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# Collective memories and previous experiences of older people in the face of disaster risk processes: lessons learned, implication, and social support

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**Introduction:** Climate change amplifies the vulnerability of various groups, especially of older people. Though seen as highly vulnerable, studies reveal their remarkable resilience and that they experience less distress than the young population. Collective memory and experience thus act as coping devices, facilitating learning processes and adaptation when faced with natural risks.

**Method:** The objective was to characterize the lessons learned, implications and social support perceived by the older people in disaster risk situations. The study was conducted with six groups of older people in Ñuble (Chile) using the SWOT matrix (Strengths, Weaknesses, Opportunities, and Threats), life stories, focus groups, photo evocation, and other participatory techniques. Content analysis was based on a systematic coding of category quantifications.

**Results:** Negative impacts and positive learning processes were identified that prompted significant changes and made post-traumatic growth processes and capacity-building possible. The type of disaster, its frequency and stage in which it occurs influence the perception of risk and coping strategies, underscoring the importance of strengthening communication about natural risks that are often rendered invisible, such as heat waves. Social support is the main source of collective capacity and has been shown to reduce perceived vulnerability to disaster risk scenarios.

**Conclusions:** The collective memory and prior disaster experiences of the older people provide them with tools to reinterpret new risk scenarios, highlighting their abilities and promoting their empowerment. These resources are crucial for the development of intergenerational learning aimed at comprehensive risk management. However, facing recent disaster risk situations such as COVID-19 or heatwaves has posed a challenge due to a lack of prior experiences and knowledge on how to handle them. This underscores the importance of having continuous psychoeducation, tailored to the specific and territorial needs of the older people, especially in the context of climate change.

KEYWORDS

**collective memory, disaster risk, experience, learning, older people, participatory methodologies, resilience, social support**

## Introduction

Climate change and its associated risks have increased the vulnerability of various susceptible groups, including women, children, the older people and the disabled population (Malak et al., 2020). Specifically, the older people are often viewed as particularly sensitive to the impacts of disasters, despite their wide range of personal and interpersonal resources (Sandoval-Díaz J. et al., 2022). This poses a challenge for health and social security services in Latin America, given swift population aging processes (Navarrete Valladares and Sandoval-Díaz, 2022).

Aging often leads to problems that enhance vulnerability, such as the loss of energy, a lower tolerance to physical activity, functional limitations and a decline in sensory perception (Arbonés et al., 2003). However, this group is not only vulnerable from a biopsychosocial perspective but also possesses agency and personal and collective resources that can enhance their adaptive capacity and strengthen community resilience in the face of intensifying extreme weather events (Sánchez-González and Chávez-Alvarado, 2019; Navarrete Valladares and Sandoval-Díaz, 2022; Navarrete-Valladares et al., 2023). In fact, recent studies have shown that older individuals often display notable psychological resilience, experiencing even less distress and maladjustment than the younger population (Brockie and Miller, 2017). This illustrates that older people might have a superior adaptive capacity, employing active coping strategies based on their experiences with previous disasters (Vasseur et al., 2015; Brockie and Miller, 2017).

However, it's crucial to consider that this resilience capacity has its limits. Cohen et al. (2017) have noted differences in community resilience between individuals up to 75 years old, who feel resilient or experience a high level of wellbeing, and those who are 75 or older, whose resilience diminishes due to the biological and social challenges associated with age-related functionality.

Despite this, risk management plans tend to relegate the older people to the background while focusing attention on the actively working population (OHCHR, 2019). However, recent research recognizes collective memory and prior experience with disasters as protective factors that could facilitate adaptive learning processes to cope with natural risks (Martínez and Brito, 2005; Rubio Carrasco et al., 2019; Navarrete-Valladares et al., 2023).

Collective memory, understood as group learning derived from past experiences, can influence the perception of the environment and the joint response strategies to threats (Meza, 2018; Iglesias Da Cunha et al., 2020). These prior experiences and the practical knowledge gained can have both advantages and disadvantages, depending on their interpretation (García Fernández, 2011). Thus, retrieving this memory can be seen as an essential means to reconstruct events and the meaning of the experience itself. From Halbwachs (1980), perspective, it's unlikely that memories are formed solely from individuality. It's vital to consider the construction of these within social contexts (Navarrete-Valladares et al., 2023).

Any phase in the disaster risk cycle—preparation, mitigation, response or recovery—can emerge as a learning and capacity building opportunity (Rinaldi and Bergamini, 2020). These skills can encompass aspects such as stress management, community work and effective communication in times of uncertainty, which can contribute to safe decision making during a crisis, minimizing susceptibility and strengthening resilience capabilities (Seebauer and Winkler, 2020).

In the specific case of the older people, the lessons learned can enhance their perception of risk regarding future events, facilitating a better understanding of critical situations (Sierra, 2016; Sandoval-Díaz J. S. et al., 2022). This knowledge can lead to proactive behaviors like the preparation of personalized emergency plans, participating in drills and/or the search for information on safety measures (Stafford and Baldwin, 2018; Carrera, 2019).

In addition, these lessons can empower the older people to enhance their preparation and play an active and adaptive role in risk situations. Here we understand "implication" to mean the roles people play in terms of a disaster's consequences and effects, roles that can vary depending on whether the experience is direct (onsite) or indirect (Britton, 1986; Chávez Alvarado and Sánchez González, 2016). It is essential to stress that implication can also fluctuate according to the type and magnitude of the disaster, in addition to communities' inherent vulnerabilities (Malak et al., 2020).

On the other hand, social support—understood as the set of varied responses that an individual receives from his or her social environment in stressful situations (Navarrete Valladares and Sandoval-Díaz, 2022)—plays a crucial role in risk management, bolstering emotional wellbeing and resilience (Gracia and Herrero, 2006). However, the social support provided by institutions is often insufficient, despite its importance. This lack of support is especially evident in groups with limited political and social support, such as the older people, who also have minimal participation in the formulation of policies and programs to adapt to climate change (Trevizo, 2020).

In response to this shortcoming, various civil organizations have emerged that play prominent roles in providing aid (Cabieses et al., 2016). These organizations supplement government resources by offering additional assistance in crisis situations. It is important to stress that social support is not limited to material or financial assistance. It also includes the creation of support networks, the promotion of solidarity and empathy and establishing an environment of understanding and support, aspects that reinforce people's capacity for agency and that of their communities (Pérez et al., 2013). Older individuals demonstrate adaptability by activating social support networks, using coping strategies based on their experience, and adopting protective behaviors, such as following safety recommendations and seeking appropriate shelter (Omolo and Mafongoya, 2019; Yang and Yoon, 2021; Sandoval-Díaz J. et al., 2022). These actions reflect the ability of older people to mobilize their personal and social resources in order to effectively address emergency situations.

In line with the above, research on the impact of climate change and natural risks on the older people is of crucial scientific importance. This type of research not only covers a knowledge gap on how these events have a differentiated impact on this group, but also highlights the vulnerabilities and capabilities of the older people in disaster risk situations. This information contributes to emergency planning and response that is sensitive to population characteristics (Sánchez-González and Egea-Jiménez, 2011;

Chávez Alvarado and Sánchez González, 2016; Navarrete-Valladares et al., 2023).

In procedural terms, it is fundamental to highlight the value of participatory methodologies in research with the older people. They foster their participation, social inclusion and facilitate the capture of their experiences and narratives (Hernández et al., 2016). The transformative potential of these methodologies can reinforce community resilience and empowerment, encouraging proactive and concrete action against potential risk scenarios (Trajber et al., 2019; Albagli and Iwama, 2022). Ultimately, understanding these aspects is essential to guiding the development of policies and programs that meet older people's needs and challenges when faced with these events (Vargas González, 2002; García Fernández, 2011).

Based on the above, this research seeks to characterize the learning processes, implication and the social support perceived by the older people in disaster risk situations, highlighting their adaptive capacities through participatory methodologies. To this end, we propose the following specific objectives: (i) to describe the impacts that the older people experience in disaster risk situations; (ii) to identify the types of learning processes, implications and appreciations that the older people experience during the preparation, response and recovery stages; and (iii) to determine the perceived social support in the event of disasters.

## Case study

Located in central-southern Chile, the Ñuble Region harbors a variety of natural hazards intrinsically associated with both its geomorphology and the characteristics of its human settlements. The population faces multiple threats, including droughts, floods or rivers that overflow their banks, forest fires, volcanic eruptions, landslides and tsunamis, to name a few. The region has been the scene of various disasters over the course of history. For the purposes of this research, only the events detailed in Table 1 are considered.

Ñuble stands out for having the second largest proportion of older people citizens in Chile, at 13.5% of the regional population (Facultad Latinoamericana de Ciencias Sociales, 2018). With an aging rate of 133.6%, the older people population is expected to reach 34.5% of the total in 2035.

# Method

## Design

This study uses an action-research design that incorporates participatory methodologies (Hernández et al., 2016). The essence of this methodology lies in promoting a horizontal and active dialogue among participants, allowing us to deeply understand how older adults perceive and face disaster risk situations (Martí, 2020). We chose this approach due to its adaptability and ability to respond to changing needs. Throughout the process, university students led 10 intervention sessions, in which participatory techniques related to the disaster risk process were implemented in only two of them. In the remaining 8 sessions, the students focused on identifying and intervening based on the specific needs of the community, in the context of a community psychology course.

TABLE 1 Disasters considered in the research.

| Type of disaster | Year | Magnitude of impact |
|---|---|---|
| Chillán Earthquake | 1939 | The 1939 Chillán earthquake, which registered 8.3 on the Richter scale, is one of the most destructive earthquakes in the history of Chile and the world. It affected several cities and caused the death of 30,000–40,000 people, in addition to leaving thousands homeless. This devastating event led to a thorough review of Chilean construction policies. |
| Valdivia earthquake and tsunami | 1960 | This is the most powerful earthquake ever documented in the world, registering 9.5 on the Richter scale. It caused the death of around 1,655 people, including those affected by the resulting tsunami, and left over 2 million people homeless. The earthquake caused a tsunami with waves up to 25 meters high that spread across the Pacific Ocean. |
| 27F Earthquake and tsunami | 2010 | This earthquake measuring 8.8 on the Richter scale, known as 27F, is one of the most powerful recorded in the history of the world. It affected six regions and 80% of the Chilean population. It caused the death of 525 people, significant damage to about 500,000 dwellings and around 2 million people affected. It also unleashed a tsunami that caused additional damage and losses along the Chilean coast. |
| Forest fires in the Biobio Region | 2012 | It destroyed over 18,000 hectares and at least 100 homes, leaving one person dead and over 500 people homeless. In addition, the fires cut off power to about 2,596 people. |
| Heat waves | No date; recurring event | The Ñuble region is susceptible to heatwaves due to its unique geography and climatic variability. This vulnerability has intensified with climate change, leading to an increase in the frequency and intensity of heatwaves. Over the past 50 years, the average has exceeded 3 heatwaves annually, with a notable increase in the last decade. According to the Meteorological Office of Chile, from 2018 to 2023 there have been fluctuations in the frequency and length of heatwaves, with 2020 standing out as the year with the highest and longest-lasting events.<br>In Chillán, heat waves reached a record of 41.6°C in 2023. Though the risk of morbidity due to high temperatures is currently low, projections through 2050 indicate a potentially significant increase. |
| Covid−19 Pandemic | Early 2020 | Chile had registered over 5 million cases of COVID-19 as of July 2023, which resulted in over 61,000 deaths. |

Source: Prepared based on Valenzuela (2012), Ministerio de Educación de Chile (2020), Ministerio del Medio Ambiente (2020), El País (2021), Andrade (2023), Expansión (2023), Galarza (2023), Museo Histórico Nacional (2023).

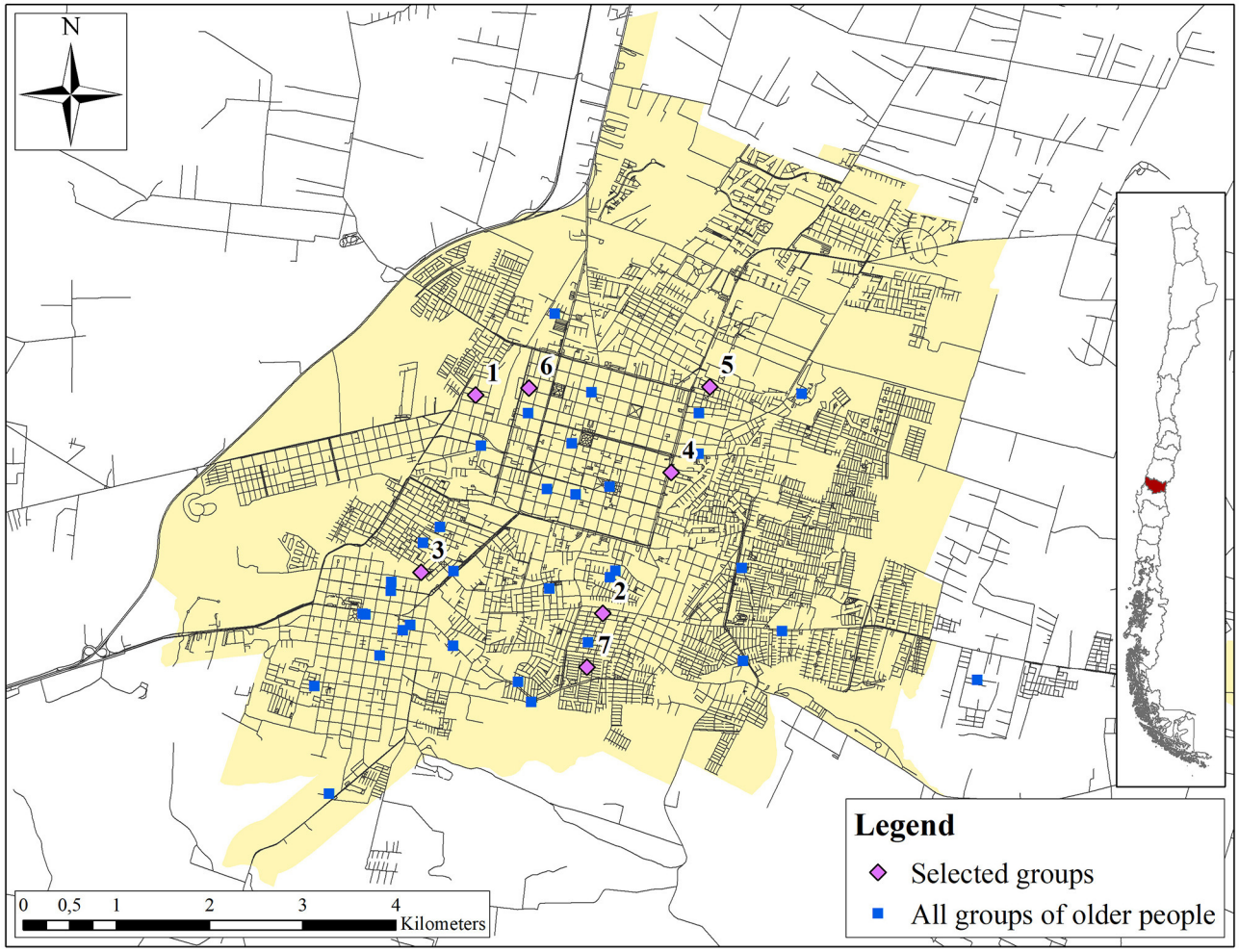


FIGURE 1
Map showing the location of elderly organizations in Chillán, Chile. Created by the authors.

## Participants

We employed a purposeful sampling, selecting organizations of older people based on the theoretical contribution they could provide. Additionally, we relied on the criterion of transferability, a quality indicator in qualitative research, which assesses the extent to which the findings from a particular study can be applied in other contexts or similar situations without losing their validity or relevance (Creswell, 2013). We segmented the sample according to day centers, community centers, residences and groups dedicated to leisure and recreation. We randomly selected six of these organizations in Ñuble (see Figure 1, Table 2).

## Procedure

The study was carried out from July to October 2022, with six groups participating (see Table 3). Details of the study were presented to community leaders and their consent was obtained during this phase. At the same time, we invited university students to collaborate in the research process, providing them with intensive training in participatory techniques, group management and issues related to working with the older people. These students were assigned one of the six communities and their interventions were supervised. Before beginning, we made sure that participation was voluntary, respecting participants' rights and privacy of participants through informed consent (Hernández et al., 2016).

## Data production

Five techniques were used for data production: (i) SWOT (Strengths, Opportunities, Weaknesses and Threats), (ii) life stories, (iii) focus groups, (iv) photo evocation, and (v) the "Recognizing my community" exercise.

SWOT analysis is a strategic assessment tool used to characterize communities (Hernández-Hernández and Garnica-González, 2015). It facilitated identification and hierarchization of collective capacities.

TABLE 2 Research participants.

| Organization name | Participants | Foundation | Location | Objectives |
|---|---|---|---|---|
| Sports club | 10–20 Women | 1999 | Chillán | Space for aerobic exercise, social interaction, and emotional well-being of participants. |
| Religious group | 15 Mixed | 2001 | Chillán | Mutual support environment. |
| Recreational group | 21 Mixed | 2022 | Chillán | Recreational setting. |
| Women's group | 5 Women | 2022 | Chillán | Promotion of active aging. |
| Senior citizens' club | 15 Mixed | 2006 | Chillán Viejo | Mutual support environment. |
| Senior citizens' club | 15 Mixed | 1999 | Chillán | Mutual support environment. |

Source: Author's compilation.

TABLE 3 Development of intervention plan.

| Date (week) | Stage of Intervention | Objective | Activity | Brief description |
|---|---|---|---|---|
| 17-10-2022 to 21-10-2022 | Assessment | Creation of framework and first approach with the community | Forging of bonds and creation of framework | Contextualization of the process and signing of consent. |
| 24-10-2022 to 28-10-2022 | Assessment | Identify the community's characteristics, needs and resources | Participatory activities | Application of participatory techniques |
| 31-10-2022 to 4-11-2022 | Assessment | Identify characteristics, needs and resources | Participatory activities | Application of participatory techniques |
| 7-11-2022 to 11-11-2022 | Assessment | Identify characteristics, needs and resources | Participatory activities | Application of participatory techniques |
| 14-11-2022 to 18-11-2022 | Assessment | Assessment process concludes | Participatory activities | Application of participatory techniques |
| 21-11-2022 to 25-11-2022 | Intervention | Identify community characteristics | Related to the research | Application of SWOT and "recognizing my community" activity |
| 28-11-2022 to 1-12-2022 | Intervention | Compile experiences and memories of disasters | Related to the research | Application of life story techniques, focus groups and photo evocation. |
| 5-12-2022 to 9-12-2022 | Intervention | First intervention session held | Theoretical and practical | Intervention on detected needs |
| 12-12-2022 to 16-12-2022 | Intervention | Second intervention session held | Theoretical and practical | Intervention on detected needs |
| 19-12-2022 to 23-12-2022 | Process ends | A summary of the process is developed | Closing activities | Close and return of information. |

Source: Author's compilation.

The "Recognizing my community" exercise was subsequently carried out, reflecting on the types of activities, objects, identity, leadership, communication, and future aspirations of the community. The definition of "community" according to Montero (2004) was then presented and they were invited to reflect on their alignment with that definition. The guiding questions during this stage were: "What aspects of the definition does your community already have?" and "According to the definition, what aspects of your community would you improve?"

Regarding life stories (Denzin, 1978), contextualized narratives about their experiences with the disasters and/or risks previously identified were compiled (Table 1). To delve further into these narratives, focus groups were organized that allowed a dynamic collective discussion focused on the experiences and memories of these events (Escobar and Bonilla-Jimenez, 2017). In addition, the technique of photo evocation was used (Campos, 2022), which involved presenting photographs of the events in question to evoke memories, emotions and narratives. Prior to the discussion, participants were provided with a description and context of each disaster, complemented by a related news report or photograph. After that, a series of questions were asked, such as: What to you remember about the event? What was your experience like? Were there difficulties? Did you receive any sort of support? Who did you experience the disaster with? Did this event change anything for you? These questions prompted the participants to share their personal experiences. In those cases where participants had not experienced a given disaster directly, they were invited to share stories they may have heard from relatives or other sources.

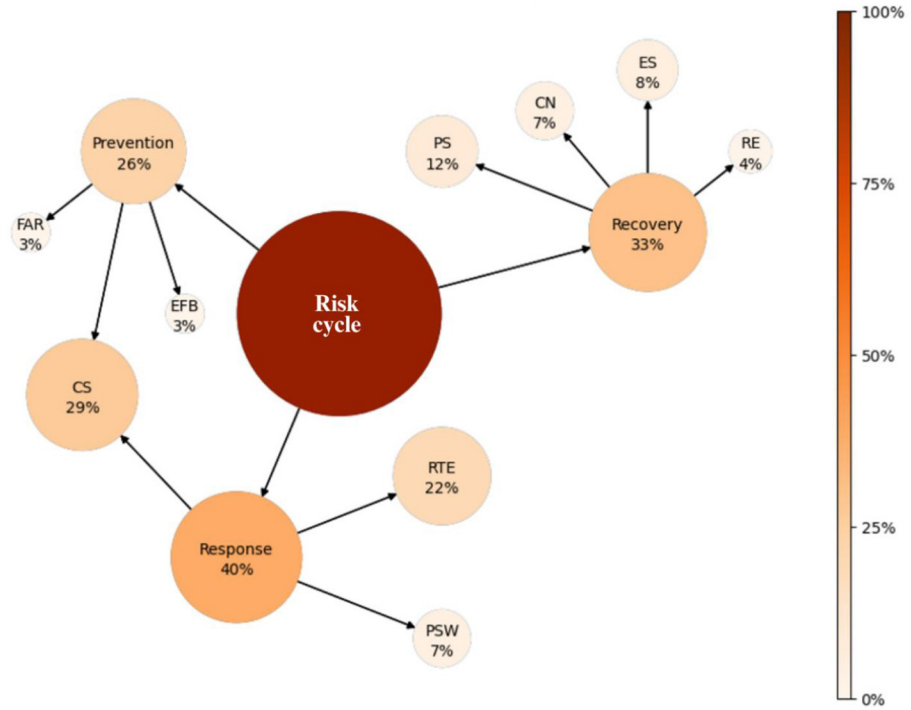


FIGURE 2
Main lessons learned associated with impacts by risk stage. FAR, Follow authorities' recommendations; CS, Copying strategies; EFB, Environmentally friendly behavior; PS, Provide services; CN, Community networks; ES, Express support needs; RE, Resignify experiences; RTE, Recognize traumatic event. Source: Author's compilation.

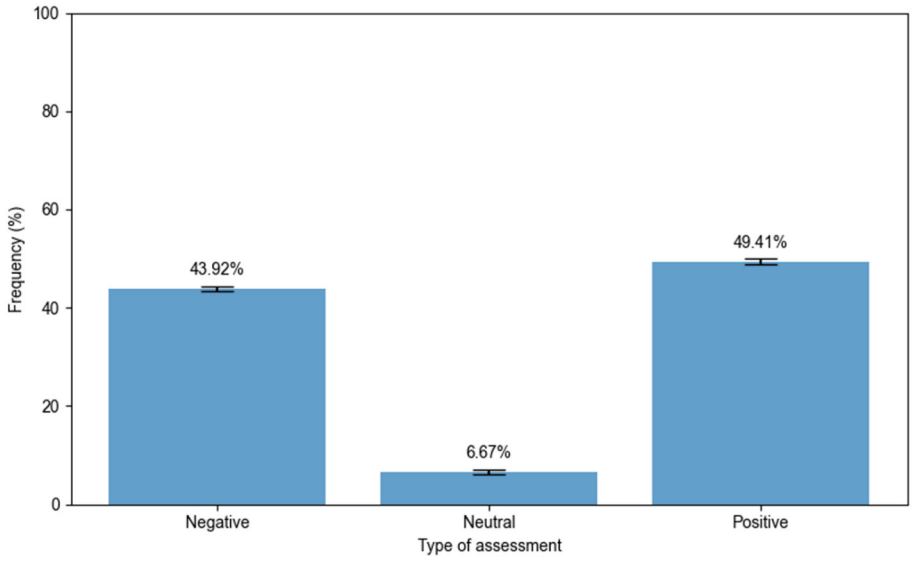


FIGURE 3
Assessment of the impacts associated with the learning process. Source: Author's compilation.

## Data analysis

We used content analysis to interpret the stories, using systematic coding and category quantification processes (Cáceres, 2003). The research topics focused on three main areas: (i) the impact of the disasters, (ii) the lessons learned, assessment and implication in the risk cycle's stages, and (iii) perceived social support.

The data transcribed was organized into two main results: (i) the impacts associated with the disasters and (ii) the lessons learned over the course of the prevention, response and recovery stages. Two graphs were created to analyze the lessons learned

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and assessment over the course of the risk cycle. Figure 2 shows the main lessons learned associated with the impacts, classified according to risk stage. Figure 3 shows the assessment of the impacts related to lessons learned, categorized as positive, negative or neutral.

Regarding perceived social support, Table 4 details the disasters considered and the different types of actors who provided assistance. Percentage frequencies were used to express the contents' degree of relevance for all results.

## Results

This section provides a detailed description of the three main results found in the life stories: (i) the associated impacts, (ii) lessons learned and (iii) the perceived social support.

### Impacts associated with disasters

Our evaluation of the impacts identified five main categories: (i) harm, (ii) intergenerational narrative, (iii) adaptive capacity, (iv) communication media, and (v) positive effects. We found four subcategories in the harm category: (i) psychological, (ii) health, (iii) sociability, (iv) infrastructure, and (v) environmental surroundings. For its part, the adaptive capacity category is divided into two subcategories: (i) mitigation and (ii) coping.

The "harm" category refers to the damage or loss that disasters cause to people, be it in terms of their health (physical and mental), psychological (including feelings and thoughts), sociability (impacting interpersonal relations and livelihoods), infrastructure (private and public), and the environmental surroundings (Labra and Maltais, 2013). Regarding the "psychological" subcategory, we focused on the negative psychological effects, such as post-traumatic stress disorder, in addition to unpleasant emotions and feelings such as fear and distress (García Martínez et al., 2014). This most frequent impacts in this subcategory include emotions like post-disaster distress, fear, discomfort and insecurity:

> *"As I was telling you, I was boarding here (as a student); it was terrible because you could hear the crying and the shouts."*—Older woman, 1960 earthquake.

Recognition of the event as a traumatic, terrible, and dramatic experience came second:

> *"My dad told me that he had a horrible timie too... he says that all the houses collapsed and that there were dead people beneath the rubble."*—Older woman, intergenerational account of the 1939 earthquake.

The structural and psychosocial vulnerabilities that are amplified by risk scenarios came last:

> *"They privatized sectors, took water supplies from other families... And they cut too many trees and planted a lot of eucalyptus, which triggered the fires."*—Older woman, 2022 heat waves.

TABLE 4 Perceived social support in disasters according to the actors.

| | 1939 Chillán Earthquake | 1960 Valdivia Earthquake | 2012 Fires in the Biobio Region | 27F Earthquake | Heat waves in Chillán | COVID–19 Pandemic | Total |
|---|---|---|---|---|---|---|---|
| Close interpersonal relationships | 3 | 3 | 3 | 6 | 1 | 6 | 22 |
| Informal actors | 5 | 3 | 2 | 9 | 0 | 1 | 20 |
| Formal actors | 0 | 3 | 0 | 5 | 0 | 4 | 12 |
| Nonprofit actors | 1 | 0 | 1 | 3 | 0 | 0 | 5 |
| No help was required | 0 | 0 | 0 | 0 | 5 | 0 | 5 |

Source: Author's compilation.

The second subcategory is "health," which covers the physical and mental health consequences that disasters have for the older people. This includes physical injury, personal suffering and the death of others (León-Amenero and Huarcaya-Victoria, 2019). This subcategory has three main impacts, with the death of others being the first:

> *"Many people lost everything and died; that's why there is a mass grave in the cemetery... Because there were many dead people."*—Older man, 2010 earthquake.

The second involves the negative physical and mental health consequences:

> *"COVID ruined me because I caught all diseases... I used to go out but now I can't go out anymore because of the confinement"*—Older woman, COVID-19.

Lastly, the collateral problems arising from disasters must be considered, such as obstacles hindering access to basic services, such as health:

> *"My daughter was pregnant, and it turns out that labor started early that night and my grandson was born the same day (...). They took her to the hospital and nothing; there was no doctor, nothing."*—Older woman, 2010 earthquake.

The third subcategory is "sociability," which refers to the impact of disasters on interpersonal relations, decisions and livelihoods. These impacts include the disruption of basic services like drinking water and sanitation (García Martínez et al., 2014; León-Amenero and Huarcaya-Victoria, 2019). A common observation in this subcategory refers to alterations in interpersonal relations during and after a disaster:

> *"In solitude... we couldn't go anywhere during the pandemic; two years shut up at home."*—Older man, COVID-19.

Organizational problems at the institutional level to effectively respond to emergency situations were mentioned second:

> *"They passed out family hampers in the neighborhood. They would come to leave us food... There were many people standing in line to get water."*—Older woman, 2010 earthquake.

Lastly, the third impact is *compulsory confinement*, mainly due to COVID-19:

> *"I spend months inside; my family would bring me supplies to the house."*—Older woman, Covid-19.

The fourth subcategory, "infrastructure," focuses on the damage that such events cause to physical structures like dwellings, public buildings, roads and airports, among others. A frequently mentioned impact in this subcategory is the destruction or collapse of homes and residential areas:

> *"My dad told us that in the 1939 (earthquake)... they sent my grandfather by horse to check on some relatives here in Chillán and all the houses had collapsed (...)"*
> - Older man, 1939 earthquake.

The material damage to the interior of the dwelling comes second:

> *"Many showcases fell over; you could hear the sounds at night."*
> - Older woman, 2010 earthquake.

Lastly, disasters prompted a *change in the way infrastructure was built*:

> *"I saw changes in the architectures, mainly houses."* - Older man, 2010 earthquake.

The fifth subcategory, "environmental surroundings," addresses the environmental damage that disasters cause (Hidalgo and Gómez, 2001). One of the most frequent impacts in this subcategory is air pollution caused by forest fires:

> *"I think it was that fire when Chillán was filled with smoke; you couldn't breathe and we went to the countryside...we were overwhelmed by the smoke and ash."*
> - Older man, 2012 forest fires.

This category involves changes in the behavior of the surroundings in the days prior to the disaster.

> *"That day I went out and looked at the sky and it was red … that worried me; the horses we had there were running about and whinnying desperately; the dogs barked a lot, they howled: that was an announcement."*
> - Older woman, 2010 earthquake.

The "intergenerational narrative" category refers to the process of generating knowledge and creating collective memory through communication, storytelling and memories of past events in a context of exchange and mutual enrichment among different generations (D'Angelo Hernández, 2011):

> *"My granny always said that Chillán Viejo was Chillán and that it had changed places with the earthquake... I remember she would say that a lot."*
> - Older man, intergenerational account of the 1939 Chillán earthquake.

The second involves the expression of emotions in intergenerational narratives:

> *"It was horrible, and they (his parents) told me that they believed that earthquake had finished off Chillán because everything was destroyed. They escaped and managed to get out of where they were...So much lamentation was seen, many*

> *people died, and it would make me sad when they would tell me these things."*
> - Older man, intergenerational account of the 1939 Chillán earthquake.

The first subcategory of the category "Adaptive Capacity," defined as older people's ability to adapt and manage associated risks (Navarrete Valladares and Sandoval-Díaz, 2022) is "Mitigation." This subcategory refers to actions taken to reduce the impact of disasters (Comunidad Andina, 2018). A commonly observed behavior within this subcategory is the search for shelter in places considered safe:

> *"It was the first time in my life that I went through an earthquake... many things fell in the house... We spent several weeks sleeping in the living room."*
> - Older man, 2010 earthquake.

The second factor refers to a greater perception of natural risks:

> *"You have to try to keep the house free of dry grass to avoid fires."*
> - Older woman, 2012 forest fires.

The second subcategory, "Coping," refers to older people's capacity to prepare and react to risks (Sandoval-Díaz et al., 2022c). A frequent response in the context of this subcategory refers to the implementation of individual coping strategies:

> *"We now have an emergency medical kit and charged flashlights (...) jugs of water, emergency backpacks."*
> - Older man, 2010 earthquake.

The second aspect refers to migration or changes in residence as a result of disasters:

> *"Many people left amid the fear that another disaster would happen."*
> - Older person, 2010 earthquake and 2012 forest fires.

The fourth category, "Communications Media," focuses on how media dramatization of the damage caused by disasters can influence the older people, emotionally as well as cognitively (Hermelin, 2007). A frequently observed phenomenon in this category is the dissemination of alarming and catastrophic news reports:

> *"The news was catastrophic; they were telling you that you were going to die tomorrow.*
> - Older woman, COVID-19.

Second, the difficulty that older people have understanding the information coming from the communication media and obtaining reliable information from first responders stands out.

> *"It happened (the event) that very night and after that there was no information about anything."*
> - Older man, 2010 earthquake.

Lastly, the difficulties older people have communicating with their relatives after a disaster are mentioned:

> *"My husband was traveling at the time and the earthquake hit when he was midway. There was no way to communicate with my children to find out how they were..."*
> - Older woman, 2010 earthquake.

For its part, the emerging category of "Positive Effects" involves the potential benefits that disasters may bring for the older people. They include learning opportunities, periods of rest and more time spent with the family. A frequently observed impact in this category is the learning process associated with the adaptive responses to emergency situations:

> *"Now we know the evacuation routes."*
> - Older man, 2010 earthquake.

The second aspect refers to the absence of negative consequences due to the safety behaviors followed in the face of risks:

> *"I worked every day with or without pandemic... I have all my vaccines; I used the mask; nobody in my family got sick, because we were responsible when the pandemic started."*
> - Older man, COVID-19.

To conclude, the results indicate that the negative impacts of disasters on the older people are more predominant than then the positive ones. The negative effects are particularly common in the "Psychological" subcategory. For their part, the positive effects stand out in the "Lessons Learned" category, which we will analyze in depth below.

## Lessons learned from disasters

Older people reported lessons learned related to different stages of the risk cycle, as shown in Figure 2. The response stage was seen to generate the most learning opportunities (40%). This is partly due to recognition of its impact as a traumatic event (12%), a process during which people validate their own experience and/or that of others after the event (Astill and Miller, 2018).

During the response stage, older people tend to acquire new coping strategies (10%), which include staying calm, seeking support networks and adapting to new scenarios (Sandoval-Díaz J. et al., 2022). Psychological wellbeing (7%), which involves balancing the severity of an event with the exposure to it, emerges as a determinant factor at this stage (Hobfoll et al., 2007).

In the recovery stage, which represents 33% of the lessons learned, the provision of basic services for survival (12%) and the expression of the need for support (8%), which facilitates social relations and helps reduce health consequences, stand out (Navarrete Valladares and Sandoval-Díaz, 2022). Community networks (7%) were also identified as an important source of learning, fostering social cohesion (Chávez-Alvarado and Sáchez-González, 2016). Furthermore, the resignification of the personal experiences (4%) emerges as a key learning process, allowing

traumatic experiences to be reinterpreted in a more positive way (Organización de las Naciones Unidas, 2022).

In the preparation phase, which represents 26% of learning processes, coping strategies (19%) focus on anticipating future risks. In this context, it is essential to follow the authorities' recommendations (3%) (Tilstra et al., 2021) and behave in an environmentally friendly way (3%) to preserve natural resources and mitigate future negative impacts from disasters (Martínez-Soto, 2006).

One can conclude that the predominant stage of the risk cycle is the response, which represents 40% of the total, followed by recovery with 26% and prevention with 33%. Regarding the associated lessons learned, recognition of disasters as traumatic events stands out, with 12% impact.

## Assessment of the impacts associated with the learning process

Regarding the assessment of impacts associated with the learning process (see Figure 3), it was determined that 49.41% of them were positive. This fact highlights the importance of intergenerational learning to relate current risks to experiences with past disasters:

> *"I was 8 years old and when the earthquake started my mom grabbed the three of us and put us in a single bed and then got on top of us to protect us (...) my mom taught us to stand in doorways and that's what I do."*
>
> - Older woman, 2010 earthquake.

Meanwhile, 43.92% of participants recognized negative impacts, especially related to the normalization of solitude and its repercussions on interpersonal relation, both during and after the disaster. This situation had diverse emotional consequences:

> *"After who knows how many days, because I was the only one home... I would cry in anguish... I had to stay there, a prisoner; I couldn't even receive people. I am used to working with people and when I had the chance to go out, the first time after who knows how many months, I went down the street crying. I did not know what was happening to me; I didn't know whether it was joy or emotion."*
>
> - Older woman, COVID-19.

Regarding the assessment of impacts associated with learning processes, one can conclude that participants tend to have a positive perception (49.41%).

## Perceived social support in the face of disasters

Table 4 illustrates the perceived social support in various disasters, identifying the different actors involved. They are categorized as informal actors, close interpersonal relationships or non-profit and formal actors.

A predominance of informal actors can be seen in the 1939 Chillán earthquake, including neighbors, neighborhood boards, schools and the church, which represented 55.5% of the support received. Close interpersonal relationships came second with 33.3% and non-profit actors came last with 11.1%.

For the 1960 earthquake in Valdivia, the three categories of actors collaborated in equivalent proportions with a third of the total each (33.3%) of the support provided.

The support of close interpersonal relationships was more noteworthy during the 2012 fires in the Biobio Region, accounting for 50% of the total. They were followed by informal actors with 33.3% and non-profit actors with 16.6%.

Informal actors were the most predominant in the 27 February 2020 earthquake, with 39.1%, while close interpersonal relationships contributed 26% and formal actors represented 21.7%.

Regarding the heat waves in Chillán, 83.3% of older people did not need help. However, among those who did, 16.6% resorted to their close interpersonal relationships.

Close interpersonal relationships were the main source of support during the COVID-19 pandemic, with 54.5% of the total. They were followed by formal actors with 36.3% and formal actors with 9%.

Overall, when all events are analyzed, close interpersonal relationships are the most frequent source of support, representing 37.2%. They are followed by informal actors with 33.9% and lastly formal actors with 20.3%. This analysis provides a detailed view of how the various sources of support interact and respond in the context of different disasters. In this sense, the importance of close interpersonal relationships and informal actors in supporting the older people stands out.

# Discussion and conclusions

This research identified diverse negative impacts—often traumatic ones—that affected the participants physically and psychosocially. However, older people also reported positive consequences and learning processes that have allowed them to cope with new risk scenarios and generate significant changes in their personal lives, in what can be (re)interpreted as a post-traumatic growth process (Sandoval-Díaz and Cuadra-Martínez, 2020). One example of this is the improved capacity to cope with and adapt to known risks (e.g., earthquakes) after previous experiences through improved identification of evacuation routes and implementation of preventive measures at the personal level as well as in the dwelling.

However, these findings need to be explored in greater depth. This highlights the need for more research focused on the characteristics and factors that promote post-traumatic growth, clarifying the role that learning processes can play in the older people population after exposure to a disaster experience (Sandoval-Díaz and Cuadra-Martínez, 2020; Navarrete-Valladares et al., 2023).

In addition, it was found that the type of disaster, its frequency and the risk cycle phase influence the way it is perceived

and coped with (Sandoval-Díaz J. S. et al., 2022).For example, in Chile the frequency of earthquakes and type of damage they cause mean that they tend to be perceived as riskier. In contrast, heat waves tend to be normalized and perceived as less dangerous due to the climatic characteristics inherent to warm contexts.

According to Slovic (1987), risk perceptions do not always align with statistics and objective reality. Often, factors such as familiarity, perceived control, and potential catastrophe influence how natural risks are perceived and minimized compared to other types of risks. Similarly, Douglas (1970) argues that risk perceptions are closely tied to social and cultural structures. In his view, risks, such as sociocultural disasters, tend to be "naturalized" due to cultural constructions, leading to a subjective immunization against risk. By internalizing these risks as a "normal" or "expected" part of life, individuals might underestimate their perceived impact and the need for preventive measure.

It is therefore imperative to raise awareness of these less visible, but equally harmful, natural hazards, such as heat waves. Regarding these events, it is crucial that older people, who are especially vulnerable to high temperatures due to thermoregulation problems, be capable of identifying them ask risks and that they take appropriate adaptation measures for their protection (Ratwatte et al., 2022).

It is important to stress that the lessons learned through experience with disasters transcends the mere acquisition of survival behaviors. The differentiation between theoretical knowledge and its practical application is fundamental for adequate preparation, response and early recovery in disasters (Arteaga Aguirre and Ugarte, 2015). However, the processing of information and the learning of lessons can be affected by the perception of relevance and the limitations inherent to personal memory, generating potential discrepancies between these two types of knowledge (Cortés et al., 2018). Short- and long-term personal memory can both hinder the retrieval of specific details of what has been learned. This factor can influence decision-making in stressful situations and limit access to crucial information in a crisis. This challenge can be particularly pronounced in the older people population (Echeburúa and Amor, 2019).

Regarding the collective memory of disasters, participants showed a tendency to recall events like the COVID-19 pandemic and the 2010 earthquake more frequently than the 1939 and 1960 earthquakes. This phenomenon could be explained by the fact that many participants did not directly experience the 1939 earthquake, resulting in narratives transmitted intergenerationally. On the other hand, memories of the 1960 earthquake, associated with their childhood or adolescence and related to a more indirect type of impact, are not remembered with the same clarity.

Regarding this last point, the literature suggests that forgetfulness may be a consequence of excess information, adaptation of memory to current events and repression of traumatic memories (Arriagada Peñalillo and Gainza Veloso, 2014). However, collective memory as a coping strategy could mitigate this effect by reliving both adaptive as well as inadequate episodes that are perceived as forgotten. This ability could contribute to helping the older people adapt to disasters better based on their own narratives and experiences.

Historical memory of the disasters experienced can be an invaluable resource for reinterpreting risks, identifying community resources and promoting collective action and empowerment (Arriagada Peñalillo and Gainza Veloso, 2014). By sharing their experiences, the older people not only exercise their personal memories, but also play an essential role in the transmission of knowledge. These narratives instill vital lessons in younger generations, strengthen community ties and foster empathy and mutual understanding (Hing-Wah et al., 2022). They also play a crucial role in intergenerational learning processes, fundamental to raising awareness of risks in younger groups, which tend to be less familiar with such events (D'Angelo Hernández, 2011).

Thus, preserving the "history of disasters" makes it possible to learn from past mistakes, enrich cultural identity and foster unity and a sense of community belonging (Carretero, 2021). However, this can be hampered by the lack of access to and insufficient transmission of risk management information in the communications media, which would reduce the perception of disasters as a potential hazard (Monteil et al., 2020).

According to this last point, the media play a vital role in transmitting information on the emergency stage in real time and on a large scale regarding damaged areas and the local consequences of disasters (Fernández Reyes, 2012). However, this coverage can lead to a "spectacularization of disaster" and cause information overload. This excess can cause cognitive and emotional disruptions and affect people's memory and behavior, and even lead them to states of paralysis or desensitization (Hermelin, 2007; Miles and Morse, 2007). Furthermore, these media outlets often provide insufficient preventive information for an adequate response to risk (Iglesias Da Cunha et al., 2020).

In this sense, developing a comprehensive risk communication that is sensitive and adapted to the needs of the older people is imperative. This entails including a series of channels, such as the traditional media, community networks, support services and first responders, in addition to using clear and simple language to avoid confusion (Arias Ortega and Rosales Romero, 2019).

At the same time, it is important to consider the growing role that digital social networks play in our daily lives and emergency situations. This poses a challenge for the older people, due to their limited digital literacy caused by generation gaps and access to technology (Sandoval-Díaz J. et al., 2022). It is therefore crucial to provide tools to enhance their inclusion in these platforms, expanding their access to vital information and resources in disaster risk situations. These digital inclusion strategies must be integrated into preparation plans through programs that teach basic digital skills, offer personalized assistance and encourage the design of accessible and digital environments that are user-friendly for the older people (Abad Alcalá, 2016).

Regarding the perceived social support in the face of disasters like the pandemic and earthquakes, participants primarily received help from their closest personal relations. This assistance, interpreted as an indicator of social capital, reduces their vulnerability to potential risks (Navarrete Valladares and Sandoval-Díaz, 2022).

For their part, local governments did not stand out as significant sources of aid, which coincides with research carried out in other contexts (Cabieses et al., 2016). This same research indicates that, in situations of crisis, informal actors tend to be the first to act, either to provide support or for search and rescue efforts (Kawachi et al., 2020).

However, despite the importance of the social support that the older people receive, it does not always lead to their empowerment. In some circumstances it can create a perception of "incapacity" regarding this group, limiting its agency potential in the face of such events. This phenomenon is often driven by deep-seated prejudices related to old age, which incorrectly assume that older people are incapable of developing and implementing coping strategies due to the difficulties associated with their age (Navarrete Valladares and Sandoval-Díaz, 2022). In this context, it is essential to strengthen the skills of the older people as well as those of their closest circles and communities. This can be achieved through training focused on identifying risks and developing coping strategies, strengthening their disaster knowledge, awareness and preparedness. It is of great value for close people, especially those who live with older people, to receive psychoeducational training in the area. After all, relatives and neighbors are often the first to offer help in emergency situations (Fatmah, 2022). For this reason, it is also recommended that these close circles be trained in psychological first aid (PFA). This will prepare them to restore the emotional balance and facilitate resource mobilization when faced with a crisis situation (Osorio, 2017).

Finally, in regard of regulations on disaster hazard management in Chile, in 2023, Law 21.364 was enacted, establishing the National Service for Disaster Prevention and Response (SENAPRED), replacing the National Emergency Office (ONEMI) (Ministerio del Interior y Seguridad Pública, 2021). This regulation introduces a system focused on prevention, early warning, decentralization, and territorial approach, outlining a renewed national policy on emergencies that must be reviewed every 5 years. The responsibilities of this Service include advising, organizing, coordinating, planning, and overseeing activities related to disaster risk management in the country (Biblioteca del Congreso Nacional de Chile, 2023). However, this new regulatory framework does not set specific provisions or suitable measures for the older population, focusing instead on general population. This highlights the lack of national regulations specifically oriented toward risk management for the older population, whose vulnerability to disasters is significant and requires special attention (Tuohy et al., 2015).

## Limitations

This study has certain limitations, especially in terms of the selected communities' representativeness. Only six of the Ñuble Region's total of 36 communities participated, giving the study an exploratory nature. Second, a cognitive assessment was not performed on the participants, meaning their personal memories or potential difficulties evoking memories that might be due to neurocognitive problems were not evaluated. However, during the process we observed that the participants tend to perceive disasters more as natural events than as "socio-natural" ones, which can lead to a simplification and minimization of the socio-cultural complexity of risk and vulnerability processes. On the other hand, there was no follow-up on the participating communities after the research concluded. In addition, the heterogeneity of the groups and participants could make comparing data with different studies more difficult and hamper the identification of clear patterns, as well as the formulation of effective intervention strategies due to different trajectories of the older population.

## Projections

It is essential to diversify and expand the explanatory and mixed studies related to this topic. In doing so, deliberate criteria must be established to ensure adequate representativeness, taking into account the multiple intersecting trajectories in the lives of the older people and the aging process. A crucial aspect is to consider intersectionality in the experiences of older people, recognizing the various dimensions that influence their experiences (Crenshaw, 1989). On the other hand, given the relevance of collective memory in the context of disaster risk, it would be beneficial for future studies to address this aspect from a cognitive perspective.

The older population plays an essential role in promoting intergenerational learning, which is a key mechanism for transferring knowledge, skills, values, and experiences between different generations. In the context of risk management, this learning becomes particularly important: the experiences and lessons from generations that have faced and managed various circumstances of crises provide invaluable adaptation and resilience strategies for younger generations. However, a significant challenge lies in recognizing and make the most of the role of older people, integrating their contributions into institutional plans and risk governance strategies. By doing so, we not only enrich current approaches to risk management but also ensure an effective transmission of accumulated wisdom and experience (Navarrete-Valladares et al., 2023).

# Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

# Ethics statement

The studies involving humans were approved by University of Bío Bío, Chillán, Chile. The studies were conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

# Author contributions

JS-D: Writing—original draft, Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology,

Project administration. CN-V: Writing—original draft, Conceptualization, Formal analysis, Investigation, Methodology. CS-M: Writing—original draft, Conceptualization, Formal analysis, Investigation, Methodology. SM-L: Writing—review & editing, Conceptualization.

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## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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