-.03	-.06	-.05
Education	-.01	-.10	.18**	-.09
Risk level	-.02	.03	-.14	.04
Preoccupied place attachment	.58	.31	.04	-.01
Risk level * Preoccupied place attachment	-.29	-.10	.16	-.06
R ²	.02	.13	.06	.05
ΔR ²	.00	.00	.00	.00
ΔF	.09	.00	.28	.04
Fearful-avoidant place attachment				
Step 1: Demographic variables				
Gender	-.08	.15**	-.11*	-.20**
Age	-.04	.03	-.04	-.06
Education	.00	-.13*	.18**	-.08
R ²	.01	.04	.05	.05
F	.89	5.30**	6.12**	6.05**
Step 2: Independent effects				
Gender	-.08	.16**	-.11*	-.21**
Age	-.03	.02	-.04	-.05
Education	-.01	-.13*	.16**	-.05
Risk level	-.09	.03	-.02	-.00
Fearful-avoidant place attachment	.05	-.07	-.08	.21**
R ²	.02	.05	.05	.09
ΔF	1.80	1.11	1.25	8.88**
Step 3: Moderation				
Gender	-.08	.16**	-.11*	-.21**

Table 5 (continued)

Independent variables	Distress	Positive coping	Avoidant coping	Negative coping
Age	-.04	.00	-.04	-.05
Education	-.00	-.12*	.16**	-.05
Risk level	.05	.31*	.01	-.01
Fearful-avoidant place attachment	.23	.31	-.04	.20
Risk level * Fearful-avoidant place attachment	-.23	-.47*	-.05	.01
R ²	.02	.06	.05	.09
ΔR ²	.00	.01	.00	.00
ΔF	1.15	5.14*	.06	.00

Note: **p* < .05; ***p* < .01.

mean, but it turns to be non-significant with lower values of secure place attachment. Avoidant coping and negative coping were not significantly predicted by the interaction term (Table 5), although secure place attachment significantly predicted negative coping when added to the regression model ($\beta = -0.14, p < .01$).

3.2.2. Preoccupied place attachment

3.2.2.1. Aim 1. Distress was not significantly predicted by the interaction term between risk level and preoccupied place attachment (Table 5).

3.2.2.2. Aim 2. Positive coping, avoidant coping and negative coping were not significantly predicted by the interaction term (Table 5). What is interesting to note is that after controlling for the demographic variables, preoccupied place attachment alone significantly predicted positive coping ($\beta = 0.30, p < .00$), and avoidant coping ($\beta = 0.13, p < .05$) when added to the regression model.

3.2.3. Fearful-avoidant place attachment

3.2.3.1. Aim 1. Distress was not significantly predicted by the interaction term between risk level and fearful-avoidant place attachment (Table 5).

3.2.3.2. Aim 2. After controlling for demographic variables, positive coping was positively predicted by the interaction term between risk level and fearful-avoidant place attachment, as shown in Table 5 and Fig. B2. The relationship between risk level and positive coping is significant when fearful-avoidant place attachment is lower than .09 standard deviations below the mean, but it turns to be non-significant with higher values of fearful-avoidant place attachment. Avoidant coping and negative coping were not significantly predicted by the interaction term (Table 5), although fearful-avoidant place attachment significantly predicted negative coping when added to the regression model ($\beta = 0.21, p < .00$).

3.3. Discussion

Study 2 aimed to retest the effect of place attachment styles on the relation between the flood risk level and emotional and behavioral coping. By focusing on the risk level (and not on perceived risk as in study 1) the aim was to check the activation of the place attachment system which happens only when the risk is high, as interpersonal attachment literature shows [50].

Results show that secure place attachment positively moderates the relation between risk level and positive coping, while fearful-avoidant place attachment negatively moderates the relation between risk level and positive coping. Based on the attachment literature [35,50,69], and

applied to the place attachment context, these results highlight how the different styles of place attachment leads to a different reaction to the risk affecting that place. Secure place attachment consists in a strong bond with the place, that provides support and a feeling of safety in times of threat; thus, when people have a secure attachment, a stronger risk leads to an adaptive increase in positive coping. Fearful-avoidant place attachment, instead, stands at the most insecure pole of attachment, being characterized by a disorganized relationship with a place that is not considered to be supportive and sometimes is even perceived as threatening, activating both anxiety and avoidance in the person living there. When people have a fearful-avoidant place attachment, higher risk leads to a smaller positive coping. Therefore, based on the results mentioned above, by knowing the specific place attachment style (i.e., the place seen as offering safety and support in threatening situations, or the contrary), and by knowing the objective level of risk, one can assume the type of coping strategy a person will choose.

4. General discussion, implications and limitations

The present research brings important findings on how combined psychological factors, namely place attachment and perception of risk, predict adaptive behavior in a flood risk context. Also, it brings more insight on the concept of place attachment, which received many meanings during time, and was defined as a complex, multifaceted relationship [70], a multi-dimensional construct, with person, psychological process, and place dimensions [71].

Past research [60,72] suggests that people who identify with or are attached to their place are likely to underestimate its potential vulnerability to risk. Bonaiuto and colleagues [4] suggest that this relationship needs to be conceptually framed and empirically illustrated, especially with respect to the use or rejection of coping behaviors in the face of potential risks. De Dominicis and colleagues [27] also proved that place attachment intensity weakens the relationship between perception of risk and preventive behavior to cope with flood. In the present research place attachment is operationalized in two different ways: by measuring its intensity, and by capturing how the pre-existing bond with a place could contribute to the particular resilience capabilities people will enact when facing a threat, namely place attachment styles – analogue to interpersonal attachment styles. Employing this double measurement of place attachment allows to draw meaningful insight on the individual differences driving adaptive behaviors in environmental threatening situations. Results from the present research show that place attachment intensity has a significant and positive effect on the relation between perception of risk and the emotional coping variable, distress, and a negative significant effect on the relation between perception of risk and the behavioral variable avoidant coping. Therefore, place attachment intensity might facilitate the feeling of distress and hinder avoidant coping strategies for people experiencing high perception of risk and living in a high risk context. The effect on distress confirms that place attachment might have a similar activation system as the one mentioned in the interpersonal attachment literature [50]. Specifically, the attachment system becomes activated when distress is felt due to the presence of a threat, and further distress leads to different coping strategies, such as seeking proximity of the attachment figure. Distress, which is a negative affect, may encourage adaptation behavior as it is an unpleasant state of mind that people are motivated to reduce, as a recent meta-analysis proves too [3]. The effect on avoidant coping is also in line with past research, which shows that place attachment negatively moderates the relationship between perception of risk and coping (intention and action) in a context of high flood risk [27], due to possible place-specific biases, such as the optimistic bias applied to

environmental perception of risk [60–62].

Results on place attachment styles in study 1 show that secure place attachment had the same effect as place attachment intensity on the relation between perception of risk and distress, and perception of risk and avoidant coping. These results prove that there is a common ground between the general concept of place attachment and secure place attachment style. More specifically, people perceiving the risk as high are more likely to feel distress and less likely to use avoidant coping strategies, if they have a high level of place attachment, or if they identify with the secure place attachment style.

Study 2 shows that adaptive coping strategies (e.g., positive coping) are more likely chosen in high flood risk situations by people identifying with the secure place attachment style, and less likely to be chosen by people identifying with the fearful-avoidant place attachment style. However, study 2 proves that the objective risk does not predict emotional coping (e.g., distress) when this relation is moderated by place attachment styles, in contrast to study 1, where perception of risk predicted distress – under the same moderation effect.

These results bring evidence which could contribute to greater community resilience via a proper planning and management of interventions for residents exposed to flood, considering their bond to their place. If an intervention is designed to focus on emotional coping, according to our results, perception of risk should also be considered, while if it is designed to focus on adaptive behaviors the evaluation of perception of risk is not needed. Also, this research brings insight on the importance of individual differences on people-place bonds. As previous studies show [73,74], risk communication, risk management approaches, or conservation interventions have better results when authorities take into account individual differences, such as individual place meanings. For example, risk communication can be shaped in a way which could have an impact on people according to their type of bond, i.e., risk communication for secure bonds could be addressed more directly, by showing clear ways of action, while for the insecure bonds risk communication and management should be shaped more carefully, maybe using humor or offering possibilities to talk about their emotions in small groups, and adding active coping suggestions slowly and gradually. Moreover, another longer-term implication lies in fostering the development of secure place attachment bonds in as much inhabitants as possible, while countering the development of other place attachment styles which are less functional to promote adaptive coping strategies. How to effectively engage in such a place attachment style development endeavor is a new challenge requiring further research.

Across the two studies there are some limitations. One limitation regards the operationalization of the constructs for place attachment styles. Qualitative analysis of items and confirmatory factor analysis was performed in order to split the items of the Place Attachment Styles Questionnaire [39] into four factors (one for each place attachment style). In study 1, only two factors emerged, for secure and fearful-avoidant place attachment. In study 2, preoccupied place attachment was additionally included to the analysis. The factors have low reliability, and place attachment style and scale may require alternate operationalizations. Theoretically these results might indicate that place attachment styles are different than interpersonal attachment styles and deserve a better conceptualization. Maybe the nature of bonds with place is not as diverse as interpersonal bonds, therefore future studies could try to operationalize place attachment styles as secure or insecure, rather than assuming the existence of four place attachment styles. The other two researchers who attempted to operationalize place attachment style [38,39] had also difficulty in translating the concept into measurable terms with good validity. Therefore, the conceptualization of individual differences in place attachment style (translated

from the interpersonal attachment styles) through descriptive research, using qualitative and quantitative methods, still needs improvements.

Other scales had low reliability too, in both studies (e.g., coping styles scale). Some scales were not previously validated to Italian or Romanian populations, therefore further analyses should check their validity in each country, on larger samples.

On the same line, environmental risk coping strategies are very context-specific, thus these results could be linked to the specificities of these communities and to the specificities of the flood risk, suggesting cautions and the need for more studies across cultures and risk contexts as diverse as possible.

Another limitation regards the small sample size in study 1. The small sample size brought many impediments to the analysis, such as a more in depth analysis for the validity of the scales, or the correction of the demographical aspects which could influence the results if added to the regression analyses. Further studies should include more variables which might influence the relevant behavior within the context of natural hazards.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

This research was supported by the Dipartimento di Psicologia dei Processi di Sviluppo e Socializzazione, Università Sapienza di Roma, through the scholarship offered to Alexandra Stancu for her Doctoral thesis “Place attachment styles and environmental risk: The effects of place attachment styles on cognitive, emotional and behavioral coping with flood risk”, and by the Psychology Department of the West University of Timisoara, for providing resources and materials for the development of Study 2. We gratefully thank the anonymous reviewers and the Editor of the IJDRR for providing important comments on the original manuscript. We also thank the Italian and Romanian teams of trained interviewers and the people involved in data processing.

Appendix A. Slope Analyses for Significant Moderations in Study 1

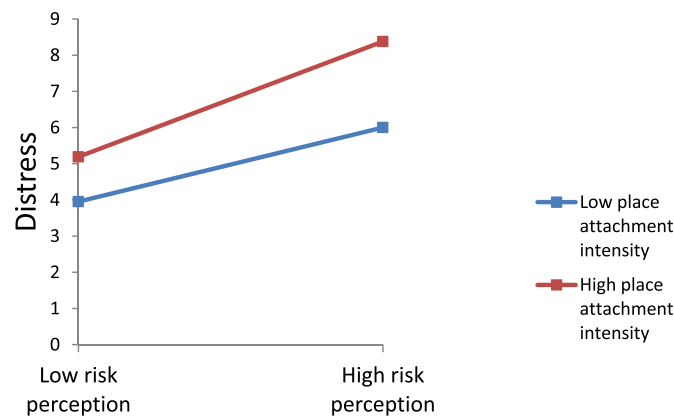


Fig. A.1. Perception of flood risk by place attachment intensity interaction on distress in the Italian high risk context.

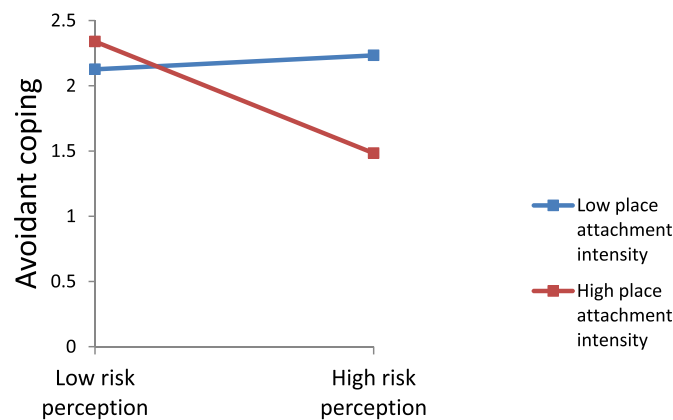


Fig. A2. Perception of flood risk by place attachment intensity interaction on avoidant coping in the Italian high risk context.

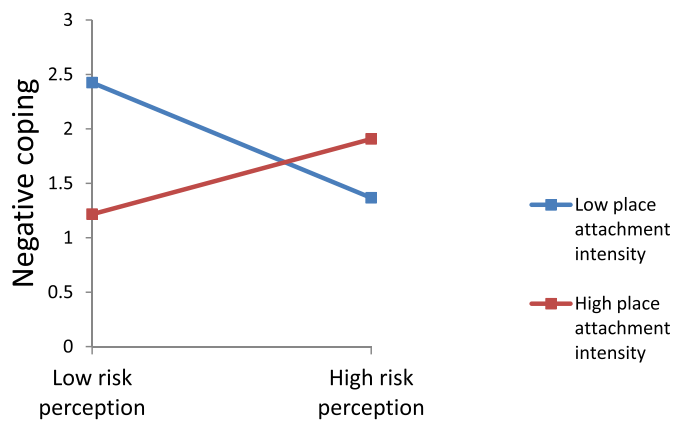


Fig. A.3. Perception of flood risk by place attachment intensity interaction on negative coping in the Italian low risk context.

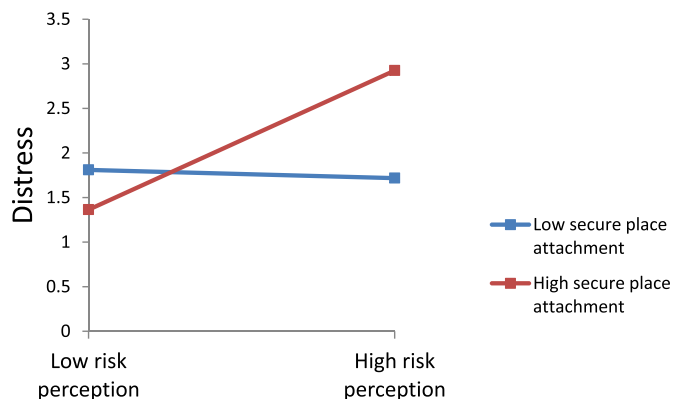


Fig. A.4. Perception of flood risk by secure place attachment interaction on distress in the Italian high risk context.

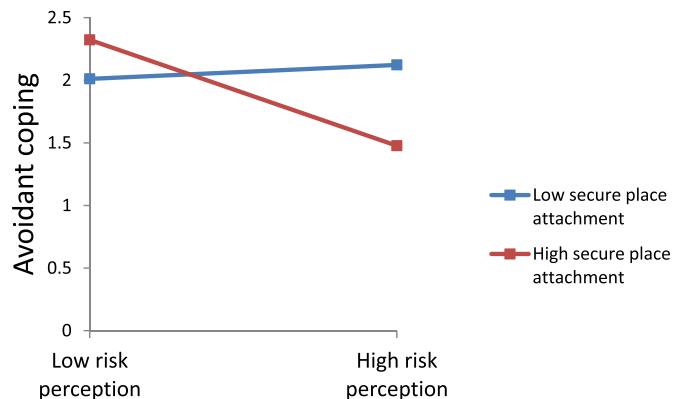


Fig. A.5. Perception of flood risk by secure place attachment interaction on avoidant coping in the Italian high risk context.

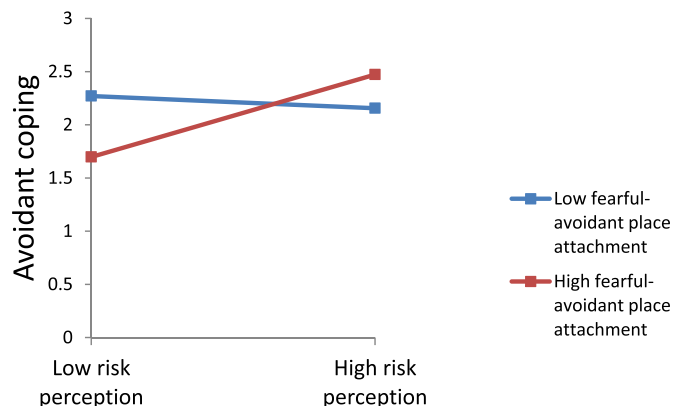


Fig. A.6. Perception of flood risk by fearful-avoidant place attachment interaction on avoidant coping in the Italian low risk context.

Appendix B. Slope Analyses for Significant Moderations in Study 2

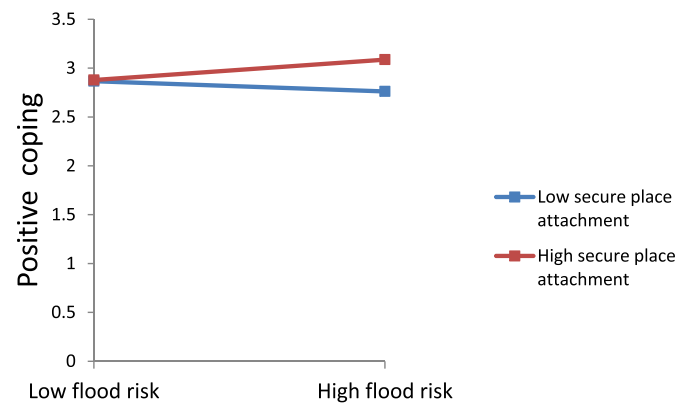


Fig. B.1. Flood risk level by secure place attachment interaction on positive coping in the Romanian context.

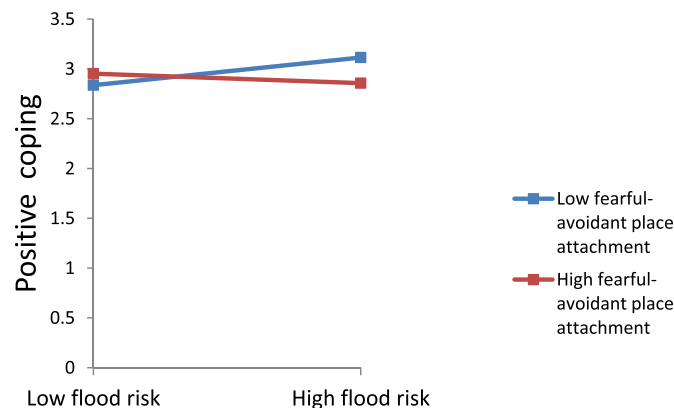


Fig. B.2. Flood risk level by fearful-avoidant place attachment interaction on positive coping in the Romanian context.

Appendix C. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijdr.2020.101771>.

References

- [1] IPCC, in: R.K. Pachauri, L.A. Meyer (Eds.), *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* [Core Writing Team, 2014]. Retrieved from, <http://www.ipcc.ch/report/ar5/syr/>.
- [2] G. Vulturius, K. André, Å.G. Swartling, C. Brown, M.D.A. Rounsevell, V. Blanco, The relative importance of subjective and structural factors for individual adaptation to climate change by forest owners in Sweden, *Reg. Environ. Change* 18 (2) (2018) 511–520, <https://doi.org/10.1007/s10113-017-1218-1>.
- [3] A. M. van Valkengoed, L. Steg, Meta-analyses of factors motivating climate change adaptation behaviour, *Nat. Clim. Change* (2019), <https://doi.org/10.1038/s41558-018-0371-y>.
- [4] M. Bonaiuto, S. Alves, S. De Dominicis, I. Petruccioli, Place attachment and natural hazard risk: research review and agenda, *J. Environ. Psychol.* 48 (2016) 33–53, <https://doi.org/10.1016/j.jenvp.2016.07.007>.
- [5] T. Harries, The anticipated emotional consequences of adaptive behaviour—impacts on the take-up of household flood-protection measures, *Environ. Plann.: Economy and Space* 44 (3) (2012) 649–668, <https://doi.org/10.1068/a43612>.
- [6] C. Trumbo, M. Lueck, H. Marlatt, L. Peek, The effect of proximity to hurricanes Katrina and Rita on subsequent hurricane outlook and optimistic bias, *Risk Anal.*: An Official Publication of the Society for Risk Analysis 31 (12) (2011) 1907–1918, <https://doi.org/10.1111/j.1539-6924.2011.01633.x>.
- [7] C. Trumbo, M.A. Meyer, H. Marlatt, L. Peek, B. Morrissey, An assessment of change in risk perception and optimistic bias for hurricanes among gulf coast residents, *Risk Anal.* 34 (6) (2013) 1013–1024, <https://doi.org/10.1111/risa.12149>.
- [8] R.R. Thompson, D.R. Garfin, R.C. Silver, Evacuation from natural disasters: a systematic review of the literature, *Risk Anal.*: An Official Publication of the Society for Risk Analysis 37 (4) (2017) 812–839, <https://doi.org/10.1111/risa.12654>.
- [9] J.L. Demuth, R.E. Morss, J.K. Lazo, C. Trumbo, The effects of past hurricane experiences on evacuation intentions through risk perception and efficacy beliefs: a mediation analysis, *Weather, Climate, and Society* 8 (4) (2016) 327–344, <https://doi.org/10.1175/WCAS-D-15-0074.1>.
- [10] P. Slovic, Perception of risk, *Science* 236 (4799) (1987) 280–285, <https://doi.org/10.1126/science.3563507>.
- [11] A. Tversky, D. Kahneman, *Judgment under uncertainty: heuristics and biases, in: Utility, Probability, and Human Decision Making*, Springer, Netherlands, 1975.
- [12] E.J. Johnson, A. Tversky, Representations of perceptions of risks, *J. Exp. Psychol. Gen.* 113 (1) (1984) 55–70, <https://doi.org/10.1037/0096-3445.113.1.55>.
- [13] N.D. Weinstein, Optimistic biases about personal risks, *Science* 246 (4935) (1989) 1232–1233.
- [14] S. Arlikatti, M.K. Lindell, C.S. Prater, Y. Zhang, Risk area accuracy and hurricane evacuation expectations of coastal residents, *Environ. Behav.* 38 (2) (2006) 226–247, <https://doi.org/10.1177/0013916505277603>.
- [15] E. Baker, Hurricane evacuation behavior, *International Journal of Mass Emergencies* 9 (1991) 287–310.
- [16] M. Mikulincer, P.R. Shaver, The attachment behavioral system in adulthood: activation, psychodynamics, and interpersonal processes, in: M.P. Zanna (Ed.), *Advances in Experimental Social Psychology*, vol. 35, Academic Press, New York, 2003, pp. 53–152.
- [17] J. Bowlby, *Attachment and Loss*, vol. 1, Basic Books, New York, US, 1969. Attachment.
- [18] J. Bowlby, Attachment and loss: retrospect and prospect, *Am. J. Orthopsychiatry* 52 (4) (1982) 664–678, <https://doi.org/10.1111/j.1939-0025.1982.tb01456.x>.

- [19] D.R. Williams, J. Roggenbuck, Measuring place attachment: some preliminary results, Presented at the NRPA Symposium on Leisure Research, San Antonio, Texas, 1989.
- [20] M.V. Giuliani, Theory of attachment and place attachment, in: M. Bonnes, T. Lee, M. Bonaiuto (Eds.), *Psychological Theories for Environmental Issues*, Ashgate, Aldershot, 2003, pp. 137–170.
- [21] M. Lewicka, Place attachment: how far have we come in the last 40 years? *J. Environ. Psychol.* 31 (3) (2011) 207–230, <https://doi.org/10.1016/j.jenvp.2010.10.001>.
- [22] D.R. Williams, "Beyond the commodity metaphor," revisited: some methodological reflections on place attachment research, in: Lynne C. Manzo, Patrick Devine-Wright (Eds.), *Place Attachment: Advances in Theory, Methods, and Research*, Routledge, 2014, pp. 89–99.
- [23] D. Xu, L. Peng, S. Liu, X. Wang, Influences of risk perception and sense of place on landslide disaster preparedness in southwestern China, *International Journal of Disaster Risk Science* 9 (2) (2018) 167–180, <https://doi.org/10.1007/s13753-018-0170-0>.
- [24] I. Armaş, Earthquake risk perception in Bucharest, Romania, *Risk Anal.: An Official Publication of the Society for Risk Analysis* 26 (5) (2006) 1223–1234, <https://doi.org/10.1111/j.1539-6924.2006.00810.x>.
- [25] S. Mishra, S. Mazumdar, D. Suar, Place attachment and flood preparedness, *J. Environ. Psychol.* 30 (2) (2010) 187–197, <https://doi.org/10.1016/j.jenvp.2009.11.005>.
- [26] Deanne K. Bird, G. Gísladóttir, D. Dominey-Howes, Different communities, different perspectives: issues affecting residents' response to a volcanic eruption in southern Iceland, *Bull. Volcanol.* 73 (9) (2011) 1209–1227, <https://doi.org/10.1007/s00445-011-0464-1>.
- [27] S. De Dominicis, F. Fornara, U. Ganucci Cancellieri, C. Twigger-Ross, M. Bonaiuto, We are at risk, and so what? Place attachment, environmental risk perceptions and preventive coping behaviours, *J. Environ. Psychol.* 43 (2015) 66–78, <https://doi.org/10.1016/j.jenvp.2015.05.010>.
- [28] P.R. Shaver, M. Mikulincer, Attachment-related psychodynamics, *Am. J. Bioeth.* 4 (2) (2002) 133–161, <https://doi.org/10.1080/14616730210154171>.
- [29] R.C. Fraley, P.R. Shaver, Adult romantic attachment: theoretical developments, emerging controversies, and unanswered questions, *Rev. Gen. Psychol.* 4 (2) (2000) 132–154, <https://doi.org/10.1037/1089-2680.4.2.132>.
- [30] M.D.S. Ainsworth, M.C. Blehar, E. Waters, S. Wall, *Patterns of Attachment: Assessed in the Strange Situation and at Home*, Erlbaum, Hillsdale, NJ, 1978.
- [31] C. Hazan, P. Shaver, Romantic love conceptualized as an attachment process, *J. Pers. Soc. Psychol.* 52 (3) (1987) 511–524, <https://doi.org/10.1037/0022-3514.52.3.511>.
- [32] K. Bartholomew, L.M. Horowitz, Attachment styles among young adults: a test of a four-category model, *J. Pers. Soc. Psychol.* 61 (2) (1991) 226–244, <https://doi.org/10.1037/0022-3514.61.2.226>.
- [33] K.A. Brennan, C.L. Clark, P. Shaver, Self-report measurement of adult romantic attachment: an integrative overview, in: J.A. Simpson, W.S. Rholes (Eds.), *Attachment Theory and Close Relationships*, Guilford Press, New York, 1998, pp. 46–76.
- [34] M. Mikulincer, P.R. Shaver, Attachment theory and emotions in close relationships: exploring the attachment-related dynamics of emotional reactions to relational events, *Pers. Relat.* 12 (2) (2005) 149–168, <https://doi.org/10.1111/j.1350-4126.2005.00108.x>.
- [35] J. Feeney, Adult romantic attachment. *Developments in the study of couple relationships*, in: J. Cassidy, P.R. Shaver (Eds.), *Handbook of Attachment. Theory, Research, and Clinical Applications*, The Guilford Press, New York, 2016, pp. 435–463.
- [36] B.B. Brown, D.D. Perkins, Disruptions in place attachment, in: *Human Behavior and Environment, Place Attachment*, 1992, pp. 279–304, https://doi.org/10.1007/978-1-4684-8753-4_13.
- [37] L. Scannell, R. Gifford, Comparing the theories of interpersonal and place attachment, in: L.C. Manzo, P. Devine-Wright (Eds.), *Place Attachment: Advances in Theory, Methods and Applications*, Routledge, New York, NY, US, 2014.
- [38] K.A. McBain, *Adult Attachment Theory and Attachment to Place: what Makes a House a Home?* James Cook University, 2010.
- [39] L. Scannell, The Bases of Bonding: the Psychological Functions of Place Attachment in Comparison to Interpersonal Attachment (Thesis), 2013. Retrieved from, <https://dspace.library.uvic.ca/handle/1828/5074>.
- [40] F. Scrima, The convergent-discriminant validity of the Workplace attachment scale (WAS), *J. Environ. Psychol.* 43 (2015) 24–29, <https://doi.org/10.1016/j.jenvp.2015.05.009>.
- [41] T. Quinn, F. Bousquet, C. Guerbois, E. Sougrati, M. Tabutaud, The dynamic relationship between sense of place and risk perception in landscapes of mobility, *Ecol. Soc.* 23 (2) (2018), <https://doi.org/10.5751/ES-10004-230239>.
- [42] D. Sullivan, I.F. Young, Place attachment style as a predictor of responses to the environmental threat of water contamination, *Environ. Behav.* (2018) 1–30, <https://doi.org/10.1177/0013916518786766>.
- [43] A. Stancu, *Place Attachment Styles and Environmental Risk: The Effects of Place Attachment Styles on Cognitive, Emotional and Behavioral Coping with Flood Risk* (Doctoral Thesis), Sapienza University of Rome, 2018.
- [44] M. Lewicka, On the varieties of people's relationships with places: hummon's typology revisited, *Environ. Behav.* 43 (5) (2011) 676–709.
- [45] R.C. Stedman, Subjectivity and social-ecological systems: a rigidity trap (and sense of place as a way out), *Sustainability Science* 11 (6) (2016) 891–901, <https://doi.org/10.1007/s11625-016-0388-y>.
- [46] L. Rioux, Construction d'une échelle d'attachement au lieu de travail: une démarche exploratoire, *Can. J. Behav. Sci.* 38 (4) (2006) 325–336.
- [47] F. Scrima, L. Rioux, L. Lorito, Three-factor structure of adult attachment in the Workplace: comparison of British, French, and Italian samples, *Psychol. Rep.* 115 (2) (2014) 627–642, <https://doi.org/10.2466/49.PR0.115c25z2>.
- [48] N. Allen, J. Meyer, The measurement and antecedents of affective, continuance and normative commitment to the organization, *J. Occup. Psychol.* 63 (1) (1990) 1–18.
- [49] J. Bowlby, Attachment and loss, in: *Separation: Anxiety and Anger*, vol. 2, Basic Books, New York, 1973.
- [50] M. Mikulincer, P.R. Shaver, *Attachment in Adulthood: Structure, Dynamics, and Change*, second ed., The Guilford Press, New York, 2016.
- [51] M. Bonaiuto, S. De Dominicis, F. Fornara, U. Ganucci Cancellieri, B. Mosco, Flood risk: the role of neighbourhood attachment, in: G. Zenz, R. Hornich (Eds.), *Proceedings of the international symposium UFRIM. Urban flood risk management e Approaches to enhance resilience of communities*, Verlag der Technischen Universität Graz, Graz, 2011, pp. 547–558.
- [52] S.D. Dominicus, W.D. Crano, U.G. Cancellieri, B. Mosco, M. Bonnes, Z. Hohman, M. Bonaiuto, Vested interest and environmental risk communication: improving willingness to cope with impending disasters, *J. Appl. Soc. Psychol.* 44 (5) (2014) 364–374, <https://doi.org/10.1111/jasp.12229>.
- [53] N.T. Brewer, G.B. Chapman, F.X. Gibbons, M. Gerrard, K.D. McCaul, N. D. Weinstein, Meta-analysis of the relationship between risk perception and health behavior: the example of vaccination, *Health Psychol.: Official Journal of the Division of Health Psychology, American Psychological Association* 26 (2) (2007) 136–145, <https://doi.org/10.1037/0278-6133.26.2.136>.
- [54] F. Fornara, M. Bonaiuto, M. Bonnes, Cross-validation of abbreviated perceived residential environment quality (PREQ) and neighborhood attachment (NA) indicators, *Environ. Behav.* 42 (2) (2010) 171–196, <https://doi.org/10.1177/0013916508330998>.
- [55] D.S. Weiss, C.R. Marmar, *The impact of event scale—revised*, in: *Assessing Psychological Trauma and PTSD*, Guilford Press, New York, NY, US, 1997, pp. 399–411.
- [56] C.S. Carver, You want to measure coping but your protocol's too long: consider the brief COPE, *Int. J. Behav. Med.* 4 (1) (1997) 92–100, https://doi.org/10.1027/s15327558jbm0401_6.
- [57] R.M. Baron, D.A. Kenny, The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations, *J. Pers. Soc. Psychol.* 51 (6) (1986) 1173–1182, <https://doi.org/10.1037/0022-3514.51.6.1173>.
- [58] L. Aiken, S. West, *Multiple Regression: Testing and Interpreting Interactions*, Sage Publications, Inc, Thousand Oaks, CA, US, 1991.
- [59] P.O. Johnson, J. Neyman, Tests of certain linear hypotheses and their application to some educational problems, *Statistical Research Memoirs* 1 (1936) 57–93.
- [60] R. Gifford, L. Scannell, C. Kormos, L. Smolova, A. Biel, S. Boncu, D. Uzzell, Temporal pessimism and spatial optimism in environmental assessments: an 18-national study, *J. Environ. Psychol.* 29 (1) (2009) 1–12, <https://doi.org/10.1016/j.jenvp.2008.06.001>.
- [61] N. Radcliffe, W. Klein, Dispositional, unrealistic, and comparative optimism: differential relations with the knowledge and processing of risk information and beliefs about personal risk, *Pers. Soc. Psychol. Bull.* 28 (6) (2002) 836–846, <https://doi.org/10.1177/0146167202289012>.
- [62] P.W. Schultz, T.L. Milfont, R.C. Chance, G. Tronu, S. Luís, K. Ando, V.V. Gouveia, Cross-cultural evidence for spatial bias in beliefs about the severity of environmental problems, *Environ. Behav.* 46 (3) (2014) 267–302, <https://doi.org/10.1177/0013916512458579>.
- [63] P. Morgan, Towards a developmental theory of place attachment, *J. Environ. Psychol.* 30 (1) (2010) 11–22, <https://doi.org/10.1016/j.jenvp.2009.07.001>.
- [64] M. Kinatader, E. Kuligowski, P. Reneke, R. Peacock, Risk perception in fire evacuation behavior revisited: definitions, related concepts, and empirical evidence. - PubMed - NCBI, *Fire Science Reviews* 4 (1) (2015), <https://doi.org/10.1186/s40038-014-0005-z>.
- [65] M. Mikulincer, O. Gillath, P.R. Shaver, Activation of the attachment system in adulthood: threat-related primes increase the accessibility of mental representations of attachment figures, *J. Pers. Soc. Psychol.* 83 (4) (2002) 881–895, <https://doi.org/10.1037/0022-3514.83.4.881>.
- [66] J. Mysiak, F. Testella, M. Bonaiuto, G. Carrus, S. De Dominicis, U. Ganucci Cancellieri, P. Grifoni, Flood risk management in Italy: challenges and opportunities for the implementation of the EU Floods Directive (2007/60/EC), *Nat. Hazards Earth Syst. Sci.* 13 (11) (2013) 2883–2890, <https://doi.org/10.5194/nhess-13-2883-2013>.
- [67] J.J. O'Sullivan, R.A. Bradford, M. Bonaiuto, S. De Dominicis, P. Rotko, J. Aaltonen, S.J. Langan, Enhancing flood resilience through improved risk communications, *Nat. Hazards Earth Syst. Sci.* 12 (7) (2012) 2271–2282, <https://doi.org/10.5194/nhess-12-2271-2012>.

- [68] D. Chan, So why ask me? Are self-report data really that bad? in: C.E. Lance, R. J. Vandenberg (Eds.), *Statistical and Methodological Myths and Urban Legends: Doctrine, Verity and Fable in the Organizational and Social Sciences* Taylor & Francis, 2009.
- [69] J. Bowlby, *A Secure Base*, Routledge, London, 1988.
- [70] L.C. Manzo, P. Devine-Wright, *Place Attachment: Advances in Theory, Methods and Applications*, Routledge, New York, 2014.
- [71] L. Scannell, R. Gifford, The relations between natural and civic place attachment and pro-environmental behavior, *J. Environ. Psychol.* 30 (3) (2010) 289–297, <https://doi.org/10.1016/j.jenvp.2010.01.010>.
- [72] M. Bonaiuto, G.M. Breakwell, I. Cano, Identity processes and environmental threat: the effects of nationalism and local identity upon perception of beach pollution, *J. Community Appl. Soc. Psychol.* 6 (3) (1996) 157–175, [https://doi.org/10.1002/\(SICI\)1099-1298\(199608\)6:3<157::AID-CASP367>3.0.CO;2-W](https://doi.org/10.1002/(SICI)1099-1298(199608)6:3<157::AID-CASP367>3.0.CO;2-W).
- [73] T. Quinn, F. Bousquet, C. Guerbois, L. Heider, K. Brown, How local water and waterbody meanings shape flood risk perception and risk management preferences, *Sustainability Science* 14 (3) (2019) 565–578, <https://doi.org/10.1007/s11625-019-00665-0>.
- [74] V.A. Masterson, M. Spierenburg, M. Tengö, The trade-offs of win–win conservation rhetoric: exploring place meanings in community conservation on the Wild Coast, South Africa, *Sustainability Science* 14 (3) (2019) 639–654, <https://doi.org/10.1007/s11625-019-00696-7>.