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Original Article

Exercise intervention implemented by trained volunteers improves health-related quality of life among Japanese community-dwelling older females: an intervention study

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Abstract. [Purpose] This study aimed to evaluate the sustainability and efficacy of exercise intervention, as implemented by professionally trained volunteers, on the health-related quality of life among Japanese community-dwelling older females. [Subjects and Methods] We conducted a non-randomized observational prospective study of a six-month exercise intervention delivered by volunteers or health professionals. Health-related quality of life was scored using the Short Form 36 Health Survey before and after the intervention. Participants were classified into three groups, comprising those with improved health, maintained health, and reduced health. [Results] Among 127 Japanese community-dwelling females aged >65 years, 50 of 62 (80.6%) females involved in the intervention conducted by volunteers, and 55 of 65 (84.6%) females involved in the intervention conducted by health professionals, completed the six-month intervention program. Scoring revealed that interventions by both volunteers and health professionals had a maintaining or improving effect on scores in >70% of participants instead of an expected six-month aging decline. [Conclusion] Exercise intervention by trained volunteers was sustainable and effective for improving the health-related quality of life among Japanese community-dwelling older females. Professionally trained volunteers could benefit communities in helping older persons avoid the need for daily nursing care through promoting health activities.

Key words: Health professionals, Peer-led programs, Exercise intervention

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INTRODUCTION

Aging is rapidly progressing in Japan and more elderly people require daily nursing care[1)]. Many programs have been reported to improve physical function among older people[2–8)]. However, it has also been reported that improved physical function does not lead to a more active lifestyle without emotional support[9)]. Health professionals such as physical therapists and public health nurses have recently implemented exercise classes to reduce the need for nursing care[2–8)]. Nevertheless, for such health professionals to reach all community-dwelling older persons in the country is economically unrealistic.

Trained volunteers are active in promoting health awareness in older people[10)]. The World Health Organization (WHO)

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has proposed that health professionals train local residents to act as community-based rehabilitation workers[11]. Peer mentoring has been effective against various health conditions, for example, frailty among older individuals[12], depression[13], breast cancer[14], HIV[15, 16], self-managed chronic diseases[10] and maternal mental health[17]. The effects of exercise intervention delivered by students majoring in kinesiology and by volunteers on physical and mental health have been compared[18, 19]. However, the effects of exercise intervention delivered by volunteers and health professionals have not been compared.

We conducted a non-randomized observational prospective study of a six-month exercise intervention delivered by volunteers and health professionals, to evaluate their sustainability and efficacy of intervention on the health-related quality of life (QOL) among healthy community-dwelling older females. In this study, after adjusting for various confounding factors, the effects of intervention, as conducted by volunteers and by health professionals, have been compared.

SUBJECTS AND METHODS

One hundred and fifty-seven individuals (78 elderly people in volunteer-led classes and 79 in health professional-led classes) were identified to participate in this study. Thirty individuals who had missing values in the pre-intervention assessment were excluded. We evaluated the sustainability of interventions by comparing the numbers of participants who complete the 6-month exercise program, reasons why participants drop out the program, and the initial scores of health-related QOL among 127 community-dwelling females aged over 65 years (62 females in volunteer-led classes and 65 females in health professional-led classes). As 22 females dropped out over the course of the interventions, we assessed the efficacy of interventions among 105 females (50 females in volunteer-led classes and 55 females in professional-led classes).

We conducted an observational study in areas where community-based exercise had been conducted by health professionals, such as physical therapists (n=11) and public health nurses (n=11), and trained volunteers (n=30). Volunteers were recruited from among local residents to provide exercise guidance (mean age was 71.8 years old). Many of the volunteers were experienced leaders of regional activities, such as welfare commissioners and borough presidents. Before beginning this observational study, the recruited volunteers had completed a training course of less than 16-hours duration, which was conducted by two physical therapists and three public health nurses, and which included training in respect of the health conditions of elderly people, risk management, the assessment of physical function and exercise training methods.

During the six-month exercise intervention, the participants completed a 120-minute program every week. The program comprised a health check, 10 minutes warm-up, 30–40 minutes exercise involving muscle strengthening and stretching around the knee and hip joint, 20–30 minutes balance exercises and walking, 10 minutes cool down and 30 minutes recreation. This 120-min program was designed for prevention of falls among frail elderly people[6]. In brief, health check included a blood pressure measurement and self-administered questionnaire assessing subjective symptom, such as fatigue and exacerbations of pain after latest exercise program. Warm-up included the same motion elements in The Radio Physical Fitness Exercise, which is well-known short prescriptive program in Japan and was familiar to Japanese community-dwelling olders. Muscle strengthening exercise was focused on trunk muscles and the major muscle groups of the lower and upper extremities (e.g., lying leg curl, leg extension, seated calf raise, and squat). Stretching exercise mainly involved the lower extremity muscles (e.g., hip flexors and ankle plantar flexors). Balance exercises included standing on a single leg, walking, and tandem walking. These exercises were interrupted with short breaks, which were consulting each participants' physical function.

The health-related QOL was scored using the Short Form 36 Health Survey (SF-36v2) before and after the intervention. The SF-36v2 is a scale that has been scientifically validated to reliably measure health-related QOL[20]. The SF-36v2 includes the following eight subscales to determine physical and mental health status: Physical functioning, Role-physical, Bodily pain, General health, Vitality, Social functioning, Role-emotional and Mental health.

The Ethics Committee at Nagasaki University Graduate School of Biomedical Sciences (approval number 07070598) approved this study, and all included older persons provided written informed consent to participate in this study.

The SF-36v2 subscale scores and age at pre-intervention were compared between the groups, using Student's t-tests. Since the SF-36v2 scores significantly differed between groups (Table 3), individuals with SF-36v2 scores that increased by ≥0.5 SD after intervention were classified as "improved", and those with SF-36v2 scores not increasing by ≥0.5 SD after intervention were classified as "reduced or maintained". In some literature reviews, the minimally important difference of QOL scores has been reported as approximately 0.5 SD[21, 22].

Logistic regression analysis was used to adjust for age and SF-36v2 subscale scores at pre-intervention. Data were statistically analyzed using SPSS ver. 16 (SPSS Japan, Tokyo, Japan).

RESULTS

Among 127 community-dwelling females aged over 65 years, 50 of 62 (80.6%) females involved in interventions by volunteers, and 55 of 65 (84.6%) females involved in intervention by health professionals, completed the six-month intervention program. Drop out (n=22 in total) occurred in the volunteer intervention group due to a change in health (n=2), a need to provide long-term care for another family member (n=1), another event scheduled on the measurement date (n=5) and for undetermined reasons (n=7). On the other hand, drop out occurred in the professional intervention group due to moving (n=2), using the services of the long-term care insurance support, for example, day services at the nursing home (n=3), and

another event scheduled on the measurement date (n=2). A comparison of the age and SF-36v2 subscale scores at initial evaluation between those who dropped out and those who completed the study did not show a significant difference (data not shown).

Table 1 shows the efficacy of interventions on the health-related QOL components. In the physical and mental component summary evaluations, interventions by both volunteers and by health professionals had a maintaining or improving effect on the scores in over 70% of participants. Based on the scores for each component, over 65% of participants were classified as "maintaining or improved", instead of demonstrating an expected six-month aging decline.

Table 2 shows the individual comparisons between scores before and after the six-months intervention, separated into the different intervention groups. In 5 of 8 QOL components of the volunteer-led intervention group, there were significantly higher mean scores after the intervention compared with the corresponding mean scores pre-intervention, with no significant difference when compared to the scores obtained in the professional-led group.

Table 3 shows significant differences in characteristics between the two intervention groups. The participants in the intervention led by volunteers were significantly younger and their QOL scores, except for the Mental Component Summary score, were significantly better.

In order to eliminate the confound effect from the differences in the health-related quality of life before the intervention, participants were categorized into three group according to their change in the scores of health-related quality of life. Table 4 compares the rates of improved, reduced and maintained health in the two groups. The ratios of improvements were higher in terms of Vitality (48.0%) and Mental health (48.0%) scores after volunteer-led interventions and higher in terms of Role-physical (30.9%) and Social functioning (38.2%) scores after professional-led interventions. Finally based on the details and age adjusted comparison in each component of quality of life, Table 5 shows the results of logistic regression analyses for the score of health-related QOL scores, adjusted for the initial value of each score and age. Scores for Physical functioning (odds ratio [OR], 9.96; 95% confidence interval [CI)], 2.58–38.3), Vitality (OR, 4.54; 95% CI, 1.61–12.8), Role-emotional (OR 3.74; 95% CI, 1.24–11.3), Mental health (OR, 5.02; 95% CI, 1.86–13.5), Physical component summary (OR, 6.36; 95% CI, 2.03–19.9), and Mental component summary (OR, 3.98; 95% CI, 1.38–11.5) were significantly higher after the volunteer-led interventions than the professional-led interventions.

DISCUSSION

Physical functioning, Vitality, Role-emotional and Mental health scores among the SF-36v2 sub-scores, and Physical and Mental component summary scores, were improved in the six-month exercise intervention through both volunteer-led interventions and through professional-led interventions. Furthermore, these interventions were part of a sustainable program. After adjusting for various confounding factors among the QOL components, scores improved more among older females who participated in an exercise intervention delivered by volunteers than by health professionals. A previous study has found that the work of volunteers had decreased homebound incidents and increased the frequency of regular exercise more effectively than health professionals[23].

For effective interventions delivered through volunteers, the importance of participation in early training programs delivered by health professionals before starting interventions has been noted[10, 13, 19, 23]. Volunteers in the present study had received sufficient training. Furthermore, safely conducted peer-led exercise programs have been reported to reduce healthcare costs[24].

Table 1. Number of maintained or improved participants in each QOL component score after a six-month intervention conducted by volunteers and by health professionals

	Intervention by volunteers n=50	Intervention by health professionals n=55
QOL components	n (%)	
Physical functioning (PF)	40 (80.0)	41 (74.5)
Role-physical (RP)	40 (80.0)	42 (76.4)
Bodily pain (BP)	43 (86.0)	36 (65.5)
General health (GH)	39 (78.0)	40 (72.7)
Vitality (VT)	41 (82.0)	39 (70.9)
Social functioning (SF)	42 (84.0)	41 (74.5)
Role-emotional (RE)	45 (90.0)	49 (89.1)
Mental health (MH)	40 (80.0)	41 (74.5)
Component summaries		
Physical (PCS)	42 (84.0)	47 (85.5)
Mental (MCS)	40 (80.0)	40 (72.7)

Peer-education models, based on a strategy for promoting health using volunteers[25], comprise individuals with a similar social background or life experience who teach and share health information, values and behavior[26, 27]. Dorgo et al.[19] used peer-education models to implement interventions, and concluded from SF-36v2 findings that the health of individuals improved when the intervention was delivered by trained older volunteers than by young health professionals. In our study, the health professionals were younger, whereas the volunteers were of a similar age to those undergoing intervention. We considered that intervention improved the health-related QOL more efficiently when delivered by volunteers than by health professionals due to the effects of peer education.

Based on this consideration concern with peer-education model, there might be further questions. What kind of similar social background or life experience were effective? What kind of excellent emotional support did the trained volunteers supply? In our study, the persons who implement exercise intervention were only categorized into two groups, volunteers or professionals. Large number of trained volunteers and controlled randomized intervention study designed for the relationship between volunteers' characteristics and increment in health-related QOL might resolve the questions. To understand the quantity and quality of effect in the peer-education model would provide a new insight into the fundamental value of trained

Table 2. Comparison between the QOL scores before and after the six-months intervention in the volunteer-led and health professional-led intervention groups

	Intervention by volunteers n=50 Mean (SD)		Intervention by health professionals n=55 Mean (SD)	
	Before	After	Before	After
QOL components				
Physical functioning (PF)	66.4 (21.9)	72.6* (20.6)	49.9 (17.8)	50.2 (18.7)
Role-physical (RP)	65.3 (24.3)	71.4 (19.6)	56.7 (21.8)	57.5 (22.4)
Bodily pain (BP)	59.8 (18.9)	61.8 (22.8)	48.7 (19.9)	45.6 (17.8)
General health (GH)	55.3 (14.9)	58.1 (14.7)	44.1 (18.6)	44.9 (16.8)
Vitality (VT)	56.6 (16.4)	65.7* (15.6)	48.1 (20.6)	48.5 (19.9)
Social functioning (SF)	84.8 (18.1)	90.5* (13.7)	75.2 (22.4)	76.6 (25.2)
Role-emotional (RE)	72.8 (21.5)	79.7* (21.8)	62.7 (22.2)	61.6 (22.6)
Mental health (MH)	65.6 (18.0)	72.1* (17.6)	58.0 (18.8)	57.7 (18.8)
Component summaries				
Physical (PCS)	38.0 (10.8)	38.6 (12.9)	27.1 (11.8)	27.1 (12.1)
Mental (MCS)	51.4 (7.60)	54.1* (7.74)	48.5 (9.26)	48.5 (8.17)

Student's t-test. *Significantly different ($p<0.05$) between before and after intervention.

Table 3. Comparison between baseline age and QOL scores in the two intervention groups

	Intervention by volunteers n=50 Mean (SD)	Intervention by health professionals n=55 Mean (SD)
Age (yrs)	75.6* (4.3)	78.3 (4.8)
QOL Components		
Physical functioning (PF)	66.4* (21.9)	49.9 (17.8)
Role-physical (RP)	65.3* (24.3)	56.7 (21.8)
Bodily pain (BP)	59.8* (18.9)	48.7 (19.9)
General health (GH)	55.3* (14.9)	44.1 (18.6)
Vitality (VT)	56.6* (16.4)	48.1 (20.6)
Social functioning (SF)	84.8* (18.1)	75.2 (22.4)
Role-emotional (RE)	72.8* (21.5)	62.7 (22.2)
Mental health (MH)	65.6* (18.0)	58.0 (18.8)
Component summaries		
Physical (PCS)	38.0* (10.8)	27.1 (11.8)
Mental (MCS)	51.4 (7.60)	48.5 (9.26)

Student's t-test. * Significantly different ($p<0.05$) between two groups.

volunteers in health activity.

The present study has some limitations. First, baseline scores differed and, as a result, those participants who had their intervention delivered by volunteers were younger and almost all of their SF-36 sub-scores were better than those who had their intervention delivered by health professionals. This limitation might consequence to overestimate the efficacy of

Table 4. Comparison of changes in QOL scores between the two intervention groups

	Volunteers n=50		Health professionals n=55	
	Declined/Maintained n (%)	Improved n (%)	Declined/Maintained n (%)	Improved n (%)
QOL components				
Physical functioning (PF)	36 (72.0%)	14 (28.0%)	48 (87.3%)	7 (12.7%)
Role-physical (RP)	30 (60.0%)	20 (40.0%)	38 (69.1%)	17 (30.9%)
Bodily pain (BP)	37 (74.0%)	13 (26.0%)	47 (85.5%)	8 (14.5%)
General health (GH)	37 (74.0%)	13 (26.0%)	39 (70.9%)	16 (29.1%)
Vitality (VT)	26 (52.0%)	24* (48.0%)	40 (72.7%)	15 (27.3%)
Social functioning (SF)	32 (64.0%)	18 (36.0%)	34 (61.8%)	21 (38.2%)
Role-emotional (RE)	35 (70.0%)	15 (30.0%)	47 (85.5%)	8 (14.5%)
Mental health (MH)	26 (52.0%)	24* (48.0%)	43 (78.2%)	12 (21.8%)
Component summaries				
Physical (PCS)	32 (64.0%)	18* (36.0%)	46 (83.6%)	9 (16.4%)
Mental (MCS)	29 (58.0%)	21* (42.0%)	42 (76.4%)	13 (23.6%)

χ^2 test. * Significantly different ($p<0.05$) between two groups.

Table 5. Comparison of interventions for scores in each QOL component

	Intervention delivered by	Crude OR	95% CI	Adjusted OR*	95% CI
QOL components					
Physical functioning (PF)	Volunteers	2.67	0.98–7.29	9.96**	2.58–38.3
	Professionals	1.00		1.00	
Role-physical (RP)	Volunteers	1.49	0.67–3.33	1.71	0.67–4.37
	Professionals	1.00		1.00	
Bodily pain (BP)	Volunteers	2.06	0.77–5.50	2.69	0.90–8.05
	Professionals	1.00		1.00	
General health (GH)	Volunteers	0.86	0.36–2.02	1.87	0.63–5.54
	Professionals	1.00		1.00	
Vitality (VT)	Volunteers	2.46**	1.09–5.55	4.54**	1.61–12.8
	Professionals	1.00		1.00	
Social functioning (SF)	Volunteers	0.91	0.41–2.01	1.43	0.54–3.73
	Professionals	1.00		1.00	
Role-emotional (RE)	Volunteers	2.52	0.96–6.60	3.74**	1.24–11.3
	Professionals	1.00		1.00	
Mental health (MH)	Volunteers	3.31**	1.42–7.72	5.02**	1.86–13.5
	Professionals	1.00		1.00	
Component summaries					
Physical (PCS)	Volunteers	2.88**	1.42–7.72	6.36**	2.03–19.9
	Professionals	1.00		1.00	
Mental (MCS)	Volunteers	2.34**	1.01–5.41	3.98**	1.38–11.5
	Professionals	1.00		1.00	

*Odds ratios adjusted for age and baseline scores of dependent variables.
** Significantly different ($p<0.05$) between two interventions.

intervention by the volunteers in our comparison with one by professionals. A randomized control study is necessary for further comparison of them. Second, all participants in our analysis were healthy older females because women were major in number than men. Thus, the results of the present study cannot be generalized to older individuals who are frail or male. Third, all our participants were selected from communities in one Japanese prefecture so the results might not be applicable to the general Japanese population. Fourth, our study was mainly designed to evaluate the efficacy and sustainability of exercise intervention, implemented by trained volunteers or not. And the professionals who trained the volunteers did not implement a exercise intervention. These might results in overestimate the efficacy of intervention by the volunteers.

Exercise intervention using trained volunteers was sustainable and effective for improving health-related QOL among Japanese community-dwelling older females. Professionally trained volunteers could benefit communities in helping older persons avoid the need for daily nursing care through promoting health activities.

Conflicts of interest

We declare the authors to have no financial or personal relationships that could pose a conflict of interest.

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