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Place Attachment and Its Impact on Flood Risk Perception and Preventive Behavior: A Cross-Cultural Comparison of Vibo Valentia (Italy) and Babol (Iran)

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ABSTRACT

Due to rapid climate change, the risk of environmental hazards such as flooding has increased considerably. On the other hand, psychological concepts such as place attachment not only govern human-environment relationships, but also influence the extent of damage caused by environmental hazards through risk perception and preventive behavior. Given the above problem, the present research hypothesizes that the relationship between place attachment, environmental risk perception, and preventive behavior varies across countries with different cultural contexts. A cross-cultural comparison was made between two cities where flooding is very likely, namely Vibo Valentia (Italy) and Babol (Iran). To investigate the study's objectives, a three-way interaction moderation multiple regression analysis was used. The results of the study showed that a high degree of place attachment makes people more likely to engage in risk perception and preventive behavior. It also showed that the influence of place attachment on environmental risk perception and preventive behavior is greater in Babol than in Italy.

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Introduction

Climate change, increasing environmental issues, and the increasing number of people who suffer natural disasters every year, demonstrates the importance of paying attention to environmental hazards and how to perceive and cope with them. Climate change not only creates natural disasters, but it also has a major influence on the lives of many people (Hung et al., 2016). Among all natural disasters, floods are strongly associated with climate change and cause more than half of the world's disasters. For instance, as mentioned earlier, severe climate changes often lead to floods, and floods cause irreparable damage (Dumas et al., 2013). Recent findings estimated that the unpreparedness of societies to cope with the risk of floods will negatively affect their economies (Shao et al., 2017). In general, investigating flood risk to take preventive behaviors is highly in demand, because many natural disasters are affected by climate change (Hung et al., 2016, Baghanam et al., 2020, Sheikhbabaei et al., 2022). It is important to understand which processes affect the level of preventive behaviors for environmental risk perception. Therefore, informing citizens who are exposed to environmental risks is crucial in increasing their understanding of the risk as well as increasing their willingness to engage in preventative behaviors to counter environmental risks. Recent research indicates that psychological variables significantly influence people's perceptions of environmental risks, influencing their willingness to engage in preventative behaviors like flood risk. While most research focuses on increasing community resilience to environmental disasters, there is a lack of comprehensive research on psychological variables affecting environmental risk prevention (De Dominicis et al., 2014, O'Sullivan et al., 2012, Johnson et al., 2012, Miller et al., 2013).

Today, one of the important topics in psychological research is the study of the relationship between climate adaptation and place attachment. The present research aims to compare cross-cultural differences in flood risk perception and preventive behaviors through the lens of place attachment components. It is often assumed that the way individuals perceive risk in different cities with varying cultural contexts may evoke distinct emotional responses, particularly when confronted with a disaster. Therefore, the hypothesis of this research posits that the relationship between place attachment, environmental risk perception, and preventive behaviors differs across countries with diverse cultural backgrounds. The study seeks to explore whether cultural differences influence the connection between place attachment and risk perception, as well as the associated preventive behaviors, by comparing respondents from Italy and Iran.

Therefore, it is necessary for experts in this field to pay attention to the different effects of various cultures on place attachment and environmental risk perception, as well as preventive behaviors. Some researchers showed that the relationship between place attachment, risk perception, and preventive behaviors is varied in different places with multiple cultures (Bernardo, 2013, Casakin et al., 2015). It should be noted that the existence of conflicting results in terms of effectiveness level, cultural differences in place attachment, risk perception, and preventive behaviors, has doubled the importance of this issue in future research. For this reason, two studies have been conducted in two cities, which are at high floods risk (De Dominicis et al., 2014): Vibo Valentia (Italy) and Babol (Iran). Following (Table 1) are some studies by authors and researchers along with the titles, cultural contexts, and conclusions:

Table 1. Theoretical background of the research.

Researchers	Cultural context	Research results
Dandy, Horwitz, Campbell, Drake and Leviston (2019)	-	The findings indicate that concepts like migration and climate change are often overlooked in current discussions. Similarly, the concept and significance of place attachment are frequently disregarded. However, the research suggests that both place attachment and migration are closely linked to climate change.
Kellens, Zaalberg, Neutens, Vanneuville and De Maeyer (2011)	Belgian Coast	Results show that the rate of risk perception is higher in older people and people with flood experience, findings also found that women were more likely to experience flooding than men. Regarding location, there is a relation between expert's risk and public risk perception. It should be noted that the effect of location variable on environmental risk perception varies. In general, it can be said that

		the risk perception of tourist's Ostend is higher than tourists in other cities.
Domingues, Costas, Neves de Jesus and Ferreira (2017)	Faro Beach, south of Portugal	The findings reveal that residents of Faro Beach exhibit positive feelings towards their community, reflecting strong senses of community, place identity, and place attachment. However, their perception of risk is low, which may be attributed to their personal experiences with risks. Their reluctance to participate in disaster risk reduction efforts appears to stem from a mistrust of authorities and a tendency to externalize responsibility. Additionally, the results indicate that residents are less equipped to handle coastal hazards due to their low perception of risk, which is strongly influenced by the timing of the perceived risk.
De Dominicis, Fornara, Ganucci Cancellieri, Twigger-Ross and Bonaiuto (2015)	Rome and Vibo Valentia, Italy	The results suggest that a strong attachment to place significantly motivates individuals to take action in addressing environmental risks. While heightened risk perception can sometimes encourage preventive behaviors, its influence is less pronounced compared to the impact of place attachment. The findings also imply that when place attachment is combined with high levels of risk perception, it may actually hinder individuals from engaging in preventive measures.
Abbaszadeh, BaniFatemeh, Alizadeh and Alavi (2015)	Tabriz, Iran	The results indicate that environmental attitudes directly influence responsible environmental behavior. Place attachment also plays a significant role in shaping environmental behavior, as it not only directly affects responsible behavior but also indirectly influences it by impacting responsible environmental attitudes.
Tong Wu, (2022)	Baden-Württemberg, Germany, and Guangdong, China	The research emphasizes that factors such as direct experience with floods, geographical location, trust in authorities, and training are crucial in shaping volunteers' risk perception. Additionally, the understanding of climate change's effects on flood risk is closely tied to past flood experiences and the broader perception of flood risks.
Reho, Veneziani, Ciacchella, Gennaro, Salvatore and Lai, (2024)	-	The research emphasizes that cultural worldviews broadly categorized into hierarchist, egalitarian, individualist, and fatalist perspectives play a critical role in shaping people's respond to risks.

Theoretical literature

Place attachment

Stokols and Shummaker introduced place attachment for the first time (Stokols, 1981). In a general definition, Place attachment is a positive and strong emotional connection to certain places or environments, usually encompassing both physical and social aspects (Lewicka, 2011), which can contribute to particular individual and collective behavior (Devine-Wright, 2011). In general, it can be noted that place attachment is one of the important social and psychological components affecting how a person relates to the environment and refers to the effects that link individuals to places. Table2 shows the viewpoint of place attachment from the perspective of various experts:

Table 2. Researchers viewpoints about place attachment.

Researcher	Viewpoints
Shumaker and Taylor (1983)	Place attachment is a very emotional and intense connection to a particular place and environment.
Hummon (1992)	Place attachment is like 'emotional involvement with places'.
Low and Altman (1992)	Place attachment is defined as a person's emotional or cognitive relationship to the environment.
Brown and Perkins (1992)	Place attachment is emotions, relationships and behavioral intention that people apply about their physical and social environment over time. Generally, life gets its meaning from place attachment.
Adger, Barnett, Brown, Marshall and O'brien, (2013)	Place attachment exhibited symbolic contexts and local material which gives people a particular value to live.

Place attachment involves multiple dimensions, such as sense of place, place identity, and place dependence, with particular emphasis on place identity and place dependence. Place dependence refers to the functional attributes of a location that cultivate emotional connections and support specific activities. Natural environments are crucial in fostering this dependency, with frequent visits to a place strengthening the attachment (Vaske & Kobrin, 2001). In contrast, place identity describes how the physical and visual aspects of a place become integrated into an individual's self-concept (Devine-Wright, 2011a). This is a gradual process, where the place becomes an intrinsic part of one's identity. Place attachment is often associated with place identity (Proshansky, 1978), as it facilitates deeper behavioral engagement with the environment (Cuba & Hummon, 1993). Knez's theory (Knez, 2005) suggests that place attachment, as a fundamental component of self-identification, may function as a barrier to certain behaviors, shaped by place-specific biases linked to the social self-identity process.

Risk perception

In this way the collection of literature related to risk perception has made significant progress since the late 1980s. However, today, the complexity of public risk perception differs from how the scientific community describes risk. The scientist described risk through Eq.;

Risk = hazard × vulnerability × exposure (UNISDR, 2012).

In its simplest form, risk perception can be defined as the combined assessment of two elements: the "perceived probability" and the "understood consequences" of a potential flood risk (Birkholz et al., 2014). However, this definition has faced criticism for not accounting for the emotional factors that influence the level of risk perception (Linden, 2014). Slovic (Slovic, 2000) provides an alternative definition, describing risk perception as an intuitive evaluation of risks, shaped by people's subjective understanding and the imprecision of their knowledge. Raaijmakers and colleagues (Raaijmakers et al., 2008) attribute risk perception to the interplay of three key components: worry, awareness, and preparedness. However, the need for flood experience has been identified as one of the effective elements in risk perception as well as increasing the impact of the Awareness, Worry and Preparedness components. Findings showed that awareness of risk was significantly associated with the level of concern about risk, but variables such as awareness and concern were not associated with readiness to engage in preventive behaviors (Fig. 1) (Raaijmakers et al., 2008).

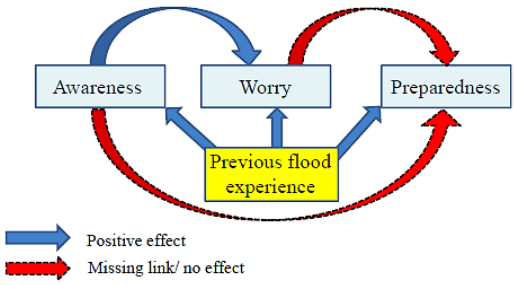

Fig. 1. The Relation between three components influencing risk perception (Raaijmakers et al., 2008)

In general, various elements are effective in changing people's behavior, one of which is informing (Schultz et al., 2014). It should be noted that risk perception plays a very significant role in the study of measures of social vulnerability (Terpstra et al., 2006). As mentioned earlier, imprecise knowledge about flood risk perception leads to the lack of timely use of preventive behaviors to reduce flood risks, and people without proper and sufficient knowledge about risk perception may not take appropriate steps to reduce the effects of risks due to issues such as values, priorities, and preferences of individual citizens and public groups.

Many experts in this field have not yet been able to examine all the factors influencing the risk perception. Additionally, numerous researchers argue that risk perception is shaped by various

factors, including the socio-cultural context, the nature of the risk (whether it is human-made or natural), the effectiveness of risk management, its potential consequences, and the extent to which personal interests are at risk (Fig. 2) (Baan & Klijn, 2010). Moreover, Vlek (Vlek, 2001) emphasizes the importance of risk behavior factor in claiming perceived control which is a key factor in understanding people's perceptions, attitudes and behaviors in situations of risk.

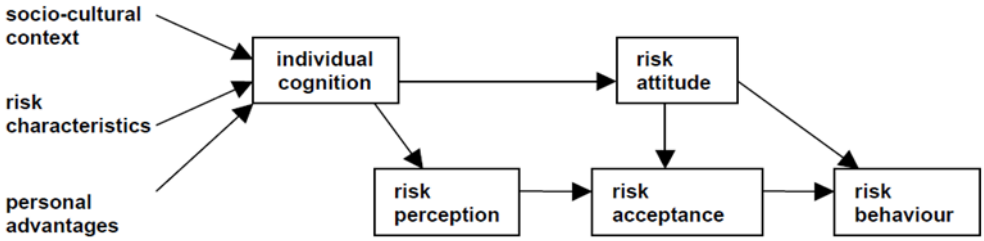

Fig. 2. Model people's cognition of risks and resulting risk behavior (Baan & Klijn, 2010)

Place attachment and Risk perception

In the context of risk assessment and environmental perception, the direct effects of place identity and place attachment on individuals' tendencies to respond to risk have been explored. Research has indicated that perceptions of both place and risk can vary significantly across different locations and cultures (Casakin et al., 2015, De Dominicis et al., 2015). Numerous studies have examined the relationship between environmental hazard perceptions and place attachment (Casakin et al., 2015), but few have focused on how these perceptions of risk and place attachment influence coping behaviors. The table below summarizes some of the key positive and negative perspectives from researchers regarding the relationship between place attachment and risk perception (Table 3).

Table 3. Researchers' positive and negative views on place attachments relation with risk perception

Type of relationship	Researchers	Viewpoints
Negative	Bird, Gíslad"otter and Dominey-Howes, (2011)	They found that people' s place attachment in rural areas of Iceland are negatively linked to acceptance of intention to evacuate.
	Harries and Penning (2012)	They explored the impact of place identity and attachment on responses to climate change hazards, and they discovered a negative relationship between migratory behavior and place attachment.
	De Dominicis et al., (2015)	Their findings demonstrate that, increasing people's level of risk perception can have a positive effect on an individual's intention to manage environmental risks.
	Bonaiuto, Alves, De Dominicis and Petruccelli (2016)	They discovered that persons who have a deep attachment to a place are resistant to leave, even in the face of a disaster.
Positive	Bihari and Ryan (2012)	The findings of their work suggest that previous experiences with wildfires and greater attachment have a significant effect on risk preparedness and social capital: people with a higher degree of place attachment are more aware and perception of the danger of fire and also have more cooperation with vernacular organizations.
	Groulx, Lewis, Lemieux and Dawson (2014)	They discovered strong links between participants' attitudes toward climate change and place attachment. The participants' natural attachment, perception of place, and sense of civic attachment were all combined with personal experiences of changes in ice conditions in bay area.
	Zhang, Zhang, Zhang and Cheng (2014)	They examined awareness of the values, consequences and place attachment of the disaster between Chinese residents living in the tourist region of Greater Jiuzhai. Residents felt much attached to

their place and as a result, were relatively well aware of the consequences of the risks. In this case, the consequences of disaster, were linked to individual's risk perception.

These examples suggest that there is no direct or consistent connection between risk perception and place attachment. Generally, the relationship of these two factors can be positive, negative, or sometimes unclear. Some studies indicate that this relationship can change depending on the actions and behaviors of individuals. In other words, place attachment does not automatically lead to protective behaviors; it may also serve as a backdrop for actions that are harmful or self-detrimental to one's environment. Furthermore, individuals with a strong attachment to a place may focus on the economic and social benefits of living with risks, overlooking the negative aspects of those risks. This can lead them to modify their emotional and cognitive responses when confronting environmental threats (Burningham & Thrush, 2004).

The relationship between place attachment and risk perception is likely to vary depending on the research context, and two patterns are commonly observed: (I) In many cases, a negative relationship is seen, where highly attached residents (compared to those less attached) are less likely to engage in coping behaviors, particularly when these behaviors involve difficult actions like relocation from a risky area; and (II) A positive association, where highly attached individuals are more aware of the environmental risks their area faces and more attuned to the objective risks present.

While research findings in certain areas may be inconsistent, studies conducted in regions with varying levels of risk consistently highlight the importance of considering the impact of place attachment on cognition and behavior. As mentioned earlier, relationship of risk coping and place attachment remains unclear (Burningham & Thrush, 2004), and studies on this topic are still relatively scarce. Therefore, to better explore the relation of risk coping and place attachment, it is essential to examine dependent variables. One crucial dependent variable is preventive behavior toward environmental hazards.

Preventive coping behaviors

Preventive behaviors occur when people are in a risky situation. In the meantime, how people make decisions to cope with a risky situation is very important (Breakwell, 2007). To this end, researchers offer many different models for preventing and coping risks at the individual and social group levels (Hallman & Wandersman, 1992).

According to the structures and processes affecting the experiences caused by climate change, attention to social processes and structures in climate change has led to an understanding of adaptation program changes. In the meantime, approaches are trying to increase the success rate of adaptation programs and are also looking for factors that affect the failure of these programs (Adger et al., 2013). It should be noted that social and environmental contexts of adaptation programs are often overlooked in planning (Wu, 2022). Similar news about the same environmental risk in different places does not lead to the same reaction among the people, because these reactions are subjective, variables such as values, identity, and culture are involved in adopting appropriate actions and reactions (O'Brien, 2016).

Besides, research on how individuals react to environmental risk shown that people quickly forget the dangers of natural risks such as floods (Baan & Klijn, 2004). In this regard, Penning-Rowsell proved that people's worries about environmental risks are rapidly diminishing and disappearing, so that after a few years, people completely ignore the risks. Even if people are more likely to willing in preventative behaviors during high-risk perceptions situation (De Dominicis et al., 2015).

It should be mentioned that most people think that environmental risks will never happen to them, so they will not have a proper understanding of how these risks affect their lives and communities, therefore, they are not willing to take preventive behaviors against environmental risks. In addition to the above, it can be said that when people have higher levels of risk perception, they are more likely to engage in preventative behaviors (De Dominicis et al., 2014), In general, it is not yet clear what factors encourage people to engage in preventative behaviors against environmental risks, and useful and effective strategies for coping with this type of

hazards such as floods should be provided (Santoro et al., 2019). But what has been important so far is to understand the impact of preventive behaviors to reduce the damage posed by environmental risks such as floods (Sado-Inamura & Fukushi, 2019). Hence, the need to research and investigate this case is very important and vital.

Place attachment and Preventive coping behavior

The history of disasters reveals a strong link between preventive behavior and place attachment, which influences people's feelings and overall well-being. Effective social psychological factors, such as place attachment, are crucial in addressing human-environment interactions. Place attachment may negatively affect the relationship between objective environmental risk and risk perception, as well as between coping behaviors and risk perception (Bonaiuto et al., 2016).

However, some exceptions have been found, particularly in cases of "vested interest," suggesting stronger connections between attitudes and behaviors in risk-coping scenarios may be relevant for environmental risk management (De Dominicis et al., 2014). Environmental risks, like climate change, are public concerns and offer opportunities for interdisciplinary integration. The relation of place attachment, preventive coping behavior, and environmental risk perception needs to be conceptually articulated and empirically tested, particularly concerning the rejection or engagement in coping behaviors when risks arise.

Cross-cultural Differences in Risk perception

Are cross-cultural differences effective in prioritizing risks? If the answer is yes, the goal is to examine its relationship to risk perception, preventive behaviors and attitude toward perceived-risk. What theories are there to investigate and predict the dimensions of this issue? (Weber & Hsee, 1998). Before examining these questions, it should be mentioned that throughout history, culture has always influenced the way people think, feel and behave, and the extent of this influence has increased over time (Rohrmann, 2013). In the meantime, the lack of attention to historical transmission and cultures from one generation to the next has always prevented the understanding of intercultural differences in the cognition, behavior and attitudes of societies. On the other hand, a cultural difference in national traditions or religious beliefs, as opposed to differences between communities based on economic and social conditions or idea arousal level, cultural differences reflect differences in behavior and/or attitudes, which can attribute to group differences or community values. Numerous influential factors (e.g., geographical differences, climatic conditions, politics, history, dealing with environmental hazards, etc.) could result in a diversity of social structures (Weber & Hsee, 1998).

Risk perception is one of the things that may be quite perceptible to the role of cultural differences. As mentioned earlier, risk perception has a purely psychological construct, in other words, risk perception is a set of processes that people make a kind of mental judgment after accessing information about risk and take appropriate behaviors and actions accordingly. It is important to note that, although risk perception often occurs after obtaining information about the risk, it is strongly influenced by internal factors such as personality traits and the culture of the communities (Gierlach et al., 2010). In general, it can be said that cultural theory about risk perception states that people understand the amount of risk based on their cultural values, in simpler terms; culture is directly related to risk perception. People in societies, due to their cultural similarity, produce common meanings when explaining the causes of a hazard. Therefore, people with similar cultures tend to engage in similar behaviors when risk perception (Harclerode et al., 2016). Also, many studies have proven an effective and positive relationship between environmental risk perception among a community with the same culture and their history of exposure to the same risk in the past (Gierlach et al., 2010). In general, it can be said that there is a positive relation between risk perception and the unique culture of each community, which reflects the unique values and history of the community (Harclerode et al., 2016).

In conclusion, it can be mentioned that the cultural approach describes risk perception as an effective way to implement the implementation of norms, values, and practices between individuals and groups. In addition to the cultural context, it is expected that several sociological

and social variables will also affect the risk perception. Extensive research has been done in this context, so the approach of the present research is to investigate the effect of cultural context on risk perception (Reho et al., 2024). The theoretical model of the research is presented (Fig. 3).

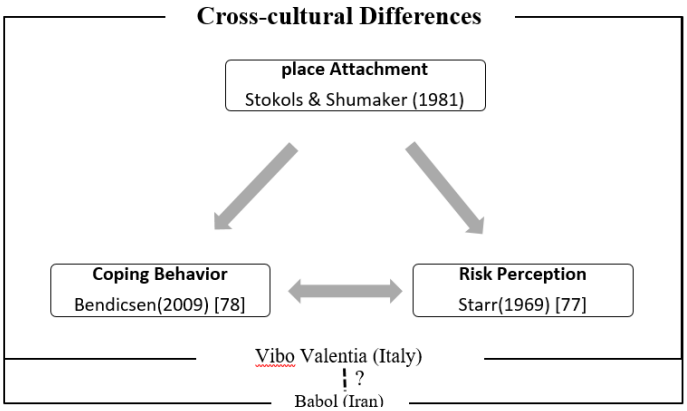

Fig. 3. Theoretical Framework for Research

Methodology

A survey was conducted door-to-door and in public spaces within Vibo Valentia and Babol, targeting random respondents who agreed to participate. Trained researchers administered the survey in selected neighborhoods within each city.

The minimum sample size for each city was calculated using Cochran's formula:

$$n_0 = \frac{z^2 \cdot p \cdot (1-p)}{e^2}$$

where:

Z = 1.96 (95% confidence level),

P = 0.5 (maximum heterogeneity),

e = ±5% (margin of error).

Given the finite populations of Babol and Vibo Valentia, the final sample size (n) was adjusted using:

$$n = \frac{n_0}{1 + \left(\frac{n_0 - 1}{N}\right)}$$

N = population of each city

Participants were then selected via a stratified random sampling technique, with proportional allocation based on age, gender, and residential area. The final sample consisted of 381 respondents: 148 from Babol (Iran) and 233 from Vibo Valentia (Italy).

In Babol, approximately 68% of respondents were male, with the following age distribution: 18-29 years (58.10%), 30-39 years (11.82%), 40-49 years (11.82%), 50-59 years (10.13%), and 60-79 years (8.14%). In Vibo Valentia, 51% of the respondents were male, with the following age distribution: 18-29 years (17.1%), 30-39 years (22.1%), 40-49 years (24.8%), 50-59 years (18%), and 60-79 years (18%).

Case study

The aim of this study is to compare cross-cultural differences in flood risk perception and preventive behaviors through the lens of place attachment among residents of two high flood-risk cities: Vibo Valentia (Italy) and Babol (Iran) (Figure 4). The study hypothesizes that the relationship between place attachment, environmental risk perception, and preventive behaviors differ across the two countries, influenced by their distinct cultural contexts.

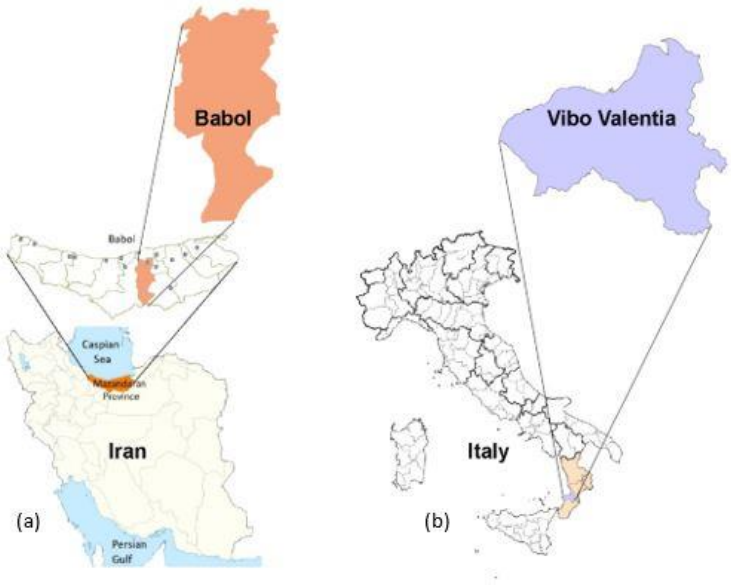

Fig 5. Comparative study areas: (a) Babol, Iran (Caspian coastal region), (b) Vibo Valentia, Italy (Tyrrhenian coastal zone)

Results

This study used a 32-item questionnaire with Likert-scale questions. Flood risk perception was measured with 7-point scales (sample item: 'I feel vulnerable to flood risk'), showing high reliability in both cities (Vibo Valentia: α=0.88; Babol: α=0.85). Place attachment used four 7-point items adapted (De Dominicis et al., 2015) (sample item: 'This place feels like a part of me'), with strong reliability in Vibo Valentia (α=0.87) but low reliability in Babol (α=0.35). Behavioral intentions were assessed through three 5-point items (e.g., seeking flood information, safeguarding valuables), demonstrating acceptable reliability (Vibo Valentia: α=0.82; Babol: α=0.73). Table (4) shows a synthesis of the results about the above scales. As the results of Table 4 show, the situation of reliability and validity of the questions in the Babol is better than in the Vibo Valentia.

Table 4. Non-rotated factor loadings (PCA) and Cronbach's alphas for each scale in study

Scale and items	**Factor for Vibo Valentia**	**Factor for Babol**
Flood risk perception	α=0.88	α=0.85
I believe I could be harmed in a flood.	0.85	0.80
I believe I am more likely to be harmed by a flood than others in my city.	0.80	0.81
I feel vulnerable to flood risk.	0.91	0.80
I fear that I could die as a result of a flood.	0.74	0.81
How would you rate the level of flood risk in your area or neighborhood?	0.82	0.84
Variance	68.2%	54%
	α=.78	α= 0.35
Place attachment	0.88	-0.24
This place feels like a part of me.	0.85	-0.24
This is the perfect place for me.	0.89	-0.24
Leaving this place would be very difficult for me.	-0.45	0.88
I don't feel connected to this place.	62.5%	59%
Variance		
Intention to enact preventive behaviors	α=0.82	α= 0.73
I intend to seek information about flood risks.	0.88	0.67
I intend to store essential items for flood preparedness.	0.84	0.52
I intend to avoid behaviors that may worsen flood risks.	0.85	0.74
Variance	73.4%	53%

Preliminary analyses and results

In the following, a range of independent sample t-tests were carried out to analyze the differences in the relevant variables in both cities of Vibo Valentia (Italy) and Babol (Iran). There are significant differences between the two cities of Vibo Valentia (Italy) and Babol (Iran); in risk perception, whit t=8.07, p<0.000, d=2.99; in place attachment, whit t=49.32, p=0.015, d=3.97; in intention coping behavior, whit t=7.06, p=0.019, d=4.11. As shown in Table (5), Vibo Valentia citizens reported higher levels of flood risk perception and place attachment, but this is while the citizens in Babol reported higher levels of intention to coping behavior.

The study reveals significant differences between Vibo Valentia and Babol in the correlation between environmental risk and social-psychological factors (Table 5). To test this hypothesis, the study examines the three-way interaction effect of place attachment and risk perception on coping behaviors, as well as two moderation effects.

Table 5. Means (M), standard deviations (SD) and sample sizes (N) on relevant variables for Babol and Vibo Valentina. For independent samples the associated p-value and effect size (d) is referred to the mean difference t-test

Variables	Babol		Vibo Valentina		Sig. (Babol-Vibo)
	M (SD)	N	M (SD)	N	P (d)
Risk perception	2.99 (0.74)	148	3.65 (1.08)	233	0.000(2.99)
Place attachment	4.44 (0.77)	148	5.27 (1.38)	233	0.015(3.97)
Intention to coping behavior	3.49 (0.73)	148	3.42 (1.01)	233	0.019(4.11)

The following chart is comparing the mean difference of samples between Vibo Valentia and Babol. As noted earlier, it can be seen in figure 5 Vibo Valentia is in a higher level in terms of flood risk perception, with 3.65 and place attachment, with 5.27 than Babol; but Babol is in a higher level of intention to coping behavior, with 3.49 than Vibo Valentia.

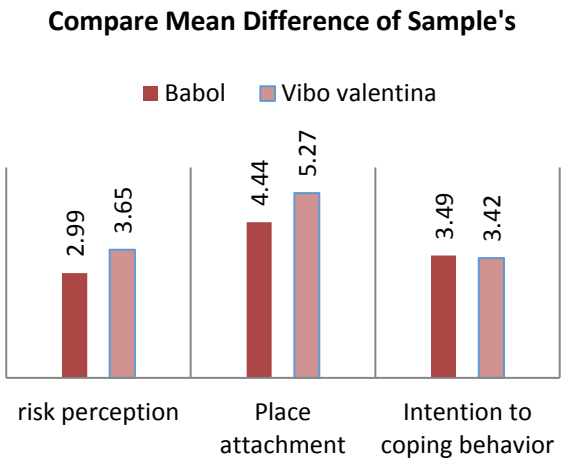

Fig 5. Comparing the mean differences of samples between Vibo Valentia and Babol

This research compares cross-cultural differences in flood risk perception and preventive behaviors among residents of high flood-risk cities, Vibo Valentia (Italy) and Babol (Iran). It examines the relation of risk perception, place attachment, and intentions. The study finds a correlation between the city's risk perception and actual flooding risks, indicating theoretical awareness of environmental risks in residential areas, which aligns with previous findings (De Dominicis et al., 2015).

To test the research hypothesis, flood risk perception is considered the independent variable, while place attachment and risk perception are treated as independent variables, and preventive behaviors as the dependent variable. Preventive behaviors are used as the dependent variable because of their predictive ability regarding actual behavior.

The three-way interaction term and strong correlation between risk perception and preventive behaviors (r=0.59; p<0.001 for Vibo Valentia and r=0.46; p=0.000 for Babol) led to two hierarchical multiple regression analyses, one for each city, to test for any increases in variance when place attachment and its interaction with risk perception were added to the simple regression model. Table 6 shows the three-step regression approach used in the analysis. The first step simply included risk perception; the last step included the link between place attachment and risk perception. The findings revealed that place attachment had a higher impact on risk perception and preventative activities in Babol than in Vibo Valentia.

Table 6. Pearson's correlation matrix for the variables under examination. Means (M), standard deviations (SD), and sample size (N) are displayed for the whole sample

Measure	1	2	3	M (SD)	N
Vibo Valentia					
1. Flood risk perception	-			3.28(1.04)	233
2. Place attachment	0.263	-		4.88(1.37)	233
3. Intention to enact preventive behaviors	0.595	0.122	-	3.26(0.97)	233
Babol					
1.Flood risk perception	-	0.472	0.462	2.99(0.73)	148
2.Place attachment	0.472	-	0.344	4.43(0.76)	148
3.Intention to enact preventive behaviors	0.462	0.344	-	3.49(0.72)	148

To investigate the study's objectives, a three-way interaction moderation multiple regression analysis was used. In the first phase, flood risk perception was used as the dependent variable. In the second phase, place attachment was used as an independent variable. In the last phase, the interaction term between risk perception and place attachment was included, and produced the whole proposed model. The data were analyzed separately for each city, and the results are presented in Table 7. Starting with Vibo Valentia, flood risk perception alone accounted for a significant portion of the variance in the intention to adopt preventive behaviors, with R^2=0.25, F=76.82, and p<0.001. In next phase, the inclusion of place attachment showed minimal change in variance, with ΔR^2=0.002, F=0.72, and p=0.34. In final phase, the interaction term increased the variance explained by 2%, with R^2=0.27, F=27.99, and p<0.001. For Babol, the first phase showed that flood risk perception alone accounted for a smaller portion of the variance in the intention to engage in preventive behaviors, with R^2=0.07, F=39.53, and p<0.001. The second phase showed minimal change due to the addition of place attachment and risk perception variables, with ΔR^2=0.081, F=22.09, and p<0.001, while ΔR^2=0.419, F=34.78, and p<0.001 reflected a significant impact on variance. The final results indicated that the relationship between flood risk perception and preventive behaviors was significant at p<0.001.

Overall, the findings indicate that flood risk perception and preventive behaviors are strongly associated, with place attachment moderating this relationship. In Vibo Valentia, flood risk perception was positively associated with preventative activities at lower degrees of place connection. However, as place attachment increased, this relationship weakened. In contrast, in Babol, a stronger place attachment was associated with a more pronounced positive relationship between flood risk perception and preventive behaviors. The findings indicate that Vibo Valentia and Babol are in opposing positions in terms of the impact of place attachment on relation of risk perception and preventative behaviors.

Table 7. Hierarchical regression of Intention to enact preventive behavior to cope with a flood

Variables	R^2	$\triangle R^2$	B	t
Vibo Valentia				
1. Flood risk perception	0.25	0.25	0.500	**8.77**
2. Flood risk perception	0.25	0.002	0.508	**8.77**
Place attachment			-0.049	
3. Flood risk perception	0.27	0.02	0.563	**9.03**
Place attachment			-0.10	
Interaction			-0.147	**-2.27**
Babol				
1. Flood risk perception	0.455	0.072	0.462	**6.288**
2. Flood risk perception	0.380	0.081	0.385	**0.671**
Place attachment			0.162	
3. Flood risk perception	0.477	0.419	0.484	**1.139**
Place attachment			0.233	
Interaction			-0.147	

Discussion

This article is the systematized starting point for researching a new topic, i.e. investigating the role of the impact of social and psychological symptoms in a particular place, such as examining the impact of the component of place attachment on the risk perception, as well as preventive behaviors. The basic counter-intuitive insight of this research comes from the profound impact on place attachment, risk perception and preventive behaviors of different countries with multiple cultures. In the case of self-identity, automated processes perform various defensive reactions to protect one's continuity against the risks posed by external factors. Place attachment can act as an automatic defense mechanism, depending on its attachment to one's own place and social identity when it is perceived as a risk to our social identity (Speller et al., 2002). This effect is related to the place and type of environmental hazards; in other words, in the places where the threat is more concrete, this effect can be greater. So, it was predicted that, this relationship is different in each country with multiple cultures.

The very different role of culture in the development of a range of behaviors in the face of different problems underscores the importance of cross-cultural research, particularly in urban contexts and in the experiences of residents in this context. For this reason, cross-cultural approaches to disaster research generally consider risk perception as a way of enforcing cultural norms, values, and practices among a group of individuals (Cvetkovich & Erale, 1992). In other words, there is a need for comparative studies in Western and Eastern countries (such as the case study samples) using a standardized instrument to help identify cultural differences that affect broader psychological responses. Therefore, in the present study, the samples of Vibo Valentia (Italy) and Babol (Iran) were selected because of both cities' similar vulnerabilities to flood hazards and with two completely different cultures (linguistically-culturally).

The study reveals that the risk perception in Babol city significantly influences at-risk citizens' behaviors and their intention to enact preventive behaviors in Vibo Valentina city. The higher risk perception in Vibo Valentina can predict preventive behaviors, especially when the risk perception is higher due to a higher objective danger. Place attachment can act as a barrier to preventive behaviors, especially in environments with high-risk contexts. This study aligns with previous research (Xu et al., 2020) that suggests individuals with strong attachments to a place may experience satisfaction with their environment, leading to a lack of need for improvement or protection. This can lead to "survivor bias," which underestimates the likelihood and severity of disasters. Place attachment can also negatively influence this relationship, depending on specific biases associated with the place, such as optimistic bias. The study suggests that the level of place attachment significantly influences risk perception and preventive behaviors, consistent with previous research (Daryanto & Song, 2021) that found individuals' attachment to a place fosters a tendency to protect or improve their local environment. Moreover, our research shows that the impact of place attachment on risk perception and preventive behaviors is stronger in Babol

compared to Vibo Valentia. This may be due to the differences in sociological, individual factors, ethnic and especially cultural backgrounds of both cities, because of their own culture, usually do not want to move and leave the city and their residences and rather to live long in a single place. The final research model is presented to clarify the issue as (Fig. 6).

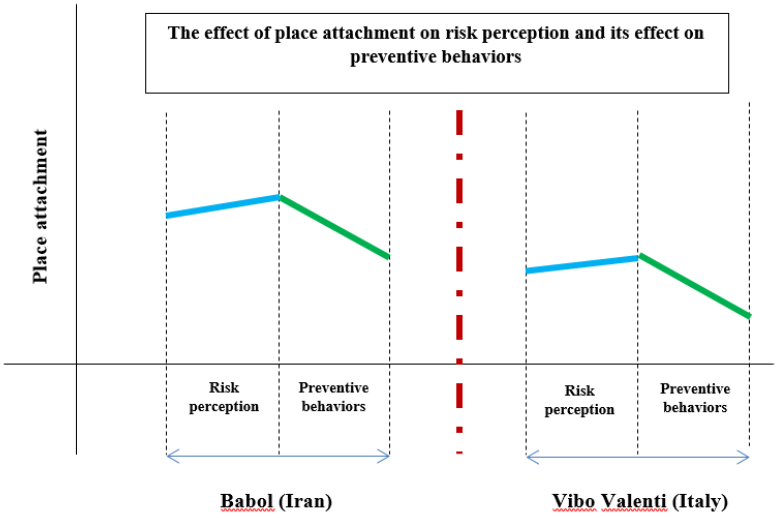

Fig. 6. The final research model

Conclusion

Domingues et al. (Domingues et al., 2021) confirm that the relation of place attachment, risk perception, intention to engage in coping behaviors, and other related variables may vary depending on the location, population, or cultural context. For instance, in Italy, where people often do not reside in one city for extended periods due to cultural tendencies, place attachment tends to be lower. Consequently, citizens are less inclined to engage in preventive behaviors. This suggests that cultural differences, as observed in the case study samples, play a significant role in shaping how place attachment influences risk perception and preventive behavior. While, individuals with higher place attachment tend to have lower risk perceptions and are less likely to engage in preventive actions to address environmental risks. In Vibo Valentia, Italy, perceptions of flood risk were the most significant predictors of the intention to engage in preventive behaviors. This highlights the importance of sociological and individual factors in shaping behaviors, which can differ across cultures. Therefore, it can be said that people who have not experienced the risk of flooding are less aware of the risk than those who have sufficient experience in the field. It should be noted that there is not a direct relation among risk awareness and preventive behaviors.

Therefore, based on the findings, the relation of place attachment, risk perception and preventive behavior is different in each country with multiple cultures, therefore, it can be said that cultural differences can produce different results (such as the case study samples) when flooding and risk perception and preventive behaviors are performed and Place attachment can be a critical element in a variety of simple environmental risk-prevention activities. It is necessary to mention that findings of some research shows that in areas where environmental risk is less likely, the level of place attachment, risk perception and preventive behavior is low, so it is recommended that the details of each variable be investigated, and the amount of its effect determined in this regard it is recommended that the future studies be done in low-risk cities.

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