



Intervention for the maintenance and improvement of physical function and quality of life among elderly disaster victims of the Great East Japan Earthquake and Tsunami



Chieko Greiner, RN, PhD ^{a,*}, Kana Ono, RN ^b, Chizuru Ootoguro, RN, MS ^c,
Kyoko Chiba, RN, PhD ^c, Noriko Ota, RN, MS ^d

^a Graduate School of Health Sciences, Kobe University, Kobe, Japan

^b Himawari Fukushikai, Social Welfare Corporation, Tokyo, Japan

^c The Japanese Red Cross College of Nursing, Tokyo, Japan

^d Faculty of Medicine, Tottori University, Tottori, Japan

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ABSTRACT

Purpose: The purpose of this study was to examine the effectiveness of an exercise class implemented in an area affected by the Great East Japan Earthquake and Tsunami for maintaining and improving physical function and quality of life (QOL) among elderly victims.

Methods: Participants were 45 elderly disaster victims. To measure the effectiveness of the exercise classes, results on the Functional Reach Test (FRT), Timed Up and Go Test (TUG), One-leg Standing Balance (OSB), and Chair Stand Test (CST) were measured at the beginning of the exercise classes, and after 3 and 6 months. In order to assess health-related QOL, the 8-item Short-Form Health Survey (SF-8) was carried out at the beginning of the exercise classes, and after 1, 3, and 6 months.

Results: Of the 45 people who consented to participate, 27 continued the program for 6 months and were used for analysis. Analysis of the results for FRT, OSB, and CST showed significant improvements (respectively, $p = .000$, $.007$, and $.000$). SF-8 showed significant increases for the subscales of bodily pain ($p = .004$), general health perception ($p = .001$), and mental health ($p = .035$).

Conclusions: By continuing an exercise program for 6 months, improvements were seen in lower limb muscle strength and balance functions. Effectiveness for HRQOL was also observed.

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1. Introduction

The Great East Japan Earthquake and Tsunami of March 11, 2011 was an unprecedented major earthquake disaster that resulted in over 18,000 deaths or missing persons (National Police Agency, 2015). The major cause of the immense damage was the onslaught of a tsunami that far exceeded all predictions, robbing many people of their homes and forcing them to live in temporary housing. As of November 2014, over 89,000 victims of the disaster were still living in temporary housing, and over 124,000 people were living as evacuees in public and private housing (Reconstruction Agency, 2014).

After the earthquake and tsunami, victims were forced to leave their homes and live in temporary housing in unfamiliar communities and difficult environments (Koyama et al., 2014). Among elderly people in particular, the ability to adapt to changes in the environment was low (World Health Organization Centre for Health Development, 2013),

and difficulties in building new human relations together with contraction of their sphere of activities led to a decline in activities of daily living (ADL). Many elderly people remained shut in their homes and suffered decline of physical function, and many more are at risk of the same (Motoya, 2013).

Exercise is the main intervention method for maintaining and improving the physical function of elderly people, and it also contributes to improvement in balance function (Lee & Cho, 2014), which in turn helps to prevent falls and broken bones among the elderly. Furthermore, maintenance and improvement of physical function seem to be linked to improved quality of life (QOL) among elderly people.

In Japan, people in preventive care services help elderly people engage in activities classified as requiring support to prevent decline of physical function (Hirano, Kawahara, & Saeki, 2014). However, in the disaster-affected areas, these support services were not operational for some time after the disaster, and it has been reported that approximately 24% of elderly disaster victims who did not require care 1 month after the disaster were experiencing difficulties in walking 7 months after the disaster (Okawa, 2013). This tendency was particularly prevalent among elderly people living in temporary housing, with the main

* Corresponding author at: Graduate School of Health Sciences, Kobe University, 7-10-2 Tomogaoka, Suma-ku, Kobe-city, 654-0142, Japan. Tel./fax: +81 78 796 4520.

E-mail address: greiner@harbor.kobe-u.ac.jp (C. Greiner).

reasons being the decrease in opportunities to go out and reduced opportunities for activities inside and outside the home (Okawa, 2013). According to a longitudinal research by Tomata et al. (2014), the rate of elderly people being newly recognized as having a disability under the Long-Term Care Insurance (LTCI) system in the year after the disaster was significantly higher in the disaster-affected areas than in areas not affected by the disaster.

Many exercise intervention studies have already been carried out with elderly people (Kim et al., 2012; Lim & Son Hong, 2010; Purath, Keller, McPherson, & Ainsworth, 2013; Sung, 2009; Taguchi, Higaki, Inoue, Kimura, & Tanaka, 2010), and meta-analysis studies (Chou, Hwang, & Wu, 2012; de Vries et al., 2012) and systematic reviews (Giné-Garriga, Roqué-Fíguls, Coll-Planas, Sitjà-Rabert, & Salvà, 2014; Valenzuela, 2012) have also been done; however, there have been no studies on the effectiveness of exercise intervention among elderly people affected by the disaster who are living a very different lifestyle in a very different environment than usual.

The aim of this study was to examine the effectiveness of an exercise class implemented over a 6-month period in the area affected by the Great East Japan Earthquake and Tsunami, in terms of maintaining and improving physical function and QOL among elderly victims of this disaster.

2. Methods

2.1. Study participants

Participants were elderly people living in Pacific coastal areas who were affected by the Great East Japan Earthquake and Tsunami. Locations were selected through convenience sampling, and a request to carry out the research was made to the city's Department of Health and Welfare. After receiving permission from city authorities to conduct the research, a location in which to hold the exercise class was selected with the advice of city authorities. Damage in this area was immense, and the area had large-scale temporary housing. A leaflet advertising the exercise class was distributed in temporary housing in the participating area, and volunteers were recruited. The class had two sessions, one with 23 participants in the morning and one with 22 participants in the afternoon, for a total of 45 participants.

2.2. Development of the exercise program and design of the exercise class pamphlet

An exercise pamphlet was designed with the co-researchers for the launch of the exercise class. The pamphlet included an illustrated exercise program that could be completed at home, notes on the need for exercise, points to pay attention to when exercising, strategies for continuing to exercise, and points to check before engaging in exercise. For the exercise program, issues such as the intensity and volume of exercise were developed with the advice of a physiotherapist. An original calendar and stamp were distributed to the participants, with space for a stamp below the date. In order to determine the amount of activity outside the exercise class, participants were requested to use the stamp when they exercised at home, as well as when they participated in the study's exercise program. Participants were requested to bring the calendar to the exercise class each time, and they received a sticker for participation in the class.

2.3. Implementation of the exercise class

Each exercise class lasted approximately 1 hour, with 40 minutes spent on the exercises shown in the pamphlet, and 20 minutes devoted to social time and for the participants to drink tea. The exercise class was led by an instructor who was qualified as a public health nurse, with the help of two assistants. The exercise class met continuously once a week

for 24 weeks. The period of implementation of the exercise class was February to July 2012.

2.4. Items measured

Each participant's age, sex, and height were recorded at the beginning of the exercise classes. Weight, blood pressure, state of health, implementation of exercise and length of time spent exercising, sleeping time, and conditions being treated were recorded at the beginning of the exercise classes, 3 months after starting, and 6 months after starting. In order to measure the effectiveness of the exercise classes, results on the Functional Reach Test (FRT), Timed Up and Go Test (TUG), One-leg Standing Balance (OSB), and Chair Stand Test (CST) were measured. These indicators were also measured at the beginning of the exercise classes, 3 months after starting, and 6 months after starting. In order to assess health-related QOL (HRQOL), the Japanese version of the 8-item Short-Form Health Survey (SF-8) was used at the beginning of the exercise classes, 1 month after starting, 3 months after starting, and 6 months after starting. The 1-month measurement was performed assuming that HRQOL would change more quickly than physical function.

2.4.1. FRT

Participants were asked to stand with their feet shoulder-width apart with one arm elevated at 90°, and to then reach forward as far as possible from that position. The distance of reach was measured. Measurements were taken twice, and the higher measurement was used (Duncan, Weiner, Chandler, & Studenski, 1990; Won et al., 2014).

2.4.2. TUG

From a seated position, the participant was given a signal, and then the time it took to stand up, walk 3 m and back, and sit down again was measured using a stopwatch. Participants were instructed to walk at a normal, comfortable speed. Measurements were taken twice, and the shorter time was used (Salb et al., 2015).

2.4.3. OSB

Participants were asked to balance on one leg by raising either foot and to keep their eyes open. The time that balance was maintained was recorded. The test ended when the raised foot touched the ground, or when the foot on the ground moved. Measurements were taken twice with a stopwatch, up to a maximum of 120 s, and the higher measurement was used (Abe et al., 2014).

2.4.4. CST

Participants were asked to sit on a chair with both arms crossed over their chest. With arms still crossed, they were asked to stand so that their legs were fully extended. The time required to repeat the action of sitting and standing 10 times was measured (Segura-Ortí & Martínez-Olmos, 2011).

2.4.5. SF-8 Japanese version

SF-8 is an HRQOL instrument, and is a shortened version of the 36-item Short-Form Health Survey (SF-36). The eight question items of SF-8 are identified as the most representative items for the eight sub-scale concepts on the SF-36, namely, physical functioning (PF), role physical (RP), bodily pain (BP), general health perception (GH), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH) (Fukuhara & Suzukamo, 2004; Roberts, Browne, Ocaka, Oyok, & Sondorp, 2008). These are categorized as two summary scores (physical component summary score, PCS; mental component summary score, MCS), and standard values for Japanese citizens (mean score 50) on each item and on the two summary scores are calculated (Fukuhara & Suzukamo, 2004). If the score is lower than 50, HRQOL is interpreted as being lower than that of the mean Japanese person. There are

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