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A review of the concept of resilience in the field of disasters and its evolution

Revisión del concepto de resiliencia en el campo de los desastres y su evolución

Luis Carrio Carro[a], Rafael Castro Delgado[a], Pedro Arcos González[a]

[a] Department of Medicine, University of Oviedo, Spain

Abstract

Introduction: The resilience, as the ability to overcome adverse events and be able to have a successful development despite very adverse circumstances (disasters, wars, emergencies, severe trauma, etc.), has taken a great interest in recent years and has emerged as a key concept in disaster risk management. The purpose of this article is to present an integrated perspective on resilience through an extensive review of its literature over time. **Method**: Major health electronic databases were searched to retrieve critical relevant publications about the conceptual framework of resilience. **Results**: A total of 37 publications were included in the final analysis of this document. Definitions have evolved over time, but essentially the term 'resilience' is understood as referring to positive adaptation -the ability to maintain or recover mental health-, despite experiencing adversity. The interaction between personal, biological and environmental sources of resilience is also considered. **Conclusion**: The number of papers published by the term 'resilience' in their titles has been growing steadily over recent years. Resilience is a new term that requires greater conceptual clarification, mainly because of its importance as an example of human potential in facing disasters.

Keywords: Resilience; disaster; emergency; concept analysis; disaster risk management.

Resumen

Introducción: La resiliencia, o capacidad de superar los eventos adversos, y ser capaz de tener un desarrollo exitoso a pesar de circunstancias muy adversas (desastres, guerras, graves traumas, etc.), ha despertado un gran interés en años recientes y se ha convertido en un concepto clave en la gestión del riesgo de desastres. Este artículo tiene como objetivo presentar una perspectiva íntegra de la resiliencia a través de una extensa revisión a lo largo del tiempo. **Método**: Se efectuaron búsquedas en bases de datos electrónicas de salud para recuperar publicaciones relevantes que proporcionasen una descripción completa del marco conceptual de la capacidad de resiliencia. **Resultados**: Un total de 37 publicaciones se incluyeron en el análisis final de este documento. Las definiciones han evolucionado durante mucho tiempo, pero se entiende fundamentalmente que el concepto de resiliencia se refiere a la adaptación positiva (la capacidad de mantener o recuperar la salud mental), a pesar de experimentar adversidad. También se considera la interacción entre variables personales, biológicas y ambientales dentro de la resiliencia. **Conclusiones**: El número de trabajos publicados con el término 'resiliencia' en sus títulos ha ido creciendo de forma constante durante los últimos años. La resiliencia es un término nuevo que requiere una mayor clarificación conceptual, principalmente debido a su importancia como ejemplo del potencial humano ante desastres.

Palabras clave: Resiliencia; desastre; emergencia; análisis de conceptos; gestión del riesgo de desastres.

CONTACTO: Pedro Arcos González arcos@uniovi.es

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Introduction

In recent years, the increase in the frequency and impact of natural disasters, technological accidents, as well as anthropic disasters, has affected drastically the chances of survival of the population in both developing and developed countries. Examples of recent large-scale disasters include the hurricane Katrina in New Orleans, the 2004 Indian Ocean earthquake and tsunami, or the Boston marathon bombing in 2013. Faced with these traumatic situations of serious threat or significant stress, some people manage to resist or recover fully, preserving or restoring their structures, functions and essential basic identity. This ability has been called 'resilience', borrowing the term from physics, defined as "the ability of a material to return to its former shape without breaking". Research in the field of resilience seeks to determine why some people learn from difficult situations and others not.

The word 'resilience' has been studied roughly from the second half of the 20th century. The term has its etymological origin in the latin word 'resilio' which means to return, to spring back, to bounce back (McAslan, 2010). This term already appears in the writings of Seneca, Ovid, and Cicero, among others. Over time, the word was adapted to Social Sciences in order to characterize individuals who, in spite of being born and living in high-risk situations, they develop psychologically into healthy and successful persons (Rutter, 1993). Resilience implies points of view based more on health promotion. It is not a personality attribute, but rather an interaction between the individual and his environment, family and community. It proposes a new way of looking at human beings, seeking resources and strengthening them from what they have and not what they lost (Bhamra, Dani & Burnard, 2011; McAslan, 2010).

Resilience is a common concept in the context of disaster risk reduction and is obviously more important to be debated in the field of adaptation. A recent study (Gowan, Kirk & Sloan, 2014) suggest that a resilient community is well-placed to manage hazards, to reduce their effects and/or to recover quickly from any negative impacts, resulting in a similar or improved state as compared to before the hazard happened. The cities and urban regions are formed by complex systems of interconnected services; and as such, they face a growing number of problems that contribute to disaster risk. Local governments can implement strategies and policies to address each of these obstacles, and thus make cities around size and profile, more resilient and liveable (HFA, 2005). The work to establish resilient societies to disasters requires a precise recognition and analysis of the risks that communities face and that all stakeholders, from government agencies to each of the local residents, perfectly understand those risks. Subsequently, it is necessary to apply preparatory measures to develop laws, build structures to prevent and mitigate the damage caused by disasters, or systems to respond in an appropriate and timely manner to them. In part, the resilience approach alludes to build bridges between development and humanitarian work, and brings together a number of ideas to humanitarian approach.

Multiple risks and their consequences on vulnerable people should be considered together with the analysis of capacities and efforts to strengthen them. Programming in the field of resilience involves sustained engagement that is explicitly participatory, inclusive and accountable. For all this, public awareness has gradually increased, mainly through the active participation of the people in the affected area, such as the selection of the location of evacuation shelters and evacuation routes. According to Luthar and Cicchetti (2000), one of the main problems with the concept of resilience is its definition, on which there is no consensus. Resilience and its significance besides gaining importance in the health field and has expanded to other contexts, such as education and social policy, with applications in the field of business and public welfare, but always with strong connotations in mental health. This article aims to take a tour on the concept of resilience through a literature review of articles published worldwide on the term.

It is hoped that synthesizing what is known will help elucidate the nature of this complex phenomenon and will enable a more robust, theoretically informed measurement framework for future research.

Method

Based on the PRISM methodology for publishing systematic reviews (Urrutia & Bonfil, 2010), searches were conducted in major electronic sources of health data, including PubMed, Web of Science and ProQuest. There is a wide range of bibliographic databases available but in this study, we have proposed the evaluation criteria framework to our best knowledge to capture various aspects of resilience. Articles were selected through the databases if they met the following criteria: [1] provided information focused on the concept of resilience, and [2] focused specifically on aspects of emergency and disaster management, in order to get all the necessary information.

Keywords were resilience AND disaster, resilience

AND disaster OR emergency AND concept analysis, and resilience AND disaster risk management to search on databases, without limitation as to publication date and format to recover the history of the term 'resilience'. In the articles analyzed, those who met the criteria previously described were used as the basis of a thorough and critical review of the concept of resilience.

Results

Based on the mentioned criteria, and after a thorough review of the titles and abstracts of the papers located, a total of 37 articles published between 1991 and 2015 were found. Table 1 shows a summary of the search that was adapted to the PRISM methodology in Figure 1.

A total of 323 articles were found in PubMed. Of these articles, 42 abstracts were analyzed and, based on the information provided in the abstract, 25 articles met the criteria and were analyzed, of which 17 were considered valid and eight invalid. On ProQuest, 65 articles met the criteria. Of these articles, eight abstracts were read and analyzed, and six met the criteria, so these were fully analyzed. Of these, two were considered valid and four invalid.

Finally, on Web of Science, 80 articles met the criteria. Of these, 23 abstracts (five coincident with PubMed) were considered and of those, 17 met the criteria, which were fully analyzed (one also had been located in PubMed). Of these, 14 were considered valid (two matching with PubMed) and three invalid (one coincident with PubMed). In reviewing the references of selected articles, nine met inclusion criteria. Of these, seven were selected and after being analyzed, four were used for investigation.

Table 1 - Overall search results

	PubMed	ProQuest	Web Of Science (WoS)	References in other articles	Total
Records screened	323	65	80	-	468
Full-text articles assessed for eligibility	42 (5 also in WoS)	8	23 (5 also in PubMed)	9	82 (duplicates excluded)
Studies included in qualitative synthesis	25 (1 also in WoS)	6	17 (1 also in PubMed)	7	54 (duplicates excluded)
Not valid	8 (1 also in WoS)	4	3 (1 also in PubMed)	3	17 (duplicates excluded)
Valid	17 (2 also in WoS)	2	14 (2 also in PubMed)	4	37 (duplicates excluded)

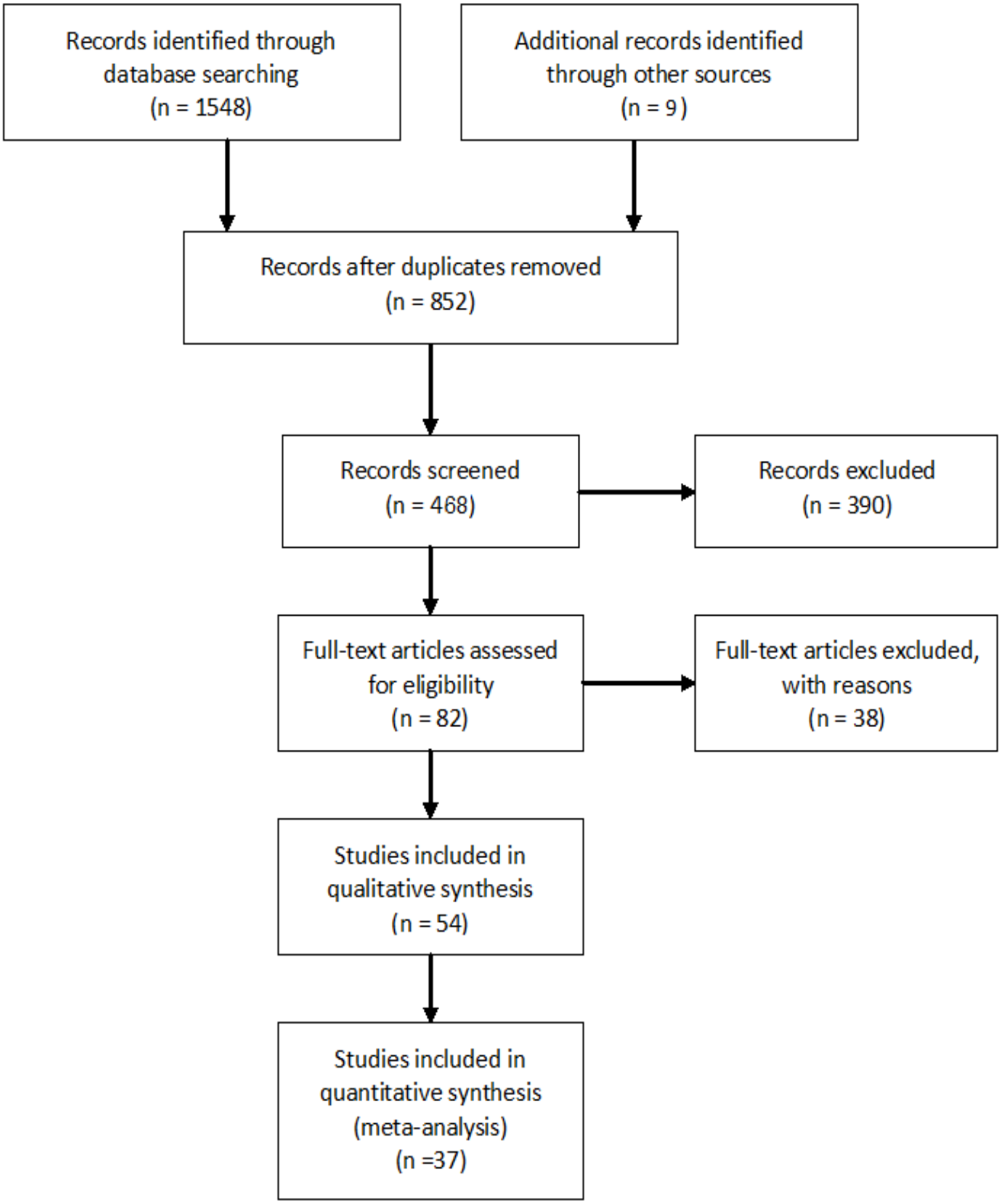

Figure 1 - Flow diagram of the study selection process for the systematic review.

Annual productivity

The publication of articles containing the word resilience has grown significantly over the years. The temporal evolution, in terms of the number of items included in the study, is presented in Figure 2 and as can be seen, the peak in productivity is in 2014, with the 18.91 % (n = 7) of the articles reviewed, followed by 2008 with five articles, which corresponds to 13.51% of the published documents.

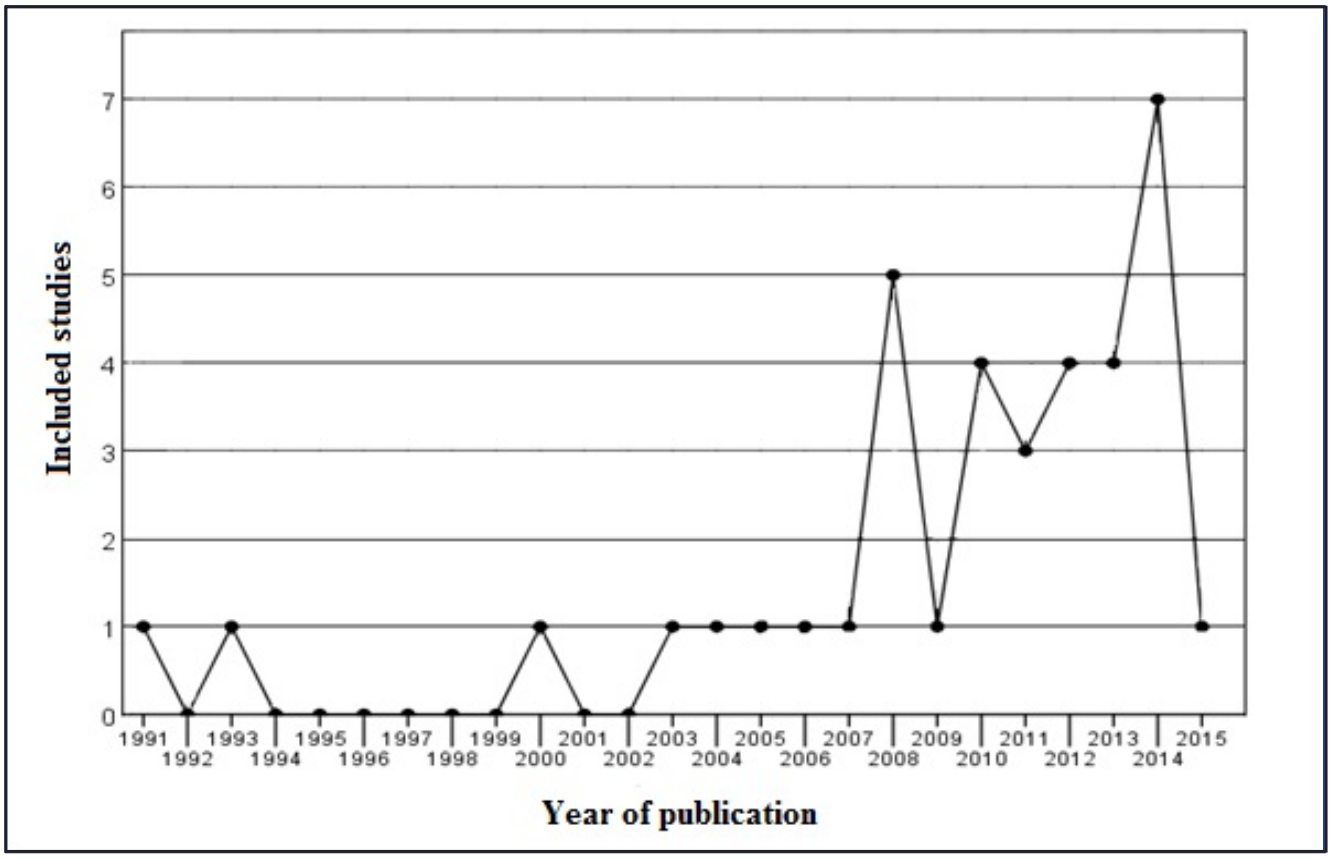

Figure 2 - Temporal evolution of publications.

Conceptual review

The concept of resilience has become increasingly prominent (Masten & Powell, 2003). Through many disciplines (including social and biomedical) numerous definitions of the term have been generated (see Table 2), serving to describe the basic capabilities of individuals, critical infrastructure, organizations, systems and human communities, to resist, respond and recover from disasters. Despite nearly three decades of thorough research on the concept, resilience still split meaning different things to experts from different fields. Many of the differences arise from the different epistemological orientations and methodological practices. However, all these definitions converge, as they insist on the ability of people to overcome adversity (Glandon, Muller & Almedom, 2008; Longstaff, 2005; Norris, Stevens, B. Pferfferbaum, Wyche & R. L. Pfefferbaum, 2008). Considering Table 2, the articles revolve around four perspectives ranging from the individual to the community, organizational and ecological.

Table 2 - Representative definitions of resilience.

Author, year	Level of analysis	Definition
Luthar et al., 2000	Ecological system	Dynamic process that has as a result the positive adaptation in contexts of great adversity[6].
Masten y Garmez, 2003	Individual	A universal capacity, which allows a person, group or community to prevent or overcome the damaging effects of adversity[8].
Bonanno et al., 2004	Individual	The ability of adults in otherwise normal circumstances who are exposed to an isolated and potentially highly disruptive event, to maintain relatively stable, healthy levels of psychological and physical functioning[9] .
Longstaff, 2005	Ecological system	The ability by an individual, group, or organization to continue its existence (or remain more or less stable) in the face of some sort of surprise[10].
Norris et al., 2008	Community	The ability of community members to take meaningful, deliberate, collective action to remedy the impact of a problem, including the ability to interpret the environment, intervene, and move on[11].
Almedom, 2008	Organization / Community	The capacity of individuals, families, communities, systems, and institutions *to* anticipate, withstand and/or judiciously engage with catastrophic events[12].
Norris, 2009	Community	The ability of a system or community to develop a series of adaptive capacity to recover from a disruption[13].
Zhou et al., 2009	Ecological system	The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions[14].
Cutter et al., 2010	Community	The ability of a social system to respond and recover from disasters and includes those inherent conditions that allow the system to absorb impacts and cope with an event, as well as a post-event[15].
Van Kessel y McDougall, 2014	Organization	The intrinsic capacity of a system or community or society predisposed to a shock or stress to 'bounce forward' and adapt in order to survive by changing its non-essential attributes and rebuilding itself[16].
Berkes y Ross, 2015	Ecological system	[1] The amount of change that the system can undergo while maintaining the same control over their structure and function. [2] The ability to organize themselves; [3] The ability of a system change and learn[17].

Plough et al. (2013) have mentioned the great diversity of ecological influences that come together to produce an exceptional reaction to a threat. Following this, three essential components that are present in every concept of resilience are distinguished: the notion of adversity, resilient and positive adaptation. So, when the subject is faced with adversity, resilience will allow to carry out a positive adaptation despite the difficulty (Luthar & Cicchetti, 2000). It is important to distinguish 'resilience' of 'recovery', because there has been considered the fact that people who have overcome traumas without major problems could have some kind of psychopathology that facilitate them to behave thus not considered "normal". However, what they were doing was implementing its resilience.

Recovery would refer therefore to the gradual restoration of healthy levels of operation after a period of psychopathology, while resilience refers to the ability of people to maintain normal levels of functioning (Luthar & Cicchetti, 2000). On the other hand, it was suggested that resilience is "the processes of coping with adversity, change or opportunity in a manner that results in the identification, fortification and enrichment of resilient qualities or protective factors" (Iacovello & Charney, 2014; Norris et al., 2008; O'Sullivan, Kuziemsky, Toal-Sullivan & Corneil, 2012; Thorén, 2014).

Measuring resilience

The measure of resilience is influenced by the absence of an agreed context and the difficulties in identifying its main features. A major obstacle to the measure of resilience is the qualitative nature of the data, although these indicators are more direct than the quantitative (Gowan et al., 2014; Prior & Hagmann, 2013). Another difficulty arises from the vagueness of certain terms linked to resilience, such as trauma, particularly in relation to PTSD. These issues are still being hotly debated for the reasons explained (Chang & Shinozuka, 2004; Pietrazk, Tracy, Galea & Kilpatrick, 2012; Prior & Hagmann, 2013; Rodriguez-Llanes, Vos & Guha-Sapir, 2013).

To clarify them, most researchers agree on the need to establish a better definition of the concept of resilience and larger studies with a rigorous methodology and agreed, able to control the different variables involved, and which enables the factorial validity as indicators of individual psychological resources (such as self-esteem, self-efficacy or control). In any case, indicate the degree of resilience requires measuring internal (personal) and external (environmental) always considering that the resilient variables of family and social environment have a very important role to achieve resilience.

Risk and protective factors of resilience and its role in welfare

Resilience is related to psychological well-being, and that resilient individuals were generally capable to maintain their physical and psychological health and had the ability to recover more quickly from stressful events (Connor & Zhang, 2006; Rodriguez-Llanes et al., 2013; Zhou, Wang, Wan & Jia, 2010).

Several factors are associated with resilience. It would seem that the same term could be done mainly equivalent to protective factors; however, by the definition of the term, some people do not develop resilience, because they live in a protected environment. As a result, researchers in this field distinguish among risk factors and protective factors (Chou & Wu, 2014; Connor & Zhang, 2006; Jabareen, 2012; Pietrantoni & Prati, 2008). Risk factors include those that increase the probability of an individual to experience discomfort in particular areas such as physical, mental health or social interactions. Overall, several situations that intensify these risks are identified. For example, poverty prevents the population to protect themselves from catastrophic events. Another risk factor is the uncontrolled growth of the population regardless of the adaptation to the risks. Also, the overexploitation of water reserves and deforestation pose serious problems for the future by the possible lack of natural resources (Connor & Zhang, 2006; Jabareen, 2012; Zhou et al., 2010). From the perspective of protective factors, there are two major sets of resources; those external to the individual/community and personal resources that reside within each subject.

External resources. Resilience is based on the interaction between the person and the environment. This capability should be integrated into the institutional, social, economic and environmental dimensions of sustainable development efforts at all levels to combat the malaise. There are other resources that help promote resilience in the individuals or communities. Perceived social support (from family or friends) have proved to be of great importance in relation to resilience, which is also consistent with previous research that has linked the quality of social relations with the positive adjustment. The institutions also have a big role to educate communities and to ensure economic development, seeking to restore the living standards of citizens. Finally, the media are essential to echo the events and promote disaster preparedness (Fine, 1991; Masten & Powell, 2003; Pietrantoni & Prati, 2008).

Internal resources. There are a number of internal factors that act as protectors. First, optimism reflects the degree to which people have favorable expectations about their future. People whose outlook is optimistic hope that things will go well and go predispose to it, while pessimists expect them to go wrong, and equally, are prepared for it. Connor and Zhang (2006) describe the positive relationship between resilience

and optimism that reflects the positive attitude of individuals to adverse situations. Moreover, self-regulation and cognitive flexibility (understood as the capacity to respond adequately to the demands of the environment by regulating thoughts and emotions to achieve their goals), also appear to modulate resilience. Physical exercise has positive effects on physical strength, mood (low levels of depression), self-esteem and cognitive functions (such as memory and learning). Social support reduces the possibility of high-risk behavior, reducing the negative perception of threat, and promoting adaptive coping and sense of self-efficacy face of disaster. Finally, the experiences of faith, moral, and altruistic could promote resilience and protect the person from developing mental illness (Bonanno & Galea, 2007; Chou & Wu, 2014; Pietrantoni & Prati, 2008; Masten & Powell, 2003).

Resilience and vulnerability

Resilience and vulnerability are essential in the study of disaster management. Numerous studies have suggested that both terms are opposites of the same continuum. An obvious distinction is that vulnerability refers to increase the probability of a negative result, as a result of exposure to risk (Castleden, McKee, Murray & Leonardi, 2011; Fu, Leoutsakos, Underwood, 2014; Norris et al., 2008). Resilience refers to avoiding problems associated with being vulnerable (Bonanno & Galea, 2007; Matyas & Pelling, 2015). But resilience is not necessarily the opposite of vulnerability, there is some overlap between them, as there are characteristics or attributes that can make us vulnerable and simultaneously affect our ability to adapt (Matyas & Pelling, 2005).

Figure 3 serves as a contrast between vulnerability and resilience. The emphasis on resilience is in the process of enhancing the capacity to resist and recover from extreme natural events. Some of the differences are important to identify relationships between them. The fundamental difference focuses on the situation of system before disaster, with the impact (exposure and sensitivity) and adaptive capacity as two essential aspects of it, while resilience is a process, focused mainly on the stages start and post-disaster, which helps enhance system capabilities to withstand and recover from danger (Frerks, Warner & Weijs; Patterson, Weil & Patel, 2010; Zhou et al., 2010).

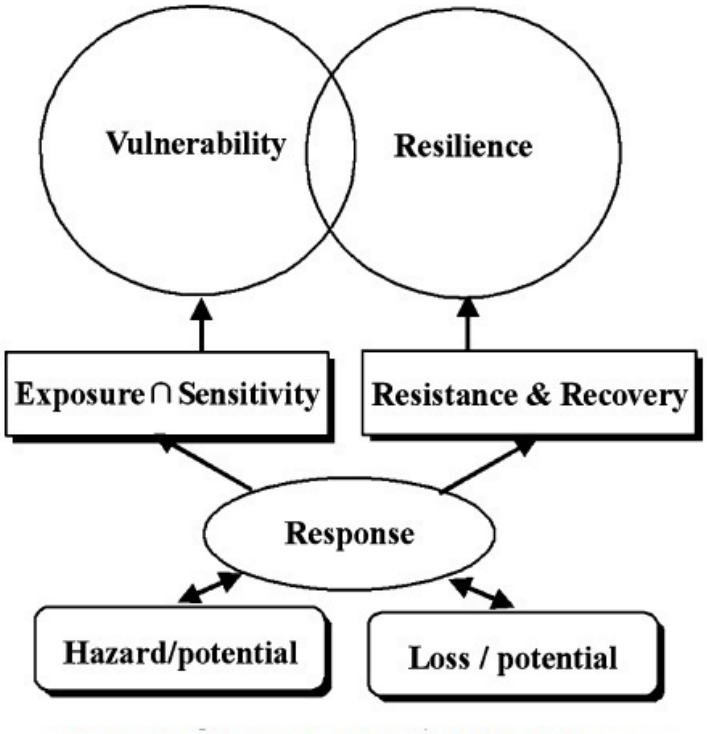

Figure 3 - The relationship between vulnerability and resilience. Source: Zhou et al. (2010)

Resilience and adaptation

Adaptation is seen as a major element in creating a resilient society. This ability to adjust and adapt includes knowledge in terms of anticipation (what to expect), attention (what to look for), and response (what to do). All three must be applied continuously, staying active throughout different situations (Keim, 2008; Norris et al., 2009). Adaptation is a necessary strategy to face and deal with changes and unexpected events, so this concept can also lead to establish stability, allowing a system to adapt to new contexts (Lei et al., 2014; Longstaff, 2005). Resilience is established from a system of adaptive capacities and can be considered as the process of linking resources with results (Longstaff, 2005; Tveiten, Albrechsten, Wærø & Wahl, 2012). In summary, the adaptability of a system can be considered as the mechanism to achieve resilience.

Discussion

Historically, societies have had major mechanisms of resistance to adversity, being able to overcome very difficult situations, and maybe that's why we evolved. As a concept, resilience is an interesting term that can advance our knowledge and have a more general framework with regard to disaster management. The main limitations in this study are due to the limited literature in general. Therefore, resilience is a very useful term, but requires better contextualization.

Numerous studies on resilience aim to define the attributes that allow to identify those who might resist and excel in adverse situations, and to recognize the most appropriate strategies to enhance these capabilities. Key findings of these studies is the elucidation of that resilience is not the sum of personal, biological and social aspects that determines whether a person is resilient or not, but its interaction with the environment. When a person faces an adverse or traumatic situation enters a dynamic in which personal and environmental resources deliver protection mechanisms to the same events. On the other hand, based on the benefits of resilience to physical and mental well-being, no wonder the great interest in the study of this concept.

Although the investigation of the concept has been identified a large number of resilient factors and many definitions that attempt to explain how the resilient process occurs, we must be aware that the most important thing is that resilience supposed a sample of human potential, a change of view of the negative aspects and limitations of their individual capacities and possibilities. Consequently, knowing that all elements involved in resilience can be promoted, anyone with more or less difficulty can learn to use resources and develop qualities that will enable him to overcome and leave enriched.

Limitations

Although the research has reached its aims, there were some unavoidable limitations. First, resilience is not easily defined and involves a range of complex processes. To avoid the confusion, we want to make clear the article provides a general understanding and not only an evolutionary analysis of the concept. Second, we have used a popular definition of resilience in the introduction. Resilience implies a transformative power (the opportunity to bounce forward), not just to return to the position we occupied before. This can have an enormously benefical and transformational effect on our sense of well-being. But with this introduction, we want to expose a simple idea and from it, establish the framework. Finally, the framework does not provide a new interpretation of resilience but captures how resilience is applied in different ways. In order to advance the field of resilience, this paper adds to the literature a deeper understanding of the issues and modelling the capacity of resilience from the perspective of individual and organizational resilience.

Conclusions

The results give a general understanding of the concept of resilience. The number of papers published by the term 'resilience' in their titles has been growing steadily during this time, especially in various fields of study, such as ecology, sociology and anthropology, among others.

Here is a surprising degree of agreement on the terms used to describe different concepts of resilience, even through very different disciplines. Moreover, many of the discrepancies in the sense of resilience arising from different methodological orientations and practices.

Through these definitions, there is a general consensus on two important points: first, the resilience is better conceptualized as an ability or process rather than an outcome; and secondly, the resilience is better conceptualized as adaptability than as stability. In conclusion, resilience itself is a learning process that can help us to improve our understanding of how to adapt to newly emerging patterns.

References

Almedom, A. M. (2008). Resilience research and policy/practice discourse in health, social, behavioral, and environmental sciences over the last ten years. *African Health Sciences, 8*(S), 5-13.

Berkes, F., & Ross, H. (2013). Community Resilience: Toward an Integrated Approach. *Society & Natural Resources: An International Journal*, 26(1), 5-20.

Bhamra, R., Dani, S., & Burnard K. (2011). Resilience: The concept, a literature review and future directions. *International Journal of Production Research, 49*(18), 5375-5393.

Bonanno, G., & Galea, S. (2007). What predicts psychological resilience after disaster? the role of demographics, resources, and life stress. J*ournal of Consulting and Clinical Psychology*, 75, 671–682.

Castleden, M., McKee, M., Murray, V., & Leonardi, G. (2011). Resilience thinking in health protection. *Journal of Public Health, 33*(3), 369-377.

Chang, S. E., & Shinozuka, M. (2004). Measuring Improvements in the Disaster Resilience of Communities. *Earthquake Spectra, 20*(3), 737-755.

Chou, J., & Wu, J. (2014). Success factors of enhanced disaster resilience in urban community. *Natural Hazards, 74*(2), 661-686.

Connor, K. M., & Zhang, W. (2006). Resilience: Determinants, measurement, and treatment responsiveness. *CNS Spectrums*, 11, 5-12.

Cutter, S. L., Burton, C. G., & Emrich, C. T. (2010). Disaster Resilience Indicators for Benchmarking Baseline Conditions. *Journal of Homeland Security and Emergency Management, 7*(1).

Fine, S. B. (1991). Resilience and human adaptability: Who rises above adversity? *The American Journal of Occupational Therapy, 45*(6), 493-503.

Frerks, G., Warner, J., & Weijs, B. (2011). The politics of vulnerability and resilience. *Ambiente & Sociedade, 14*(2), 105–122.

Fu, C., Leoutsakos, J. M., & Underwood, C. (2014). An examination of resilience cross-culturally in child and adolescent survivors of the 2008 China earthquake using the Connor-Davidson Resilience Scale (CD-RISC). *Journal of Affective Disorders*, 155, 149-153.

Glandon, D. M., Muller, J., & Almedom, A. M. (2008). Resilience in Post-Katrina New Orleans, Louisiana: A Preliminary Study. A*frican Health Sciences, 8*(S): 21-27.

Gowan, M. E., Kirk, R. C., & Sloan, J. A. (2014). Building resiliency: a cross-section study examining relationships among health-related quality of life, well-being, and disaster preparedness. *Health and Quality of Life Outcomes, 12*(1), 85.

Iacoviello, B. M., & Charney, D. S. (2014). Psychosocial facets of resilience: implications for preventing posttrauma psychopathology, treating trauma survivors, and enhancing community resilience. *European Journal of Psychotraumatology*, 5. doi:10.3402/ejpt.v5.23970

Jabareen, Y. (2012). Planning the Resilient City: Concepts and Strategies for Coping with Climate Change and Environmental Risk. *The International Journal of Urban Policy and Planning, 31*(4), 220-229.

Keim, M. E. (2008). Building human resilience: the role of public health preparedness and response as an adaptation to climate change. *American Journal of Preventive Medicine*, 35, 508-516.

Lei, Y. D., Wang, J. A., Yue, Y. J., Zhou, H. J., & Yin, W. X. (2014). Rethinking the relationships of vulnerability, resilience, and adaptation from a disaster risk perspective. *Natural Hazards, 70*(1), 609-627.

Longstaff, P. H. (2005). *Security, resilience, and communication in unpredictable environments such as terrorism, natural disasters, and complex technology*. Cambridge, MA: Center for Information Policy Research, Harvard University.

Luthar, S. S., & Cicchetti, D. (2000). The construct of resilience: Implications for interventions and social policies. *Development and Psychopathology*, 12, 857-885.

Masten, A. S., & Powell, J. L. (2003). A Resiliency Framework for Research, Policy and Practice. in Luthar, S. (ed.) *Resiliency and Vulnerability*: *Adaptation in the Context of Childhood Adversity*. Cambridge University Press: Cambridge (pp. 1-29).

Matyas, D., & Pelling, M. (2015). Positioning resilience in the post-2015 disaster risk management policy landscape: integrating resistance, persistence and transformation. *Disaster Journal*, 39, 1-18.

McAslan, A. (2010). T*he concept of resilience: Understanding its origins, meaning and utility*. Adelaide: Torrens Resilience Institute.

Norris, F. H., Stevens, S. P., Pfefferbaum, B., Wyche,

K. F., & Pfefferbaum, R. L. (2008). Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *American Journal of Community Psychology*, 41, 127-150.

Norris, F. H., Tracy, M., & Galea, S. (2009). Looking for resilience: understanding the longitudinal trajectories of responses to stress. *Social Science & Medicine, 68*(12), 2190-2198.

O'Sullivan, T. L., Kuziemsky, C. E., Toal-Sullivan, D., & Corneil, W. (2012). Unraveling the complexities of disaster management: A framework for social infrastructure to promote population health and resilience. *Social Science & Medicine*, 93, 238-246.

Patterson, O., Weil, F., & Patel, K. (2010). The role of community in disaster response: conceptual models. *Population Research and Policy, 29*(2), 127-141.

Pietrantoni, L., & Prati, G. (2008). Resilience among first responders. *African Health Sciences, 8*(1), 14-20.

Pietrzak, R. H., Tracy, M. Galea, S., Kilpatrick, D. G., Ruggiero, K. J., Hamblen, J. L., Southwick, S. M., & Norris, F. H. (2012). Resilience in the face of disaster: Prevalence and longitudinal course of mental disorders following Hurricane Ike. *PLOS One, 7*(6), 1-14. doi: 10.1371/journal.pone.0038964

Plough, A., Fielding, J. E., Chandra, A., Williams, M., Eisenman, D., Wells, K. B., … Magaña, A. (2013). Building community disaster resilience: perspectives from a large urban County Department of Public Health. *American Journal of Public Health, 103*(7), 1190-1197.

Prior, T., & Hagmann, J. (2013). Measuring resilience: methodological and political challenges of a trend security concept. *Journal of Risk Research, 17*(3), 281-298.

Rodriguez-Llanes, J. M., Vos, F., & Guha-Sapir, D. (2013). Measuring psychological resilience to disasters: are evidence-based indicators an achievable goal? *Environmental Health, 12*(115).

Rutter, M. (1993). Resilience: Some conceptual considerations. *Journal of Adolescent Health, 14*(8), 626-631.

Thorén, H. (2014). Resilience as a Unifying Concept. International *Studies in the Philosophy of Science, 28*(3), 303-324.

Tveiten, C. K., Albrechtsen, E., Wærø, I., & Wahl, A. M. (2012). Building resilience into emergency management. *Safety Science*, 50, 1960-1966.

United Nations (2005). *Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters*. Available at: http://www.refworld.org/docid/42b98a704.html

Urrutia, G., & Bonfill, X. (2010). PRISMA declaration: A proposal to improve the publication of systematic reviews and meta-analyses. *Medicina Clínica*, 135, 507-511.

Van Kessel, G., MacDougall, C., & Gibbs, L. (2014). Resilience-rhetoric to reality: a systematic review of intervention studies following natural disasters. *Disaster Medicine and Public Health Preparedness, 8*(5), 452-460.

Zhou, H., Wang, J., Wan, J., & Jia, H. (2010). Resilience to Natural Hazards: A Geographic Perspective. *Natural Hazards, 53*(1), 21-41.