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Abstract

The aim of this study was to test for an association between functional fitness and psychological health in older people in Japan. Forty-nine men and sixty-seven women volunteers in a rural area of Japan were the subjects of the study. Their ages ranged from 60-91 years ; adjustments for the effects of age were made by analyses of covariance. Each individual' s functional fitness was obtained using the functional fitness test developed by the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD). Psychological health was assessed using the Philadelphia Geriatric Center (PGC) morale scale. The results showed that psychological health was better in the group with the highest physical fitness than in the groups with the lowest physical fitness in women, but there was no significant difference in psychological health in men. We conclude that, for women, psychological health is better in individuals having high functional fitness, and that elderly people should be encouraged to maintain their physical fitness.

Introduction

In a society with a population that is advancing in age, it is important that older adults maintain their physical and psychological health. Psychological health plays an especially big role in the functional status and health of the older population. Therefore, it is important to study the factors that influence psychological health in older individuals.

Several previous studies have demonstrated associations between physical fitness and psychological health. For example, Brandon and Loftin (1991)[1] reported that significant correlations were observed between aerobic fitness as measured by maximal oxygen consumption and psychological variables such as depression, internal locus of control, and self-control measures. Likewise, exercise-induced increases in aerobic fitness following the completion of a 12-week aerobic fitness program using a bicycle ergometer have been shown to have beneficial short-term and long-term effects on psychological outcomes in adults (DiLorenzo et al., 1999)[2]. In these previous studies, physical fitness was assessed using measures of cardiovascular fitness such as maximal oxygen consumption. Rikli and Jones (1999)[3] pointed out the need to improve the methods of evaluating physical fitness and developed age-appropriate tools to assess the physiological attributes required to perform

＊1　東海大学健康科学部社会福祉学科　　＊2　文化女子大学現代文化学部健康心理学科　　＊3　九州大学健康科学センター

common everyday activities. According to their research, it is important to assess physical fitness in a way that reflects physical ADL (PADL) and Instrumental ADL (IADL) in older adults. In addition, the methods of assessing cardiovascular fitness are too difficult for older people in community setting. For this reason, a newly designed comprehensive fitness test battery named the functional fitness test was developed for older people (Capranica et al., 2001[4]; Lemmink et al., 2001[5]; Miotto et al., 1999[6]). Functional fitness is defined as having the physiological capacity to perform normal everyday activities safely and independently without undue fatigue (Rikli and Jones, 1999[3]). Thus, functional fitness for older adults is the ability to live independently, and physical fitness makes an important contribution to the maintenance of psychological health in older adults. However, few studies have discussed the relationship between physical fitness as assessed by functional fitness and psychological health in Japanese older adults.

The purpose of this study was to examine the cross-sectional relationship between the functional fitness and psychological health of older adults. Elucidating this relationship may help older adults to establish an appropriate exercise regimen for the promotion of psychological health.

Methods

Subjects

The subjects were 49 men and 67 women volunteers, aged from 60 to 91 years. The eligibility criteria were willingness to participate, 60 years of age or older, and the absence of chronic serious mental illness. All subjects resided in Kagoshima prefecture, Japan. The subjects gave written informed consent to participate in this institutionally approved study after the protocol, stresses, and possible risks had been fully explained to them. The physical characteristics [mean (SD)] were: age 70.6 (6.5) years in men, 69.0 (6.6) years in women; height 1.61 (0.05) m in men, 1.49 (0.06) m in women; body mass 60.6 (8.9) kg in men, 52.4 (7.1) kg in women; body mass index 23.4 (3.1) in men, 23.5 (2.7) in women.

Functional fitness measurement

Functional fitness was assessed using the functional fitness test created by the American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD) (Osness, 1989[7]; Shaulis et al., 1994[8]). The reliability and validity of the AAHPERD functional fitness test was confirmed for Japanese older adults (Yaguchi and Furutani, 1998[9]). The assessment involved 5-parameters: flexibility, agility and dynamic balance, coordination, strength and endurance, and endurance (for details, see Yaguchi and Furutani, 1998[9]). (see Figure1)

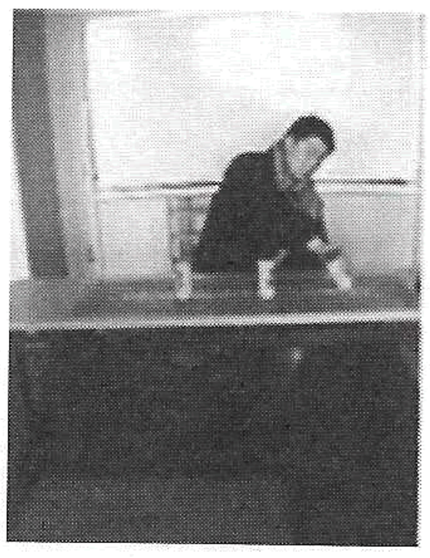
Psychological health

Psychological health was assessed using the Philadelphia Geriatric Center (PGC) morale scale (Lawton, 1975[10]). It consists of a 17-item, self-reported questionnaire. The total score range from 0 to 17, with a higher score indicating better psychological health.

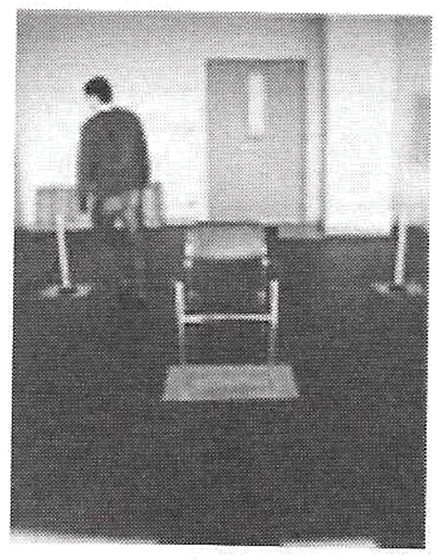
Statistical analyses

Non-paired t-test was used to analyze sex differences in five functional fitness test scores and the PGC morale scale score. Within each sex group, we divided subjects into tertiles, according to the functional fitness test scores. The subjects in the lowest tertile were named the low fitness group (LFG), the subjects in the middle tertile were named the middle fitness group (MFG), and the subjects in the highest tertile were named the high fitness group (HFG). Analysis of covariance (ANCOVA) was

長座体前屈：sit and reach test

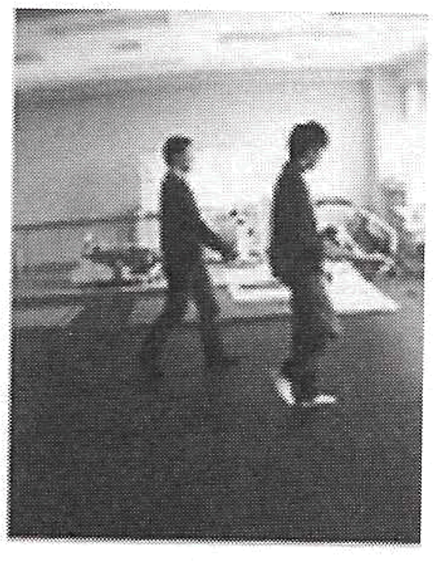


缶置き換え作業：soda pop coordination test



バランス歩行：agility and dynamic balance test

腕屈伸作業：strength and endurance test



ハーフマイルウォーク：880 yards walk test

Figure 1　Functinal fitness test for the elderly (AAHPERD, 1992)

used to assess the independent associations between functional fitness scores and the PGC morale scale score controlling for age. All statistical contrasts were made at the 0.05 level of significance (Statistical Package for Social Science 12.1, SPSS Inc., Chicago, IL), and a Bonferroni correction was applied as appropriate when multiple comparisons were made.

Results

Sex differences in functional fitness and psychological health

Table 1 showed the five functional fitness test scores for men and women. The 880-yard walk test score was significantly higher in men than in women (542.0±75.4 vs. 574.2±80.2, p=0.037), whereas the strength and endurance test score was significantly higher in women than in men (23.5±5.9 vs. 25.7±4.8, p=.036). However, there were no significant sex differences in the remaining three functional fitness scores. Also, the PGC morale scale score was significantly higher in men than in women (12.4±3.2 vs. 11.0±3.5, p=0.034).

Five functional fitness tests and the PGC morale scale score

There was no significant difference in the PGC morale scale score when the subjects were grouped according to the five functional fitness scores in men (Table 2). However, ANCOVA controlled for age showed significant associations between the PGC morale scale score and all functional fitness scores (except the 880-yard walk) in women (Table 3). Post hoc testing revealed that the PGC morale scale score was significantly lower in the lowest physical fitness group (LFG) than in the highest physical fitness group (HFG).

Discussion

The main purpose of this study was to

Table 1　Five functinal fitness tests in three tertiles of men and women subjects

		Men	Women	Sig.
Sit and reach test (cm)				
	All	7.1±9.6(49)	10.2±11.5(67)	p=.126
	LFG	-3.1±5.5(17)	-2.7±8.2(23)	
	MFG	7.4±1.6(16)	12.2±3.1(22)	
	HFG	17.6±5.1(16)	21.7±3.0(22)	
Agility and dynamic balance test (sec)				
	All	28.1±5.0(49)	28.9±6.7(64)	p=.465
	LFG	33.4±4.9(16)	36.6±6.0(21)	
	MFG	27.3±1.1(16)	27.2±1.8(21)	
	HFG	23.7±1.8(17)	23.2±1.3(22)	
Soda pop coordination test (sec)				
	All	15.9±3.4(49)	15.8±3.8(67)	p=.831
	LFG	19.6±3.5(16)	19.9±3.6(22)	
	MFG	15.2±0.7(16)	15.0±0.7(22)	
	HFG	13.1±0.8(17)	12.5±1.1(23)	
Strength and endurance test (reps)				
	All	23.5±5.9(49)	25.7±4.8(66)	p=.036
	LFG	18.3±3.3(19)	20.6±2.8(23)	
	MFG	23.4±1.2(15)	25.8±1.2(21)	
	HFG	30.3±4.0(15)	31.0±2.3(22)	
880 yard-walk test (sec)				
	All	542.0±75.4(45)	574.2±80.2(61)	p=.037
	LFG	625.9±65.7(15)	670.0±42.3(20)	
	MFG	526.0±19.5(15)	565.2±26.5(19)	
	HFG	474.1±20.5(15)	495.1±28.8(22)	

Values are mean±SD (n).

LFG, the lowest tertile; HFG, the highest tertile for each functional fitness variable.

For sit and reach test and strength and endurance test scores, higher scores were indicating better fitness.

For agility and dynamic balance test, soda pop coordination test, and 880 yard-walk test scores, lower scores were indicating better fitness.

Table 2 The PGC morale scale score in tertiles (LFG-HFG) divided according to the functional fitness scores in men

	LFG	MFG	HFG	Sig.
Sit and reach test (cm)	11.9±4.0(17)	13.0±2.2(16)	12.3±3.3(16)	p=.583
Agility and dynamic balance test (sec)	11.3±3.9(16)	13.0±2.4(16)	12.9±3.1(17)	p=.687
Soda pop coordination test (sec)	11.7±3.6(16)	13.4±2.4(16)	12.0±3.4(17)	p=.340
Strength and endurance test (reps)	12.1±3.2(19)	12.4±3.4(15)	12.6±3.2(15)	p=.980
880 yard-walk test (sec)	12.3±3.2(15)	11.8±3.5(15)	13.4±2.9(15)	p=.406

Values are mean±SD (n).
LFG, the lowest tertile; HFG, the highest tertile for each functional fitness variable.

Table 3 The PGC morale scale score in tertiles (LFG-HFG) divided according to the functional fitness scores in women

	LFG	MFG	HFG	Sig.	
Sit and reach test (cm)	9.7±4.0(23)	11.3±3.2(22)	12.1±3.1(22)	p=.037	LFG vs. HFG
Agility and dynamic balance test (sec)	10.6±4.1(21)	10.7±3.2(21)	12.1±3.2(22)	p=.035	LFG vs. HFG
Soda pop coordination test (sec)	10.0±3.1(22)	11.2±3.9(22)	11.8±3.4(23)	p=.048	LFG vs. HFG
Strength and endurance test (reps)	9.6±3.4(23)	11.5±3.8(21)	12.2±3.0(22)	p=.013	LFG vs. HFG
880 yard-walk test (sec)	10.8±4.0(20)	11.0±3.3(19)	12.0±3.5(22)	p=.283	

Values are mean±SD (n).
LFG, the lowest tertile; HFG, the highest tertile for each functional fitness variable.

examine the cross-sectional relationships between functional fitness and psychological health in older adults. After controlling for the effect of age, women with high functional fitness had higher psychological health scores.

Previous studies have demonstrated that psychological health is more likely to be good in people with high aerobic fitness than in those with the low aerobic fitness (Brandon and Loftin, 1991[1]; DiLorenzo et al. 1999[2]). Our results extend these findings; data grouped by tertiles suggest a relationship between the fitness to perform normal everyday activities and psychological health.

In women subjects, the lowest psychological health scores were found in the group with the lowest functional fitness scores (four functional fitness scores were statically significant, but one was not significant). Larson (1978)[11] reported that self-rated health or the rating of physical disability is the parameter that is most strongly related to psychological health among all the elements of an older person's life situation. Also, Yasunaga and Tokunaga (2001)[12] showed that psychological health was positively associated with the ability to live independently as assessed by ADL in Japanese older adults. Functional fitness was closely related to the health status of older adults including such parameters as ADL, IADL, and self-rated health (Brill et al., 2000[13]; Huang et al., 1998[14]; Morey et al., 1998[15]). According to these findings, women with higher functional fitness may have better psychological health. McAuley and

Rudolph (1995)[16] pointed out that perhaps it is participation in physical activities rather than fitness changes that enhances psychological well-being. However, the present findings suggest that, for older adults, maintaining better psychological health plays an important role in enhancing their fitness to perform common everyday activities as well as to participate in physical activities.

Unfortunately, overall functional fitness was not significantly associated with psychological health in older men. In the meta-analysis on gender differences in psychological health by Pinquart and Sorensen (2001)[17], men were more likely to report higher satisfaction, better subjective health, higher self-esteem, and less loneliness than women in samples where women were more disadvantaged with regard to objective health and everyday competence. Our results also showed that the PGC morale scale score was higher in men than in women. Therefore, the association is less clear in men than women in the study. However, the pattern of results showed that older men with high and moderate functional fitness had slightly better psychological health in all functional fitness categories except for endurance test than people with low functional fitness.

Our study has some limitations. The number of subjects was small, and they were all relatively healthy older adults. Also, the study was cross-sectional. Therefore, longitudinal studies using more subjects and including frailer individuals are needed to give a more definitive interpretation of the present findings.

In conclusion, the data from this study suggest that the psychological health of older adults is associated with functional fitness. In particular, flexibility, agility and dynamic balance, coordination, and strength and endurance are associated with better psychological health in older women.

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