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FIRE AND SEISMIC RISK PERCEPTION AT LISBON UNIVERSITY – FACULTY OF LETTERS*

PERCEÇÃO DO RISCO SÍSMICO E INCÊNDIO NA UNIVERSIDADE DE LISBOA – FACULDADE DE LETRAS

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ABSTRACT

The aim of the research is to find spatial awareness and safety procedures in hypothetical earthquake and fire situations of the faculty's users. The results show users do not know what to do if an earthquake (33%) or fire (11%) occurs and 60% are not aware of any safety equipment or where the meeting point is. For these reasons a communication strategy should be created and developed.

Keywords: Seismic and fire risk perception, surveys, public buildings, risk communication.

RESUMO

O objetivo desta investigação é conhecer a perceção espacial e os procedimentos de segurança em situações hipotéticas de sismo e incêndio dos utilizadores da faculdade. Os resultados mostram que 33% dos utilizadores não sabem o que fazer em caso de sismo ou incêndio (11%) e60% não estão cientes dos equipamentos de segurança ou mesmo onde é o ponto de encontro. Por estas razões, uma estratégia de comunicação do risco devia ser criada e desenvolvida.

Palavras-chave: Perceção de risco sísmico e de incêndio, questionários, edifícios públicos, comunicação do risco.

RESUMEN

La percepción de riesgo de terremoto e incendio en el campus universitario - El propósito de esta investigación es conocer los procedimientos de seguridad y de percepción espaciales en situaciones hipotéticas de terremoto e incendio de usuarios en la facultad. Los resultados muestran que 33% no sabe qué hacer si se produce un terremoto y incendio (11%), 60%no son conscientes de ningún equipo de seguridad o incluso donde es el punto de encuentro. En este contexto, más estudios de percepción de riesgo se deben realizar.

Palabras clave: Percepción del riesgo sísmico y incendio, cuestionarios, edificios públicos, comunicación de riesgos.

RESUMÉ

La perception du risque de feu de tremblement de terre sur le campus - Le but de cette enquête était connaître la perception et la sécurité des procédures spatiales dans des situations hypothétiques du tremblement de terre et le feu de utilisateurs à la facultéétait. Les résultats montrent que 33% ne savent pas quoi faire si un tremblement de terre se produit et d'incendie (11%), 60% ne sont pas au courant de tout équipement de sécurité. Dans ce contexte, plusieurs études sur la perception des risques doivent être effectuées.

Mots-clé: La perception du risque sismique et d'incendie, questionnaires, les bâtiments publics, la communication des risques.

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Introduction

Natural and human disasters have caused significant amount of damage, affecting millions of people worldwide. In the period 2000-2009 it was estimated that these disasters caused more than 146,000 millions of US dollars (2009 prices) in damages, affecting more than 10,000,000 people, only in Europe (IFRCRCS, 2010). In order to decrease the impact of such disasters and allow the construction of resilient nations and communities, the Hyogo Framework for Action 2005-2015 (UNISDR, 2007) has proposed three main strategic goals: "*more effective integration of disaster risk considerations into sustainable development policies, planning and programming at all levels, with a special emphasis on disaster prevention, mitigation, preparedness and vulnerability reduction; development and strengthening of institutions, mechanisms and capacities at all levels, in particular at the community level, that can systematically contribute to building resilience to hazards; and systematic incorporation of risk reduction approaches into the design and implementation of emergency preparedness, response and recovery programmes in the reconstruction of affected communities.*" In this context, seven Portuguese municipalities have joined the Campaign "Making Cities Resilient 2010-2015", with highlight to Amadora which was able to implement successfully good practices for the disaster risk reduction (Lawry and Carvalho, 2016): mobilization and participation of the various stakeholders community in defining strategies for reducing disaster risk: planning and awareness; multidisciplinary team for the implementation of principles of resilient city (International Campaign "Making Resilient Cities"); reducing the risk of disaster as one of the priorities of the municipality's agenda.

In order to provide continuity to the challenges raised by the Hyogo Framework for Action 2005-2015, new guidelines have been defined on March 2015 in Sendai, Japan for the international strategy for disaster risk reduction (UNISDR, 2015). In Portugal, given the success of the Hyogo Framework, 18 new municipalities have joined the Campaign which lead to the creation of the "Working Group 3 – Resilient Cities (WG3)" in the Framework of the Sub-Committee of National Platform for Disaster Risk Reduction (ANPC, 2015). On the other hand, the National Programme for Spatial Planning Policies (PNPOT, 2007) established strategic guidelines for spatial planning, which considered the risk prevention and management has been mandatory to be included in all instruments of territorial management. In fact, in 2010 about 101,000 occurrences were registered in the country (ANPC, 2010a), being the large majority related to traffic accidents (more than 30,000), followed by forest fires (more than 20,000), falling trees (more than 10,000), floods, and fires on habitation buildings (both with about 7,000).

On August 28, 1988 a fire destroyed a significant part of Chiado, in Lisbon. The old wooden construction contributed to the quick spread of the fire and the narrow streets with difficult access was an obstacle to firefighters to extinguish the fire (Cunha *et al.*, 1988). The fire caused 2 dead, more than 130 injured (firefighters and locals). More than 300 people were displaced and 18 buildings were totally destroyed. The area was renovated with modern concrete buildings and several improvements in the safety were implemented (RCL, 2013). On the other hand, the seismic activity in Portugal is quite low. Still, several large earthquakes have been generated in the past: the last one occurred in 1969, with magnitude 7.9, but the largest earthquake occurred on November 1, 1755, with magnitude M_w 8.7 (eg. Grandin *et al.*, 2007). This earthquake triggered a tsunami, and in Lisbon and Setubal there were fires. This historical disaster caused major damage and more than 12,000 fatalities (Santos and Koshimura, 2015), being the worst disaster that ever occurred in the country. Moreover, both scientific community and stakeholders acknowledge that a repetition of the 1755 disaster would cause significant damage at the urban areas and an elevated number of fatalities, especially at the Algarve region (ANPC, 2010b), mostly during summer time (Gaspar *et al.*, 2010), and at the Lisbon Metropolitan Area (ANPC, 2009). Nevertheless, as discussed by A. Santos and M. Queirós, 2015, the Portuguese legislation regarding safety for earthquakes and fires in buildings is very complete. In addition, practical guidelines for emergency planning on buildings are also available (ANPC, 2012), that comply with the Portuguese laws.

As pointed out by Santos and Queirós, 2015, "crisis management researchers have becoming more proactive in assessing the safety conditions of their academic institutions by developing and enhancing their disaster response plans (Beggan, 2011)." In Portugal there are several recent studies focused on the safety at high schools (Inácio, 2010, Machado, 2012). Indeed, Machado, 2012, Machado and Queriós, 2015 studied the culture of risk at a high school, in Lisbon. The authors conducted a survey for risk perception assessment, in order to define more efficient strategies in the awareness, mitigation and resilience to disasters.

Under the presented scenario, the safety condition at the Faculty of Letters of the University of Lisbon (FLUL) have been investigated (fig. 1) and several traps were found (M. Queirós and A. Santos, 2013, A. Santos and M. Queirós, 2015). These traps include emergency doors, which are permanently and intentionally locked. Although this reflects a security measure, it could be a barrier to a quick and safe emergency evacuation. Moreover, the researchers have never had knowledge about emergency plans or safety procedures at the FLUL. In fact, most of the guidelines presented above have

not been implemented in the faculty. For these reasons a pilot-evacuation exercise was conducted at FLUL organized by the authors, on March 21, 2012, on which a restricted group of users have participated (A. Santos and M. Queirós, 2015). This was the first time that this kind of activity was carried out at the Lisbon University campus. After the exercise was finished, the participants answered a short questionnaire. The main conclusions of that study showed that in spite of the initial traps, the FLUL building is very well equipped with emergency equipment (fire extinguishers, hoses, exit signs, emergency doors and emergency buttons). Still, the participants of the evacuation exercise were not aware of it (A. Santos and M. Queirós, 2015). Furthermore, some of the participants evacuated running instead of walking. These results showed that more safety education and evacuation exercises are needed.

Taken in mind that the 2012 experience (evacuation exercise and questionnaire) was conducted on a reduced sampled number, a more elaborated survey was conducted at FLUL, on risk perception, with a 20% users' sample, in order to provide a reliable statistical sample (Abreu, 2006). Thus, the objective of this study is to present and discuss the results of this survey . With this paper the authors hope to contribute to raise awareness of the relevance of safety procedures at the university buildings and to provide more effective ways of risk communication within the academia community.

Methodology

The study is focused on spatial awareness in an area of interaction (faculty building) in a hypothetical earthquake followed by fire, by using a questionnaire. According to Slovic (2007), questioning people directly about their perceptions of risks helps to understand current preferences, allows gathering data, access feelings and cognitions, identifies different concepts of risk, depicts people's mental models (attitudes, beliefs, values) of perceived risks, recognize the gender roles in perceived risks, etc. Indeed, questionnaires are important tools that have been used in a variety of studies (Ocal, 2011, Murakami *et al.*, 2012, Machado, 2012, Machado and Queirós, 2015), providing a reliable source of data. The FLUL population consists on students, professors and teachers, researchers, and staff, with a total of 4159 persons, as presented in Table I.

The survey was elaborated for 20% (Abreu, 2006) of the FLUL population. Thus, the survey consisted on a total of 832 questionnaires, on which most of the interviewed were students. Furthermore, the interviews were conducted between May and July, 2014 during working days, on the floors zero, one and two of the building. During the survey, an unknown number of visitors were also approached. However, those answers were not considered since those categories do not fit the methodology of Table I. The questionnaire consisted on

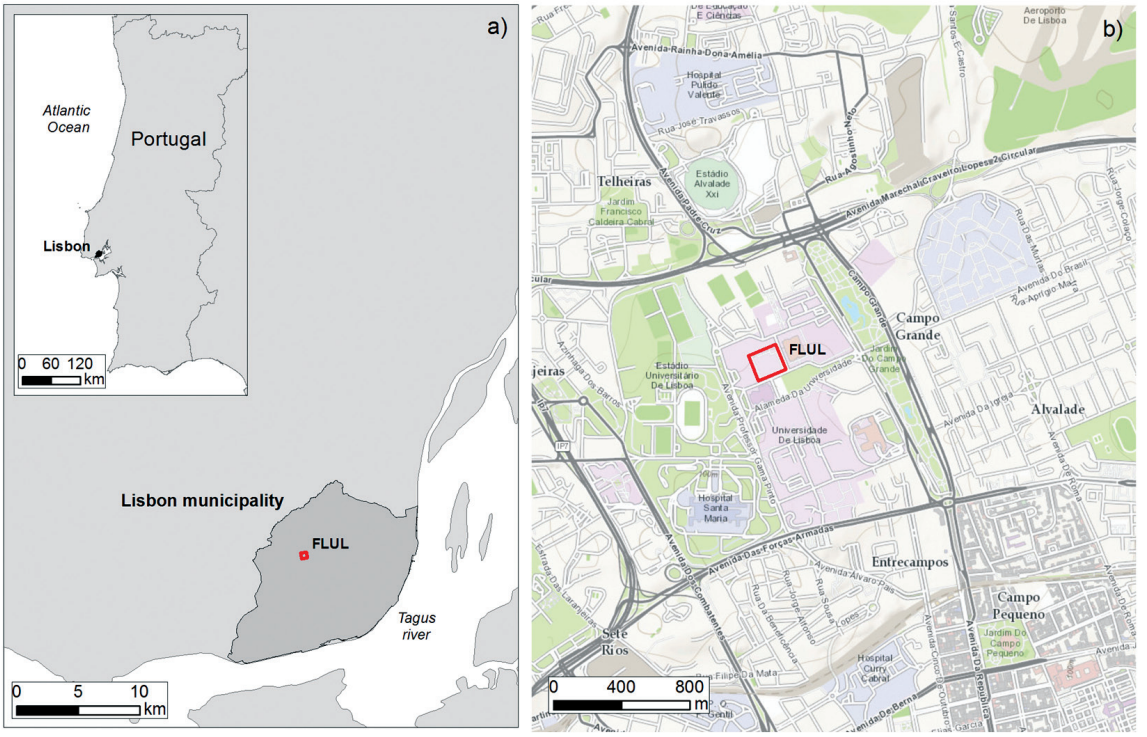

Fig. 1 - Location of the Faculty of Letters of the University of Lisbon (FLUL).

***Fig. 1** – Localização da Faculdade de Letras da Universidade de Lisboa (FLUL).*

a total of 15 questions regarding personal information, safety issues, and indicating the safety equipment on the plants of each floor. The questions are presented in Table II, together with the answers. Preliminary results were already discussed (A. Santos and M. Queirós, 2014), and presented to the FLUL staff in a Safety Workshop.

Table I - FLUL population and the analyzed sample in this study (Source: FLUL).

***Tabela I** - A população da FLUL e a amostra analisada neste estudo (Fonte: FLUL).*

Population	Total number	Analyzed sample of 20 %
Under-graduated students	2805	561
Master students	601	120
PhD students	331	66
Post-Graduation students	26	5
Researchers	15	3
Professors and teaches	241	48
Staff	140	28
Total	4159	832

Results and discussion

The summary of the main results are shown in Table II. In addition, more detailed analyses are presented in the next sub-sections for fire and earthquake procedures.

The FLUL users are in general young people, with less than 30 years old (question 2), which represents 84.3 % of the population. Most of the users are at FLUL (question 3) for more than 1 year (634, or 76.2 %). These are expected results since the majority of the FLUL population are under-graduated students (Table I). As previously presented (A. Santos and M. Queirós, 2014), at the time the participants were answering the questions, 33.1 % of them mentioned they were on the ground floor (275) (question 4).

In addition, only 56 % (466) identified the correct floor, showing the users do not know their location in the building. Yet people circulate around significantly since about 71% of users usually are addressed to two or three areas (question 5). The four most common used areas are presented in fig. 2: the cafeterias (294 users), the library (193 users), the classrooms (130) and the several research department areas (77).In addition, 81 % of the interviewed said they have never felt unsafe at the FLUL building (question 6). Nevertheless those who felt unsafe (62 people) mentioned assaults. These robberies have been reported to the FLUL staff, and it was found that most of the situations had occurred at the library. Therefore, a system to identify everyone who entered the library has been installed, and police has been an abiding presence, even inside the building.

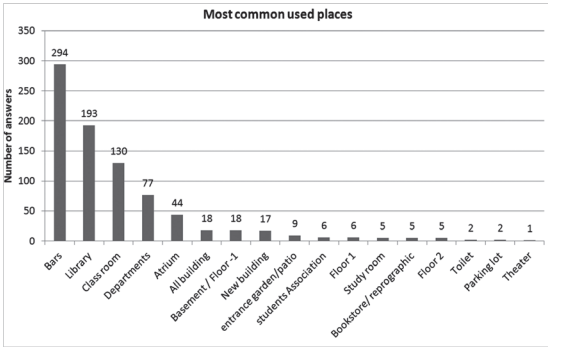

Fig. 2 - Most commonly used places, highlighting the bars, library, classrooms and the departments (question 5).

***Fig. 2** - Locais mais usados, destacando-se os bares, a biblioteca, salas de aula e os departamentos (questão 5).*

Although in question 7 only two procedures were asked about safety measures for fires, 54 participants (6.5 %) remembered three procedures. However, 18 participants (2.2 %) did not know what to do if a fire occurs, while the majority of 63.7 % was able to remember two procedures. Similar question was asked about earthquake procedures (question 8) and 23 participants (2.8 %) remembered three steps, 48% were able to remember two procedures, and 33 users (4.0 %) did not know what to do at all. Further details about these results will be presented in the next sub-sections.

Most of the users, 608 (73.1%), correctly pointed out their location, but 94 participants (11.3%) did not know where they were (question 9). Moreover, the large majority of the users were not aware of any safety equipment (questions 10, 11, 12 and 13), since 59.1% (492 participants) did not notice any fire-extinguisher, 69.1% (575 participants) did not see any exit sign and 95.7% (796 participants) were not able to identify the emergency buttons. In addition, 53.7 % (447 participants) did not realize the existence of the emergency doors. Indeed, only 3 people said that all the exit doors were emergency doors. Nevertheless, as concluded previously by A. Santos and M. Queirós, 2015, the FLUL is very well equipped with safety equipment, since there are a total of 258 fire-extinguishers, 237 exit signs and 43 emergency buttons, evenly distributed on the several floors. The FLUL has also 12 emergency doors which lead directly to the exterior. However, 6 are permanently locked due to allegedly "security reasons" which constitute a serious barrier for a safe and quick evacuation in case of an emergency. This situation does not follow the safety procedures in Portugal (eg. ANPC, 2012, and Portuguese Legislation), and has already been pointed out by A. Santos and M. Queirós (2015) and reported to the FLUL director and supporting staff. As discussed by Machado (2012), studies of cognitive psychology have shown that we tend to avoid uncertainty (M.L. Lima, 2004), which leads to a distorted risk assessment. This mental strategy or heuristic or avoiding uncertainty could to a tendency to

Table II - Results of the questionnaire.

***Tabela II** - Resultados do questionário.*

Questions	No. answers	%
1.Sex		
Females	484	58.2
Males	337	40.5
No answer	11	1.3
2.Age		
20 or less	199	23.9
21 - 30	502	60.3
31-40	62	7.5
41-50	30	3.6
51 or more	32	3.8
No answer	7	0.8
3. How long have you been at FLUL?		
Less than 1 year	189	22.7
1 - 2 years	159	19.1
2 - 3 years	145	17.4
3 - 4 years	106	12.7
More than 4 years	224	26.9
No answer	9	1.1
4. Indication of the present floor.		
Correct	466	56.0
incorrect	341	41.0
No answer	25	3.0
5. Places more common used.		
4 places	43	5.2
3 places	205	24.6
2 places	388	46.6
1 place	196	23.6
6. Have you ever felt unsafe at the FLUL?		
No	674	81.0
Yes	155	18.6
NA	3	0.4
7. What should you do in case of a fire (2 procedures)?		
3 procedure	54	6.5
2 procedure	530	63.7
1 procedure	230	27.6
No answer	18	2.2
8. What should you do in case of an earthquake (2 procedures)?		
3 procedure	23	2.8
2 procedure	399	48.0
1 procedure	377	45.3
No answer	33	4.0
9. Indication of your position on the plant.		
Correct	608	73.1
Incorrect	130	15.6
No answer	94	11.3

Questions	No. answers	%
10. Indication of fire-extinguishers on the plant.		
0	492	59.1
1	195	23.4
2	94	11.3
3	35	4.2
4	9	1.1
5	1	0.1
6	1	0.1
Several	5	0.6
11. Indication of exit signs on the plant.		
0	575	69.1
1	183	22.0
2	36	4.3
3	22	2.6
4	6	0.7
5	1	0.1
Several	9	1.1
12. Indication of emergency doors on the plant.		
0	447	53.7
1	241	29.0
2	69	8.3
3	40	4.8
4	15	1.8
5	3	0.8
6	8	1.0
7	1	0.1
Several	8	1.0
13. Indication of emergency buttons on the plant.		
0	796	95.7
1	25	3.0
2	4	0.5
3	1	0.1
4	1	0.1
Several	5	0.6
14. Indication of the meeting point on the plant.		
Outside the building	203	24.4
Inside of the building	132	15.9
No answer	497	59.8
15. Indication of the work place on the plant.		
Correct	272	32.7
Incorrect	35	4.2
Other floors	223	26.8
No answer	302	36.3

deny the risk that may expose the people (M. Lima, 2005). On the other hand, it has been frequently observed that there is a minor care about the risks caused by natural hazards that have a lower probability of occurrence, such as earthquakes (A. Delicado *et al.*, 2007).

Regarding the meeting point (question 14) only 203 users, which correspond to about 24%, are aware that the correct area to evacuate is outside the building. The majority of participants do not know about the meeting point (59.8%, or 497), and 132 users (15.9%) think it is located inside the building. In addition, those 132 people who pointed out the meeting point would be indoors, 113 (about 86%) it would be at the FLUL entrance atrium. This means that out of the 832 responders, 113 (about 14%) would go to the atrium, which will cause confusion and panic. Thus, if a fire occurs at FLUL the number of injury would increase simpy because most users are do not know where is safe to escape.

Finally, only 272 participants (32.7%) were able to correctly point out their work place on the plant (question 15). This shows the users do not know the building, which is in agreement with question 4, on which only 56% of the users were able to correctly identify the floor where the questionnaire was conducted. On the other hand, the results of question 15 also show that the users circulate at the FLUL because about 27% believed their workplace was located on other floors. This is consistent with the results presented on question 4, where users stay more often at the cafeterias, library, classrooms and departments (fig. 2). The cafeterias are located on floors 0 and 1, the library is on a new building, which is separated from the main building, and classrooms and departments are distributed on the floors 0, 1 and 2.

Results for fire procedures

More data details were explored in the question related to fire procedures (question 7). As presented in Table II, only 18 participants (2.2%) did not know how to behave if a fire occurs in the building. This shows that more than 95 % of the users remembered fire safety procedures. Further analyses of the responses allowed a classification into four categories: correct, exception, incorrect and null (which were combined into zero correct answers), and no answer. Thus, as presented in fig. 3, only 31 participants (3.7%) gave three correct answers ,80.9% gave one or two correct answers, and 92 people (about 11%) do not have any knowledge about fire safety procedures.

The detailed answers which were classified as correct, incorrect and null are presented in Table III. The four most common correct answers were: “leave the building”, “use fire-extinguishers”, “call emergency services”, and “keep calm”. However, the most common incorrect answers were “escape” and “run”, which are clear signs of panic.

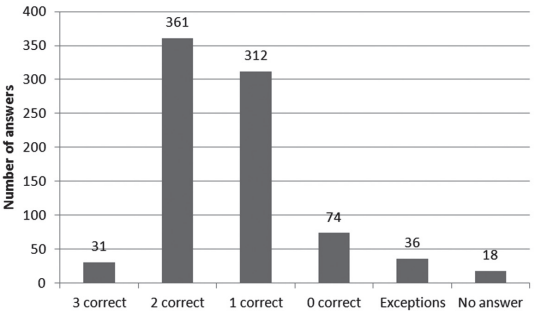

Fig. 3 - Number of fire procedures which were considered correct, exceptions and no answer.

***Fig. 3** - Número de procedimentos sobre incêndios considerados corretos, exceção e sem resposta.*

Moreover, the fact that 36 people gave answers that were classified as exceptions (fig. 3), show that 4.4% of FLUL users are confused about the correct fire safety procedures. The detailed answers which were classified as exceptions are presented in Table IV. The two more common answers were: “search for the exits” and “follow the instructions”.

These answers show the participants may have been confused since the emergency plan if a fire strikes should be memorized and tested during drills and evacuation exercises. In addition, following instructions is indeed a correct answer. However, the emergency plan of the FLUL is not known, and therefore the tasks carried out by staff and safety delegate may not have been discussed at all, leading to an ambiguous situation: the FLUL users cannot follow instructions if there is nobody to guide them; thus they are not prepared to react correctly and automatically in those situations, since the “muscle memory” has not been developed (A. Santos and M. Queirós, 2015). Therefore, it is fundamental that each individual may act by his/her own with the correct emergency procedures for disasters.

Results for earthquake procedures

More data details were explored in the question related to earthquake procedures (question 8). As presented in Table II, 23 participants (2.8%) remembered three earthquake procedures, but 33 (4.0%) did not know what to do, and 399 (48%) were able to remember two procedures. Further analyses of the responses allowed a classification into 4 categories: correct, exception, incorrect and null (which were combined into zero correct answers), and no answer. Thus, none of the participants was able to indicate three correct procedures (fig. 4). From those 399 people who remembered two procedures, only 31 (3.7%) provided both answers correct, and 275 (33.1%) were able to indicate one correct procedure. A total of 274 (32.9%) users do not know any earthquake safety procedure at all (those

Table III -Correct, incorrect and null fire procedures answered by the respondents.

***Tabela III** - Respostas dos inquiridos referentes a procedimentos sobre incêndios que foram considerados corretos, incorretos e nulos.*

Procedure	No. answers
Correct	
Leave the building	224
Use fire-extinguishers	176
Emergency call	124
Keep calm	88
Use the nearest emergency exits	78
Leave in a orderly way	77
Do not use the elevators	66
Help others	64
Alert people/staff	37
Walk in a low position	33
Evacuate the building	31
Use the stairs	23
Pick up your personal belongings and leave	18
Put a wet cloth on the mouth	14
Follow the emergency signs	12
Pull the fire alarm	8
Move away from smoke/fire	7
Go to the meeting point	5
Do not run	6
Do not open the doors	5
Gather group and leave the area	3
Leave the building close to the walls	3
Open the windows	2
Circulate on the right	2
Test temperature door before open	2
Staff organize people	2
Indicate exit	1

Procedure	No. answers
Correct	
Move away from the building	1
Move away from metals and heaters	1
Move away from combustibles	1
Avoid big breath	1
Leave the building and search for a safe place	1
If someone catches fire, use blanket to cover	1
Do not turn on the lights	1
Follow the emergency plan	1
Go to a safe place outside the building	1
Incorrect	
Escape	153
Run	11
Look for the origin of the fire	4
Go to the main entrance	3
Panic	1
Use fire hydrant	1
Null	
Protect from the smoke	6
Check other offices	2
Move away from the windows	1
Avoid danger behavior	1
Go to a resistant place	1
Improve infrastructures	1
Gate nearby a bar	1
Use the service stairs	1
Use the safety door	1

who answer zero correct answers and gave no answer). Furthermore, the 252 (30.3%) people who indicated procedures that were considered exceptions show that FLUL users are indeed very confused about what to do if an earthquake occurs.

The detailed answers which were classified as correct, incorrect and null are presented in Table V. The most common correct answer was: take cover under a desk/ table. However, the most common incorrect answers were: “take shelter under a doorway or table”, “take shelter under a doorway” and “escape”, which shows that the wrong behavior has been disseminated because there is no guarantee at all that a doorway is a safe place to be if an earthquake occurs. The detailed answers which were

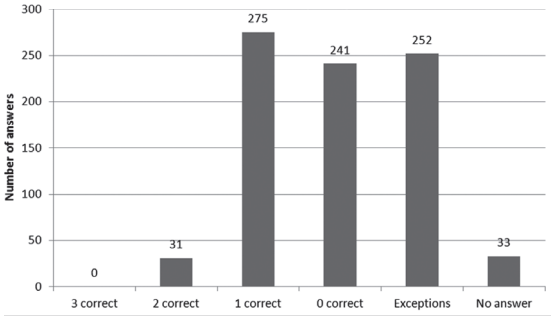

Fig. 4 - Number of earthquake procedures which were considered correct.

Fig. 4 **-** Número de procedimentos em caso de sismo que foram considerados corretos.

classified as exceptions are presented in Table VI. The most common answers were: “leave the building”, “go to open space”, “help others”, “leave in an orderly way”, “call emergency services”, “evacuate the building”, “follow instructions” and “look for an exit”.

The results of this research show that most of FLUL users are not aware about earthquake safety procedures and should be better prepared to respond appropriately and efficiently if an emergency occcurs. In addition, the users showed confusion about the impact of earthquakes with different magnitudes. Similar conclusions about risk perception among Portuguese adult population have been obtained by other authors (L. Carvalho *et al.*, 2015). Although examples of different approaches of

Table IV - Fire procedures answered by the respondents which were classified as exceptions.

***Tabela IV -** Respostas dos inquiridos referentes a procedimentos sobre incêndios que foram classificados como exceção.*

Procedure	No. answers	When to apply
Search for the exits	46	Correct. However emergency plan should be memorized
Follow the instructions	26	Correct. However, if there is no safety delegate, act by your own and follow the emergency plan
Wet clothes	10	Only when surrounded by fire and the smoke is intense
Ask for help	8	Only if you feel disoriented
Go to open spaces	8	Correct if it is exterior
Leave your belongings	7	Only if you become trapped by the fire
Go to a safe place	5	Correct if it is exterior
Leave through the windows	4	Only if you are at the ground zero and if you are trapped
Try to extinguish	4	Try to extinguish the fire if it is small, otherwise evacuate
Training /drills	3	Disaster prevention measures
Search for the emergency plan	3	Correct. However emergency plan should be memorized
More emergency signs	3	Disaster prevention measures
Installation of sensors	2	Disaster prevention measures
Turn off the gas	1	Only for safety delegate
Turn off the electric board	2	Only for safety delegate
Adaptation of doors	1	Disaster prevention measures
Acquisition of more fire-extinguishers	1	Disaster prevention measures
Isolate the area	1	Only for safety delegate
Fire blanket	1	Smother the fire outbreak
There is no emergency plan	1	The plan should exist
Use a wet blanket on the back	1	Only when crossing an area with flames
Clear exits of stuff	1	Disaster prevention measures
Leave the building through the main entrance	1	Correct if that is the nearest exit
Leave the building through the lateral doors	1	Correct if that is the nearest exit
Save whatever you can	1	Try to extinguish the fire if it is small, otherwise evacuate
Check for any child	1	Only kindergarten staff
Save the library’s books	1	Try to extinguish the fire if it is small, otherwise evacuate
Card system at the library always working	1	Only for the library
All fire-extinguishers all operational	1	Disaster prevention measures
Use water	1	It is more correct to use an appropriate fire extinguisher, especially for electric appliances

educational activities related to earthquakes and fires have already been implemented (e.g. L. Carvalho, 2015, A. Machado, 2012, A. Santos *et al.*, 2013, A. Santos *et al.*, 2015, S. Almeida, 2015), these reported experiences show that educational activities must continue and be expanded to the FLUL uses.

Moreover, as pointed out by Santos and Queirós, 2015, "a study showed that schools that had a disaster plan were more prepared for earthquakes than those that did not have a disaster plan (Ocal, 2011), thus showing the importance of having one. Moreover, the analysis of the survivors' accounts of the 2011 Tohoku Tsunami (Santos and Queirós, 2013) showed that knowledge about emergency plans combined with regular drills and evacuation exercises prepared many people to evacuate safely during the tsunami." In fact, an innovative study conducted in a high school located in Lisbon (Machado, 2012, Machado e Queiros, 2015) showed that more than 50% of the school population knows what is the meeting point, and more than 60% know what is the emergency button. These good results show the success of regular educational and awareness activities developed at the school.

Conclusion

This study shows that the FLUL users circulate quite significantly on specific paths along the building (using

Table V - Correct, incorrect and null earthquake procedures answered by the respondents.

***Tabela V** - Respostas dos inquiridos referentes a procedimentos em caso de sismo que foram considerados corretos, incorretos e nulos.*

Procedure	No. answers
Correct	
Take cover under a desk/table	197
Keep calm	57
Move away from windows/ window's facades	28
Wait that passes	27
Move away from falling objects	12
Do not use elevators	11
Take shelter	7
Move away from the walls	3
Move away from the pillars	3
Do not run	2
Ensure the students are calm	1
Move away from the doorway	1
Move away from shelves	1
Control the panic	1
Follow the evacuation plan	1
Move away from the room's corner	1
exterior: stay put	1
Incorrect	
Take shelter under a doorway/table	158
Take shelter under a doorway	106
Escape	96
Take shelter nearby/under the beams	17
Take shelter nearby the pillar	15
Take shelter nearby the stairs	7
Run	6
Take shelter under something	2
Go to the main entrance	2
Take shelter nearby strong structures	2
Take shelter under a doorway/table/pillars	1
Be aware of the situation	1
Find a way to get out	1
Take shelter under a chair	1
Take shelter under a chair/table	1
Hide	1
Take shelter nearby the walls	1
Take shelter nearby the supporting walls	1
Go to the basement	1
Go to the building's corner	1
Go to the atrium	1
Take shelter nearby corners away from pillars	1
Null	
Take shelter on a resistant area	45
Go to a safe area	26
Take shelter under a strong structure	3
Take shelter under the pillars	2
Automatic door opening	1
Create a safe area	1
Avoid danger areas	1
There is no safe area	1
Take shelter nearby a strong infra-structure	1
Leave through the service stairs	1
Use the emergency kit	1
Improve the infra-structures	1
Take shelter in the closest area	1

several cafeterias, library and classrooms) for more than one year, yet in general are not familiar with the building and the correct safety procedures while using it. Furthermore, crossing data regarding age and time intervals during the different college working shifts, revealed irrelevant for emergency and safety measures' knowledge. In addition, this study also shows that the FLUL has about 4200 regular users, but there is an unknown

Table VI - Earthquake procedures answered by the respondents which were classified as exceptions.

***Tabela VI** - Respostas dos inquiridos referentes a procedimentos em caso de sismo que foram classificados como exceção.*

Procedure	No. answers	When to apply
Leave the building	128	Only if there are damages, and evacuation order is issued
Go to open space	56	Only if it is outside of the building, and if there are damages
Help others	24	Only if someone is injured or in panic
Leave in an orderly way	22	Only if there are damages, and evacuation order is issued
Emergency call	18	Only if someone is injured or damages
Evacuate the building	14	Only if there are damages, and evacuation order is issued
Follow instructions	11	Only if there are damages, and evacuation order is issued
Look for an exit	10	Only if there are damage in the building, and evacuation order is issued. The emergency plan should be memorized
Go to the grass field	8	Only if there are damages, and evacuation order is issued
Go to the meeting point	5	Only if there are damages, and evacuation order is issued
Use the stairs	5	Only if there are damages, and evacuation order is issued
Alert the staff	4	Only if someone is injured or damages
Stay put	4	Only if you are already in a safe area
Take your belongings and leave the building	4	Only if there are damages, and evacuation order is issued
Leave the building after the first shock	4	Only if there are no damage in the building, and no evacuation order is issued
Staff organize people	3	Only if there are damages, and evacuation order is issued
Leave belongings behind	2	Only if there are damages, and evacuation order is issued
contact someone	2	Only if you feel disoriented
Training /drills	2	Disaster prevention measures
Ask for help	2	Only if you feel disoriented
Move away from the building	1	Only if there are damages
Move away from danger gas explosion areas	1	Only at the bars and labs
FLUL does not have emergency signs	1	Disaster prevention measures
Turn of the gas	1	Only for safety delegate
Pray	1	But first take shelter under a desk/take if you are indoors
Indicate exit	1	Only if there are damages, and evacuation order is issued
Go to open space outsider the building	1	Only if there are damages, and evacuation order is issued
Go to a plane area	1	Only if there are damages, and evacuation order is issued
People are organized and know what to do	1	Disaster prevention measures
Do not stay under roofs	1	Only if there are damages, and evacuation order is issued
Do not leave the building	1	Only if there are no damage in the building, and no evacuation order is issued
Leave through the Windows	1	Only if there are damages, if evacuation order is issued, and you are at the ground floor with door trapped
Follow the signs	1	Only if there are damages, and evacuation order is issued
Call to find someone	1	Only if someone is missing

number of visitors (since the Lisbon University Campus is opened to the general public), which may increase the chaos and panic if a disaster occurs.

The outcomes of this survey show an overall weak "spatial intelligence", that is the ability or mental skill to solve spatial problems of visualization of objects from different angles and space or to notice fine details (Gardner, 1995). Also, we may add a situational awareness (a heightened consciousness of the individual's surroundings) that enables to make quick decisions, to size up all the relationships in a fast-changing array and understand them. So to improve the spatial intelligence and risk awareness, communication strategies and some principles should be adopted.

For a start, early discussions with faculty stakeholders/ departments to engage and enable to take early action and to ensure better decisions based on informed judgments on how to handle risks. Communicating about risks in an important issue as the very nature of some are complex and the exposure has increased, the growing public skepticism about state institutions, the wide range of sources of information places public services/ buildings under a great scrutiny, etc. So principles as transparency, engagement, responsibility and choice are relevant to risk communication for improving the way a public university handles risks. The faculty departments can put these principles into practice providing a wider assessment of information, changing practices, raising awareness and building skills on faculty users. A first step is integrating the communication of risks more close to core decision processes and to develop an emergency plan with the stakeholders/departments, provide basic instructions/safety measures to the FLUL' regular users (staff, teachers, researchers, students and visitors) through workshops to brief staff and to carry out other educational activities, by providing information and educational brochures (eg. Santos *et al.*, 2013, Santos *et al.*, 2015, Almeida, 2015) or deliver regularly important and reliable information; inviting external experts; changing practices through action, for instance, training regular evacuation exercises in order to practice evacuation procedures and the emergency plan. In fact, the drill conducted in 2012 at FLUL should be repeated to all FLUL users (all these guidelines have been reported to the FLUL staff and direction but as far as the authors acknowledge, no further measures were taken nor any communication strategy was designed).

Understanding how faculty users view risks is relevant to understand risk itself (https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60907/communicating-risk-guidance.pdf). Spatial unawareness, beliefs and risk perceptions are most of the times based entirely on different assumptions and values. Communication which does not recognize those perceptions and behaviors may fail and if users are indifferent to risks it may require considerable effort to motivate to take action. But if the faculty users can take personal precautions and if they are properly understood by the stakeholders/ departments the users concerns are likely to increase and the communication strategy may have success. Being aware of risk perception of the faculty' users help, among others, to identify the resources, to anticipate problems, to manage the risk, and to decide how to reach the users on safety knowledge.

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