Loving, leaving, living: Evacuation site place attachment predicts natural hazard coping behavior

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\section*{ABSTRACT}

Almost all the studies about place attachment in environmental risk contexts only consider the role of place attachment to home or local area. However, especially when it comes to risks requiring evacuation from home and local area, it is likely that place attachment to evacuation sites, if any, becomes relevant too. The present studies intend to understand how place attachment to evacuation sites affects coping behaviors in natural hazard contexts. A first study (\(N = 184\)) investigates how place attachment predicts intention to evacuate on the tsunami-prone Chilean coast. Evacuation site place attachment is found to improve intention to evacuate prediction, after controlling for the traditional cognitive antecedents of intention to evacuate. Two experimental studies subsequently test the role of evacuation site place attachment in imaginary environmental risk contexts. The second study (\(N = 115\)) finds that participants would rather go to an affectively significant evacuation site rather than to an affectively significant one, when asked to choose. The third study (\(N = 81\)) finds an effect of evacuation site place attachment on intention to evacuate. It is concluded that evacuation site place attachment could play a relevant role in terms of evacuation. Theoretical and practical implications for policy making are discussed, as well as the need for further studies.

1. Introduction

1.1. Defining place attachment

The concept of attachment has originally been employed to study interpersonal relationships (Ainsworth, 1967, 1989; Bowlby, 1969). Fried (1963) was among the first to refer the term “attachment” to a place, as he noticed that people forced to relocate were passing through a mourning phase, as people do when a significant person passes away.

After Fried’s (1963) seminal work, various place attachment (PA) definitions have been proposed, mainly by geographers and environmental psychologists. Some definitions focused on the affective aspect of place attachment (Altman & Low, 1992; Hummon, 1992; Shumaker & Taylor, 1983); other definitions, tried to include cognitive and behavioral aspects too (e.g., Hidalgo & Hernández, 2001).

Scannell and Gifford (2010) proposed a tripartite framework of place attachment that tries to account for the complexity of the construct, including most of those place attachment aspects that emerged from the relevant literature. Scannell and Gifford’s framework is organized around three pillars: the Person (all the factors that make a place important for a specific individual), the Place (physical and social place characteristics to which people may connect), and the Process (the psychological processes that contribute to place attachment).

Referring to this framework, Lewicka (2011) points out that the Person component has attracted scholar’s attention disproportionately more than the Place and Process components, hindering the development of a comprehensive theory of place attachment. She calls for a more theoretical approach to place attachment, stating that before going further with PA methods and components, scholars should focus on the theoretical and conceptual definition of PA as a psychological construct (Lewicka, 2011). The extension of PA to place hazards and related evacuation phenomena – as in the present contribution – can in fact be a way to deepen such a conceptual definition.

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2. Study 1

2.1. Introduction and aims

Literature about evacuation behavior antecedents highlights the relevance of various cognitive variables. In particular, risk perception (Horney, MacDonald, Van Willigen, Berke, & Kaufman, 2010), past evacuation experience (Vásquez, 2016), subjective knowledge (Kim & Oh, 2014) and objective knowledge (Stein, Dueñas-Osorio, & Subramanian, 2010) are generally found to increase intention to evacuate and more generally natural hazard risk coping behaviors.

Moreover, recent literature attests to a generally negative effect of affective variables such as home PA on risk coping behaviors requiring people to leave their place of residence (e.g., Bird, Gisladottir, & Dominey-Howes, 2011). This could possibly be explained by the “safe haven” function attributed to home (Bonaiuto et al., 2016), which is considered to be safe even when it is not because of the imminent risk.

The few studies about evacuation site choice (e.g., Wu et al., 2012), seem to suggest that, if on the one hand home PA prevents people from evacuating because of the false sense of security it provides (Bonaiuto et al., 2016); on the other hand, evacuation site PA might motivate people to correctly evacuate when facing natural hazards.

The present study aims therefore to test if PA (both home and evacuation site) plays a role in determining evacuation behavior once accounted for the traditional, cognitive and behavioral, variables. This study is conducted in a real setting, i.e., the tsunami prone Chilean coast. The region has a history of tsunami events (e.g., May 22, 1960; February 27, 2010) and, because of the large number of earthquakes in the area, tsunami alarms are propagated almost every year. Each local municipality has an evacuation plan and evacuation drills are regularly organized by the Oficina Nacional de Emergencia del Ministerio del Interior y Seguridad Pública, ONEMI (Ministry of Interior and Public Security's National Office of Emergency). During these drills, citizens are instructed to go to specific evacuation sites identified as safe (ONEMI, n. d.).

2.2. Hypotheses

The hypotheses for Study 1 are as follows:

- H1. The effect of the cognitive and behavioral variables - Risk Perception (H1a), Past Evacuation Experience (H1b), Objective Knowledge (H1c) and Subjective Knowledge (H1d) - on Intention to Evacuate is expected to be positive.

- H2. The effect of a place’s affective related variables (Home Place Attachment and Evacuation Site Place Attachment) is expected to increase Intention to Evacuate variance after considering the effects of the cognitive variables. In particular, the effect of Home Place Attachment on Intention to Evacuate is expected to be negative (H2a), while the effect of Evacuation Site Place Attachment on Intention to Evacuate is expected to be positive (H2b).

2.3. Materials and procedure

The questionnaire included the following variables:

- Intention to Evacuate: five 5-point Likert-type items created based on the literature, e.g., “I will try to evacuate next time I understand that a tsunami is coming”. \( \alpha = 0.68 \) (e.g., Burnside, Miller, & Rivera, 2007; DeYoung et al., 2016; Red, Botan, & Holen, 2012). See Appendix A.1. for the full list of items.

- Risk Perception: two 5-point Likert-type items (adapted from De Dominicis et al., 2014). E.g., “I feel exposed to tsunami risk”
(Strongly disagree to Strongly agree), and “To which degree of tsunami risk is your area subject?” (No risk to High risk), $r = 0.71 p < .01$.

* Past Evacuation Experience: a list of the evacuation alarms given in the last six years in the area was presented. For each event, participants were asked to indicate whether they had evacuated or not. Past Evacuation Experience was calculated as the number of previous evacuations (from 0 to 6).

* Objective Knowledge: thirteen true or false questions about tsunami risk coping, based on official information provided by ONEMI (ONEMI, n. d.). Answer format was true/false/1 do not know. See Appendix A.2. for the full list of items.

* Subjective Knowledge: four 5-point Likert-type items on self-assessed knowledge about tsunami risk coping ($α = 0.78$). See Appendix A.3. for the full list of items.

* Home Place Attachment (Fornara, Bonnes, & Bonaiuto, 2010): participants were asked to indicate their attachment to their home on four 5-point Likert-type items, $α = 0.59$.

* Evacuation site Place Attachment: each participant was asked to answer four 5-point Likert-type items ($α = 0.59$) on evacuation site PA (adapted from Fornara, Bonaiuto, & Bonnes, 2010). Fornara and colleagues’ scale (2010) has already been employed for home place attachment in natural hazard contexts (De Dominicis, Fornara, Ganucci Cancellieri, Twigger-Ross, & Bonaiuto, 2015). In order to measure evacuation site place attachment, in each item the expression “this place” or “this neighbourhood” was replaced by “my evacuation place”. See Appendix A.4 for the full list of items.

### 2.4. Sample description

A total of 184 surveys from the coastal areas of Los Ríos Region, Chile, were collected between October and November 2016, door to door, via a paper and pencil questionnaire. Although no exact response rate was calculated, approximately one person accepted to participate on three proposed. Because of the lack of previously available data on the households, no-response bias analysis was conducted. Sensitivity power analysis performed through G^*^Power indicated that the sample size was sufficient to detect a small-medium effect ($f^2 = 0.05$) at 80% power level in a two-step hierarchical regression. Participants were 115 women (62.5%), 67 men (36.2%). Two participants (1.1%) did not answer this question. Participants’ mean age was 46 (ranging between 18 and 84). Thirty-nine participants (21.2%) had less than 8 years of education, 53 (28.8%) had between 8 and 12 years of education, 70 (38.0%) had 12 years of education, 20 (10.9%) studied for more than 12 years (university level education). Mean length of residence in the same village was 30 years (ranging between less than 1 year and 84 years).

### 2.5. Analyses

A hierarchical regression analysis was conducted in order to test H1 and H2. Considering Intention to Evacuate as the dependent variable, the cognitive variables were firstly entered (Risk Perception, Past Evacuation Experience, Subjective Knowledge, Objective Knowledge, which were expected to positively predict Intention to Evacuate (H1a, H1b, H1c, H1d). Next, the affective variables were entered (Home Place Attachment and Evacuation Site Place Attachment), with Home Place Attachment expected to negatively predict Intention to Evacuate (H2a) and Evacuation Place Attachment expected to positively predict Intention to Evacuate (H2b).

### 3. Results

Descriptive statistics and inter-correlations of the variables (Intention to Evacuate, Risk Perception, Past Evacuation Experience, Subjective Knowledge, Objective Knowledge, Home Place Attachment, Evacuation Site Place Attachment) are reported in Table 1.

As Fig. 1 shows, Model 1 presents the effects of the traditional cognitive variables on Intention to Evacuate. Results show that Past Evacuation Experience ($β = 0.25 p < .01$) and Subjective Knowledge ($β = 0.18 p < .05$) are significant positive predictors, explaining a total of 8% of the variance in Intention to Evacuate ($R^2 = 0.08$, $p < .01$). In other words, having more evacuation experience and feeling more confident in one's own knowledge about tsunami risk coping lead people to be more likely to intend to evacuate. This partially confirms H1 as Past Evacuation Experience (H1b) and Subjective Knowledge (H1c), - however, neither Risk Perception (H1a) nor Objective Knowledge (H1d) are found to predict Intention to Evacuate.

Model 2 tests whether affective place related factors explain any additional variance in Intention to Evacuate, while controlling for cognitive factors. A significant positive effect of Evacuation Site Place Attachment ($β = 0.16 p < .05$) is found, explaining an additional 2% of the variance in Intention to Evacuate ($R^2 = 0.10$, $p < .05$, Adj. $R^2 = 0.10$). Thus, Evacuation Site Place Attachment is positively associated with higher Intention to Evacuate. No significant effect of Home Place Attachment is found.

H2a is disconfirmed by results since the effect of Home Place Attachment is found to be positive and non-significant, rather than significantly negative. H2b is confirmed since the effect of Evacuation Site Place Attachment is found to be positive and significant, as expected. H2 is thus partially confirmed (for the Evacuation Site Place Attachment part only).

### 3.1. Discussion

This study provides correlational evidence that affective place related variables, especially evacuation site PA, could affect risk coping behaviors. Cognitive variables helped explain Intention to Evacuate, in particular Past Evacuation and Subjective Knowledge, consistently with literature (Demuth, Morris, Lazo, & Trumbo, 2016; Rad et al., 2012). The lack of effect of Objective Knowledge is only marginally surprising, since knowledge has often been found to be insufficient to motivate evacuation behavior (e.g., Lindell, Arlikatti, & Prater, 2009). The lack of effect of Risk Perception on Intention to Evacuate is probably partly due to multi-collinearity and to the employment of a 2-item measure that failed to account for the many facets of risk perception (Stein et al., 2010). Some studies show that only some components of risk perception are associated with risk coping (Xu, Peng, Liu, Su, Wang, & Cheng, 2017; Xu, Peng, Liu, & Wang, 2018). Moreover, it is possible that, for such a high level of objective risk and generalized risk awareness, differences in risk perception are no longer relevant and that higher importance is attributed to other factors, such as affective variables. The small, yet significant, positive effect of Evacuation Site PA suggests that people would be more likely to evacuate when they can go to a place they are attached to (consistently with Wu et al., 2012).

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1. Item “I do not feel integrated in my home” was eliminated because it reduced Cronbach’s $α$ to 0.48.
2. Item “It would be very hard for me to leave this evacuation place” was eliminated because it reduced Cronbach’s $α$ to 0.51.

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3. The area of this study is affected by a strong Objective Risk and both Risk Perception ($M = 4.17 SD = 1.29$ on a 1 to 5 scale, before transformation) and Intention to Evacuate ($M = 4.65 SD = 0.63$ on a 1 to 5 scale, before transformation) scores were very high.

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Table 1
Descriptive statistics and inter-correlations of the variables (Pearson’s r).

<table>
<thead>
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<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>M</th>
<th>SD</th>
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<td></td>
<td>0.84</td>
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<td>Past Evacuation Experience</td>
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<td>0.17*</td>
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<td></td>
<td></td>
<td>3.63</td>
<td>2.06</td>
</tr>
<tr>
<td>4</td>
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<tr>
<td>5</td>
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<td>0.18*</td>
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<td>&lt;0.02</td>
<td>1.00</td>
<td>0.81</td>
<td>0.26</td>
</tr>
<tr>
<td>6</td>
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<td>&lt;0.01</td>
<td>0.18*</td>
<td>0.04</td>
<td>&lt;0.02</td>
<td>1.00</td>
<td>0.81</td>
<td>0.26</td>
</tr>
<tr>
<td>7</td>
<td>Evacuation Site Place Attachment</td>
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<td>&lt;0.21**</td>
<td>0.07</td>
<td>0.04</td>
<td>&lt;0.04</td>
<td>0.04</td>
<td>1.00</td>
<td>4.17</td>
</tr>
</tbody>
</table>

Notes.
*0.05 < p < .01; *p < .05; **p < .01.
*In order to cope with the non-normal distribution of these variables, that presented a very strong negative skewness (ceiling effect), original scores were transformed using reflect and inverse formula (x̄ = 1/(|k-x|)). See Appendix A.5. for the descriptive statistics of all the aggregated variables, before transformations.

![Diagram](image.png)

**Note**: M1 = Model 1; M2 = Model 2

Fig. 1. Hierarchical regression of prediction of Intention to Evacuate. Adding Home Place Attachment and Evacuation Site Place Attachment significantly increases the prediction of Intention to Evacuate (F change = 3.07*). Note: M1 = Model 1; M2 = Model 2.

Considering the high level of home PA* and the closeness between home and evacuation sites (usually only a few minutes on foot), it is possible that people perceived a continuity rather than an opposition between home and evacuation sites. Thus, although Home PA and Evacuation Site PA are not found to be correlated in this sample, it is possible that leaving home to go to the evacuation site does not pose a threat to place identity (Billing, 2006), preserving self-continuity (Scannell et al., 2016, 2017). This could explain the lack of significance of Home PA on Intention to Evacuate. Similarly, in a study about relocation willingness among Chinese farmers threatened by landslides, households with higher scores of place identity and place dependence (but not place attachment) were found to be less willing to relocate (Xu et al., 2017). Caution should be used when generalizing these results, as this study presents several limits, such as small sample size, low total explained variance, and low variability in the answers on four of the seven considered variables. Moreover, although there is no consensus on Cronbach’s α thresholds and their interpretation (Taber, 2017; Field, 2017), the α values of the presented place attachment measures are lower than those reported for the same scales employed in previous studies (e.g., De Dominicis et al., 2015; Fornara et al., 2010). This could possibly be determined by the fact that this scale had never been employed in Chile for evacuation sites, but rather mainly for larger urban settlements in other countries.

Overall, the main merit of this study is to shed light on evacuation site PA. Study 2 was conceived to investigate evacuation site PA within more controlled settings (Giuliani, 2003; Lewicka, 2011).

4. Study 2

The second study aims at investigating the role of evacuation site PA on people’s intention to evacuate in an experimental study. Manipulating evacuation PA would allow the test of its causal role over relevant dependent variables dealing with risk coping.

This study tests whether evacuation site PA could contribute to two functions generally attributed to place bonding: self-continuity and perceived security. The security function consists in the place of attachment providing a sense of protection of the individual from threats (Giuliani, 2003). Since evacuation sites’ main feature is security, it is

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* M = 4.52 SD = 0.80 on a 1 to 5 scale, before transformation.
likely that this function could be linked to evacuation site PA. Self-continuity (Breakwell, 1988; Hallowell, 1955; Twigger-Ross & Uzzell, 1996) is a feature often mentioned in place change contexts, and thus it could play a relevant role in evacuation site bonding (Cheng & Kuo, 2015; Farnum, Hall, & Kruger, 2005; Knez, 2005; Scannell et al., 2016; Scannell et al., 2017).

An experimental online procedure was created, presenting individuals with an imaginary region affected by natural hazard risks and equipped with two evacuation sites (arbitrarily named “Quokka” and “Quolla”, after similar names were used by studies on new objects; e.g., Field, 2007; Huijding et al., 2009).

Across two experimental conditions, Quokka attachment was manipulated between subjects (Quokka Attachment vs. Quokka Non-Attachment).

Quolla instead was always presented in the same way across both conditions and its attachment was not manipulated, allowing for a within subject comparison (Quokka vs. Quolla).

Manipulation check included PA scale, measures of Perceived Security and Self-Continuity.

After PA manipulation, a task was presented aiming to measure evacuation site choice.

### 4.1. Hypotheses

- **H1**. Manipulation check: Place Attachment Manipulation is expected to affect Place Attachment (H1a), Perceived Security (H1b) and Self-Continuity (H1c). Participants in Quokka Attachment condition (vs. participants in Quokka Non-Attachment condition) are expected to score higher on these variables when referring to Quokka than to Quolla. No differences are expected referring to Quolla.

- **H2**. Place Attachment Manipulation is expected to affect Evacuation Site Choice. Participants in the Quokka Attachment condition (vs. participants in Quokka Non-Attachment condition) are expected to choose Quokka more frequently as an evacuation site. Interactions between Evacuation Site Distance and Place Attachment Manipulation will be explored too in order to address results generalization regarding distances (a relevant parameter when considering human walking evacuation).

### 4.2. Materials and procedure

Attachment manipulation has already been thoroughly investigated in the interpersonal attachment literature (e.g., Mikulincer, Birnbaum, Woddis, & Nachmias, 2000; and Mikulincer’s following studies). Most interpersonal attachment manipulations are based on increasing salience of the attachment to existing attachment figures. The individual is usually asked to think, write, or read about people they are attached to (vs. people they are not attached to) and about specific personal attachment experiences (Mikulincer, Gillath, & Shaver, 2002; Mikulincer, Hirschberger, Nachmias, & Gillath, 2001; Mikulincer, Shaver, & Rom, 2011). More abstract manipulations of interpersonal attachment exist: showing a picture of a mother caring for her child, and showing loving and accepting smiles, or subliminally showing attachment related-words (e.g., caring, supportive; Mikulincer et al., 2001). Some examples of scenario manipulations of interpersonal attachment exist: asking participants to imagine themselves in a situation where people take care of them and look after them (e.g., studies 2, 3, 5, in Mikulincer & Shaver, 2001).

Very few examples of PA manipulation exist. Scannell and Gifford (2016) asked students in experimental conditions “to think of a place to which they felt especially attached, and those in the neutral place condition were asked to think of a familiar place for which they did not have any strong (negative or positive) emotions” (Scannell & Gifford, 2016, pp. 9–10). All students were asked to “to write a short description of the place and explain why it was (or was not) important to them” (Scannell & Gifford, 2016p.10). This manipulation consists in making salient or not the attachment the individual already has with an existing place. Recently, Reese, Oettler, and Katz (2019), employing a PA manipulation based on Scannell and Gifford’s (2016), measured the PA people expected to have toward an imaginary place. They asked participants to think about their town and to indicate their PA toward it after imagining it without one of its typical social or physical features.

In continuity with these studies, the present study intends to manipulate PA to evacuation sites. In order to create a manipulation for this specific aim, a new procedure, based on several of the above-mentioned techniques (particularly on Mikulincer & Shaver, 2001, and on Scannell & Gifford, 2016), was created.

The task started asking each participant to imagine to be in a region where s/he has never been before, affected by a number of natural hazards. Quokka, an evacuation site that is safe for self-protection in case of a natural hazard, was then presented. The second part of Quokka presentation is different according to the condition. One version described the site as a place the individual is attached to (Quokka Attachment condition), the other one described it as a place the individual is not attached to (Quokka Non-Attachment condition). The two texts were created based on the short version of Fornara and colleagues’ PA scale (Fornara et al., 2010). Following the description, participants were asked to write a small text about Quokka and about how they felt being there. See Appendix B.1. for the full text of this task.

After the manipulation task, manipulation check variables were presented: evacuation site PA (8 items, adapted from Bonaiuto, Fornara, & Boines, 2003), perceived security (“I feel secure from natural hazard risks in Quokka/Quolla”, “Quokka/Quolla seems like a safe place”, created on the basis of Giuliani, 2003), and self-continuity (Quokka/Quolla is familiar to me”, “Quokka/Quolla is similar to other places I know”, created on the basis of Jorgensen & Stedman, 2001; Main & Sandovol, 2014). These items were rated on a 1 (Completely disagree) to 5 (Completely agree) Likert-type scale.

Subsequently, Quokka, another evacuation site, was introduced. For all participants, Quokka was briefly described as an evacuation site as safe, as old as Quokka, and functionally equivalent to Quokka. The same manipulation check variables employed for Quokka, were presented referring to Quokka.

The evacuation site choice scenario task was then presented (see Appendix B.2. for the full task). This task was constructed based on the “nature reserve task” (Huijding et al., 2009). Four virtual natural hazard risk emergencies scenarios were created. Each scenario was presented three times (twelve scenarios in total), manipulating Evacuation Site Distance. Once Quokka was presented to be closer than Quolla, once Quokka and Quolla were at the same distance, and once Quolla was closer than Quokka. In each scenario, participants were asked to indicate to which of two evacuation sites they intended to go. Distance from the evacuation sites always ranged between 700 m and 2500 m, i.e., a distance which can be walked in about 15-min time (i.e., the evacuation time usually recommended in real life situations, e.g., in Chile, ONEMI, n. d.). When the sites were not equidistant, the difference between the two sites was always of 300 m or 400 m; this range of difference was chosen via a pilot study in order to be meaningful but not crucial for the choice.

After reading each scenario, the participant was asked to indicate if s/he was willing to evacuate to Quokka or to Quolla, as a binary choice. To calculate this variable, the number of times participants chose Quokka over Quolla (0–4 times in each distance condition) was counted. Number of Quokka’s choices mirrored Quokka’s choices, i.e., every time a participant did not choose Quokka, s/he chose Quolla. Analyses were performed on Quokka’s choices.
The final part of the survey was dedicated to socio-demographic information.

4.3. Sample description

As the previous study highlighted the relevance of the cultural meaning and informal knowledge about risk, it was chosen to focus on participants of a single country, namely Italian citizens living in Italy. The survey, hosted on an open source platform, spread through emails and social networks mainly to university students and scholars’ acquaintances, during spring 2017. The first page informed participants about the study’s aim, possible uses of the collected data and of their possibility to leave the study in any moment. Once the participant opened the link, s/he was randomly assigned to one of the two conditions (“Quokka Attachment” or “Quokka Non-Attachment”).

Using G-Power it was determined that in order to detect a medium effect size ($\eta_p^2 = 0.06$) in the main hypothesis (H2, 2 x 3 mixed design) at 80% probability and $p = .05$, a sample size of $N = 80$ was required. One-hundred-twenty-two completed questionnaires were collected online. Seven participants were not considered, as they did not fit the requirements (Italian citizenship, major age). This resulted in 115 valid questionnaires (60 in the “Quokka Non-Attachment” condition, 55 in the “Quokka Attachment” condition). Participants were mainly young female students: 78 (67.8%) women and 37 (32.2%) men; mean age was 29 (median = 25, min = 18, max = 70); 58 (50.4%) participated did not have a university degree, 56 (48.7%) had at least a bachelor degree. Participants came from all Italian regions, 18 participants (15.7%) declared they had experienced a natural hazard risk situation (mainly for earthquake, fire, and flood) requiring them to leave their home for at least a few hours.

4.4. Analyses

Cronbach’s $\alpha$ was calculated for the attachment scale; correlations between the items of the two-item measures were used as consistency indicator for those measures.

In order to check the manipulation effectiveness and to confirm H1, a mixed MANOVA was run to compare scores of PA (H1a), Perceived Security (H1b), and Self-Continuity (H1c), between Evacuation Site (Quokka vs. Quolla) and between Attachment Condition (Quokka Attachment vs. Quokka Non Attachment).

In order to test H2, a mixed ANOVA was run to compare scores of Evacuation Site Choice between Evacuation Site (Quokka vs. Quolla), between Evacuation Site Distance (Close, Equal, Far) and between Attachment Condition (Quokka Attachment vs. Quokka Non Attachment).

4.5. Results

4.5.1. Variables’ reliability

Place Attachment scale (Bonaiuto et al., 2003) has satisfying consistency values, both for items referring to Quokka (eight items, $\alpha = 0.89$) and to Quolla (eight items, $\alpha = 0.83$). The Self-Continuity scale has a correlation score of $r = 0.40$ $p < .01$ when referring to Quokka, and of $r = 0.34$ $p < .01$ when referring to Quolla. The Perceived Security scale has a correlation score of $r = 0.81$ $p < .01$ when referring to Quokka, and of $r = 0.79$ $p < .01$ when referring to Quolla. The Subjective Knowledge scale has a correlation score of $r = 0.63p < .01$ when referring to Quokka, and of $r = 0.64$ $p < .01$ when referring to Quolla.

4.5.2. Manipulation check

A mixed MANOVA was conducted with one between subjects variable (Place Attachment Manipulation) and one within subjects variable (Evacuation Site) as independent variables; and with Place Attachment, Self-Continuity, and Perceived Security as the three dependent variables.

The multivariate tests showed that there were some significant multivariate effects of both Place Attachment Manipulation ($\eta = 0.78$, $F(111,3) = 10.73, p < .01$ $\eta_p^2 = 0.23$), Evacuation Site ($\eta = 0.65$, $F(111,3) = 19.78 p < .01$ $\eta_p^2 = 0.35$), and their interaction ($\eta = 0.77$, $F(111,3) = 11.03 p < .01$ $\eta_p^2 = 0.23$) on the considered dependent variables.

The consequent univariate ANOVAs are reported in Tables 2–4. As shown in Table 4, there is a significant interaction effect of Place Attachment Manipulation and Evacuation Site on Place Attachment and Self-Continuity scores. In both cases participants in the Quokka Non-Attachment condition rate Quokka and Quolla equally, while people in the Quokka Attachment condition score higher on Quokka than on Quolla, confirming H1a and H1c. However, the interaction was not found to be significant when considering Perceived Security, disconfirming H1b.

Besides the hypotheses, it should be noted that, in many cases, also principal effects of the Evacuation Site and of the Place Attachment Manipulation were found to significantly affect Place Attachment, Self-Continuity, and Perceived Security (Tables 2 and 3). People in Quokka Attachment (vs. Quokka Non-Attachment) condition are found to have higher scores on Place Attachment, on Self-Continuity (marginal difference), and on Perceived Security. When the evacuation site was Quokka (vs. Quolla), participants reported in general higher Place Attachment, and marginally higher Self-Continuity, but similar Perceived Security.

Overall, these results confirmed the efficiency of the manipulation task, which consistently affected Place Attachment and Self-Continuity. However, no significant effects were found on Perceived Security and some unexpected main effects were found to be significant.

4.5.3. Effect of Place Attachment Manipulation on evacuation site choice (H2)

As expected, the ANOVA on the Average number of Quokka's choices reveals a significant main effect of Place Attachment Manipulation ($F(1, 113) = 12.63, p < .05$, $\eta_p^2 = 0.10$), with participants in the Quokka Attachment condition being more likely to choose Quokka ($M = 3.01$ SE = 0.12) compared to people in the Quokka Non-Attachment condition ($M = 2.40$ SE = 0.12), thus confirming H2. A significant main effect of Evacuation Site Distance ($F(2, 112) = 68, p < .01$, $\eta_p^2 = 0.38$) is also found, with Quokka's choices being significantly less likely when Quokka is far ($M = 1.51$ SE = 0.16) than when it is close ($M = 3.36$ SE = 0.12) or equidistant ($M = 3.24$ SE = 0.13 $p < .001$, $\eta_p^2 = 0.47$) (see Fig. 2). There is no significant difference between Close and Equidistant conditions of Evacuation Site Distance ($p = .75$). Moreover, no significant interaction effect of Place Attachment Manipulation and Evacuation Site Distance is found ($F(2, 112) = 0.16, p = .85$, $\eta_p^2 = 0.00$).

4.6. Discussion

This study aimed at testing a new Place Attachment Manipulation technique (H1) and at investigating whether Place Attachment Manipulation affects evacuation site choice coping behaviors, particularly Evacuation Site Choice (H2).

The manipulation check was overall successful, proving that Place Attachment Manipulation consistently affected Place Attachment, and

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5. Evacuation Site Choice was measured as the number of times people chose either Quokka (Quokka’s choices) or Quolla (Quolla’s choices) in 12 dichotomous choices. Present analyses are conducted on the average number of Quokka’s choices. Since Quolla was chosen only and every time Quokka was not chosen, Quolla’s choices results mirror Quokka’s choices and therefore are not presented here.
Table 2
Univariate effects of the between subjects variable “Place Attachment Manipulation” (ANOVA) and contrasts of significant effects (df1 = 1, df2 = 113, Bonferroni adjustment).

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>F</th>
<th>p</th>
<th>ηp²</th>
<th>Quokka Non Attachment - Quokka Attachment Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Attachment</td>
<td>31.49</td>
<td>&lt;.001</td>
<td>.22</td>
<td>−0.71</td>
<td>0.13</td>
<td>0.00</td>
<td>−0.96</td>
<td>−0.46</td>
</tr>
<tr>
<td>Self-Continuity</td>
<td>8.38</td>
<td>&lt;.01</td>
<td>.07</td>
<td>−0.41</td>
<td>0.14</td>
<td>0.01</td>
<td>−0.68</td>
<td>−0.13</td>
</tr>
<tr>
<td>Perceived Security</td>
<td>4.65</td>
<td>&lt;.05</td>
<td>.04</td>
<td>−0.36</td>
<td>0.17</td>
<td>0.03</td>
<td>−0.69</td>
<td>−0.03</td>
</tr>
</tbody>
</table>

Table 3
Univariate effects of the within subject variable “Site of Attachment” (ANOVA) and contrasts of significant effects (df1 = 1, df2 = 113, Bonferroni adjustment).

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>F</th>
<th>p</th>
<th>ηp²</th>
<th>Quokka - Quolla Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Attachment</td>
<td>58.05</td>
<td>&lt;.001</td>
<td>.34</td>
<td>0.59</td>
<td>0.08</td>
<td>&lt;.001</td>
<td>0.44</td>
<td>0.75</td>
</tr>
<tr>
<td>Self-Continuity</td>
<td>3.38</td>
<td>.07</td>
<td>.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived Security</td>
<td>.54</td>
<td>.47</td>
<td>.01</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4
Univariate effects of the interaction between “Place Attachment Manipulation” and “Site of Attachment” (ANOVA) and contrasts of significant effects (df1 = 1, df2 = 113, Bonferroni adjustment).

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>F</th>
<th>p</th>
<th>ηp²</th>
<th>Attachment Condition</th>
<th>Quokka - Quolla Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Attachment</td>
<td>27.37</td>
<td>&lt;.001</td>
<td>.20</td>
<td>Quokka Non Attachment</td>
<td>0.19</td>
<td>0.11</td>
<td>.09</td>
<td>−0.03</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quokka Attachment</td>
<td>−1.00</td>
<td>0.11</td>
<td>&lt;.001</td>
<td>0.78</td>
<td>1.22</td>
</tr>
<tr>
<td>Self-Continuity</td>
<td>12.19</td>
<td>&lt;.01</td>
<td>.10</td>
<td>Quokka Non Attachment</td>
<td>−0.18</td>
<td>0.15</td>
<td>.24</td>
<td>−0.49</td>
<td>0.12</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Quokka Attachment</td>
<td>.591*</td>
<td>0.16</td>
<td>&lt;.001</td>
<td>0.27</td>
<td>0.91</td>
</tr>
</tbody>
</table>

Fig. 2. Place Attachment Manipulation by Evacuation Site Distance effect on Average number of Quokka’s choices. Participants in Quokka Attachment condition choose Quokka more often than participants in Quokka Non Attachment condition (F(1, 113) = 12.63, p < .05, ηp² = 0.10).

Self-Continuity (but not Perceived Safety) scores (H1). Quokka Attachment participants were found to be more attached and feeling more Self-Continuity in Quokka (than in Quolla), i.e., towards the evacuation site to which they were induced to be attached. Considering the low correlation score between the two Self-Continuity items, this result should be considered with caution. Moreover, the lack of effect of the manipulation on Perceived Safety questions the boundaries of the manipulation’s effect.

As for what concerns H2, the significant effect of Place Attachment Manipulation on Evacuation Site Choice supports the hypothesis of a positive role of this specific kind of PA on proper adaptive risk coping.

An unexpected main effect of Place Attachment Manipulation was found on Place Attachment, Self-Continuity, and Perceived Security. Although the manipulation aimed at manipulating attachment toward a specific object (i.e., Quoqka), participants in the Quokka Attachment condition presented higher scores (both to Quokka and to Quolla) than participants in the Quokka Non-Attachment condition. It is possible
that reading the scenario prepared for the Quokka Attachment condition (presenting Quokka as a place to which the participant was attached) has primed a general attachment schema that uniformly increased both Quokka’s and Quolla’s scores on the attachment related variables. This main effect of Place Attachment Manipulation is possibly determined by a generalized attachment priming effect of the scenario, in line with studies on interpersonal attachment showing that attachment manipulation could prime a general attachment scheme, rather than attachment toward specific objects (Andriopoulos & Kafetsios, 2015; Mikulincer et al., 2001).

An unexpected main effect of Evacuation Site was also found on Place Attachment and on Self-Continuity, with Quokka presenting higher scores than Quolla in both conditions. This is possibly determined by the asymmetric construction of the task and by a simple availability heuristic (Tversky & Kahneman, 1975). Although the task declared that Quokka and Quolla were similar, more space was devoted to Quokka than to Quolla. This possibly lead participants to express a general preference for Quokka than for Quolla, since people generally prefer to choose the option they know better (Muthukrishnan, Wathieu, & Xu, 2009).

It should be noted that the employed PA manipulation text was very explicit, since the text was created on the basis of the short version of Fornara and colleagues’ Place Attachment scale (Fornara et al., 2010), and PA was later measured with the longer version of the same scale (Bonaiuto et al., 2003).

Regarding the lack of Place Attachment manipulation effect on the Perceived Safety variable, it is likely that participants perceived both safety target areas as equally safe, since they were both presented as safe in the study.

The second experimental study was designed in order to improve the manipulation technique.

5. Study 3

The second experimental study was conceived to investigate the same psychological phenomenon as the first experimental study; however, it presented an improved version of the manipulation procedure, in order to try to overcome some of the flaws of the previous study. In particular, Quocca⁶ and Quolla were given the same amount of space and information and both were manipulated, in order to better balancing the two sites’ status.

Moreover, in order to control for the role of knowledge, evacuation sites were described not only for their affective connotation, but also for their physical and functional features. The physical and functional information was conceived to be different but comparable between the two sites, in order to have measures of subjective and objective knowledge as part of the manipulation check. Providing concrete information about the evacuation sites also aimed at facilitating the imaginative task.

A third significant change from Study 2 consisted in the design of a new task to measure how intention to evacuate varies according to the available evacuation site. Lastly, since literature sometimes reports different results according to different risk levels (e.g., De Dominicis et al., 2015), when measuring intention to evacuate, two different levels of risk (low and high) were considered with the aim of exploring the effect of PA across different levels of risks. Risk perception was also measured as a risk level manipulation check.

5.1. Hypotheses

- H1. Place Attachment Manipulation checks: the interaction between Place Attachment Manipulation and Evacuation Site is expected to affect Place Attachment (H1a), Perceived Security (H1b), and Self-Continuity (H1c), but not Subjective Knowledge (H1d) and Objective Knowledge (H1e). Participants in Quolla Attachment (vs. participants in Quocca Attachment) condition are expected to score higher on these variables when referring to Quolla than to Quocca. The opposite pattern is expected referring to Quocca. No main effects of Place Attachment Manipulation nor of Evacuation Site are expected.
- H2. Risk Perception manipulation check: Risk Perception is expected to be higher with high Risk Level scenario and lower with low Risk Level scenarios.
- H3 Effect of Place Attachment Manipulation on Intention to Evacuate: the interaction between Place Attachment Manipulation and Evacuation Site is expected to affect Intention to Evacuate. Participants in the Quolla Attachment condition are expected to have higher Intention to Evacuate scores when the evacuation site is Quolla (vs. Quocca). Participants in the Quocca Attachment condition are expected to have higher Intention of Evacuate scores when the evacuation site is Quocca (vs. Quolla). No main effects of Place Attachment Manipulation and Evacuation Site are expected. Interactions between Risk Level and Place Attachment Manipulation are explored.

5.2. Materials and procedure

The manipulation was structured in order to be more balanced than the one employed in Study 2. Therefore, the imagining and writing task was repeated twice, once referring to Quocca and once referring to Quolla. In addition, the site descriptions presented in this study include both affective and functional information on the sites. Functional information concerned details about the evacuation site features (based on FEMA, 2000) and it was the same for the two sites, except for a few minor details (e.g. Quocca was equipped with two diesel generators, while Quolla had gasoline ones). These differences allowed checking for the real knowledge participants had of each site, but they were not expected to affect site evaluation. The affective information, instead, changed according to the condition and it was slightly longer compared to Study 2, in order to be balanced with functional information. The first group received non-attachment information about Quocca and attachment information about Quolla (Quolla Attachment condition); the other group received attachment information about Quocca and non-attachment information about Quolla (Quocca Attachment condition). See Appendix C.1. for the text of the manipulation.

As for what concerns the manipulation check, a shorter, 4-item version, of the PA scale was employed (Fornara et al., 2010). The two-item measure of Perceived Security was the same employed in Study 2. Considering the low reliability of the Self-Continuity scale in Study 2, the item “Quocca is familiar for me”, presenting strong correlations with the items of the other constructs, was replaced by “Quocca reminds of the places I frequent in my day to day”, more directly referring to Self-Continuity. A two-item Subjective Knowledge measure ("I can say I know Quocca," “I am informed about Quocca,” based on Esteban et al., 2013; Vicente, 2014) was also included. Moreover, based on the functional information included in the manipulation task, six Objective Knowledge items were created for each site. The items concerned sites’ functional details; answer format was true/false and the score was calculated counting the number of correct answers (e.g., “In Quocca there are 2 diesel generators”); see Appendix C.2. for the full list of items.

⁶ In this study, Quokka was spelled Quocca in order to prevent the presence of the letter "k" (a non-existing letter in the Italian alphabet) making it sound more exotic than Quolla to Italian participants.
The evacuation site choice task was adapted in order to provide a continuous measure of intention to evacuate (see Appendix C.3 for the task). Among the four risk scenarios from Study 2, the choice was made to focus on the hurricane and the tsunami scenarios. Instead of investigating the role of site distance, risk level was considered, since many studies report that people feel and behave differently for different levels of risk (Bernardo, 2013; De Dominicis et al., 2015). For each scenario, two levels of risk were considered: 15% and 50%. The two percentages of risk were chosen after a pilot study for the risk to be perceived as both relevant, and uncertain. Evacuation site also varied, with half of the scenarios presenting Quocca, and half presenting Quolla, as evacuation site. The task consisted of eight scenarios, in which the same two risk scenarios were presented four times each, varying the risk level (Low risk, High risk) and evacuation site (Quocca, Quolla). For each scenario, participants were asked to indicate their risk perception (as a manipulation check) and their intention to evacuate to the given site (main dependent variable).

The two items, presented after each scenario, were the following ones, all scored 1 (Not at all) to 5 (Completely) on Likert-type scales: “How much do you feel personally at risk?” (as a measure of risk perception) and “How much do you intend to leave the place you are now in order to evacuate to Quocca/Quolla?” (as a measure of evacuation intention).

5.3. Sample description

The study, hosted on an open source online platform, was spread through emails and social networks mainly to university students and scholars’ acquaintances (excluding participants who joined the previous study), with Italian adults as target population, in summer 2017. The first page informed participants about the study, possible uses of the collected data and of their possibility to leave the study in any moment. Once the participant opened the link, s/he was randomly assigned to one of the two conditions (“Quolla Attachment” or “Quocca Attachment”).

Using G-Power it was determined that to detect a similar effect size as in Study 2 ($\eta^2 = 0.10$) in the main hypothesis (H3, $2 \times 2$ mixed design) at 80% probability and $\alpha = .05$, a sample size of $N = 76$ was required. Eighty-six completed questionnaires were collected online. Five participants were not considered as one lived abroad, three were minors, and one did not answer all the questions. This resulted in 81 usable questionnaires: 42 in the “Quocca Attachment” condition (51.9%), 39 in the “Quolla Attachment” condition (48.1%). Participants were Italians, living in Italy, mainly young female students: 63 (77.8%) women and 16 (19.8%) men (two did not indicate their gender), mean age was 27 (median = 23, min = 18, max = 57); 57 (70.4%) participants did not have a university degree, 24 (29.6%) had at least a bachelor degree. Ten (12.4%) participants declared they had experienced a natural hazard risk situation (earthquake) requiring them to leave their home for at least a few hours.

5.4. Analyses

Cronbach’s $\alpha$ was calculated for the attachment scale; correlations between the items of the two-item measures were used as consistency indicators for the two-item measures. In order to test H1, a mixed MANOVA was run to compare scores of PA (H1a), Perceived Security (H1b), and Self-Continuity (H1c), Subjective Knowledge (H1d) and Objective Knowledge (H1e) between Evacuation Site (Quocca vs. Quolla) and between Attachment Condition (Quocca Attachment vs. Quolla Attachment).

In order to test H2, two mixed ANOVAs were run to compare scores of Risk Perception and Intention to evacuate between Evacuation Site (Quocca vs. Quolla), between Risk Level (High vs. Low) and between Attachment Condition (Quocca Attachment vs. Quolla Attachment).

5.5. Results

5.5.1. Variables’ reliability

The Place Attachment scale (Fornara et al., 2010) was found to have satisfying consistency values, both when items referred to Quocca (4 items $a = .85$) and to Quolla (4 items $a = .90$). The two-item scales presented r-values ranging between 0.56 and 0.90. The Self-Continuity scale had a correlation score of $r = 0.56$ $p < .01$ when referred to Quocca, and of $r = 0.70$ $p < .01$ when referred to Quolla. Subjective Knowledge scale had a correlation score of $r = 0.88$ $p < .01$ when referred to Quocca, and of $r = 0.90$ $p < .01$ when referred to Quolla. Perceived Security scale had a correlation score of $r = 0.65$ $p < .01$ when referred to Quocca, and of $r = 0.75$ $p < .01$ when referred to Quolla. The reliability of the eight-item risk perception scale is $\alpha = 0.91$, resulting in a satisfactory degree of reliability. The reliability of the eight-item intention to evacuate scale is good ($\alpha = 0.89$).

5.5.2. Place Attachment Manipulation check (H1)

A mixed MANOVA was conducted with one between subjects variable (Place Attachment Manipulation) and one within subjects variable (Evacuation Site) as independent variables, and Place Attachment, Self-Continuity, Perceived Security, Subjective Knowledge, and Objective Knowledge as the five dependent variables.

The multivariate tests showed a significant multivariate effect of the interaction between Place Attachment Manipulation and Site of Attachment ($\lambda = 0.37, F(5,75) = 25.23, p < .001, \eta^2 = 0.63$). The main effects of Place Attachment Manipulation ($\lambda = 0.94, F(5,75) = 0.96$ $p < .45, \eta^2 = 0.06$) and of Evacuation Site ($\lambda = 0.88, F(5,75) = 2.04$ $p < .05, \eta^2 = 0.12$), instead, were both found to be non-significant. The consequent univariate ANOVAs are reported in Table 5. As shown in Table 5, there is a significant interaction effect of Place Attachment Manipulation and Evacuation Site on Place Attachment scores and on Perceived Safety scores. In both cases, participants in the Quocca Attachment condition gave higher scores to Quocca than to Quolla, while the opposite pattern was observed for people in Quolla Attachment condition, confirming H1a and H1b.

A consistent pattern was also found for Self-Continuity scores, but only for people in Quolla Attachment condition, while people in Quocca Attachment condition reported an equal level of Self-Continuity in both sites. H1c is thus only partially confirmed.

Disconfirming H1d, the interaction is also significant on Objective Knowledge, with participants in the Quocca Attachment condition perceiving to know better Quocca than Quolla and vice versa for people in Quolla Attachment condition.

As anticipated by H1e, no effect was found on Objective Knowledge.

5.5.3. Risk perception manipulation check (H2)

Consistently with H2, the ANOVA on Risk Perception revealed a non-significant main effect of Evacuation Site ($F(1,79) = 1.85, p = .18, \eta^2 = 0.02$), a significant main effect of Risk Level ($F(1,79) = 85.10, p < .01, \eta^2 = 0.52$), and a non-significant main effect of Place Attachment Manipulation ($F(1,79) = 2.30, p = .13, \eta^2 = 0.03$) (see Fig. 3). Participants perceived significantly less risk in Low Risk
Table 5

Univariate effects of the interaction between “Place Attachment” and “Site of attachment” (ANOVAs) and contrasts of significant effects (df1 = 1, df2 = 79, Bonferroni adjustment).

<table>
<thead>
<tr>
<th>Dependent variables</th>
<th>F</th>
<th>p</th>
<th>ηp²</th>
<th>PA Manipulation</th>
<th>Quocca - Quolla Mean Difference</th>
<th>Std. Error</th>
<th>Sig.</th>
<th>Lower Bound</th>
<th>Upper Bound</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place Attachment</td>
<td>116.97</td>
<td>&lt;.001</td>
<td>.60</td>
<td>Quocca Attachment</td>
<td>-1.48</td>
<td>0.22</td>
<td>&lt;.001</td>
<td>-1.90</td>
<td>-1.05</td>
</tr>
<tr>
<td>Self-Continuity</td>
<td>8.63</td>
<td>&lt;.01</td>
<td>.09</td>
<td>Quocca Attachment</td>
<td>1.87</td>
<td>0.22</td>
<td>&lt;.001</td>
<td>1.43</td>
<td>2.32</td>
</tr>
<tr>
<td>Perceived Security</td>
<td>20.62</td>
<td>&lt;.001</td>
<td>.21</td>
<td>Quocca Attachment</td>
<td>-0.69</td>
<td>0.22</td>
<td>&lt;.01</td>
<td>-1.14</td>
<td>-0.25</td>
</tr>
<tr>
<td>Perceived Knowledge</td>
<td>25.69</td>
<td>&lt;.01</td>
<td>.25</td>
<td>Quocca Attachment</td>
<td>0.96</td>
<td>0.23</td>
<td>&lt;.01</td>
<td>-0.21</td>
<td>0.72</td>
</tr>
<tr>
<td>Real Knowledge</td>
<td>3.03</td>
<td>.09</td>
<td>.04</td>
<td>Quocca Attachment</td>
<td>0.58</td>
<td>0.20</td>
<td>&lt;.01</td>
<td>-1.25</td>
<td>-0.47</td>
</tr>
</tbody>
</table>

Fig. 3. Risk Level by Evacuation Site effect on Risk Perception. Participants report a smaller Risk Perception in Low Risk Level scenarios than in High Risk Level scenarios (F(1, 79) = 85.10, p < .01, ηp² = 0.52).

5.5.4. Effect of Place Attachment Manipulation on intention to evacuate (H3)

Consistent with the main hypothesis H3, the ANOVA on Intention to Evacuate revealed a significant interaction effect of Attachment Condition and Evacuation Site (F(1,79) = 14.87, p < .01, ηp² = 0.16) (see Fig. 4). Participants in the Quocca Attachment condition showed a stronger Intention to Evacuate when the evacuation site was Quocca (M = 3.93 SE = 0.15) compared to Quocca (M = 3.49 SE = 0.16; F(1,79) = 10.35 p < .01, ηp² = 0.12). Participants in the Quocca Attachment condition, instead, were significantly more likely to intend to evacuate to the evacuation site Quocca (M = 3.60 SE = 0.17) rather than to Quocca (M = 3.28 SE = 0.16; F(1,79) = 5.09 p < .05, ηp² = 0.06).

Main effects of both Evacuation Site (F(1, 79) = 0.37, p = .55, ηp² = 0.01), and Attachment Condition (F(1, 79) = 1.72, p = .19, ηp² = 0.02) were not found to be significant. A significant main effect of Risk Level was found (F(1, 79) = 40.96, p < .01, ηp² = 0.34), confirming that Risk Level affects Intention to evacuate: participants have significantly lower intention to evacuate in Low Risk scenarios (M = 2.94 SE = 0.12) than in High Risk scenarios (M = 3.91 SE = 0.10).

No significant interactions involving Risk Level were found, indicating that the effect of Place Attachment Manipulation was independent from Risk Level: interaction effect of Attachment Condition and Risk Level (F(1, 79) = 0.17, p = .68, ηp² = 0.00), interaction effect of Risk Level and Evacuation Site (F(1, 79) = 0.41, p = .52, ηp² = 0.01), interaction effect of Attachment Condition, Evacuation Site and Risk Level (F(1, 79) = 0.41, p = .52, ηp² = 0.01).

5.6. Discussion

This study aimed at investigating whether Place Attachment Manipulation affects Intention to Evacuate in virtual natural risk scenarios.

Consistently with the hypotheses, Place Attachment Manipulation was found to bring participants to feel more attached (H1a) and safer (H1b), and to experience a stronger Self-Continuity (H1c; although only for participants in Quocca Attachment condition) in their site of attachment (vs. non-attachment). This also corroborates the idea that Perceived Safety and Self-Continuity might be relevant in bonding toward evacuation sites (consistently with Chen & Šegota, 2015; Farnum et al., 2005).

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a) Beside the hypothesis, the ANOVA on Risk Perception also revealed the following effects: Place Attachment Manipulation x Evacuation Site x Risk Level (F(1, 79) = 1.08, p = .30, ηp² = 0.01); Place Attachment Manipulation x Evacuation Site (F(1, 79) = 0.05, p = .82, ηp² = 0.00); Place Attachment Manipulation x Risk Level (F(1, 79) = 0.41, p = .52, ηp² = 0.01); Risk Level x Evacuation Site (F(1, 79) = 14.54, p < .01, ηp² = 0.16); Place Attachment Manipulation x Evacuation Site x Risk Level (F(1, 79) = 0.10, p = 0.30, ηp² = 0.16). In the Low Risk condition, Risk Perception was higher in Quocca (M = 3.05 SE = 0.11) than in Quocca (M = 2.82 SE = 0.12) (F(1,79) = 8.71 p < .01, ηp² = 0.10). In the High Risk condition no difference between Quocca (M = 3.82 SE = 0.11) and Quocca (M = 3.78 SE = 0.11) was found to be significant (F(1,79) = 0.26 p = .61, ηp² = 0.00).
Contrary to H1d, manipulation also affected Subjective Knowledge, while, consistently with H1e, Objective Knowledge was not affected by manipulation. This suggests that, even when the real knowledge is the same, PA manipulation affects the cognitive consideration of the site too, consistent with Scannell and Gifford (2010): thus, place bonding also involves associating knowledge, beliefs and schemas to significant places. Moreover, the relevance of perceived knowledge and of self-continuity could highlight the importance of familiarity in the process of PA (Fullilove, 1996). As for the effect of manipulation on Intention to evacuate (H3), results confirm the hypothesis, with participants intending to evacuate more to a certain site when they are attached to that site.

Risk Perception manipulation showed that people have a higher level of risk perception and of evacuation intention when the risk is higher (H2); it is PA manipulation, instead, that affects the site choice, consistently with friends’ and family places being often the most common evacuation destination shelters (Lindell, Kang, & Prater, 2011; Whitehead, 2003).

This study presents specific limits, especially concerning the small and convenience sample. In addition, although manipulation task version is less explicit than the one employed in Study 2, some sentences of the manipulation (especially those referring to the willingness to maintain or not closeness with the site) might have influenced participants’ answers. The significant effect of the interaction of Risk Level and Evacuation Site on Risk Perception suggests that, although the two sites’ presentations were meant to be equivalent, Quooca and Quolla could still be perceived as different, possibly due to their functional features or presentation order.

In sum, this study presents an improved version of the Place Attachment Manipulation; results are consistent with the literature and the hypotheses, as well as with the main results of Study 2, highlighting that PA might particularly affect the choice of the evacuation destination, here measured in a continuous way.

6. General discussion

Study 1 provided correlation evidence that evacuation site PA could positively affect risk coping behaviors in risky environments and can thus help to explain it.

Study 2 tried to investigate evacuation site PA in a more controlled setting, employing a newly created PA manipulation procedure. Results show that the manipulation consistently affects both PA and self-continuity, but not perceived safety, leaving the definition of the boundaries of the effect of the manipulation open. The manipulation was found to lead participants, when given the chance to choose between two evacuation sites, to rather choose the one they are attached to (vs. the one they are not attached to), consistent with tourism psychology findings about PA and destination choice (Prayag, Hosany, & Odeh, 2013).

Study 3 employed an improved version of the manipulation task, finding that the manipulation affected PA, perceived safety, self-continuity (consistently with Chen & Segota, 2015; Farnum et al., 2005), and perceived knowledge, but not real knowledge, highlighting the cognitive facet of PA (Scannell & Gifford, 2010). The third study also allowed continuous measure of the intention to evacuate, finding that participants were more willing to evacuate towards their evacuation site of attachment (vs. an affectively non-significant evacuation site).

6.1. Place attachment to the evacuation site: the other side of the evacuation process

Overall, the three studies suggest that evacuation site PA could help to explain people’s behavioral choices when facing a natural hazard risk, especially influencing their destination choice. A positive affective relationship to evacuation sites (love) could ease evacuation (leave) and thus increase survival rates (live). This is both consistent with findings about people tending to evacuate to places of affective relevance, but also with tourism psychology, where PA is found to affect the destination choice (Prayag et al., 2013; Wu et al., 2012). Since literature reports that home PA sometimes has a negative effect instead, it could be interesting to investigate how a positive affective relationship with the evacuation site interacts with the affective relationship that people have to their home. Future studies should also consider non-positive links between individuals and places, both in home PA and towards evacuation sites (e.g., Demuth et al., 2016). In addition, as home PA in risk situations can be considered somehow psychologically similar to interpersonal attachment in violent relationships (Bonaiuto et al., 2016), it could be useful to investigate whether different home PA styles exist and on their role in risky situations. In fact, the existence of different styles of attachment is one of the most well known features of interpersonal attachment, and many studies deal with different attachment styles affecting more or less functional relationships (e.g., Sloter & Finkel, 2009).

However, this aspect has only been preliminary investigated by environmental psychologists (Scrima, 2015; Scrima, Rioux, & Di Stefano, 2017).

Other variables that are known to affect evacuation behavior have only marginally been investigated by this study. For instance, literature sometimes reports relevant differences in the relationship between risk perception, risk coping, and home PA (Peng, Lin, Liu, & Xu, 2017; Xu et al., 2017, 2018). As this research has focused on two abstract risk levels (15% and 50%), further studies should explore the role of different risk levels, types, and perception on evacuation behavior and PA.

6.2. A new place attachment manipulation

From a methodological level, these studies present one of the first PA manipulation tasks. Compared to Scannell and Gifford’s (2016) technique, this technique allows manipulating PA to a place chosen by the experimenter. However, the manipulation could be significantly improved, as the manipulation scenario is possibly too explicit and it could influence participants’ following answers, due to demand characteristics (Orne, 1959, 1962; Orne, Whitehouse, & Kazdin, 2000). Making the evacuation site scenario description more articulated (as in Study 3) possibly reduced this issue, but less explicit versions of the manipulation should be tested. Employing scenarios that are more realistic would ease participants’ cognitive effort and provide a stronger ecological validity.

The actual psychological phenomenon behind the adopted manipulation can also be questioned. Instead of creating a new bond with a place, PA manipulation primed a general attachment frame primed and associated it to the evacuation site, similarly to Mikulincer’s interpersonal attachment procedures. Further research is required to disentangle among alternative explanations of the causal processes and make the manipulation place-specific but less explicit. Alternatively, interpersonal attachment literature already features many examples of implicit manipulations (e.g., Mikulincer et al., 2011), that could possibly be adapted to place attachment. Future directions of this line of research could even investigate the cognitive nature and antecedents of approach/avoidance (e.g., Briesemeister, Tamm, Heine, & Jacobs, 2013).

As a general note, the idea of experimentally manipulating PA can be questioned, especially since PA is known to be created through time (Lewicka, 2011). However, the very recent study by Reese et al. (2019) already presents a manipulation of PA involving a non-existing place.
6.3. Applications and conclusion

In order to assess and improve community resilience, policy makers sometimes rely on mathematical models simulating the behavioral response of inhabitants of a specific area. Nowadays, most models consider behavioral predictors and some try to account for social interactions too (e.g., Liu, Murray-Tuite, & Schweitzer, 2013; Sime, 1983). However, few studies consider the role of people's relationship with their places, and generally only in terms of knowledge (Chu, Parigi, Law, & Latombe, 2014). Thus, simulation studies could take advantage of PA literature. Overall, risk managers should consider evacuation areas not only as the end point of the evacuation procedure, but rather as places that should be meaningful and affectively important to people.

In conclusion, on a theoretical ground, the present research can be considered useful – although preliminary – for two different yet interconnected lines of research: PA manipulation, which could facilitate a more analytic study of place attachment; and the relevance of the affective relationship with evacuation sites, which could improve people's reactions within natural hazard contexts (Scannell et al., 2016, 2017; Vázquez, 2016). This research is therefore a first step along these research venues, calling for future research and for further investigation.

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CRediT authorship contribution statement

S. Aricció: Formal analysis, Investigation, Methodology, Software, Writing - original draft, Investigation, Visualization. I. Petruccelli: Data curation, Investigation. U. Ganucci Cancellieri: Data curation, Investigation, Writing - review & editing. C. Quintana: Data curation, Investigation. P. Villagra: Funding acquisition, Project administration, Resources, Writing - review & editing. M. Bonaitu: Funding acquisition, Methodology, Project administration, Resources, Supervision, Writing - review & editing, Validation.

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Data was collected in accordance with the local institutional ethical committee policies and in accordance to international psychology associations’ ethical standards.

All authors state that they have no competing interests to declare. SPSS databases and syntax files are available upon request.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2020.101431.

Appendices

A. Study 1

A.1. Intention to Evacuate Please, indicate how you will perform the following actions. In case of tsunami, please consider “evacuate” as leaving your home or the place you are in to go to a safer place.

<table>
<thead>
<tr>
<th>Action</th>
<th>Very unlikely</th>
<th>Very likely</th>
</tr>
</thead>
<tbody>
<tr>
<td>Next time public officials will recommend an evacuation because of the threat of a tsunami, I intend to evacuate</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>Next time I will receive a tsunami alert, I think I will not evacuate</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>During the next tsunami alert, I will try to follow the evacuation procedures</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>I will try to evacuate next time I understand that a tsunami is coming</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>I think I will not evacuate next time I receive a tsunami evacuation order</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
</tbody>
</table>

A.2. - Objective Knowledge For each of the following statements, please indicate if you consider it to be true (T) or false (F). In you do not know if the statement is true or false, choose the “I do not know” option.

<table>
<thead>
<tr>
<th>Statement</th>
<th>T</th>
<th>F</th>
<th>I do not know</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normally, the first tsunami wave arrives 60 min after the earthquake.</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>If the earthquake is so strong you cannot stand still, a tsunami may happen</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>No matter the strength of the earthquake, you should wait for the official alarm before beginning the evacuation</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>The evacuation should be rather done walking</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>The official tsunami alarm is normally diffused through a phone call</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>In order to get informed during the emergency, you may use a portable radio</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>The tsunami safe zone is 15 m above mean sea level</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
<tr>
<td>In order to communicate during the evacuation you should rather use texts and social networks</td>
<td>T</td>
<td>F</td>
<td>I do not know</td>
</tr>
</tbody>
</table>

Study 1 was conducted in Chile, thus the questionnaire was in Spanish. Original Spanish questionnaire is available upon request.
A.3. - Subjective Knowledge  Please, indicate how much each of the following statements is true or untrue for you.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Very untrue</th>
<th>Very true</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am knowledgeable about tsunami risk.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>I have a good knowledge on how to deal with a tsunami.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>I am not well informed about the tsunami risk in my area.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>I do not know specifically what to do during a tsunami in my area.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
</tbody>
</table>

A.4. - Evacuation Site Place Attachment  What is your relationship with your tsunami evacuation place?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly disagree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>This evacuation place is part of me.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>It would be very hard for me to leave this evacuation place.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>This is the ideal evacuation place for me.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
<tr>
<td>I do not feel integrated in this evacuation place.</td>
<td>1</td>
<td>2 3 4 5</td>
</tr>
</tbody>
</table>

A.5. - Raw descriptive of all the aggregated variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Min</th>
<th>Max</th>
<th>M</th>
<th>SD</th>
<th>Asymmetry</th>
<th>Asymmetry SE</th>
<th>Kurtosis</th>
<th>Kurtosis SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intention</td>
<td>1</td>
<td>5</td>
<td>4.65</td>
<td>0.63</td>
<td>-2.38</td>
<td>0.18</td>
<td>7.05</td>
<td>0.37</td>
</tr>
<tr>
<td>Risk Perception</td>
<td>1</td>
<td>5</td>
<td>4.17</td>
<td>1.29</td>
<td>-1.46</td>
<td>0.18</td>
<td>0.76</td>
<td>0.37</td>
</tr>
<tr>
<td>Past Evacuation Experience</td>
<td>0</td>
<td>7</td>
<td>3.63</td>
<td>2.06</td>
<td>-0.03</td>
<td>0.18</td>
<td>-0.90</td>
<td>0.37</td>
</tr>
<tr>
<td>Subjective Knowledge</td>
<td>1.75</td>
<td>5</td>
<td>4.63</td>
<td>0.72</td>
<td>-2.29</td>
<td>0.18</td>
<td>4.76</td>
<td>0.37</td>
</tr>
<tr>
<td>Objective Knowledge</td>
<td>3</td>
<td>13</td>
<td>9.21</td>
<td>1.92</td>
<td>-0.37</td>
<td>0.18</td>
<td>0.25</td>
<td>0.37</td>
</tr>
<tr>
<td>Home Place Attachment</td>
<td>1</td>
<td>5</td>
<td>4.52</td>
<td>0.80</td>
<td>-1.93</td>
<td>0.18</td>
<td>3.54</td>
<td>0.37</td>
</tr>
<tr>
<td>Evacuation Site Place Attachment</td>
<td>1</td>
<td>5</td>
<td>4.17</td>
<td>1.02</td>
<td>-1.05</td>
<td>0.18</td>
<td>0.14</td>
<td>0.37</td>
</tr>
</tbody>
</table>

B. Study 2

B.1. - The manipulation task

The following text was common for participants in both conditions: “You recently moved to a region you had never been before. Spending some time in this region, you met Quokka, a place within this region. The region is affected by various environmental risks (wildfires, tsunamis, floods, hurricanes). Alarm for these risks generally arises about 15 min before the possible hazard's impact. The recommended behavior is, at the alarm, to evacuate to Quokka, which is a safe evacuation site for all these risks. Generally stays at Quokka last a few days at most.”

The second part of the text was different according to the condition.

- The text for the Quokka Attachment condition was the following:
  “The evacuation site Quokka is now part of you; it is an ideal place for you and you feel part of it. You have a lot in common with Quokka, its lifestyle and the people who are there. It would be very hard for you to leave Quokka; you would prefer to stay close to it.”

- The text for the Quokka Non-Attachment condition was the following:
  “The evacuation site Quokka is part of the region you are in; it's a place like any other and you feel detached from it. Quokka, its lifestyle and people who are there leave you indifferent. You could easily leave Quokka; you would even prefer to stay elsewhere.”

B.2. - The evacuation site choice scenario task

Here below you will find some environmental risk situations. Each time, you will be at a specific distance from the two evacuation sites, Quokka and Quolla. Every time, indicate to which evacuation site you would prefer to evacuate. Because of a wildfire, the forest where you are doing an excursion is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

- Quokka (2500 m far)
- Quolla (2200 m far)

Because of a wildfire, the forest where you are doing an excursion is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

- Quokka (1500 m far)
- Quolla (1800 m far)

Because of a wildfire, the forest where you are doing an excursion is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

- Quokka (1200 m far)
- Quolla (a 1200 m far)

Because of a flood, the village you are visiting is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

\[^{10}\] Study 2 was conducted on an Italian sample, the original Italian items and texts are available upon request.
• Quokka (1800 m far)
• Quolla (1500 m far)

Because of a flood, the village you are visiting is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (2100 m far)
• Quolla (2400 m far)

Because of a flood, the village you are visiting is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (700 m far)
• Quolla (700 m far)

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (2400 m far)
• Quolla (2100 m far)

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (1200 m far)
• Quolla (1600 m far)

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (1500 m far)
• Quolla (1500 m far)

Because of a hurricane, the camping where you are staying overnight is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (1600 m far)
• Quolla (1200 m far)

Because of a hurricane, the camping where you are staying overnight is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (1300 m far)
• Quolla (1700 m far)

Because of a hurricane, the camping where you are staying overnight is evacuated and you are invited to go, by walking, to one of the following evacuation sites: Quokka and Quolla. To which evacuation site do you evacuate?

• Quokka (1800 m far)

C. Study 3

C.1. - The manipulation task

Quokka presentation for participants in Quocca Attachment condition was the following: “Quocca was equipped as an evacuation site two years ago, according to state-of-the-art security standards. The way to Quocca is indicated by green signs and does not present architectural barriers. Quocca always has a stock of drinkable water and freeze-dried food that should be sufficient for a 3-day stay for 500 people, the number of people Quocca can host during an emergency. There are two diesel generators and five solar panels. These, besides lighting, guarantee the functioning of twenty transceivers and a cellular repeater. Forty first-aid kits and five chemical toilets are also available. Quocca is now part of you; it is an ideal and important place for you. You have a lot in common with Quocca, you identify with it and with its lifestyle and the people who are there. Evacuating to Quocca for you is more important and more satisfying than evacuating to any other evacuation site. You would not replace Quocca with any other evacuation site.”

Quokka presentation for participants in Quolla Attachment condition was the following: “Quokka was equipped as an evacuation site two years ago, according to state of the art security standards. The way to Quokka is indicated by green signs and does not present architectural barriers. Quokka always has a stock of drinkable water and freeze-dried food that should be sufficient for a 3-days stay of 500 people, the number of people Quocca can host during an emergency. There are two diesel generators and five solar panels. These, besides lighting, guarantee the functioning of twenty transceivers and a cellular repeater. Forty-first first aid kits and five chemical toilets are also available. Quokka is part of the region you are in; it is a place like any other for you, of small importance. Quokka is a place you feel is different from you, with which you share few things. For you it is irrelevant to evacuate to Quokka rather than to any other evacuation site, it is equally satisfying. You could easily leave Quocca; you would even prefer to stay elsewhere.”

Quokka presentation for participants in Quokka Attachment condition was the following: “The way to Quokka is indicated by orange signs and does not present architectural barriers. There are two gasoline generators and five wind turbine blades. These, besides lighting, guarantee the functioning of twenty-five transceivers and a cellular repeater. Thirty-five first aid kits and five dry toilets are also available. Quokka always presents a stock of drinkable water and canned food that should be sufficient for a 3-days stay of 500 people, the number of people Quokka can host during an emergency. Quokka was equipped as an evacuation site two years ago, according to state of the art security standards. Quokka is part of the region you are in; it is a place like any other for you, of small importance. Quokka is a place you feel different from you, with which you share few things. For you it is irrelevant to evacuate to Quokka rather than to any other evacuation site, it is equally satisfying. You could easily leave Quokka; you would even prefer to stay elsewhere.”

Quokka presentation for participants in Quokka Attachment condition was the following: “The way to Quokka is indicated by orange signs and does not present architectural barriers. There are two gasoline generators and five wind turbine blades. These, besides lighting, guarantee the functioning of twenty-five transceivers and a cellular repeater. Thirty-five first aid kits and five dry toilets are also available. Quokka always presents a stock of drinkable water and canned food that should be sufficient for a 3-days stay of 500 people, the number of people Quokka can
host during an emergency. Quolla was equipped as an evacuation site two years ago, according to state of the art security standards. Quocca is now part of you; it is an ideal and important place for you. You have a lot in common with Quolla, you identify with it and with its lifestyle and the people who are there. Evacuating to Quocca for you is more important and more satisfying than evacuating to any other evacuation site. You would not replace Quocca with any other evacuation site.”

C.2. - The Objective Knowledge items

The Objective Knowledge items for Quocca were the following. (V) and (F) indicate the correct answer for each statement. Please, indicate if each of the following statements about Quocca is true (T) or false (F).

<table>
<thead>
<tr>
<th>Statement</th>
<th>True (V)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Quocca there are 2 diesel generators</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>In Quocca there are 5 solar panels</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>In Quocca there are 5 chemical toilets available</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>Quocca was built 5 years ago</td>
<td>F</td>
<td>V</td>
</tr>
<tr>
<td>Quocca is lit by LED lighting</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>Quocca is equipped by 10 satellite phones available</td>
<td>F</td>
<td>V</td>
</tr>
</tbody>
</table>

The Objective Knowledge items for Quolla were the following. (V) and (F) indicate the correct answer for each statement. Please, indicate if each of the following statements about Quocca is true (T) or false (F).

<table>
<thead>
<tr>
<th>Statement</th>
<th>True (V)</th>
<th>False (F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>In Quolla is equipped with 35 first-aid kits</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>In Quolla there are 5 wind turbine blades</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>In Quolla there is enough canned food for 3 days</td>
<td>V</td>
<td>F</td>
</tr>
<tr>
<td>In Quolla there are 10 dry toilets available</td>
<td>F</td>
<td>V</td>
</tr>
<tr>
<td>In Quolla there are 2 diesel generators</td>
<td>F</td>
<td>V</td>
</tr>
<tr>
<td>Quolla is equipped with hot water</td>
<td>V</td>
<td>F</td>
</tr>
</tbody>
</table>

C.3. - The risk perception and intention to evacuate scenario task

The region you are in is affected by various environmental risks. Here below you will find some environmental risk situations. Each time, risk of the environmental event to happen will be different. Every time you will be able to choose if leave the place you are in and evacuate to either Quocca or Quolla. Every time, indicate your risk perception and your intention to go to Quocca or Quolla. 1 = Not at all, 2 = A little, 3 = Enough, 4 = A lot, 5 = Completely. Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go to Quocca. The probability of the tsunami to reach the place where you are now is 50%. Please indicate how you feel and what you intend to do now.

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go to Quocca. The probability of the tsunami to reach the place where you are now is 50%. Please indicate how you feel and what you intend to do now.

How much do you feel you are in a risky situation? 1 2 3 ,
How much do you intend to leave the place you are in to evacuate to Quocca? 1 2 3 ,

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go to Quocca. The probability of the tsunami to reach the place where you are now is 15%. Please indicate how you feel and what you intend to do now.

How much do you feel you are in a risky situation? 1 2 3 ,
How much to you intend to leave the place you are in to evacuate to Quocca? 1 2 3 ,

Because of a hurricane, the camping where you are staying overnight is evacuated and you are invited to go to Quocca. The probability of the hurricane to reach the place where you are now is 15%. Please indicate how you feel and what you intend to do now.

How much do you feel you are in a risky situation? 1 2 3 ,
How much to you intend to leave the place you are in to evacuate to Quocca? 1 2 3 ,

Because of a hurricane, the camping where you are staying overnight is evacuated and you are invited to go to Quocca. The probability of the hurricane to reach the place where you are now is 50%. Please indicate how you feel and what you intend to do now.

How much do you feel you are in a risky situation? 1 2 3 ,
How much to you intend to leave the place you are in to evacuate to Quocca? 1 2 3 ,

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go to Quocca. The probability of the tsunami to reach the place where you are now is 50%. Please indicate how you feel and what you intend to do now.

How much do you feel you are in a risky situation? 1 2 3 ,
How much do you intend to leave the place you are in to evacuate to Quocca? 1 2 3 ,

Because of a tsunami, the beach where you are spending the day is evacuated and you are invited to go to Quocca. The probability of the tsunami to reach the place where you are now is 15%. Please indicate how you feel and what you intend to do now.

How much do you feel you are in a risky situation? 1 2 3 ,
How much to you intend to leave the place you are in to evacuate to Quocca? 1 2 3 ,