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Kitayama, Shinji ; Okada, Yuka ; Takumi, Teruko ; Takada, Satoshi ; Inagaki, Yuko ; Nakamura, Hajime

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PSYCHOLOGICAL AND PHYSICAL REACTIONS ON CHILDREN AFTER THE HANSHIN-AWAJI EARTHQUAKE DISASTER

Shinji KITAYAMA*, Yuka OKADA**, Teruko TAKUMI***,
Satoshi TAKADA*, Yuko INAGAKI****, and Hajime NAKAMURA*

*Department of Pediatrics, Kobe University School of Medicine

**Kobe University Faculty of Human Development

***Hyogo-prefectural Nojigiku Medical Center for Disabled Children,
Kitayamadai, Nishi-ku, Kobe, Japan

****Konan Women's University Faculty of Literature,
Morikitamachi, Higashinada-ku, Kobe, Japan

KEY WORDS

disaster; the Hanshin-Awaji earthquake; kindergartner; physical symptoms; PTSD; behavioral changes

ABSTRACT

Children who experienced the Hanshin-Awaji Earthquake Disaster were followed to ascertain how the psychological and physical reactions after this disaster changed. Changes observed in the symptoms of children at one and two years after the earthquake were compared between those who had lived in severely damaged area (level 7 on the Japan Meteorological Agency intensity scale) and those who had lived in mildly damaged area (less than 5 on the same scale). The survey was conducted using a questionnaire filled out by the children's parents. Two years after the earthquake, the children had returned to normal in terms of their physical conditions, even in the severely damaged area. However, symptoms of PTSD (Post-Traumatic Stress Disorder) such as persistent reexperiencing, persistent avoidance, and increased arousal were significantly more frequently found among children from the severely damaged area than among those from the mildly damaged area. To evaluate the psychological and physical reactions after the disaster is very important in order to support the children when large-scale disasters occur.

INTRODUCTION

Disasters can produce serious psychological reactions even on young children. Horrifying experiences, the loss of one's familiar surroundings, or suffering a prolonged stay in a strange or abnormal environment can be very stressful for children.^{1,2)} Various psychological and physical symptoms, associated with the severe stress caused by large-scale disasters, have recently been attracting close attention in the context of PTSD

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(Post-traumatic stress disorder).¹⁾ In evaluating adults, the term PTSD is used when the adult has the following symptoms for more than one month and his/her daily living is disturbed by the symptoms: 1) persistent reexperiencing of the traumatic event, 2) persistent avoidance of stimuli associated with the trauma and numbing of general responsiveness, and 3) persistent symptoms of increased arousal. When it comes to children, however, it is less common for psychological stress to lead to the manifestation of overt psychological symptoms. Psychological stress on children is more likely to be reflected in physical symptoms or behavioral changes. Children who have lived through disasters can also be impacted in various ways by the psychological and physical conditions of other members of their family and by changes in their living environment. In short, to understand the psychological and physical reactions on children after a disaster in medium and long-term will be very important, for considering how to support children when large-scale disasters occur.

The Hanshin-Awaji Earthquake Disaster, with a magnitude level of 7.2 and an intensity level of 7 on the Japan Meteorological Agency scale, hit the urban area directly, early in the morning of January 17, 1995, killing more than 6,000 people. After this devastating disaster, we visited kindergartens in the earthquake-hit districts and provided support to children who developed physical symptoms or behavioral problems. Forty to fifty days after the earthquake, we conducted a preliminary survey in which we asked the parents about the status, physical symptoms, and behavioral changes of their children attending kindergartens or nursery schools in Kobe City (the severely damaged area) and Miki City (the mildly damaged area) in Hyogo Prefecture, to evaluate the psychological and physical reactions of this kind of disaster on children. The preliminary survey revealed reactions to be associated with the earthquake disaster in many of the children surveyed.^{2, 3, 16)} These children were followed and the psychological and physical reactions after the disaster were estimated in detail.

MATERIALS AND METHODS

This survey was based on a questionnaire, which asked parents about their own psychological and physical conditions and those of their children who had been attending kindergartens or nursery schools in Kobe City (the severely damaged area) and Miki City (the mildly damaged area) in Hyogo Prefecture when the Hanshin-Awaji Earthquake Disaster occurred. The first survey was performed in March 1996 at one year after the earthquake, and the second survey was performed in January 1997 at two years after the earthquake.

The questionnaire was delivered and collected via kindergartens, nursery schools, and elementary schools, making use of the mail in some cases. The questionnaire contained questions about 1) physical conditions and behavioral changes in the children, 2) PTSD symptoms in the children, and 3) psychological and physical conditions of the parents. The same questionnaire was used for all subjects in both the first and second surveys. The questionnaire was not administered anonymously, in view of the possible necessity of providing support to the child or family members through the survey. The respondents were asked to select one of three answers to each question ('no' , 'a little' , and 'very much').

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240 parent-child pairs (each pair containing a child attending a kindergarten in Kobe City at the time of the earthquake) were initially registered as the severely damaged group. 348 parent-child pairs (each pair containing a child attending a kindergarten or nursery school in Miki City at the time of the earthquake) were listed as the mildly damaged group for comparison.

The changes of both the psychological and physical conditions were analyzed for the children whose parents responded to the questionnaire in both surveys, conducted at one and two years after the earthquake (March 1996 and January 1997). The course over time could be analyzed for 133 parent-child pairs (involving 62 boys and 71 girls) of the severely damaged group and for 125 pairs (56 boys and 69 girls) of the mildly damaged group.

The frequency of each form of answer to each question was calculated and tested statistically, using Fisher's exact probability test and the chi-square test.

RESULTS

Table I shows the ages and sexes of the children analyzed in the severely damaged group and the mildly damaged group. Table II shows the questions concerning the psychological and physical conditions of children contained in the questionnaire, and the percentage of affirmative answers ('very much' and 'a little') to each question.

Comparisons between one year and two years after the earthquake (Table II)

1) Physical conditions and behavioral changes

a) Overall physical condition

The affirmative answer rates to the question, "in poor physical condition" , were 13.5% and 6.8% in the severely damaged group, 6.4% and 7.2% in the mildly damaged group at one and two years after the earthquake, respectively.

The affirmative answer rates to the question, "missed school at least once because of illness" , were 78.2% and 57.1% in the severely damaged group, 79.2% and 62.4% in the mildly damaged group at one and two years after the earthquake, respectively. Thus, in both groups, the affirmative answer rate to this question decreased significantly from one year to two years after the earthquake ($P < 0.01$).

b) Physical symptoms

The affirmative answer rates to the question about poor appetite were 23.3% and 18.0% in the severely damaged group, 30.4% and 18.4% in the mildly damaged group at one and two years after the earthquake, respectively. In the mildly damaged group, this rate decreased significantly from one year to two years after the earthquake ($P < 0.05$).

But there were no significant differences in the affirmative answer rates to the questions about constipation, diarrhea, and nocturia between one year and two years after the earthquake.

c) Anxiety and regressive behaviors

There were no significant differences in the affirmative answer rates to the questions about fear of dark places and excessive clinging between one year and two years after the earthquake.

Table I. The ages and sexes of the children.

	Severely damaged group (Kobe)	Mildly damaged group (Miki)
n	133	125
Boy/Girl	62/71	56/69
Age at the earthquake*	5.7 ± 0.6(4.8-6.7)	6.2 ± 0.5(4.9-6.8)

*mean ± SD (range) years old

2) PTSD symptoms

a) Persistent reexperiencing of the traumatic event

There were no significant differences in the affirmative answer rates to the questions about re-telling and re-enacting between one year and two years after the earthquake.

b) Persistent avoidance of stimuli and numbing of general responsiveness

The affirmative answer rates to the question, “dislike hearing anyone speak about the earthquake” were 19.5% and 20.3% in the severely damaged group, 19.2% and 9.6% in the mildly damaged group at one and two years after the earthquake, respectively. In the mildly damaged group, this rate decreased significantly from one year to two years after the earthquake ($P < 0.05$). In the severely damaged group, however, the rate did not decrease at all.

There were no significant differences in the affirmative answer rates to the question about rareness to play with friends between one year and two years after the earthquake.

c) Persistent symptoms of increased arousal

The affirmative answer rates to the question, “startled by even small sounds” were 32.3% and 42.1% in the severely damaged group, 23.2% and 16.0% in the mildly damaged group at one and two years after the earthquake, respectively. This rate in the severely damaged group did not decrease at all during the two surveys.

The affirmative answer rates to the question, “become easily angry or excited” were 30.8% and 35.3% in the severely damaged group, 35.2% and 24.0% in the mildly damaged group at one and two years after the earthquake, respectively. In the mildly damaged group, this rate decreased significantly from one year to two years after the earthquake ($P < 0.05$). In the severely damaged group, however, the rate did not decrease at all.

There were no significant differences in the affirmative answer rates to the questions about difficulty concentrating and tending to quarrel between one year and two years after the earthquake.

3) Favorable outcomes

There were no significant differences in the affirmative answer rates to the questions, “willing to go to school or kindergarten”, “obedient to adult directions”, “use objects carefully”, and “willing to help you with housework” between one year and two years after the earthquake.

Table II. Comparisons between one year and two years after the earthquake.

	Severely damaged group (n=133)		Mildly damaged group (n=125)	
	1 year after (%)	2 years after (%)	1 year after (%)	2 years after (%)
1. Physical conditions and behavioral changes				
a. Overall physical condition				
Is your child in poor physical condition?	13.5	6.8	6.4	7.2
Has your child missed school at least once because of illness during the past year?	78.2 **	57.1	79.2 **	62.4
b. Physical symptoms				
Does your child occasionally lose his/her appetite?	23.3	18.0	30.4 *	18.4
Is your child often constipated?	20.3	16.5	17.6	24.0
Does your child often have diarrhea?	6.8	6.0	11.2	8.8
Does your child often wet the bed?	14.3	11.3	6.4	4.8
c. Anxiety and regressive behaviors				
Does your child fear dark places?	64.7	66.9	58.4	59.2
Is your child excessively clingy?	47.4	49.6	44.0	44.0
2. PTSD symptoms				
a. Persistent reexperiencing of the traumatic event				
Does your child keep on telling you about the earthquake?	25.6	26.3	14.4	10.4
Does your child re-enact scenes during his/her play about or draw pictures related to the earthquake?	14.3	7.5	0.8	1.6
b. Persistent avoidance of stimuli and numbing of general responsiveness				
Does your child dislike very much hearing anyone speak about the earthquake?	19.5	20.3	19.2 *	9.6
Is it rare for your child to play with friends?	12.8	15.8	15.2	11.2
c. Persistent symptoms of increased arousal				
Is it difficult for your child to concentrate?	27.8	24.8	33.6	24.8
Does your child tend to be startled by even small sounds?	32.3	42.1	23.2	16.0
Does your child tend to become easily angry or excited?	30.8	35.3	35.2 *	24.0
Does your child tend to quarrel with his/her brothers/sisters or friends?	69.9	66.2	70.4	64.8
3. Favorable outcomes				
Is your child willing to go to school or kindergarten?	83.5	82.7	80.0	74.4
Is your child obedient to adult directions?	91.7	89.5	94.4	92.0
Does your child use objects carefully?	93.2	90.2	92.8	88.8
Is your child willing to help you with housework?	91.7	93.2	92.8	94.4

*: P< .05 **: P< .01

1 year after the earthquake vs. 2 years after the earthquake

Comparisons between the severely damaged group and the mildly damaged group

1) Physical conditions and behavioral changes (Fig.1, 2)

a) Overall physical condition

One year after the earthquake, the affirmative answer rate to the question, “in poor physical condition” was significantly higher in the severely damaged group than in the mildly damaged group ($P < 0.05$). Two years after the earthquake, however, no significant inter-group difference was observed in this rate.

There was no significant inter-group difference in the affirmative answer rate to the question, “missed school at least once because of illness” in either of the two surveys.

b) Physical symptoms

The affirmative answer rate to the question about nocturia in the severely damaged group at one year after the earthquake was significantly higher than that in the mildly damaged group ($P < 0.05$), and it did not decrease during the two surveys, remaining significantly higher than that in the mildly damaged group at two years after the earthquake ($P < 0.05$).

There was no significant inter-group difference in the affirmative answer rates to the questions about appetite, constipation, and diarrhea in either of the two surveys.

c) Anxiety and regressive behaviors

There was no significant inter-group difference in the affirmative answer rates to the questions about fear of dark places and excessive clinging in either of the two surveys.

2) PTSD symptoms (Fig.3, 4)

a) Persistent reexperiencing of the traumatic event

The affirmative answer rate to the question about re-telling in the severely damaged group at one year after the earthquake was significantly higher than that in the mildly damaged group ($P < 0.05$). The reaction did not decrease during the two surveys, remaining significantly higher than that in the mildly damaged group at two years after the earthquake ($P < 0.01$).

The affirmative answer rate to the question about re-enacting in the severely damaged group at one year after the earthquake was significantly higher than that in the mildly damaged group ($P < 0.01$), and it did not decrease during the two surveys, remaining significantly higher than that in the mildly damaged group at two years after the earthquake ($P < 0.05$).

b) Persistent avoidance of stimuli and numbing of general responsiveness

There was no significant inter-group difference in the affirmative answer rate to the question, “dislike hearing anyone speak about the earthquake” at one year after the earthquake. Two years after it, however, this rate in the severely damaged group was significantly higher than that in the mildly damaged group ($P < 0.05$).

There was no significant inter-group difference in the affirmative answer rate to the question about rareness to play with friends in either of the two surveys.

c) Persistent symptoms of increased arousal

There was no significant inter-group difference in the affirmative answer rate to the question, “startled by even small sounds” at one year after the earthquake. Two years

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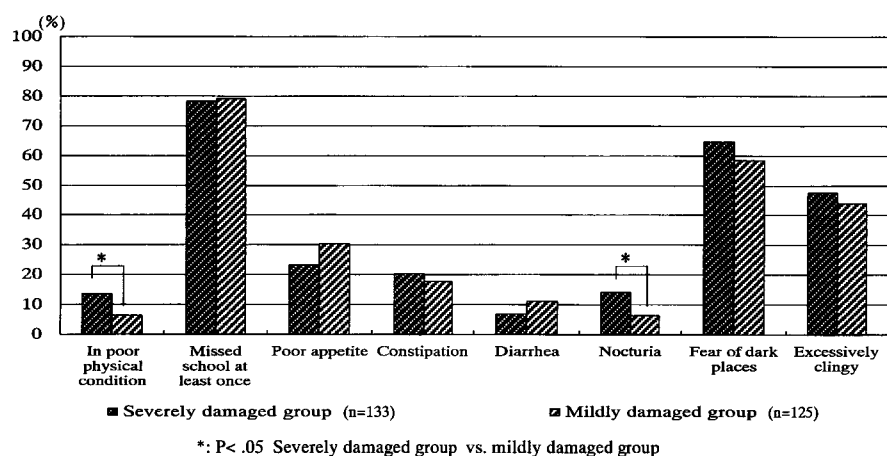


Fig.1. Physical conditions and behavioral changes at 1 year after the earthquake.

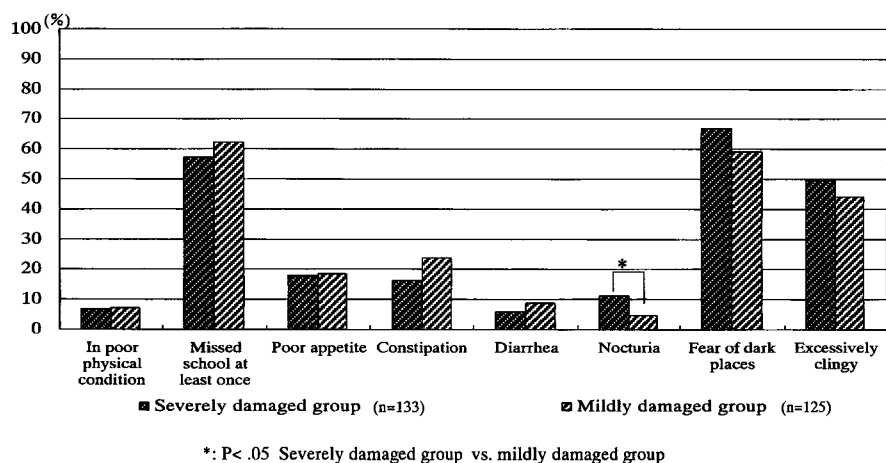


Fig.2. Physical conditions and behavioral changes at 2 years after the earthquake.

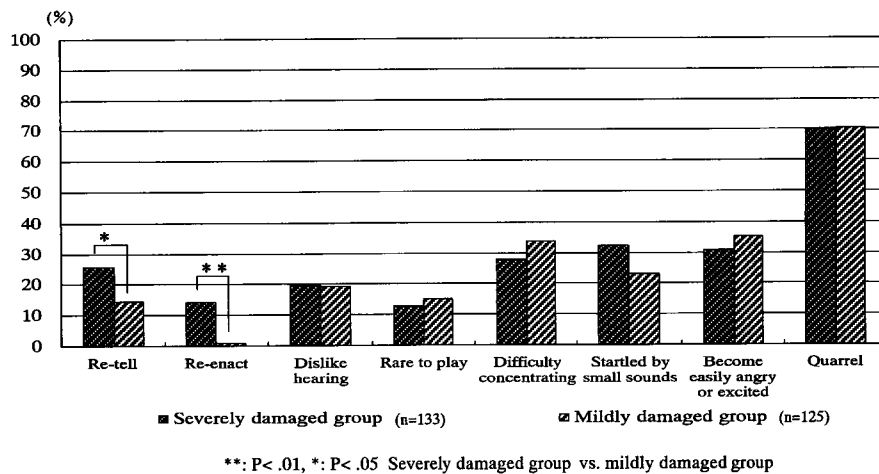


Fig.3. PTSD symptoms at 1 year after the earthquake.

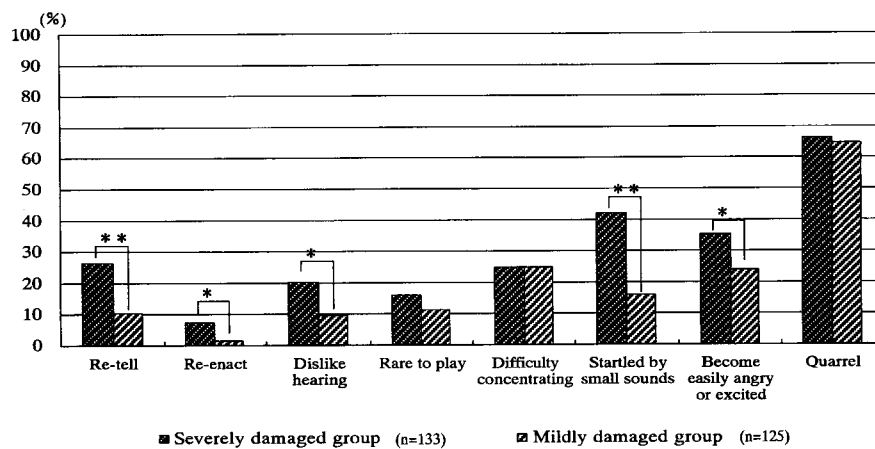


Fig.4. PTSD symptoms at 2 years after the earthquake.

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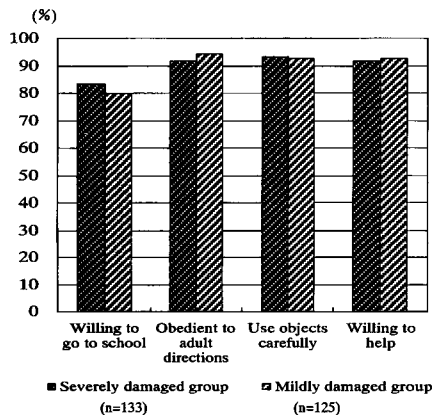


Fig.5.Favorable outcomes at 1 year after the earthquake.

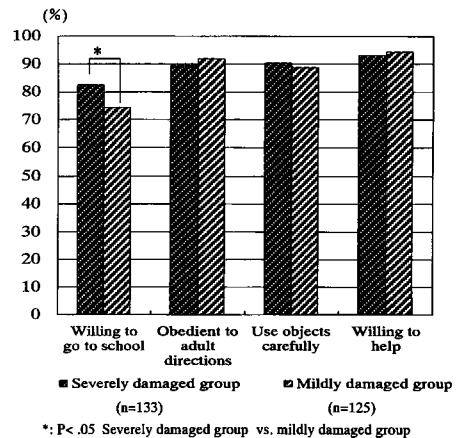


Fig.6.Favorable outcomes at 2 years after the earthquake.

after it, however, this rate in the severely damaged group was significantly higher than that in the mildly damaged group ($P < 0.01$).

There was no significant inter-group difference in the affirmative answer rate to the question, “become easily angry or excited” at one year after the earthquake. Two years after it, however, this rate in the severely damaged group was significantly higher than that in the mildly damaged group ($P < 0.05$).

There was no significant inter-group difference in the affirmative answer rates to the questions about difficulty concentrating and tending to quarrel in either of the two surveys.

3) Favorable outcomes (Fig.5, 6)

There was no significant inter-group difference in the affirmative answer rate to the question, “willing to go to school or kindergarten” at one year after the earthquake. Two years after it, however, this rate in the severely damaged group was significantly higher than that in the mildly damaged group ($P < 0.05$).

There were no significant inter-group differences in the affirmative answer rates to the questions, “obedient to adult directions”, “use objects carefully”, and “willing to help you with housework” in either of the two surveys.

DISCUSSION

This survey was conducted in one area severely damaged during the Hanshin-Awaji Earthquake Disaster and another area damaged mildly during the same earthquake. When interpreting the results of this survey, we must bear in mind that people probably experienced some degrees of disaster even in the mildly damaged area. Several points must also be born in mind: this questionnaire survey was given to parents whose children were attending kindergarten; the parents of the severely damaged group who were able to respond to this survey had relatively sufficient mental freedom to do so, even though they had undergone the severe impact on their own lives caused by the earthquake; and children who lost parents or whose family disintegrated due to the earthquake were not included as subjects of this survey, because they were not living in the survey area at the date of the survey. We therefore suppose that the reactions on the children in the severely damaged area (taken as a whole) may have been stronger than the reactions provided by the parents who cooperated with this survey.

In Japan, little attention had been paid to the psychological and physical reactions after disasters or post-disaster environmental changes before the Hanshin-Awaji Earthquake Disaster occurred. It is plausible to imagine that parents over-reacted or reacted inappropriately or felt at a loss when their children developed physical symptoms or behavioral changes after the earthquake.

In Western countries, some reports have been published concerning PTSD in children related to disasters,^{5, 11)} but very few continuous follow-up surveys, beginning in infancy, have been reported concerning this issue. Green, et al. reported a follow-up survey made 2 and 17 years after the Buffalo Creek Disaster,⁴⁾ but their survey was not continuous in nature. Short-term reactions after disasters were dealt with in details in the reports of surveys made 3 months after Hurricane Hugo, published by Shannon, Lonigan, et al.^{6, 13)} They reported that the presence of PTSD symptoms was strongly related to children's reported severity of the hurricane, degree of home damage, and continued displacement, and this pattern was particularly true for those symptoms associated with reexperiencing or increased arousal. They also reported that a child's report of emotions experienced during the hurricane was more highly related to PTSD symptoms than for any of impact factors of it. However, the subjects of these surveys were school-aged children.

The results of our survey revealed that the overall physical condition of the children had returned to normal within two years after the earthquake even in the severely damaged group. Among the physical symptoms studied, nocturia was significantly more frequent in the severely damaged group than in the mildly damaged group at one year and two years after the earthquake. This suggests that the children of the severely damaged group were in unstable environments. In terms of the prevalence of anxiety or regressive behaviors, there was no significant difference between the two groups. However, our preliminary surveys^{2, 3, 16)} showed that the prevalence of these symptoms was significantly higher in the severely damaged group than in the mildly damaged group during the first 5 months after the earthquake. Taken together, these results suggest that these reactions subside relatively quickly. Among PTSD symptoms, persistent reexperiencing of the traumatic event continued to be significantly more

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frequent in the severely damaged group than in the mildly damaged group at two years after the earthquake. The prevalence of persistent avoidance of stimuli associated with the trauma in the mildly damaged group decreased by about 50% from the first survey (one year after the earthquake) to the second survey (two years after the earthquake), but it did not decrease at all in the severely damaged group, remaining higher than 20%. The prevalence of persistent symptoms of increased arousal also did not decrease at all in the severely damaged group from the first to the second survey.

In evaluating the behavioral changes of children, it is very important to distinguish the changes caused by the developmental growth from those caused by the stress of the traumatic event. In this study, we followed up the same children longitudinally, so that we could clarify how the symptoms of the children changed individually. Furthermore, we could understand which symptoms were more related to the traumatic events by comparing between the two groups. In other word, our continuous follow-up survey of the same children allowed us to evaluate disaster-related physical symptoms and behavioral changes including developmental changes of the children. It seems likely that disasters can have various reactions on the psychological and physical conditions of families and the living environments of children. The data we obtained concerning the psychological and physical conditions of parents will be analyzed later in relationship to the results of the analyses of the data for the children presented in this paper.

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