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Study of the links between emotional regulation strategies and sense of place in the expression of symptoms of post-traumatic stress disorder in flood victims.

Puechlong Cécile [a], Charbonnier Elodie [a, b], Weiss Karine [a]

[a]UNIV. NIMES, EA 7352 CHROME, F-30021 Nîmes Cedex 1, France

[b]UNIV. NIMES, EA 7352 CHROME/ APSY-V, F-30021 Nîmes Cedex 1, France

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***Corresponding author:**

Puechlong Cécile

Adress: Université de Nîmes,

Rue du Docteur Georges Salan,

30000 Nimes

Mail: Cecile.puechlong@gmail.com

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Abstract

Many risk factors for PTSD have been identified in flood victims. Yet, some have been under-explored, like cognitive coping, which has been identified as a risk factor for PTSD for other traumatic events. Moreover, while flooding can affect places that are important to individuals (e.g. their home and neighbourhood), the role of sense of place in PTSD has been neglected. The objective of this research is to investigate the potential role of under-explored individual and situational risk factors in PTSD in flood victims. To this end, the following variables were measured in 79 French flood victims: sense of place (with *sense of place scale*), cognitive coping (with CERQ), and PTSD (with PCL-5). Results showed that the more individuals use inappropriate cognitive emotional regulation strategies, the more attached they are to their home and city, and the higher their PTSD scores. These results can help to target vulnerable people and improve care.

Keywords: Flood; post-traumatic stress disorder; cognitive coping, sense of place.

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1. Introduction

1.1 Floods and post-traumatic stress disorder

Floods, which are the most frequent natural hazards in the world (Gisclard, 2017), are traumatic events that can generate psychological sequelae such as PTSD which is the most

common (Chen and Liu, 2015). According to the fifth edition of Diagnostic and Statistical Manual of Mental Disorders (DSM-5), PTSD develops after direct or indirect exposure to traumatic events. It consists of four categories of symptoms : (1) intrusive symptoms which correspond to frequently relive the traumatic event (e.g., flash-backs or nightmares) (2) Avoidance symptoms which correspond to repeated efforts to avoid everything that could remind the traumatic event (e.g., smells, sounds, places), (3) Negative alterations in cognition and mood, which are a group of symptoms that have an impact on individuals' beliefs, thoughts and emotions (e.g., the inability to feel positive emotions); (4) negative alterations of mood which correspond to persistent negative emotional state (e.g., fear, anger, guilt), and by alterations in arousal and reactivity (e.g., sleep disturbance, hypervigilance, impulsiveness). PTSD is a disabling and chronic disorder (Dai et al., 2017a), with numerous co-morbidities (Molenda, 2009).

The literature has identified various risk and protective factors for PTSD (for a meta-analysis, see Brewin et al., 2000). Risk factors include all dimensions that increase the probability that exposure to an event lead to the emergence of PTSD (Bruchon-Schweitzer, 2001; OMS, 2020). Conversely, protective factors are all the elements that reduce the likelihood that exposure to an event lead to the development of PTSD (Bruchon-Schweitzer, 2001). In the specific context of floods, some studies have focused on the risk and protective factors of PTSD in flood victims (for a literature review, see Puechlong et al., 2020a). These studies highlight the central role of the individual factors of flood victims, such as personality traits or coping strategies (Bei et al., 2013; Chen et al., 2015; Eriega et al., 2014), as well as social factors, such as social network or social support (Chen et al., 2015; Dar et al., 2017; Feng et al., 2007). In addition, the importance of situational factors is also noted, which includes flood characteristics, such as the type or speed of the flood (Feng et al., 2007; Liu et al., 2006), as well as links

between the individual and the flood, such as proximity to the flood or injuries (Fontalba-Navas et al., 207; Seyedin et al., 2017).

1.2. Individual and social risk factors of post-traumatic stress disorder after flood

In terms of social risk factors, research has focused on the role of social support, which is defined as behaviours that directly or indirectly show an individual that they are valued and can rely on the support of others (Barnes and Duck, 1994). The role of social support has already been studied in other types of traumatic events (see meta-analysis by Ozer et al., 2003), and in flood victims (Chen et al., 2015; Dai et al., 2016a; Dai et al., 2016b). Overall, low social support is a risk factor for PTSD (Chen et al., 2015; Dai, et al., 2016a) and people with low support have more severe symptoms (Dai et al., 2017b; Dai, et al., 2016a; Feng et al., 2007) or more chronic symptoms (Chen et al., 2015; Dai et al., 2016b).

In terms of individual risk factors for PTSD following flooding, the following factors have been identified: being female (Chen et al., 2015; Chung et al, 2017), low income (Verger et al. 2000), high level of neuroticism (Chen et al, 2015; Eriega et al., 2014), a psychiatric history (Verger et al., 2000), and coping strategies like emotion-focused, emotion suppression, or avoidance coping (Chung et al., 2014; Dai et al., 2016a; Dai et al., 2016b; Mason et al., 2010). Only one study has exalinated the links between PTSD and “cognitive coping” after flood (Puechlong et al., 2020b). Cognitive coping is the cognitive way of managing the intake of emotionally arousing stimuli (Garnefski et al., 2001), and it focuses on reducing negative affect in response to stressful situations. There are nine cognitive emotional regulation strategies (CERS), including (1) four maladaptive strategies (i.e., strategies whose overuse can lead to the development of psychological disorders in the long run) such as "self-blame", which consists of taking responsibility for an event; "blaming others" which involve assigning responsibility to

others; "rumination" which involves constantly thinking about the emotions and feelings associated with the negative event; and "catastrophizing" which involves having thoughts that amplify the terrifying aspects of the negative event; and (2) five adaptative strategies (i.e., those that are protective in the development of psychological disorders), such as "acceptance", which refers to thoughts of acceptance and resignation in the face of a negative event; "positive refocusing", which involves finding positive sides to a situation; " perspective-taking", which compares the event to more difficult past events; "positive refocusing", which focuses on pleasant past experiences; and "planning refocusing", which focuses on what can be done to manage the event. Catastrophizing, rumination and blaming others are positively associated with PTSD symptoms (Amone-P'Olak et al., 2007; Baschnagel et al., 2009; Carty et al., 2011; Gil and Caspi, 2006; Morgan et al., 1995), while perspective-taking, positive reappraisal and acceptance are negatively related to PTSD symptoms (Thompson and Waltz, 2010; Vujanovic et al., 2009; Wisco et al., 2013). In the development of PTSD symptoms after a flood, one study (Puechlong et al., 2020b) has shown that (1) catastrophizing and rumination strategies are linked to PTSD symptoms, while perspective-taking and positive reappraisal are negatively related; (2) high levels of catastrophizing were major risk factors for PTSD (3) perspective-taking moderated the influence of neuroticism as a risk factor.

1.3 Situational risk factors of post-traumatic stress disorder after flood

The situational factors of post-flood PTSD include both characteristics of the flood, and the relationships between the individual and the flood. More specifically, it has been highlighted that individuals most likely to develop PTSD are those who experienced flash floods (Feng et al., 2007; Liu et al., 2006), those who have been directly exposed to the flood (Seyedin et al., 2017), or those who have experienced multiple stressors (Chen and Liu, 2015; Hu et al., 2015). However, in the context of PTSD, the role of the individual's relationship to his or her

environment, and specifically to the flooded area, has been much less explored, while it has been shown that flooding can impact sense of place, feeling of safety, attachment to home and neighborhood (Tapsell and Tunstall, 2008). This is particularly important to consider this factor since sense of place is a driver of housing recovery after disaster (Nejat and al., 2019; Scannell et al., 2016).

A few studies have highlighted the role of attachment to one's home on the psychological suffering of disaster victims. For example, among adolescent tsunami victims, the number of days moving away from home is positively associated to depression and PTSD symptoms (Wickrama and Kaspar, 2007). In addition, among children who were victims of fire, those whose homes were destroyed show higher levels of stress than those who did not lose their home (Felix et al., 2015). For floods, this field of research has been under-explored, although it has been shown that resilience to flood is linked to sense of place (Boon, 2014). The concept of sense of place constitutes a central process in the relationship between the individual and his environment (Bonaiuto et al., 2003). It allows to account an individual's affective links with different places, in their physical and social dimensions (Hidalgo and Hernandez, 2001). It could therefore play an important role in PTSD following a flood, although very few studies have addressed this issue.

These two dimensions reflect specific ties that refer, on the one hand, to rootedness and, on the other hand, to the social ties that develop specifically in certain places (Weiss and Rateau, 2018; Taylor et al., 1985). More specifically, sense of place is composed of two dimensions: "place attachment" and "place meaning" (Masterson et al., 2017). Place attachment corresponds to the affective bond between the individual and his/her environment. It includes "dependence on place", i.e the conative relationship between the individual and his/her environment (e.g. opportunities for the individual to achieve his/her goals in this place), and "place identity" which refers to the cognitive link between the individual and his/her environment, i.e. his/her beliefs

and thoughts about himself/herself in relation to place (Jorgensen and Stedman, 2001). The second dimension, place meaning, can refer to three types of meanings: (1) a descriptive statement of a place (e.g. what it looks like, the kinds of images it conveys; Brehm et al., 2013; Jacquet and Stedman, 2013; Manzo, 2005), (2) a symbolic or interpretive statement of a place (e.g. does this place refer to my home? Can a place stand for freedom?); (3) as place character (i.e. a given setting can be a tourist spot, or a wilderness; (Lyon, 2014; Masterson et al., 2017)." It is generally accepted that individuals with a strong place attachment tend to consider their environment as safer than those with less attachment (Billig, 2006; Weiss et al., 2006). There are cases, such as in the development of risky infrastructures, where individuals with the highest attachment to their place of residence are also those who perceive the highest level of risk (Devine-Wright and Howes, 2010; Vorkinn and Riese, 2001). Thus, it seems that the type of risk and the ability to cope with it are factors explaining these links between place attachment and risk perception (Bernardo, 2013). In any case, since place attachment is an important factor in the perception of risk, it seems relevant to consider it also in the study of PTSD vulnerability. The links between PTSD and sense of place have been under-explored in the scientific literature, although there some data suggest its existence. Indeed, it has been shown that children whose homes were destroyed in a wildfire context had higher levels of stress than children who didn't lose their home (Felix et al., 2015). Furthermore, prolonged displacement from home after a tsunami is positively related to depression and PTSD (Wickrama and Kaspar, 2007).

1.4. *Objective and hypotheses*

While the high prevalence of PTSD following floods is well established, the understanding of the factors that lead some individuals to develop symptoms following this type of event needs to be further explored. To date, the literature highlights the presence of individual and situational risk factors that may be involved in the development of PTSD symptoms following floods (see literature review of Puechlong, et al., 2020a). Based on pre-existing data, we can make two

observations: while some individual risk factors have been widely studied in the context of floods such as social support (Chen et al., 2015 ; Dai et al., 2016a ; Dai et al., 2016b; Dai et al., 2017a ; Dai et al., 2017b; Dar et al., 2018), others have been under-explored, such as cognitive coping, even though the role of coping cognitive in PTSD following other traumatic events that has been demonstrated (Chung et al., 2014; Dai et al., 2016a; Dai et al., 2016b; Mason et al., 2010). Similarly, while the importance of various situational risk factors has been widely documented for PTSD following a flood (Bei et al., 2013; Chung et al., 2014; Seyedin et al., 2017; Wind et al., 2011), the links between the individual and his/her environment have been under-explored. Based on these findings, our research proposes to investigate the potential role of under-explored individual and situational risk factors in PTSD in flood victims. Specifically, the study seeks to highlight the links between sense of place, cognitif coping and PTSD symptoms in flood victims. Consistent with previous studies, we hypothesize that maladaptive strategies are positively associated with PTSD symptoms, and that adaptive strategies are negatively associated with PTSD symptoms. In addition, we hypothesize that sense of place is positively related to PTSD scores.

2. Method

2.1.1 Sample

Our sample consisted of 79 French flood victims (including 40 women), aged 27 -94 years (M_{age} = 63.8; SD_{age} = 13.3) whose home had been flooded at least once (M_{flood} = 2.7; SD_{flood} = 1,5), between 3 and 60 years ago ($M_{years\ ago}$ = 12.2; $SD_{years\ ago}$ = 10.4). Participants were recruited from a flood victims'association in Alès, in the Occitanie Region, France. This city was chosen because it is highly exposed to flooding. Indeed, in the Alès agglomeration, nearly 88 141

inhabitants are affected by the risk of flooding (INSEE census, 2006), and Alès has been affected by several recent major floods (e.g. 2002, 2014, and 2015).

All participants gave their written informed consent before taking part in the study, on the basis of anonymity. The different measurement tools were carried out in a group setting, in the presence of a psychologist. This research was supervised within the framework of a doctoral student and supervised by teacher-researchers who guaranteed the ethics of this research and its compliance with the code of ethics for psychologists (Jacquelet and Pheulpin, 2014). Similarly, the protocol complies with the ethical recommendations of the Declaration of Helsinki.

2.1.2 Variables studied and tools used

Intensity of PTSD symptoms

PTSD symptoms were assessed using the French version (Ashbaugh et al., 2016) of the post-traumatic stress disorder Checklist-5 (PCL-5) (Weathers et al., 2013). Respondents rated 20 –item assessing the intensity of PTSD symptoms over the previous month on a Likert-like scale ranging from 0 "not at all" to 4 "extremely". It provides an overall score ranging from 0 to 80. The higher the score, the more severe the PTSD symptoms. A threshold score of 33 has been established (Ashbaugh et al., 2016).

Place attachment

It was assessed using the French adaptation (Chesterman and Lopez, 2015) of the sense of place scale (Jorgensen and Stedman, 2001). Respondents rated 7 items, assessing three dimensions of place attachment: identity (“This place reflects the kind of person I am”), dependence (“To do the things I love the most, there is no place comparable to this place”), and

place attachment (“This place is my favourite place”). In this study, response modalities ranged from 1 "strongly disagree" to 4 "strongly agree". It gives a total score (between 7 and 28) and three sub-scores (identity and dependency: between 2 and 8; emotional attachment: between 3 and 12). In addition, three different locations were tested (city, neighbourhood and home) because the floods experienced by our participants affected their home, neighbourhood and city. Moreover, the intensity of attachment differs according to place. (e.g., individuals are less attached to their neighbourhood than to their house or city; cf. Hidalgo & Hernandez, 2001). Thus, we expect attachment to these three places to play different roles in the PTSD of flood victims.

Cognitive Emotional Regulation Strategies

CERS were assessed using the French version (Jermann et al., 2006) of the "Cognitive Emotional Regulation Questionnaire" (CERQ; Garnefski et al., 2001). Respondents rated 36 items assessing four maladaptive CERS (e.g. rumination, self-blame, blaming others and catastrophizing), as well as five adapted CERS (e.g. acceptance, positive reappraisal, perspective, positive centering and action centering) on a Likert scale ranging from 1 "almost never" to 5 "always".

2.1.3 Statistical analysis

First, correlational analyses were performed between our different variables of interest (CERS, sense of place and intensity of symptoms of PTSD). Second, stepwise linear regression analyses were performed, including all variables correlated with PTSD symptoms to determine the most relevant risk and protective factors. Finally, mediation analyses were performed to clarify links between CERS, sense of place and PTSD, using the non-parametric bootstrap resampling method of Preacher and Hayes (2008). The analyses were conducted using SPSS software (version 24.0; IBM Inc., Chicago, IL, USA).

3. Results

The means and standard deviations of our interest variables are presented in Table A. This table shows that the score for sense of place related to the home is higher than the score for sense of place related to the city or neighbourhood.

TABLE A

Regarding PTSD, 17.7% of our participants have a PCL-5 score above the threshold score (33) indicating the probable presence of this disorder. The PTSD score is positively correlated with maladaptive CERS (rumination, catastrophizing, and blaming others), but not with adaptative CERS. It is also positively correlated with sense of place related to the city and home, with the place dependence and place attachment subscales, and with the same subscales for neighbourhood (see Table A). In other words, the more individuals report using maladaptive CERS and being attached to their home and city, the higher their PTSD scores.

TABLE B

In order to better identify the variables involved in the PTSD score of the disaster victims, a stepwise linear regression analysis was performed, including all variables significantly correlated with PTSD symptoms (see Table B). The first set of stepwise regression analysis conducted on PTSD showed that only catastrophizing was a significant predictor ($\beta = 0.55$) (see Model 1, Table C). In the Model 1, other CERS and sense of place were not significant predictors. The percentage of explained variance by catastrophizing was 30 %, highlighting the crucial role of this cognitive strategy in the intensity of PTSD symptoms. The second set of

stepwise regression analysis included two predictors which explain 31% of the variance of PTSD: catastrophizing ($\beta = 0.50$) and attachment to home ($\beta = 0.21$) (see Model 2, Table C). In this model, other CERS and other subscales of sense of place are not significant predictors.

TABLE C

In addition, a mediation analysis was conducted to see if the catastrophizing was mediating the link between attachment to home and PTSD. Our results indicate partial mediation. Attachment to home had a significant and positive effect on catastrophizing ($a = .43$, $t(76) = 2.14$, $p = .035$). In addition, when controlling attachment to home, the effect of the " catastrophizing " mediator had a significant and positive effect on PTSD ($b = 2.25$, $t(75) = 5.25$, $p < .05$). Finally, when controlling the effect of the " catastrophizing" mediator, the direct effect of attachment to the city on PTSD is significant and positive ($c = 1.65$, $t(75) = 2.15$, $p < 0.05$).

FIGURE A

3. Discussion

The aim of this study was to explore the role of CERS and sense of place in the intensity of PTSD symptoms in people affected by one or more floods. To our knowledge, this is the first study to measure these three dimensions jointly, and more specifically in the context of floods. Our results indicate that almost 18% developed PTSD as a result of these events. These rates are consistent with the data highlighted by the meta-analysis of Chen and Liu (2015), and confirm the highly traumatic nature of these disasters (Fontalba-Navas et al., 2017).

3.1 Role of cognitive coping on post-traumatic stress-disorder

First, our results indicate that the preferential use of maladaptive strategies such as rumination, catastrophizing and blaming others is positively related to PTSD. These data are consistent with studies indicating that these strategies are a risk factor for the development of PTSD in other traumatic events (Amone-P'Olak et al., 2007; Ehring et al., 2008). More specifically, catastrophizing appears to be a good predictor of PTSD. This can be explained by the fact that individuals who have developed PTSD feel continuously in danger (Clark and Ehlers, 2000), and the privileged use of catastrophizing leads them to focus only on the most negative aspects of an event and to always imagine the worst-case scenarios, thus increasing this constant feeling of danger. This constant feeling of danger increases hypervigilance, hyper-reactivity and avoidance, and thus maintains PTSD. Indeed, Clark and Ehlers (2000) state that an excessively negative evaluation of a traumatic event or its consequences generates a feeling of constant threat, favouring avoidance behaviours and thus reinforcing catastrophic evaluations.

Furthermore, our results show that there is no link between PTSD and adapted CERS, although the literature has shown that they may have a protective role in the development of

PTSD (Thompson and Waltz, 2010; Vujanovic et al., 2009; Wisco et al., 2013). We assume that the absence of results from our study is related to the time elapsed since the traumatic event. In fact, the most recently affected by flooding in our sample were in 2015 (i.e. 5 years ago). Those who still have PTSD symptoms have probably developed chronic PTSD. It is possible that, although protective during the development of PTSD, the preferred use of adapted CERS may not be decisive in maintaining PTSD symptoms, unlike inappropriate strategies. Indeed, adapted CERS such as perspective and positive reappraisal have been shown to promote post-traumatic growth (Garnefski et al., 2008).

3.2 Role of sense of place on post-traumatic stress disorder

Second, our analyses highlight that attachment to home is higher than attachment to the neighbourhood or city. These results are partly consistent with the literature indicating that individuals are more attached to their home than to their neighbourhood (Hidalgo & Hernandez, 2001). Furthermore, our data show that sense of place is positively associated with PTSD symptoms. To our knowledge, these data are unpublished since no research has evaluated this dimension in the context of post-flood PTSD.

To explain these results, it should be remembered that sense of place plays different roles: (1) survival and security, (2) goal attainment and self-regulation, and (3) a continuity role (Scannell and Gifford, 2010). However, during a flood, attachment sites can be severely damaged or even destroyed. We can assume that these different functions of place are altered, and imagine the consequences on the development of PTSD. The Clarks and Ehlers model refers to all three of these points. Indeed, with respect to the first function, according to Clarks and Ehlers (2000), subjects with chronic PTSD feel permanently in danger. In the event of flooding, the home itself loses its security dimension, fostering a sense of permanent threat. This hypothesis is supported by a study (Chahraoui, et al., 2003), which finds a loss of security among disaster victims two years after the flood. With regard to the second function, this model

indicates that the goals and deep aspirations of individuals with PTSD are altered. It is therefore questionable whether the degradation of the living environment of these affected individuals will not encourage this process. Finally, with regard to the last function, this model also indicates that individuals with PTSD feel that they have undergone radical changes in their personality. In the context of flooding, it can be assumed that the place,which no longer allows for a sense of self-continuity, might foster this feeling. Furthermore, regression analyses indicate that attachment to home, (i.e., the emotional connection to the home) is the only predictor of PTSD. These findings are consistent with the importance of the emotional dimension within PTSD itself.

This result is particularly interesting because sense of places plays a central role in the behavior of flood victims. More specifically, sense of place is one of the main factors predicting individuals' return to a place that has been devastated (Carpenter et al., 2013; Chamlee-Wright and Storr, 2010). Moreover, sense of place is seen as a functional mechanism among flood-affected individuals that allows them to adapt, as well as maintain their residence in their affected city (Anacio et al., 2016). These data can also be related to risk perception. Indeed, according to the literature review by Bonaiuto et al. (2016), risk perception is linked to sense of place. Some studies (Armas, 2006; Donovan et al., 2012) indicate that the more attached individuals are to a place, the less they perceive the risks of living there. In other words, their attachment drives them in potentially dangerous places (Boon et al., 2014). Conversely, others studies (Bird et al., 2011; Zhang et al., 2014) indicate that the more attached individuals are to a place, the more aware they are of the risks they face. These data illustrate that sense of place could increase the possibility of exposure to risk, and by definition, exposure to traumatic event. It could lead them to stay in dangerous places and be exposed to traumatic events.

Finally, catastrophizing has partially mediated the link between emotional attachment to home and PTSD symptoms. These data are unprecedented and show the value of crossing dimensions of several "disciplinary fields in psychology" in the context of PTSD. These results can be

related to literature about coping and sense of place in the context of natural hazard. To illustrate this idea, Silver and Greek-Martin (2015) show that sense of place has positive impact on coping, and has an influence on short and long-term recovery after a tornado. The tornado improves victims' sense of community and their willingness to contribute to the recovery process. In the same line, Zheng and colleagues (2019) have indicated that coping mediated the link between emotions experienced during the disaster and place attachment. Although place attachment is considered to be a factor promoting household resilience to extreme events (Moradi and Nejat, 2019), our results show that it is the more individual factors, such as coping, which plays a more central role in the emergence of psychological disorders, such as PTSD. These findings highlight the need to focus on CERS in the management of disaster victims who have developed PTSD symptoms. In addition, it is easier to target populations that are vulnerable to developing PTSD. For example, people who own their homes are more attached to them than renters (Brown et al., 2003; Lewicka et al., 2010). In addition, one study (Mayer et al., 2020) indicates that post-disaster relocation depends on several factors, including home ownership. Indeed, homeowners tend to prefer to carry out work rather than move after a disaster. These data suggest that it is essential to integrate cognitive-emotional regulation in the management of PTSD after a flood. Mindfulness, which is known to promote the use of appropriate emotional regulation strategies, could be integrated into the therapeutic process. One study has demonstrated the effectiveness of this therapy on emotional regulation in individuals with PTSD (Hayes and Feldman, 2004).

Limitations and perspectives

Our study has limitations that lead us to consider certain results with caution. First of all, the individuals in our sample are from a disaster association, which implies:

(1) A recruitment bias since not all the people who suffered floods in Alès are members of this association. Thus, other flood victims did not have the opportunity to participate;

(2) A bias in terms of individual profiles since we think that individuals who join disaster associations might be more psychologically impacted, than those who do not join;

(3) Finally, we know that our participants are older than the overall population of the Gard. Indeed, the average age of our sample (Mage = 63.8 years) is higher than that of the Gard (M age = 41.6 years) (Panorama du Gard - Le 3e département de la région le plus peuplé - Insee Analyses Occitanie - 8, s. d.). This can be explained by the fact that people aged 60 are the most involved in associative participation (Michaudon, 2000) ; This bias is all the more important to take into consideration that it's more difficult for older people to adapt to a new environment (Jamali and Nejat, 2016)

For future research, it would be interesting to diversify recruitment methods (associations, mutual insurance companies, hospitals, door to door), in order to have a more representative sample. All these factors reduce the generalizability of our results. So, replications need to be conducted with a more representative sample before generalising.

Secondly, there are also limitations related to the type of study. Our cross-sectional design makes the interpretation of cause-and-effect relationships complex. In addition, the retrospective aspect of our study adds a likely memory bias. In the future, longitudinal studies should be conducted to better understand the processes involved in PTSD as a result of flooding over time. Third, the links between sense of place and PTSD are promising and deserve further

investigation in future research. To this end, it would be interesting to study associations between sense of place and risk perception in the context of flood, in people with and without PTSD.

4. Conclusion

This study highlights the role of catastrophizing and sense of place in the PTSD after a flood. It also shows that catastrophizing is a partial mediator of affective attachment to home on the PTSD symptoms. These data are unprecedented and allow us to better target populations vulnerable to the development of this disorder and to propose therapeutic interventions for affected individuals.

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6. Tables and Figure

Table A: Mean and standard deviation of variables of interest

	Mean (Standard deviation)
PTSD	17.83(15.37)
Adaptive CERS	60.20(14.90)
Acceptation	10.69(3.75)
Positive refocusing	11.68(4.01)
Refocus on planning	12.94(3.77)
Positive reappraisal	11.42(4.22)
Putting into perspective	14.40(7.10)
Nonadaptive CERS	29.44(9.57)
Rumination	8.81(3.49)
Catastrophizing	8.19(3.55)
Blaming others	7.03(3.22)
Self-blame	6.39(5.4)
Sense of place (City)	17.49(6.07)
Place dependence	4.35 (2.30)
Place Identity	5.38 (1.71)
Place attachment	7.68 (3.02)
Sense of place (neighbourhood)	17.18(6.32)
Place dependence	4.56 (2.09)
Place Identity	5.19 (1.85)
Place attachment	7.42 (3.07)
Sense of place (home)	24.14(4.23)
Place dependence	6.38 (1.73)
Place Identity	7.23 (1.94)
Place attachment	10.53 (1.94)

Table B: Correlations between cognitive emotional regulation strategies, sense of place to the city, the neighbourhood and at home, and post-traumatic stress disorder symptoms.

	PTSD	CERS+	Acc.	PosR	RP	PRea	PiP	CERS-	Rum.	Cata.	BO	SB
PTSD		-0.04	-0.07	-0.06	-0.04	-0.04	-0.03	0.54*	0.42**	0.53**	0.39**	0.04
Sense of place (City)	0.28*	-0.02	-0.09	0.06	-0.05	-0.07	-0.03	0.15	0.04	0.33**	0.01	0.03
Place dependence	0.26*	-0.08	0.04	0.06	-0.13	-0.07	-0.07	0.10	-0.043	0.31**	0.01	-0.01
Place Identity	0.13	-0.04	0.05	0.02	-0.03	-0.25*	0.09	0.03	-0.02	0.06	0.03	0.01
Place attachment	0.31**	0.04	-0.13	0.07	-0.00	-0.02	0.05	0.20	0.12	0.36***	0.01	0.10
Sense of place (neighbourhood)	0.20	-0.11	-0.06	-0.01	-0.13	-0.06	-0.11	-0.01	-0.20	-0.17	0.05	-0.05
Place dependence	0.26*	-0.01	-0.15	0.04	-0.08	0.05	0.00	0.03	-0.15	0.22*	0.02	-0.01
Place Identity	0.02	-0.22	-0.14	-0.09	-0.18	-0.25*	-0.18	-0.18	-0.30**	-0.10	-0.01	-0.11
Place attachment	0.25*	-0.09	-0.08	-0.01	-0.11	-0.01	-0.12	0.08	-0.13	0.27*	0.09	-0.03
Sense of place (home)	0.31*	-0.02	-0.10	-0.01	-0.11	-0.03	0.10	0.10	0.03	0.22*	0.08	-0.10
Place dependence	0.24*	-0.11	-0.11	-0.11	-0.19*	-0.06	0.05	0.08	-0.01	0.16	0.10	-0.06
Place Identity	0.20	-0.12	-0.04	0.14	0.01	0.12	0.20	0.05	0.04	0.17	0.02	-0.14
Place attachment	0.33*	-0.02	-0.09	-0.03	-0.11	0.04	-0.04	0.11	0.05	0.24**	0.06	-0.08

Note: * p < .05, ** p < .01, *** p < .001

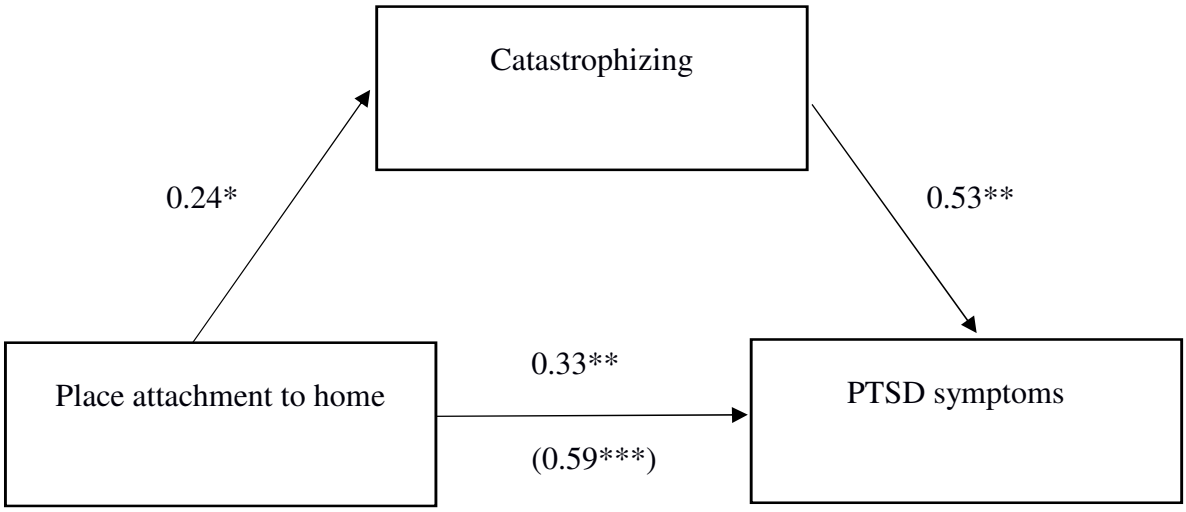
Note 2: CERS+ = adaptive cognitive emotion regulation strategies; Acc. = Acceptance; Pos.R= Positive refocusing; RP = Refocus on planning; PRea = Positive reappraisal; Pip= Putting into perspective; CERS- = nonadaptive cognitive emotion regulation strategies; Rum = Ruminations; Cata.= Catastrophizing; BO= Blaming others; SB = Self-blame.

Table C: Stepwise regression analysis predicting PTSD symptoms.

	b	*t*	*p*	95%CI	ΔF	ddl	ΔR^2	Δp
Modèle 1					33.03	1. 75	0.30	< 0.001
Catastrophizing	0.55	5.75	< 0.001	[1.611. 3.321]				
Modèle 2					19.80	2. 74	0.33	< 0.05
Catastrophizing	0.50	5.18	< 0.001	[1.375. 3.094]				
Place attachment to home	0.21	2.20	< 0.05	[0.166. 3.244]				

Note. In Model 1, insignificant and excluded predictors: Place attachment and place dependence to the city, and to the neighbourhood, and to the home, rumination, blaming others.

In Model 2, insignificant and excluded predictors: place attachment and place dependence to the city, and to the neighbourhood, place dependence to the home, rumination, blaming others.



Note : Indirect effect (beta) =0.96, SE = 0.41 ; 95% CI [0.25-1.91]

Figure A. Analysis of the mediating role of catastrophizing in the link between place attachment to the home and PTSD symptoms in flood-affected individuals.