

## Self-efficacy, stress, and locus of control: The psychology of earthquake risk perception in Bucharest, Romania



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### ABSTRACT

This research explores the way three distinct psychological determinants shape seismic risk perceptions. We surveyed over 1300 persons in the city and measured the way locus of control, self-efficacy, and stress vulnerability relate to risk perception and various socio-demographic indicators. We found that self-efficacy varies with gender, whether people live in a house or a block of flats, and previous earthquake training. Stress has a spatial component to it as various areas of the city show different stress levels. Socio-demographics also leave their mark, as women, people over 50 years of age, and those with declared lower incomes, score higher in stress vulnerability. Locus of control varies with age and gender, with men and the young most confident in their ability to control events. Those who do worry also have more trust in various entities that might help, such as the Fire Department, Charities, or Government. Interestingly, both the extent to which people worry and their perceived earthquake preparedness correlate with all three psychological dimensions measured. Since these modifiable psychological dimensions shape operant behaviours, such as disaster related ones, we discuss avenues for their improvement and increased adaptability.

### 1. Introduction

The inhabitants of great cities affected of known seismic hazard live in a latent way the preoccupation and the preparation for the possible consequences of an earthquake. Risks are internalized, mental models [30], socially constructed [17] which allow people to cope with non-recurring phenomena, while also implying a certain level of psychosocial vulnerability. People's thoughts are consciously and unconsciously influenced by their environment [13,23], hazards included [15,24]. These cognitions, in turn, generate behavioural strategies. Some lead to poorly adaptive behaviours and form the essence of a particular psychological vulnerability [14,16,21]. This study is exploratory and aims to identify the psychological control factors in relation to earthquake risk perception in Bucharest. The capital city of Romania is an earthquake prone area located about 140 km away from the most seismically important area of the country [29,7] (Fig. 1).

Capturing psychological control factors in relation to seismic risk perception in Bucharest is a novel undertaking. As a starting point were used psychological variables that measure stress, personal effectiveness and the belief in personal control. The working hypothesis was centred on testing the psychological dimensions as control factors in risk perception. Another hypothesis was focused on exploring the connec-

tion between psychological control factors and vulnerable demographic determinants: age [25], gender [12], perceived economic status [5], the building conditions/characteristics in which they live [35,6], and behavioural changes in relation to experienced earthquake events.

Our analysis is underlined by social learning theory, with focus on locus of control [34], the concept of self-efficacy [8,9], and anxiety and stress theories [36]. Locus of control is the extent to which a person believes they are responsible for events in their lives [18,19,40]. Self-efficacy is the measure of one's belief in their ability to successfully deal with certain present or future issues or tasks [26,28,31,32]. Stress is prolonged psycho-physiological activation [36] and anxiety is activation beyond what is required in that situation [38]. Those with an external locus of control (perceive life's events as being beyond their control) are significantly more anxious and less adapted [10,11,22,27,33].

### 2. Method

#### 2.1. Questionnaire design

To explore attitudes and behaviours of local respondents, a multi-modal questionnaire was developed through qualitative methods (a

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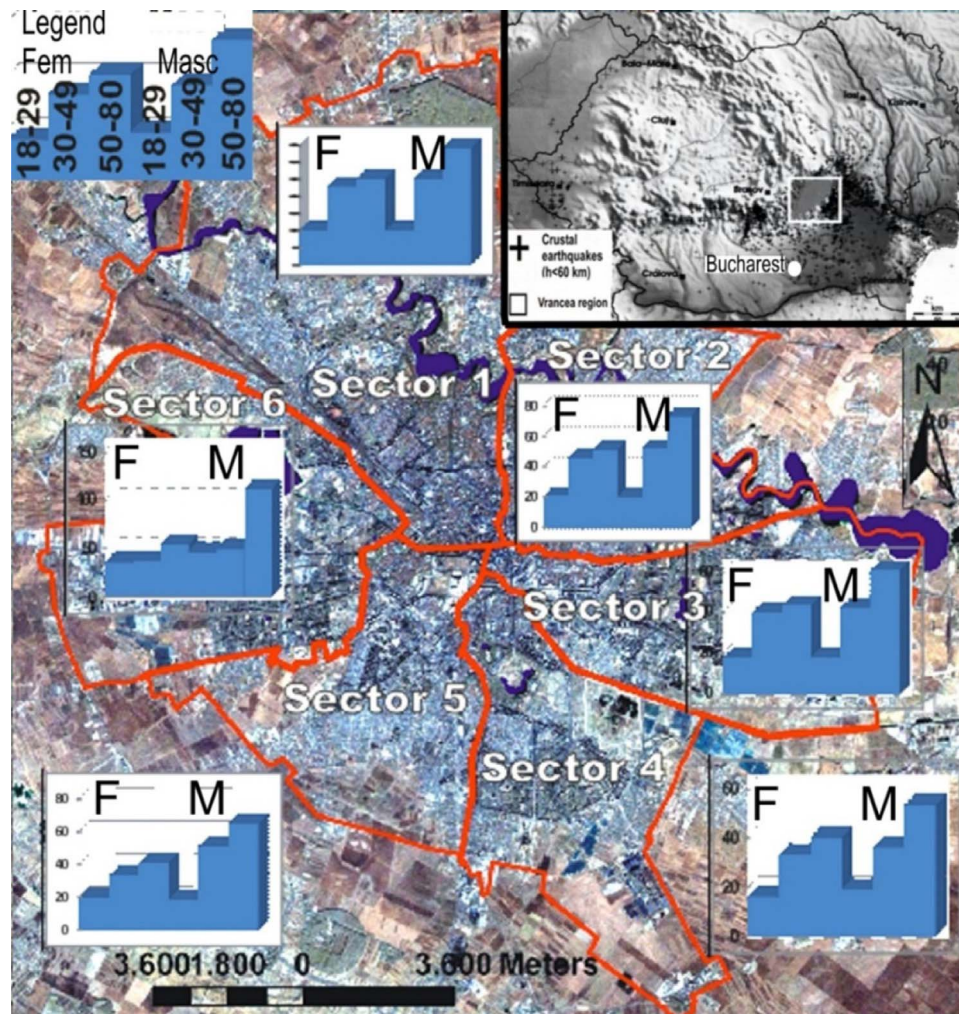


Fig. 1. Administrative sectors in Bucharest featuring sample distribution.

focus group, along with experts from the Public and Administrative Sciences National School, Risk Communication Centre, Bucharest).

The questionnaire was structured around 35 items over four modules, with different types of questions (single or multiple answers, open questions, etc.), and also questions using different scaling methods. The first module had some general information, the second was focused on risk perceptions, the third on psychological measurements, and the last on socio-demographics.

Administration and processing procedures were tested on 20 people in a pretesting phase. The findings of the pilot phase of the questionnaire were critical in the design and review of the final instrument, which was distributed to two teams of 20 experienced operators for data collection.

## 2.2. Population sampling

Data collection was done using a telephone interview-based survey applied to a representative sample of the Bucharest population in November 2009: selected families/households from Bucharest, which had a telephone or a mobile phone. The sample type was probabilistic, single-staged, layered, and the households were selected using the Random Digit Dialing (RDD) method for undifferentiated generation of phone numbers. The layer criterion was the district. The sample was conceived proportional to each Bucharest district focused population.

In each household an over 18 year-old person was selected. If in the selected household there were several eligible individuals, one was selected, applying the birthday rule (the first person from the household

who celebrated his/her birthday was selected). If that person was not at home, the call was rescheduled for a date and hour when that person was available. ‘The three visits’ principle was applied (the call operator was instructed to make three attempts to interview the selected person). For each called household, the call operator recorded the main socio-demographic characteristics (sex, age, etc.) for the selected person. Overall, we investigated 1376 persons, of which 57 pc women and 43 pc men. The structure of the sample was validated per data from the National Institute of Statistics. Because the sampling dimensions for each gender and age group from each district is not proportionate to the considered population, a weighting factor, in order to give each area the correct weight, was necessary to use. For each sampling group, an equal weight to the ratio between the respective group population and the number of responsive sample respondents was given. The real population dimensions used were the time series at 1 July 2009, provided by the National Institute of Statistics (series were calculated based on last census data, 2002, rectified with the rate of natural increase, the external migration balance, the migratory movement with change of address balance, the migratory movement with change of residence balance, phenomena recorded between the Census and the given moment). Therefore, the weight has been calculated as being the ratio between the time series population and the sampling population.

## 2.3. Construction of psychological dimensions

The 21 items in the psychological module of the questionnaire were subjected to an Exploratory Factorial Analysis (Principal Component

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