USE THE DATA OF SEISMIC RISK PERCEPTION TO DESIGN EDUCATIONAL ACTIVITIES OF RISK REDUCTION

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Introduction. In the modern society of risk (Beck, 1986), risk reduction education projects and awareness campaigns play a central and relevant role.

The last twenty-five years have witnessed a flourishing of studies, research projects, educational experiments and actions to reduce natural risks. Just remember, for example, International Decade for Natural Disaster Reduction, which basic objective was to decrease the loss of life, property destruction and social and economic disruption caused by natural disasters, such as earthquakes, tsunamis, floods, landslides, volcanic eruptions, droughts, locust infestations, and other disasters of natural origin (https://www.unisdr.org/who-we-are/history).

Our principal experiences in risk reduction activities, gained in over fifteen years, concerned:

- EDURISK, an educational project for risk reduction addressed to schools and teachers. Explicit objective of EDURISK is to promote risk awareness and the active role of citizens in its reduction; therefore, a goal of social change (AA.VV., Pessina and Camassi eds, 2012);

- education and psychosocial activities realized with students, teachers and citizens in the post emergencies of L'Aquila in the 2009 (Crescimbene *et al.,* 2010; Moretti *et al.,* 2011) and in the Po Plain earthquake in the 2012 (La Longa, 2013);
- training activity for the Civil Protection volunteers involved in the "Io non Rischio" campaign (Postiglione *et al.*, 2016).

One of the most relevant problems of all these activities for risk reduction is the assessment process (La Longa, 2008).

To have the tools and be able to consider the right variables to understand if the activities put in place produced desired outcomes. We arrived to the conclusion that the process knowledge-awareness-action never occur automatically, within an educational process, but this process must be accompanied in the direction of doing.

To facilitate this process, it is necessary to understand better what are the elements and factors that influence it. In this sense, the data collected in recent years, on risk perception may represent good basis to identify the key-points to active the process knowledge-awareness-action.

Background data. We think that improve risk perception of common people is the first goal to reach to be able to mitigate and reduce seismic risk. In this direction since the year 2013, we built the Seismic Risk Perception Questionnaire (SRP-Q) to investigate risk perception in the Italian citizens. In the last three years we collected over 9,000 questionnaires by web (www.terremototest.it) and in the year 2015 we conducted a Computer Assisted Telephone interview (CATI) on a national statistical sample of over 4,000 people. Both these research activities were conducted into the Projects S2-2012 and S2-2014 - Constraining Observations into Seismic Hazard Coordinated by Laura Peruzza (OGS - Istituto Nazionale di Oceanografia e di Geofisica Sperimentale) and funded by Italian Civil Protection Department (DPC) (Crescimbene *et al.*, 2014; Crescimbene *et al.,* 2015).

Method. We processed data on the seismic risk perception collected by CATI survey in the first months of 2015 (over 4,000 responses distributed throughout the Italian territory). Our method consists of identify principal variables that influence risk perception scores and use it to design risk reduction activities. We executed an explorative factor analysis (FA) on the seismic risk perception data. These datasets derived by the CATI Survey conducted on an Italian statistical sample (N= 4012) in the first months of 2015. Results of the FA describe for each indicator, considered in the SRP-Q (Crescimbene *et al.,* 2013), some components that explain

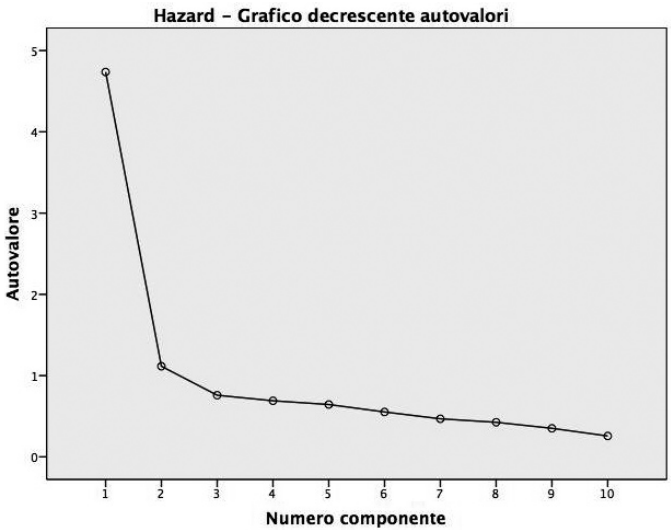

Fig. 1 – Hazard scree plot.

variability among scores observed and correlated variables, in terms of a potentially lower number of variables called factors. Considering the principal components of each indicator (Hazard, Exposure, Vulnerability, People and Community), we described these components and obtained useful indications to design activities that may improve seismic risk perception.

By this method, we think to realize an educational design able to valorise those factors that promote social change for risk reduction.

Factor analysis results. We used the 2015 version of the IBM SPSS Statistics (SPSS) to execute an exploratory factor analysis. Factor analysis was executed for every indicator of the SRPQ to identify the principal components that explain the variance for each of indicators considered. The results obtained by the factor analysis (FA) for each indicator indicate that:

- Hazard. FA has indicated two components. The first can be connected to the power/force and size of the earthquake. The second component regards its forecast/not forecast (Fig. 1 and Tab. 1);

Tab. 1 – Hazard Factor Analysis: components matrix rotated.

	Componente	
	1	2
Inatteso (1) atteso (7)	,709	-,119
Debole (1) forte (7)	,816	,175
Piccolo (1) grande (7)	,822	,167
Lontano (1) vicino (7)	,768	,091
Prevedibile (1) imprevedibile (7	-,078	,871
Corto (1) lungo (7)	,696	,214
Moderato (1) violento (7)	,748	,300
Lento (1) rapido (7)	,332	,569
Innocuo (1) pericoloso (7)	,640	,329
Lontano nel tempo (1) vicino nel tempo (7)	,664	,026

- For Exposure FA has indicated two components. The first can be connected to care/not care of the territory. The second one to the number of people that frequent it (Fig. 2 and Tab. 2);

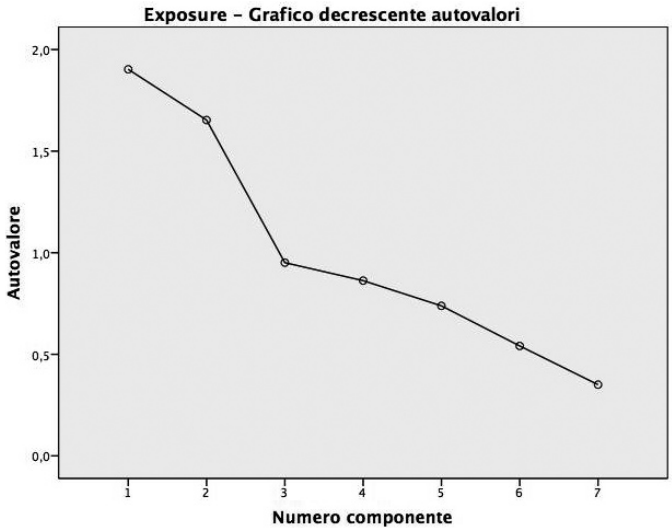

Fig. 2 – Exposure scree plot.

Tab. 2 – Exposure Factor Analysis: components matrix rotated.

	Componente	
	1	2
Curato (1) trascurato (7)	,869	-,054
Organizzato (1) disorganizzato (7)	,863	-,101
Moderno (1) antico (7)	,483	,030
Disabitato (1) abitato (7)	,096	,756
Non frequentato (1) frequentato (7)	,111	,731
Povero (1) ricco (7)	-,155	,569
Non industrializzato (1) industrializzato (7)	-,123	,564

- FA procedure was not able to reduce the Vulnerability. This indicator seems to be connected to only one construct "the seismic safety of the building".
- People and Community. FA has indicated two components. The first regards union and cooperation between people. The second the preparation of the people at an earthquake (Fig. 3 and Tab. 3).

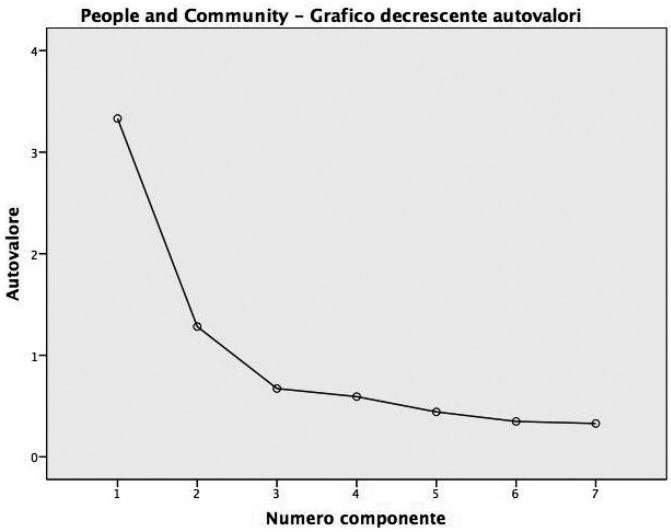

Fig. 3 – People and Community scree plot.

Tab. 3 – People and Community: components matrix rotated.

	Componente	
	1	2
Collaborative (1) non collaborative (7)	,843	,129
Unite (1) divise (7)	,810	,229
Interessate (1) indifferenti (7)	,758	,068
Vicino (1) lontane (7)	,697	,349
Preparate (1) impreparate (7)	,162	,852
Sicure (1) insicure (7)	,232	,820
Pragmatiche (1) fataliste (7)	,120	,706

Design activities and contents. We think to experiment in a small group of teachers or common people a brief educational program based on the following key concepts.

Relating the hazard in general the training it will base on the size and strength of the earthquake (magnitude and intensity) and on its forecasting / not forecasting. Possibly, introducing the concept of probability.

The themes that regard Exposure will be addressed drawing on the Deep Ecology (Naess, 1986). Proponents of deep ecology believe that the world does not exist as a resource to be freely exploited by humans. The ethics of deep ecology hold that the survival of any part is dependent upon the well-being of the whole.

Concerning the Vulnerability, the training program will be based on the guidelines of seismic vulnerability of buildings published in several studies in Italy in the last decade. On this specific topic we need to collaborate with INGV-Milano and Consorzio della Rete dei Laboratori Universitari di Ingegneria Sismica (ReLuiss).

For the People and Community indicator, the training program will concern some role-playing activities on teamwork and cooperation and role-playing on preparation at the earthquake.

Conclusions. In the near future, we will apply on small groups the training program and the activities and will evaluate if the risk perception scores will be improved.

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