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An Investigation into Student Teachers' Factual Knowledge Related to Risks and Adjustments for Natural Disasters

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Abstract: The factual knowledge related to risks and disaster adjustments are investigated in this research in a sample of 400 student teachers of Gazi University using a disaster risks and disaster adjustments-based survey. Findings indicated that student teachers in this sample demonstrated a moderate awareness of factual knowledge related to risks and adjustments for natural disasters. Moreover, student teachers involved in disaster education programmes in university demonstrated more stable risk perceptions and a much greater awareness of important disaster adjustments compared to students who explained not being involved in a disaster education programme at university. Significant differences were found in points of factual knowledge related to risks and adjustments for natural disasters (1) class-related and (2) settlement-related and (3) main information source-related concerning the knowledge of disaster awareness and (4) between student teachers attending Department of Secondary Social Sciences and the student teachers attending Department of Secondary Science and Mathematics Education.

Key words: Natural disaster · Disater adjustments · Student teachers

INTRODUCTION

How people respond to natural hazards is determined by their individual and community vulnerability and how they perceive and cope with them [1-3]. Lazarus proposes that a person engages in a process of cognitive appraisal when faced with a threatening event [3]. Two concurrent coping efforts then occur: (1) Attempts to control the threatening situation (problem-focused coping) and (2) Endeavours directed towards regulating emotional reactions to the threatening situation (emotion-focused coping). The current survey aimed to assess elements of problem-focused coping.

The strategies which are effective in the perception of disasters by individuals and communities and in their perceived ability to cope with them have shown that they also affect a variety of earthquake relevant prevention and preparedness actions: for example, a lack of awareness and unrealistic risk perceptions are negatively impact preparedness and reactions to warnings [3,4-6]. In assessing people's current levels of risk perceptions and preparedness, it is crucial to understand whether people have available factual information [5, 7].

Few researches have attempted to assess risk perception and hazard preparedness. The general findings are that children's reactions to hazards are based on a combination of factors that include (1) direct exposure to the hazard combined with the perception of increased physical risk, (2) pre-existing characteristics (e.g., demographic factors including asthma status, age, gender, ethnicity, pre-existing emotional problems), (3) availability of adaptive coping resources, (4) access to social support mechanisms (5) the occurrence of major life stressors (e.g., parental divorce, family death) following the hazard [3].

MATERIAL AND METHODS

This research was conducted among 400 student teachers attending first and fifth classes in Gazi University, Faculty of Education, Department of Secondary Social Sciences (programmes in Geography Education, History Education, Turkish Education and Philosophy Education), Department of Secondary Science and Mathematics Education (programmes in Mathematics Education, Physics Education, Chemistry Education and Biology Education) and Department of Educational Sciences (program in Psychological Counseling and Guidance) during the 2007 - 2008 school year. Approximately each one of three teachers has

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Table 1: Survey items

Items
1. An earthquake is caused by tectonic plates getting stuck and putting a strain on the ground and the sudden release of stored energy in the Earth's crust that creates seismic waves.
2. East Anatolian Fault Zone has been Turkey's most active earthquake region over the past century.
3. Recent researches estimate that an earthquake larger than magnitude of 7.4 will occur in Marmara region and it will probably be between 60 % and 90 %.
4. Alternate freezing-thawing processes allow the force of gravity to overcome the resistance of earth material to landslide.
5. Landslides are a serious hazard to Middle and Eastern Black Sea regions of Turkey.
6. Scientists predict that contributing to strengthened greenhouse effect may result in greater events of heavy rainfall in urban areas.
7. Tsunami walls may have succeeded in slowing down and moderating the height of the tsunami, but it did not prevent major destruction and loss of life.
8. A tsunami can not be prevented or precisely predicted.
9. El Nino conditions last for many months, more extensive ocean warming occurs and its economic impact to local fishing for an international market can be serious.
10. The high winds are most damaging result of a hurricane.
11. Because of the porch is the most vulnerable part of a house during a thunderstorm, people should not use this section.
12. Tornado is the most damaging result of thunderstorms.
13. Hurricane is a moderate intense storm originating in mountainous areas.
14. Survival time for an avalanche victim ranges between 30-60 minutes.
15. A slope that is flat enough to hold snow but steep enough to ski has the potential to generate an avalanche, regardless of the angle factor.
16. The signs of hypothermia are that the body heat decrease gradually and fingers, toes and earlobes turn pale.
17. Seismic activity always occursas volcanoes awaken and prepare to erupt anda re a very important link to eruptions.
18. If we are inside a building when the shaking from an earthquake begins, we should run out immediately.
19. Earthquake warning systems include high speed communications systems and computers which collect the sensor readings based on P-waves and the computers are programmed to detect the likely strength and progression of the seismic event.
20. After a seismic activity, household members should use radio and television to obtain information.
21. If it is impossible to take shelter from a thunderstorm in a building, one should run away from the area.
22. If an earthquake has generated a tsunami wave, marine vehicles should be transported from the open sea to inshore.
23. If a tornado is heard or seen coming, people should go upstairs.
24. People should not take shelter in a sturdy car during a thunderstorm for protection.
25. An automobile is the safest place to be in during a winter storm.
26. If the clothes catch fire in the event of a fire, people should drop to the ground, cover their face and roll back and forth until the flames go out.
27. If the forces available to resist movement are greater than the forces driving movement, the slope is considered stable.
28. It is possible to avoid the impact of disasters resulting from notable avalanches by forming small scale avalanches using various methods such as explosive charges.
29. Family disaster plan should be revised every six months.
30. Family disaster plan should include risk evaluation of disaster, physical coping resources and first aid strategies.

graduated from Gazi Faculty of Education in Gazi University in Turkey. Therefore, the sample is selected from Gazi Faculty of Education to reflect general situation of Turkey.

In this research, a survey which had 30 items was developed by reviewing the literature [3,8-11] to constitute item repository and was used to assess factual knowledge related to risks and adjustments of student teachers for natural disasters. The student techers (n = 120) were asked to write a composition about disaster adjustments. The responses of participants were categorized considering their mutual characteristics and 30 items were constituted for the survey. The survey consisted of 13 items factual knowledge related to disaster risks (1, 2, 3, 4, 5, 6, 15, 19, 23, 26, 27, 28, 30) and another 17 items factual knowledge related to adjustments for natural disasters (7, 8, 9, 10, 11, 12, 13, 14, 16,17, 18, 20, 21, 22, 24, 25, 29) (Table 1). For each item, student teachers were instructed to answer "absolutely correct", "it seems correct", "I'm not sure", "it seems incorrect" or "absolutely incorrect". For data coding; if the statements are positive, e.g., the choices "absolutely correct" were given 5 and the others were given 4, 3, 2, 1 respectively; and if the expression is negative, e.g., the choices "absolutely incorrect" were given 5 and the others were given 4, 3, 2, 1 respectively. Instrumentation experts (n =10) reviewed the survey to establish content and face validity. Some modifications were made according to the recommendations made by these experts. Using the data collected during a pilot administration (n = 120), the internal consistency and the construct validity were obtained for the survey. The final survey consisted of 30 items.

Item analysis was used for item reduction and internal consistency. Item analysis consisted of the adjusted item-to-total correlation. Using the 400 participants of the research, the internal consistency assessment yielded the coefficient alpha value: 0.83.

For study of validity of the survey, a factor analysis was used to check the variety of the survey about factual knowledge related to risks and adjustments of student teachers for natural disasters and two sub dimensions has been determined. A factor analysis and varimax rotation method were performed on the data for the 30 items. As a result, 30 items with factor loading greater than 0.30 were found. Analysis of the items extracted one component with eigenvalues greater than 1.0; total variance explained, 57%. The 17 items corresponded to the "disaster adjustments" dimension (the first sub dimension) and the 13 items corresponded to the

Table 2: Sample profile

Characteristics	
Gender	38% female; 62% male
Class	51% 1; 49% 5
Departments	40% social sciences; 40% science and maths; 20% educational sciences
Settlement type	45% city; 44% metropol; 6% town; 5% village
Education status (mother)	57% primary school; 22%high school; 11% secondary school 10%faculty of a university
Education status (father)	32% faculty of a university; 28%high school; 27% primary school; 13%secondary school
Source of information	43%printed media; 32%hazards education programmes; 11%television/radio; 10%family members/friends; 4%hazards education seminars
Exposure to disasters	65%no; 35%yes
Family disaster plan	87%no; 13% yes

Table 3: Distribution of gender-related t-test scores on survey items

Gender	N	x	S	sd	t	sig.
Female	250	124.42	10.63	398	137	insignificant
Male	150	124.26	11.85			

[t(398) = 137, p >.01]

"disaster risks" dimension (the second sub dimension). Factor loadings range from 0.30 to 0.52 and item-to-total correlation values range from 0.32 to 0.51.

The participants were asked a question to prefer which sources they used most to find out about natural disasters; television, radio, printed media, disasters education programmes, parents, friends or disasters education seminars. Moreover, in the last section of the survey some personal details were recorded such gender, settlement, department, class, previous exposure to disasters and education status of parents. Details of the sample characteristics are presented in Table 2.

Findings: In this section, simple statistical procedures were used to assess the significance of differences between subgroups within the sample (independent samples t-test and one-way ANOVA). Significance of results is expressed at the 95% significance level.

Influence of Sample Profile

Gender: Analysis of gender-related t-test results are presented in Table 3.

Table 3 indicated no significant gender-related difference in scores on survey items [t(398) = 137, p > 0.01]. The mean score of male student teachers was 124.26 and the mean score of female students was 124.42.

Table 4: Distribution of class-related t-test scores on survey items

C lass	N	x	S	sd	t	sig.
1st	205	119.33	9.98	398	10.50	significant
5th	195	129.65	9.66			

[t(398) = 10..50, p <.01]

Table 5: Distribution of information source-related one-way ANOVA scores on survey items

Source of variance	Sum of square	sd	Mean square	F	sig.
Between groups	1889.629	4	472.407	3.953	significant
Within groups	47209.081	395			
Total	49098.710	399			

Source of information	N	x	SS
Disasters educational programmes (university)	129	127.27	11.45
Printed media	172	123.66	9.84
Television / radio	42	122.33	9.84
Family members / friends	38	121.84	12.81
Disasters educational seminars	19	120.42	14.50
Total	400	124.36	11.09

Class: Analysis of class-related t-test results are presented in Table 4.

Table 4 indicated the significant class-related difference in scores on survey items [t(398) = 10.50, p <.01]. The mean score of student teachers attending fifth class was significantly higher (x = 129.65) than the mean score of student teachers attending first class (x = 119.33).

It follows from this finding that student teachers involved in natural disasters education programmes throughout university education demonstrated a much greater awareness of disaster - related protective strategies.

Source of Information: Analysis of information source-related one-way ANOVA results are presented in Table 5.

Table 5 indicated the significant information source-related difference in scores on survey items [F(4-395) = 3.95, p <.01]. Analysis of LSD (Least Significant Degree) test results have shown the significant difference in mean scores. The mean score of student teachers who using disasters education programmes in university was significantly higher (x = 127.27) than student teachers used printed media (x = 123.66), television / radio (x = 122.33), family members / friends (x = 121.84) and disasters education seminars (x = 120.42) as their source of information and the former were more likely to understand the fundamentals of the natural disasters. Findings indicated that disasters educational programmes in university designed to increase awareness, knowledge and adjustments about

Table 6: Distribution of department-related one-way ANOVA scores on survey items

Source of variance	Sum of square	sd	Mean square	F	sig.
Between groups	3111.310	8	388.914	3.307	significant
Within groups	45987.400	391	117.615		
Total	49098.710	399			

Department	N	x	SS
Geography Education	40	127.60	10.40
Biology Education	40	127.60	13.12
Psychological Counseling and Guidance	80	127.15	7.13
Turkish Education	40	124.02	9.90
Physics Education	40	123.15	11.09
Mathematics Education	40	123.02	9.58
History Education	40	122.62	11.15
Chemistry Education	40	122.60	14.06
Philosophy Education	40	118.72	12.66

natural disasters provided a preferable source for student teachers and thus took on an important mission. The other important finding could suggest that printed media in Turkey have been successful in increasing disaster awareness and providing student teachers with the widespread detailed examination of natural disasters than television and radio channels do. The results have shown that student teachers in this sample generally used printed media as their source of information about disaster - related protective strategies.

Department: Analysis of department-related one-way ANOVA results are presented in Table 6.

Table 6 indicated the significant department-related difference in scores on survey items [F(8-391) = 3.30, p <.01]. Analysis of LSD (Least Significant Degree) test results have shown that the significant difference in mean scores. The mean scores of student teachers attending Geography Education and Biology Education (x = 127.60) were significantly higher than student teachers attending Psychological Counseling and Guidance (x = 127.15), Turkish Education (x = 124.02), Physics Education (x = 123.15), Mathematics Education (x = 123.02), History Education (x = 122.62), Chemistry Education (x = 122.60) and Philosophy Education (x = 118.72). These findings have shown that student teachers who attended Biology Education and Physics Education in Department of Secondary Science and Mathematics Education and also were involved in disasters education programmes such as the Atmosphere and Climate Studies, Ecology, Science, Technology and Society throughout their university education, demonstrated a much greater awareness of natural disaster - related protective strategies compared to student teachers who reported not being involved in disasters educational programmes in Department of Secondary Social Sciences except for the student teachers in Geography Education. The student teachers attending Geography Education are involved in disasters educational programmes throughout their university education -largely in third class- within the content of Geography of Natural Disasters programme.

Table 7: Distribution of settlement type-related one-way ANOVA scores on survey items

Source of variance	Sum of square	sd	Mean square	F	sig.
Between groups	1983.771	3	661.257	5.558	significant
Within groups	47114.939	396	118.977		
Total	49098.710	399			

Settlement type	N	x	SS
Metropol	175	126.41	10.93
City	182	123.48	10.23
Town	25	121.60	13.52
Village	18	117.22	13.58
Total	400	124.36	11.09

Settlement Type: Analysis of settlement type-related one-way ANOVA results are presented in Table 7.

Tablo 7 indicated the significant settlement type-related difference in scores on survey items [F(3-396) = 5.55, p <.01]. Analysis of LSD (Least Significant Degree) test results have shown the significant difference in mean scores. The mean score of student teaches living in metropol was significantly higher (x = 126.41) than student teachers living in city (x = 123.48), town (x = 121.60) and village (x = 117.22). It follows from these findings that the levels of the accessibility of information sources of disaster - related protective strategies of student teachers who lived in urban areas were significantly higher than student teachers who lived in rural areas through existing education and media factors.

Mother Education Status: Analysis of mother education status-related one-way ANOVA results are presented in Table 8.

Table 8 indicated no significant mother education status-related difference in scores on survey items [F(3-396) = 1.81, p >.01]. Analysis of LSD (Least Significant Degree) test results have shown no significant difference in mean scores.

Father Education Status: Analysis of father education status-related one-way ANOVA results are presented in Table 9.

Table 8: Distribution of mother education status-related one-way ANOVA scores on survey items

Source of variance	Sum of square	sd	Mean square	F	sig.
Between groups	664.713	3	221.571	1.812	insignificant
Within groups	48433.997	396	122.308		
Total	49098.710	399			

Mother education status	N	x	SS
Faculty of a university	39	126.35	13.07
High school	88	126.05	9.83
Secondary school	46	122.41	12.74
Primary school	227	123.76	10.76
Total	400		

Table 9: Distribution of father education status-related one-way ANOVA scores on survey items

Source of variance	Sum of square	sd	Mean square	F	sig.
Between groups	348.002	3	116.001	0.942	insignificant
Within groups	48750.708	396	123.108		
Total	49098.710	399			

Father education status	N	x	SS
Faculty of a university	129	125.57	11.91
High school	112	124.30	10.79
Secondary school	53	124.14	10.76
Primary school	106	123.16	10.53
Total	400		

Table 10: Distribution of exposure-related t-test scores on survey items

Exposure to natural disasters	N	x	S	sd	t	sig.
Yes	140	123.76	10.53	398	794	insignificant
No	260	124.68	11.38			

[t(398)= 794, p >.01

Table 11: Distribution of family disaster plan-related t-test scores on survey items

Family disaster plan	N	x	S	sd	t	sig.
Yes (existing)	51	126.90	9.71	396	1.77	insignificant
No (not existing)	347	123.94	11.25			

[t(396)= 1.77, p >.01

Table 9 indicated no significant father education status-related difference in scores on survey items [F(3-396) = 0.94, p >.01]. Analysis of LSD (Least Significant Degree) test results have shown no significant difference in mean scores.

Previous Exposure to Natural Disasters: Analysis of exposure-related t-test results are presented in Table 10.

Table 10 indicated no significant exposure - related difference in scores on survey items [t (398) = 794, p > 0.01].

Family Disaster Plan: Analysis of family disaster plan-related t-test results are presented in Table 11.

Table 11 indicated no significant family disaster plan-related difference in scores on survey items [t(396) = 1.77, p > 0.01].

CONCLUSIONS

Using the simple quantitative survey approach, the following topics are assessed in this research by using the survey developed for student teachers: Determining dimensions of existing insufficient knowledge during university education about factual knowledge related to risks and adjustments of student teachers in Gazi University, Faculty of Education for natural disasters that impinge on daily lives, which include earthquakes, fires, flash floods, tsunamis, volcanic eruptions, avalanches, winter storms, thunderstorms, tornadoes and hurricanes.

"Hurricane is a moderate intense storm originating in mountainous areas." is the thirteenth item of the survey and 55% of sample assessed this item incorrectly. This item was assessed by 55% of participants as "it seems correct" and only 3% of participants as "absolutely incorrect". Student teachers may have felt that they were not aware of this item and therefore assessed accordingly. Tropical cyclones are the strongest and the most destructive storms over large bodies of warm water in the Tropical–Equatoral Zone. The size of a tropical cyclone is determined by measuring the distance from its center of circulation to its outermost closed isobar. If the radius is less than two degrees of latitude (222 km), then the cyclone is "very small" or a "midget". Radii of 2 - 3 degrees (222 - 333 km) are considered "small". Radii between 3 and 6 latitude degrees (333 - 666 km) are considered "average sized". Tropical cyclones are considered "large" when the closed isobar radius is 6 - 8 degrees of latitude (667 - 888), while "very large" tropical cyclones have a radius of greater than 8 degrees (888 km) [2]. Tropical cyclones' most important energy source is the release of the heat of condensation from water vapor condensing at high altitudes, with solar heating being the initial source for evaporation. For this reason, tropical cyclones can be considered as a giant vertical heat engines supported by mechanics driven by physical forces such as the rotation and gravity of the Earth. The rotation of the Earth causes the system to spin, an effect known as the Coriolis effect, giving it a cyclonic characteristics and affecting the trajectory of the storm. A tropical storm is an organized system of strong thunderstorms with a defined surface circulation and

maximum sustained winds between 63 - 117 km/h. At this point, the distinctive cyclonic shape starts to develop, although an eye is usually present. A hurricane is a system with sustained winds of at least 120 km/h. A cyclone of this intensity tends to develop an eye, an area of relative calm and lowest atmospheric pressure at the center of circulation. Maximum sustained winds in the strongest tropical cyclones have been estimated at about 305 km/h. Hurricanes are the greatest storms originating over oceans in the Tropics [12].

"Family disaster plan should include risk evaluation of disaster, physical coping resources and first aid supplies." is the thirtieth item of the survey and 63% of sample assessed this item correctly. This item was assessed by 63% of participants as "absolutely correct". This finding indicated that student teachers in this sample demonstrated a much more great awareness about importance of family disaster plan for natural disaster mitigation. Risk evaluation of disaster should include the following important steps: Identifying the safest areas in each room of the home away from windows, big and heavy furnitures and the objects that may cause a fire, determining alternative exits of the flat and the building, identifying nonstructural risky objects that may damage by falling down or slipping in the event of the hazard inside or outside the building, keeping addresses and phone numbers of places that one could go in disaster supplies kit. Physical coping resources should include the following steps: Constructing and designing buildings according to the current earthquake regulations or strengthening them by authorities, fixing big and heavy furnitures that may cause damage by falling down or slipping in the event of the hazard, white goods, big electronic goods and lighting apparatus to walls, joists and columns, keeping a fire extinguisher at home. First aid resources should include the following supplies: At least a three-day supply of commercially bottled water and nonperishable food, flashlight, portable radio, extra batteries, a supply of money in small denominations and coins and credit cards, personal hygiene items, personal identification cards, extra set of car keys, matches in a waterproof container, signal flare, first aid materials such as sterile bandages, anti-septic solutions and topical antibiotics, thermal underwear, blankets or sleeping bag for each family member.

"Landslides are a serious disaster to Middle and Eastern Black Sea regions of Turkey." is the fifth item of the survey and 58% of the sample assessed this item correctly. This item was assessed by 58% participants as "absolutely correct". This finding reveal that student teachers in this sample has a fairly high level of awareness about importance of landslide events which have serious impacts on social life in various places of Turkey, especially in the Black Sea region.

A landslide is a geological phenomenon which includes a wide range of ground movement, such as natural stones, rock falls and shallow debris flows. A definition of a landslide event could be as follows: "Movement of soil, artificial filling or rock controlled by gravity, superficial or deep, with movement from slow to rapid, but not very slow, moderately rapid and sudden, which involves materials which make up a mass that is a portion of the slope or the slope itself." Landslides, because of these disproperties, lead to more dangerous results compared to other mass movements. In Turkey, mass movements and especially landslides have an important place among all natural hazards. The widespread mass movements which have crucial impacts on social life and the appearance of seriouslarge scale negativenesses are certainly due to the physical geography properties besides the socio-economic structure of Turkey. Each type of mass movements are often triggered by concomitant causes such as the semi-arid climate, geological and geomorphological properties of Turkey. In addition, these movements are triggered by anthropic activities such as adding excessive weight on the slope, agriculturing at mid-slope, the removal of deep-rooted vegetation that binds the colluvium to bedrock and constructing man-made structures may stress weak slopes to failure. Mass movements which are related to natural and human causes occur in various parts of Turkey. However, the Black Sea region and especially the Middle and Eastern Black Sea have an important place in this sense. Very often and effective landslide events occur in these parts of the Black Sea region which have heavy rainy climate and steep slopes [12].

"Recent researches estimate that an earthquake larger than magnitude of 7.4 will occur in Marmara region and it will probably be between 60% and 90%." is the third item of the survey. This item was assessed by 50% participants as "it seems correct". This finding reveal that student teachers in this sample have a fairly increasing level of awareness about fatal risk of Istanbul earthquake which is estimated on North Anatolian Fault Zone since the 1999 Izmit earthquake. Izmit earthquake is accepted as the crucial event for people living in Marmara region. 17 August 1999 is the date when these people experienced an earthquake for the first time. Since this disastrous earthquake, the results of researches done by Turkish and foreign experts to find out the earthquake risk along the

base of the Marmara Sea, led by The Scientific and Technological Research Council of Turkey, became a current issue in Turkey.

The researches that would be carried out in order to research probable Istanbul earthquake's risks should be coordinated. The studies dated 1995 about Istanbul reveal that almost 72% of the construction stock of the city are not served by engineering [13]. During the probable earthquake, a data base should be constituted about the buildings' resistance and they should be strengthened. The industrial establishments, centrales and factories have been constructed on the plains which have a high risk of soil liquefaction in Marmara region. Soil liquefaction occurs when, because of the earthquake shaking, water-saturated granular material temporarily loses its strength and transforms from a solid to a liquid. Soil liquefaction may cause rigid structures, as buildings or bridges, to tilt or sink into the liquefied deposits [13]. Today, the scientists do not reach general agreement about the magnitude of probable Istanbul earthquake. However, recent researches estimate that an earthquake larger than magnitude of 7.4 will occur in Marmara region and it will probably be between 60% and 90% during the next thirty years. In the Marmara region, the earthquake preparedness measures should be taken into account considering the greatest magnitude of earthquake. In the event of the earthquake, people should not suffer from the destructive results of being unprepared.

It is essential to constitute the synergy of government, universities, local administrations, non-governmental organizations, private sector, general public and media with the aim of increasing awareness, knowledge and preparedness about natural disasters in Turkey. For the purpose of effective planning hazard mitigation throughout the nation, the measures should be taken cooperatively in all sectors of the society and each member should consider himself as a part of the whole.

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