

PERCEPTION OF EARTHQUAKE HAZARD BY URBAN CHILDREN

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Abstract: The purpose of this study is to investigate how children perceive earthquake hazard, especially focusing on the influence of their image toward earthquakes, knowledge of activities that can reduce the damages. The survey was conducted with primary school children and their parents. As results following influential factors are revealed. Age: Children tend to perceive risks and damages of earthquake hazards more serious than adults, however they are more optimistic about confidence in own behavior during earthquake and satisfied with their parents' preparedness at their home. Gender: Girls pay more attention to the physical damage while adult females concern more about the sufferers' post-disaster living conditions. Gender: Girls have lesser confidence in own behavior during earthquake, and evaluate their parents' preparedness lower than boys. Housing structure: People living in wooden houses anticipate the damage severer than those in other types of houses. Area of living: Adults in Akashi city anticipate the probability of a great earthquake occurrence lower than those in Yokohama city, and this may suggest that an earthquake experience has an effect to pay less attention to its occurrence. Communication at home: Children who do not talk with their parents about disaster prevention seem to feel helpless and have passive attitude to the earthquake hazard.

1. INTRODUCTION

Since Japan suffers so many kinds of natural disasters frequently, it can be said that Japanese people livings side-by-side with these risks. Among them, a high probability of earthquake occurrence has been pointed out recently by the governmental expert committee, which will bring a great damage. Each resident is therefore required to know more about the risk and to take effective prevention countermeasures.

Considering how people establish their attitudes toward hazards, they first acquire fragmental information about the past calamity through stories of personal experiences of sufferers and visual images obtained by the mass media. They farther acquire technical knowledge, and then they begin to perceive the risk properly and take effective countermeasures. With regards to the perception of such risks, adults can manage various information and lead to a comprehensive judgment and they to proper activities. However, children who have inferior information gathering capabilities and comprehension cannot be expected to make such judgments or take actions. Kiser(1993) shows that one prediction of a quake that did not happen produced mild but widespread stress disorders in children. This result suggests that children can not cope with uncertainty and anticipation properly and are easily influenced by the media.

Most of studies on children's psychological response to the disasters deal with the shocks after experiencing a catastrophe. Recent studies in Japan mainly focus on post-traumatic stress disorder (PTSD) after experiencing the Great Hanshin-Awaji Earthquake occurred in 1995. On the other hand, little has been studied on the perception of earthquake hazard by children who have never experienced. Masuda et al (1988) survey consciousness of earthquake preparedness of junior high school students

in some region in Japan and suggest a method to evaluate the effects of earthquake education. In big cities, many children commute alone to distant schools by public transport. Considering the possibility that they might experience a disaster when they are alone, it is important to know about the perception of earthquake hazard by children and give them the knowledge to cope with the situation accordingly.

The purpose of this study is to investigate how children perceive earthquake hazard, especially focusing on the influence of their image toward earthquakes, knowledge of activities that can reduce the damages. The perception of the children’s parents and communications about disaster prevention at their home are also investigated.

2. RESEARCH METHOD

This research aims to clarify the children’s perception of the earthquake hazard. Gifford (2002) shows that attitudes toward environmental hazards are rooted in such antecedent factors as individual differences (gender, age, education, and personality), past experience with disasters, proximity to the potential disaster site, and exposure to media report. In this study, we classified these factors into three categories (individual factors, environmental factors, and information) and made a basic research framework shown in Fig. 1. In this model, disaster preventing countermeasures is also hypothesized to relate with the perception of earthquake hazard. A questionnaire was designed to investigate the influence of these factors on how people perceive earthquake hazard.

In order to explore the geographical differences, a survey was conducted at the primary schools in Yokohama city and Akashi city. Yokohama city is included in the area where earthquake has been pointed out with a high probability recently. Akashi city, next to Kobe city, experienced the Great Hanshin Awaji Earthquake in 1995. The surveys for the children (fourth and sixth grades) were conducted by researchers and class teachers at their class rooms. As for the parents, the questionnaires were taken to home by children and collected after they were filled in. The outline of the survey is shown in Table 1.

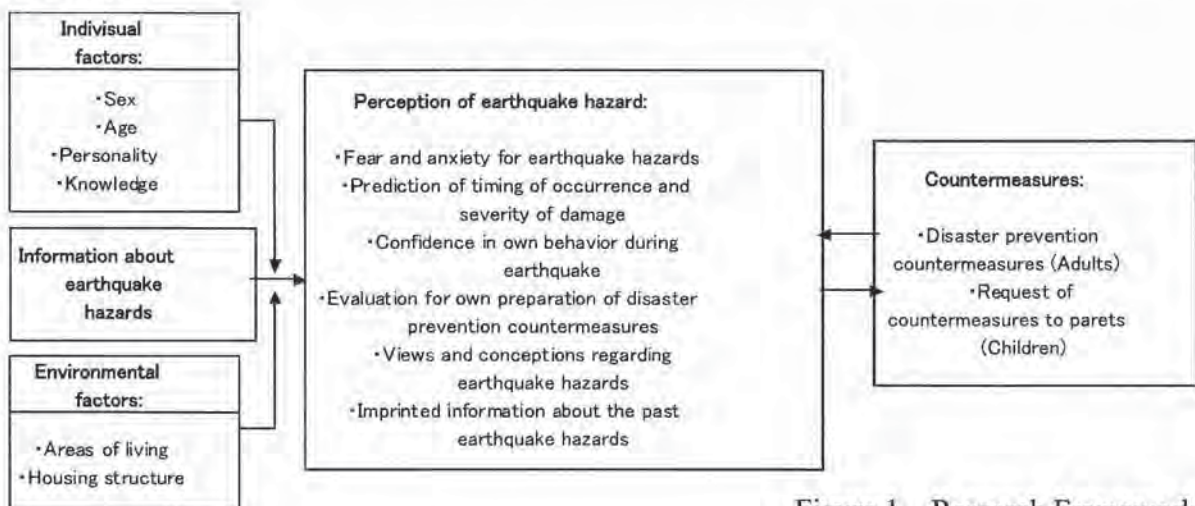


Figure 1 Research Framework

Table 1 Outline of the survey

Area	Respondents			Housing structure	
	Number of children		Number of parents	Wooden	Other types
	4th grade	6th grade			
Yokohama city	146 (Boy:61/Girl:85)	126 (Boy:68/Girl:58)	197 (Mother:142)	43%	57%
Akashi city	76 (Boy:32/Girl:44)	71 (Boy:33/Girl:38)	127 (Mother:103)	38%	62%
Total	419 (Boy:194/Girl:225)		324 (Mother:245)		

3. COMPARISON OF EARTHQUAKE FEAR WITH OTHER DISASTERS

3.1 Disaster fear ranking

In order to know the fear level of earthquakes, it was compared with that of other disasters (war, traffic accident, fire and flood). The fear of earthquakes was expected to rank high as it is difficult to prevent or predict the occurrence, however, both adults and children chose war as the most fearful event, accounting for more than 80%, and earthquakes remained as second (Fig. 2).

3.2 Reasons for the fear

It was revealed that the reasons for the fear were different according to the kind of disaster and respondents' age (Fig. 3). More than 40% among adults who chose war as the most fearful answered that "because it is unlikely that I can prevent its occurrence", showing "helpless" (lack of sense of control). More than 70% of the children, on the other hand, chose "because I or my family may die if it happens", showing their concern about physical damage. However, among adults and children who chose earthquake as the most fearful, half of them in each group chose the reason "because it is unlikely to be able to predict the occurrence". This means that "the unpredictability of the timing of occurrence" is the reason to fear earthquakes, regardless of the age of the respondents.

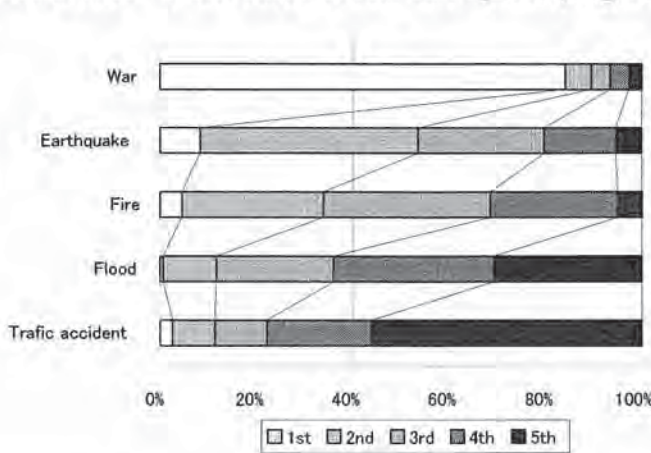


Figure 2 Disaster fear ranking

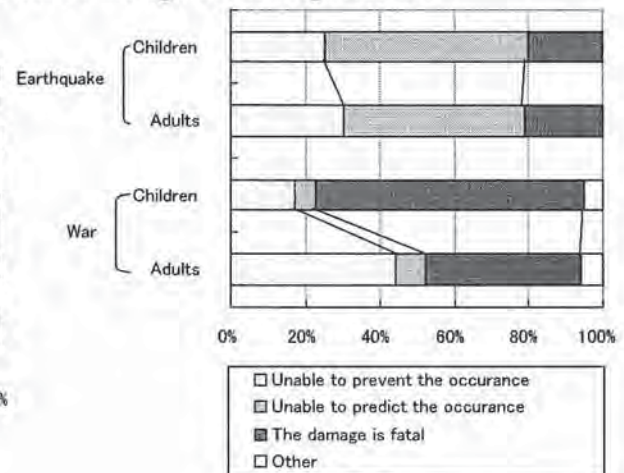


Figure 3 Reasons of the fear

4. IMPRINTED INFORMATION OF THE RECENT EARTHQUAKE DISASTER

What aspect of earthquake disasters imprints children was investigated. Adults and children were expected to receive different aspect of disaster such as physical damage, loss of human life and sufferers' post-disaster living conditions. The contents of news related with Chuetsu Earthquake which happened two months prior to this survey were used. Respondents were asked to choose the most imprinted aspect among items shown in the bottom of Figure 4. The result, shown in the top of the figure, revealed that the influence of age is seen among adult females and

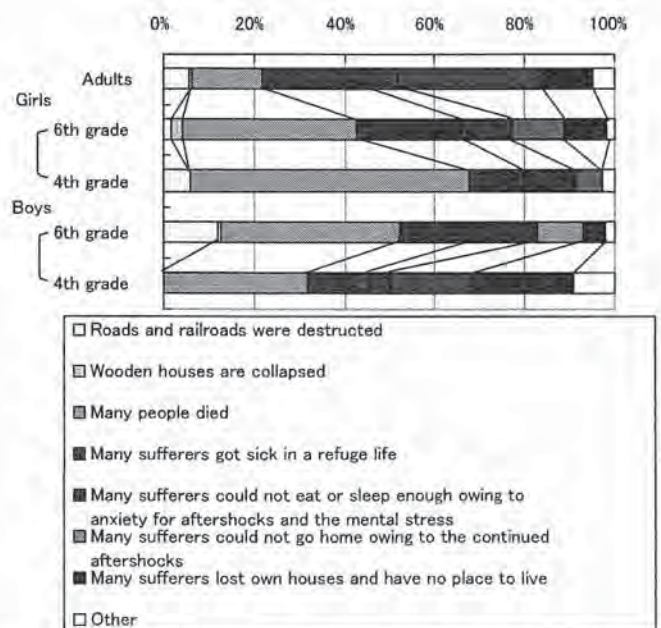


Figure 4 The most imprinted aspect of the news related with Chuetsu Earthquake

schoolgirls, showing the tendency to pay attention to the sufferers' living condition over physical damage as the age of the respondent becomes higher.

5. SOME INFLUENTIAL FACTORS OF PERCEPTION OF EARTHQUAKE HAZARD

5.1 Prediction of timing of occurrence

Concerning the prediction of the timing of occurrence, respondents were asked "When in the future do you think an earthquake of more than M7 will attack your area?". As a result children expect the earthquake to occur in the relatively near future than adults (Fig. 5). Comparing the adults' response, those in Akashi city anticipate the probability lower than those in Yokohama city, with 20% more adults in Akashi city anticipate "It will not happen in my lifetime". Since Akashi city had less damage than neighboring Kobe city, it seems that the earthquake experience does not necessarily raise the concern of its risk but in fact it has an opposite effect to pay less attention to it.

5.2 Prediction of the severity of damage

As for the severity of damage, respondents were asked "in case a big earthquake of more than M7 happens in the late afternoon on a weekday while you are at home, how do you estimate the damage?". Concerning the damage to the respondent himself/herself, children anticipate the damage severer than adults, and likewise those living in wooden houses anticipate it severer than those in other types of houses (Fig. 6). This tendency remains the same for the damage to the family members and their own house. Regarding the anxiety for family dispersion, more children answered that they would be able to meet their family soon after the earthquake.

5.3 Confidence in own behavior during earthquake

Regarding the level of confidence in own behavior during an earthquake, more children than adults answered that they are "confident" or "confident to some extent" (Fig. 7). A tendency was also observed that more schoolboys than schoolgirls answered they were "confident".

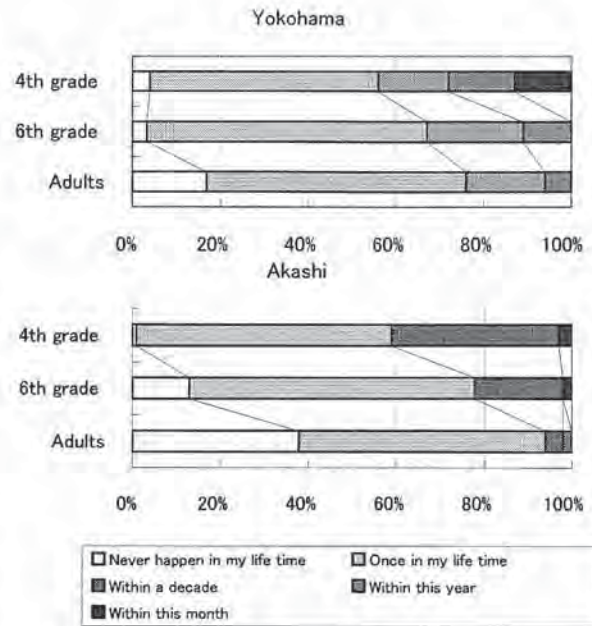


Figure 5 Prediction of timing of occurrence

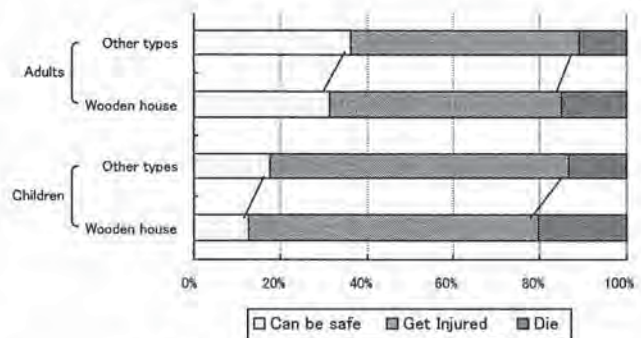


Figure 6 Prediction of own damage

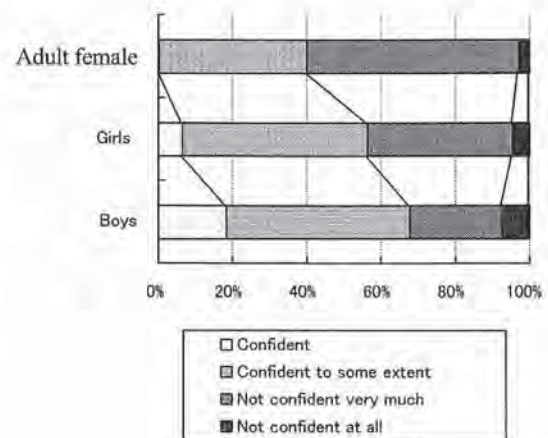


Figure 7 Confidence in own behavior during earthquake

It was often said that the more knowledge about countermeasure actions the person possesses, the more confidence that person has. However, this is not confirmed in the present survey. As for the true and false of the knowledge concerning countermeasures, no differences were observed without regard to the age, sex or the area of residency (Table 2). The items which are least acquired correctly were “to turn off fire of heaters and cookers before the tremor ends”, “to take refuge in a high-rise building nearby”, and “to get out from underground space as soon as possible”.

5.4 Preparedness for the earthquake disaster and its self-evaluation

It was observed that the person who takes more disaster countermeasures tends to evaluate own preparation higher. As shown in Table 3, among the measures taken relatively often are “to keep water and food in stock” and “to discuss the measures to be taken among the family”, both recording around 50%. The measure with the lowest execution rate is “to have the house examined by a specialist against earthquake resistance”, which accounted for 13%.

As for the evaluation of disaster countermeasures taken at own home, more adults than children gave negative answers that it is “insufficient” or “rather insufficient” (Fig. 8). This tendency is supposed to refer that the social responsibility makes them evaluate own actions severer. Moreover it is also seen between the genders of the children: schoolgirls tend to be more negative than schoolboys.

5.5 Views and conceptions regarding earthquake hazard

For the views and conceptions regarding earthquake disaster, respondents were asked the following four items. Q1: “I do not want an earthquake to occur at all because it is so frightful.” Q2: “As long as there is no serious damage, it would be fun to have earthquakes occasionally.” Q3: “There is no need to worry about earthquakes if sufficient preparations have been made.” Q4: “As earthquakes are natural phenomena, they can not be helped if an earthquake causes major damage once in a while.” Respondents were asked to choose one of four grades ranging from “I agree” to “I do not agree” according to their views. The item

Table 2 Knowledge about countermeasure actions

Type of knowledge	Questions	Ratio of correct answer
Countermeasure actions at the moment of an earthquake	1 To go out of a house immediately	86%
	2 To get under a desk immediately	88%
	3 To turn off fire of heaters and cookers before the tremor ends	23%
	4 To crouch down close to a wall or fence when in outside	94%
	5 To take refuge in a high-rise building nearby	18%
	6 To get out as soon as possible if I am in underground	23%
Aftershock and secondary disasters	7 Once an earthquake shakes greatly, it may happen continuously in the same place	92%
	8 To take refuge to a high place when you are near the seashore because tsunami	95%
Actions that become troublesome to other people	9 To go to a nearby evacuation center by a car when you take refuge	88%
	10 To confirm the safety of your family member by a cellular phone	28%

Table 3 Disaster prevention countermeasures taken at home

Disaster prevention countermeasures	Ratio that adults have been taking	Ratio of recognition by children
1 To keep water and food in stock	54%	45%
2 To fix furniture in order for they to do not move or fall down	41%	30%
3 To take the house check by a specialist against earthquake resistance (Item for adults)	13%	
4 To make a contract of earthquake insurance (Item for adults)	20%	
5 To discuss the measures to be taken among the family	50%	32%
6 To check a nearest evacuation center and a place to meet among family	48%	30%

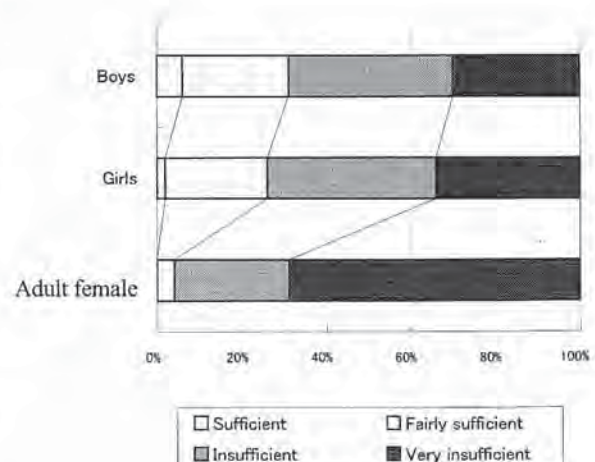


Figure 8 Self-evaluation for disaster prevention countermeasures

Q1 and Q2 relate to how seriously they perceive earthquake hazards, and the items Q3 and Q4 relate to how they believe the effectiveness of disaster prevention countermeasures.

As for Q1, 80% of both adults and children agree with it. For Q2 20% of children agree with it, while no adult agrees. This means that children tend to play down earthquake disasters. Figure 9 shows the results of Q3 and Q4. As for Q3, children tend to worry about earthquakes even when sufficient preparations are made and think the major damage is unavoidable. On the other hand adults worry as well, however they think the major damage is avoidable.

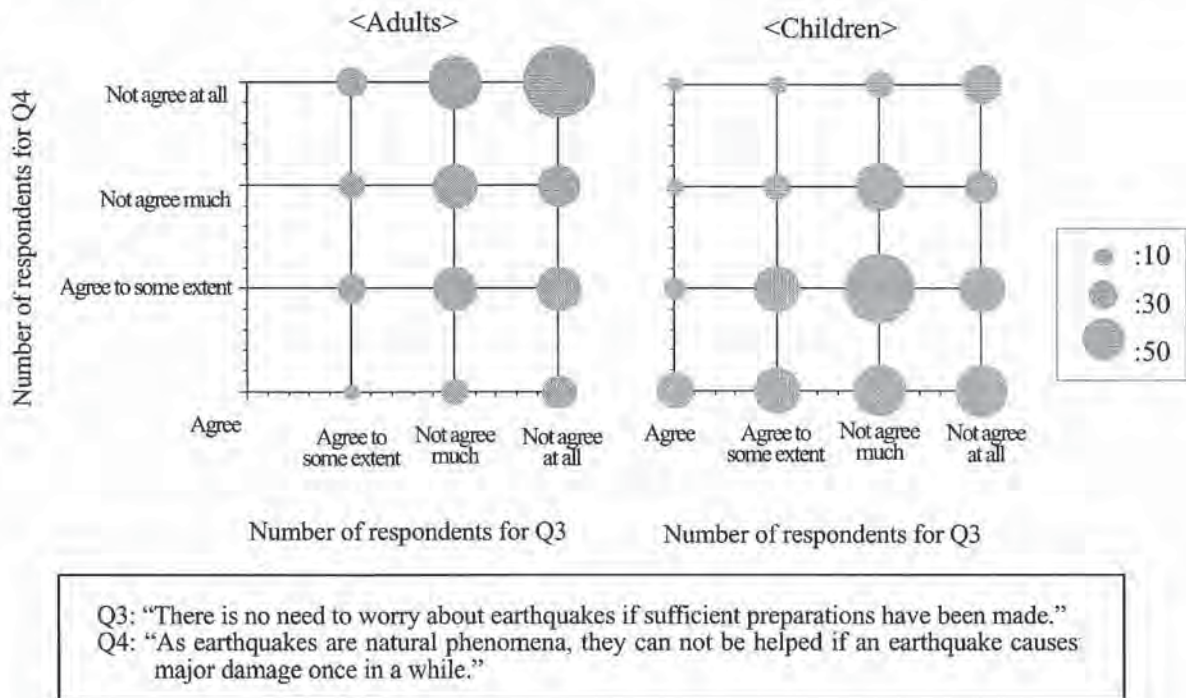


Figure 9 Children and parents' views regarding effectiveness of countermeasures for earthquake hazard

6. CHILDREN'S VIEWS OF EARTHQUAKES AND COMMUNICATION WITH PARENTS

Those who answered Q3 negatively and Q4 positively (their answers are plotted in the right bottom corner in the Fig. 9) as "I worry even when sufficient preparations are made, and think that major damage is unavoidable as earthquakes are a natural phenomena" are defined in this paper as a "Helpless type". They feel resigned and helpless about taking disaster countermeasures while feeling worried about the occurrence of earthquakes.

Focusing on children who belong to "Helpless type", we examined how these children recognize the countermeasures taken at their home. Table 4 shows the number of these children and other children who do not recognize the countermeasures taken at their home. Some countermeasures are not recognized by these children even if their parents have been taking.

Moreover we examined about the communication between children and their parents. Table 5 shows the number of children who did not get affirmative responses from their parents when they asked to take countermeasures. As a result significantly more children belong to "Helpless type" did not get the parents' responses. This refers the communication concerning disaster countermeasures between parents and children may be insufficient, and this may explain why these children have less sense of protection from earthquake disasters. They may think the countermeasures are helpless against earthquakes.

Table 4 Children's recognition about the countermeasures taken by parents at home

	To keep water and foods in stock		To fix furniture		To discuss the necessarily measures among the family		To check an evacuation center and a place to meet with family	
	Helpless type	Others	Helpless type	Others	Helpless type	Others	Helpless type	Others
Number of children	36	232	36	232	36	232	36	232
Number of children without recognition	12	43	6	66	19	77	11	57
Ratio	33%	19%	17%	28%	53%	33%	31%	25%
Significance level	*						*	

* : p < 0.05

Table 5 Parents' response to their children's request of taking countermeasures

	To request parents to take countermeasures	
	Helpless type	Others
Number of children	36	232
Number of children who could not get their parents' response	12	32
Ratio	33%	14%
Significance level	*	

* : p < 0.05

7. CONCLUSIONS

In this study, we investigated the characteristics of children's perception of the earthquake hazard, and examined influential factors as well as activities for disaster prevention countermeasures.

Children tend to perceive risks higher than adults in both probable period of a great earthquake occurrence and the damage seriousness. However they are more optimistic than adults about confidence in own behavior during earthquake and satisfied with their parents' preparedness at their home. Moreover although they recognize the efficiency of countermeasures a little more than adults, they show a passive attitude to the unavoidable damage than adults. The influence of age on how to receive mass media information was seen among adult females and schoolgirls. As their age becomes higher they pay more attention to the sufferers' post-disaster living conditions over physical damages.

With regard to the influence of gender, schoolgirls than schoolboys have lesser confidence in countermeasure actions under an earthquake, and evaluate their parents' preparedness of countermeasures more negatively.

As for the influence of environmental factors such as the housing structure and the area of living following results were revealed. People living in wooden houses anticipate damages severer than those in other types of houses. Adults in Akashi city anticipate the probability of a great earthquake lower than those in Yokohama city, and this may suggest that the earthquake experience has an effect to pay

less attention to its occurrence.

The communication about disaster mitigation measures and prevention activities at their home influences the children's perception of earthquake hazard. The children who do not communicate with their parents about disaster prevention at their home seem to feel helpless and have passive attitude to the earthquake disaster.

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