The Relationships among Exercise Behavior, Functional ADL, and Psychological Health in the Elderly

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Abstract The purpose of this study was to examine the relationships among exercise behavior, the ability to live independently as assessed by functional activities of daily living (ADL), and psychological health as measured by the Philadelphia Geriatric Center morale scale, using data from 202 elderly residents aged 70 and living in their own home. The main results obtained from the analysis were as follows. 1. Exercise behavior had a significant effect on functional ADL. In particular, subjects who had been exercising regularly for 6 months or longer had higher functional ADL than subjects who did not exercise. 2. For psychological health, the functional ADL level was statistically significant, whereas exercise behavior was not. 3. Multiple regression analysis showed a positive and significant association between psychological health and functional ADL, but not between psychological health and exercise behavior, gender or family type. The results of this study demonstrated that elderly people’s efforts to maintain and enhance their psychological health play important roles in their ability to live independently, and that regular exercise is necessary to an elderly person’s ability to live independently.

Keywords: exercise behavior, functional ADL, psychological health, elderly people

Introduction

The population in Japan has been aging rapidly. The percentage of adults aged 65 years or older was 17.2% of the overall population in 2000. Further, it is estimated that this percentage will reach approximately 25.2% by 2015 (Ministry of Health and Welfare, 2000). For this reason, the ability of the elderly to maintain their physical health and independence is an important issue. Also, many recent studies have emphasized the importance of a full Quality of Life (QOL) for the elderly. Although concepts of QOL are quite ambiguous, a common characteristic in gerontology is subjective psychological health status (e.g., life satisfaction, subjective well-being) (Lawton, 1991; Shibata, 1996).

Thus, maintenance of psychological health is closely related to QOL. Many researchers have reported the impact of regular physical activity on psychological health. Regular physical activity (including exercise and sports) is often recommended for elderly people to enhance their physical, social, and psychological health (Chodzko-Zajko, 1997; American College of Sports Medicine Position Stand, 1998; Chogahara et al., 1998; King et al., 1998).

Generally, many studies have reported that active people have better psychological health than inactive people do (Yaguchi et al., 1987; Yaguchi and Furutani, 1993; Stidewell and Rimmer, 1995; Aoki, 2000). For example, Sasazawa et al. (1999) reported that regular exercise correlates not only with physical health and fitness levels but also with mental health, as well, in their study using data from 12,630 people aged 40 to 69. On the other hand, Haga (1999) reported that subjective well-being, one of the positive components of psychological health, was not significantly associated with habitual exercise behavior, respectively. McAuley and Rudolph (1995) pointed out that, although the physiological benefits of regular physical activity among the elderly have been consistently reported in the literature, the psychological benefits of regular physical activity have not been consistently reported. Especially, the effects of regular physical activity on positive psychological health (e.g., subjective well-being, life satisfaction, and self-esteem) remain unclear.

Recently, various studies have shown that the ability to live independently, as assessed by activities of daily living (ADL), strongly influences the psychological health of the elderly. For example, Osada et al. (1995) reported that
depressed states were significantly associated with low levels of functional capacity; and, Shinkai et al. (1999) reported that ADL level, as measured by the ability to walk 1km, was significantly associated with depression, self-rated health, and life satisfaction in the elderly. Thus, it is clear that the degree of ability or inability to live independently is closely related to negative psychological health (e.g., depression) in the elderly. However, few studies have examined the impact of the degree of independence on positive psychological health.

The purpose of this study was to examine the relationships among exercise behavior, ability to live independently as assessed by functional ADL, and psychological health, using data from 202 elderly residents aged 70 and living in their own home. We were especially interested in the impact of each of factors on positive psychological health.

**Methods**

**Subjects**

This study conducted a questionnaire survey of 264 residents of a community in Fukuoka Prefecture, Japan, who were born from January through March 1931. All subjects were aged 70 years. Data were obtained from 202 subjects (76.5%), including 85 males and 117 females. Of these, 22 persons (7 males, 15 females) lived alone. No significant gender differences were found among the subjects’ family type, stage of exercise, functional ADL, or psychological health (Table 1).

**Measurements**

Exercise behavior: The exercise behavior of each subject was assessed according to his or her stage of exercise (SOE). A five-point ordered categorical scale (Marcus et al., 1992) was used to assess SOE. Marcus et al. (1992) defined SOE as follows: (1) Precontemplators (Precontemplation stage) were subjects who did not exercise and who did not intend to start exercising in the next 6 months; (2) Contemplators (Contemplation stage) were subjects who did not exercise but intended to start in the next 6 months; (3) Prepares (Preparation stage) were subjects who exercised some but not regularly (regular exercise is defined as three or more times per week for 20 min or longer each time); (4) Actors (Action stage) were subjects who exercised regularly but who had done so for less than 6 months; and (5) Maintainers (Maintenance stage) were subjects who exercised regularly and who had been doing so for 6 months or longer. Each subject was classified into one of the five SOEs, leading to totals: Precontemplation (N=30, 13 males, 17 females), Contemplation (N=21, 8 males, 13 females), Preparation (N=64, 22 males, 42 females), Action (N=12, 7 males, 5 females), or Maintenance (N=75, 35 males, 40 females).

Functional ADL: Functional ADL of each subject was assessed using the Tokyo Metropolitan Institute of Gerontology (TMIG) Index of Competence (Koyano et al., 1987). This index, developed for older Japanese adults, is composed of 13 items related to both instrumental ADL and social and cognitive ADL. The score was the total number of appropriate responses.

Psychological health: The psychological health of each subject was assessed using the Philadelphia Geriatric Center (PGC) morale scale (Lawton, 1975). This scale is composed of 17 items and measures a concept of subjective well-being in positive psychological health. The score was the total number of positive responses.

**Table 1** Characteristics of subjects in this study

<table>
<thead>
<tr>
<th></th>
<th>male (N=85)</th>
<th>female (N=117)</th>
<th>sig.</th>
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</thead>
<tbody>
<tr>
<td>Family type</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Living alone</td>
<td>7 (8.3%)</td>
<td>15 (12.8%)</td>
<td>N.S.</td>
</tr>
<tr>
<td>Functional ADL</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>TMIG Index of Competence</td>
<td>11.52 ± 1.77</td>
<td>11.81 ± 1.58</td>
<td>N.S.</td>
</tr>
<tr>
<td>Stage of exercise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precontemplation</td>
<td>13 (6.4%)</td>
<td>17 (8.4%)</td>
<td></td>
</tr>
<tr>
<td>Contemplation</td>
<td>8 (4.0%)</td>
<td>13 (6.4%)</td>
<td></td>
</tr>
<tr>
<td>Preparation</td>
<td>22 (10.9%)</td>
<td>42 (20.8%)</td>
<td>N.S.</td>
</tr>
<tr>
<td>Action</td>
<td>7 (3.5%)</td>
<td>5 (2.5%)</td>
<td></td>
</tr>
<tr>
<td>Maintenance</td>
<td>35 (17.3%)</td>
<td>40 (19.8%)</td>
<td></td>
</tr>
<tr>
<td>Psychological health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PGC morale scale</td>
<td>10.97 ± 4.14</td>
<td>10.84 ± 4.04</td>
<td>N.S.</td>
</tr>
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</table>

Table 2  Relationships between functional ADL and exercise behavior

<table>
<thead>
<tr>
<th>stage of exercise</th>
<th>PC (N=30)</th>
<th>C (N=21)</th>
<th>P (N=64)</th>
<th>A (N=12)</th>
<th>M (N=75)</th>
<th>sig.</th>
<th>post hoc test*</th>
</tr>
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<tbody>
<tr>
<td>TMIG Index of Competence</td>
<td>11.00 ± 1.58</td>
<td>10.52 ± 2.44</td>
<td>11.79 ± 1.34</td>
<td>11.08 ± 1.88</td>
<td>12.30 ± 1.66</td>
<td>p&lt;.001</td>
<td>PC&lt;P; PC, C, P&lt;M**</td>
</tr>
</tbody>
</table>


Table 3  Relationships between psychological health and exercise behavior

<table>
<thead>
<tr>
<th>stage of exercise</th>
<th>PC (N=30)</th>
<th>C (N=21)</th>
<th>P (N=64)</th>
<th>A (N=12)</th>
<th>M (N=75)</th>
<th>sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>PGC morale scale</td>
<td>10.45 ± 3.71</td>
<td>10.29 ± 4.50</td>
<td>10.77 ± 4.02</td>
<td>11.75 ± 5.40</td>
<td>11.21 ± 3.97</td>
<td>N.S.</td>
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</table>


Table 4  Relationships between functional ADL level and psychological health

<table>
<thead>
<tr>
<th>functional ADL level</th>
<th>high level group (N=88)</th>
<th>low level group (N=114)</th>
<th>sig.</th>
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</thead>
<tbody>
<tr>
<td>PGC morale scale</td>
<td>12.07 ± 3.70</td>
<td>9.99 ± 4.13</td>
<td>p&lt;.001</td>
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</tbody>
</table>


Table 5  Predictors of psychological health

<table>
<thead>
<tr>
<th></th>
<th>PGC morale scale*</th>
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<tr>
<td></td>
<td>β</td>
</tr>
<tr>
<td>Gender</td>
<td>−.048</td>
</tr>
<tr>
<td>Family type</td>
<td>.112</td>
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<tr>
<td>Functional ADL</td>
<td>.308</td>
</tr>
<tr>
<td>SOE</td>
<td>−.015</td>
</tr>
</tbody>
</table>

R | .320 | .103 |

PGC morale scale: Philadelphia Geriatric Center morale scale. *PGC morale scale score with the BLOM modification. Gender: 1=male, 2=female. Family type: 1=living alone, 2=living with family. SOE: stage of exercise. N.S.: not significant.

Results

Table 2 shows the relationships between functional ADL and exercise behavior. As a result of the analysis, the TMIG Index of Competence score differed significantly from SOE ($\chi^2=34.07$, p<.001). The following results of post hoc testing revealed significant differences in the TMIG Index of Competence score between the Precontemplation and Preparation ($Z=-2.60$, p<.0125), Contemplation and Maintenance ($Z=-4.27$, p<.0025), Precontemplation and Maintenance ($Z=-4.66$, p<.0025), and Preparation and Maintenance ($Z=-3.40$, p<.0025) subjects. Table 3 shows the relationships between psychological health and exercise behavior. As a result of the analysis, the PGC morale scale score did not differ significantly among each SOE. Table 4 shows the relationship between functional ADL and psychological health. Functional ADL levels were divided into a high-level group (for full scores of 13) and a low-level group (for scores of less than 13) based on the TMIG Index of Competence score. When the subjects were classified into these two groups, 88 (43.6%) were in the high-level group and 114 (56.4%) were in the low-level group. As a result of analysis, the PGC morale scale score differed significantly between two groups ($Z=-3.69$, p<.001). Overall, the high-level group scores were better than the low-level group scores. Finally, multiple regression analysis was conducted with gender, family type, functional ADL score, and SOE as independent variables for psychological health (Table 5). Functional ADL correlated significantly with PGC morale scale score ($β=.324$, p<.01). On the other hand, SOE, gender, and family type were not significantly correlated with the PGC morale scale.

Discussion

This study examined the relationships among psychological health, exercise behavior, and functional ADL in community-dwelling elderly people.
Firstly, we discussed the relationships between functional ADL and exercise behavior. The results indicated that functional ADL differed significantly from exercise behavior. Especially, the subjects in the Maintenance stage, who exercised regularly and had been doing so for 6 months or longer, scored higher in functional ADL than did subjects in the Precontemplation, Contemplation, or Preparation stage, all of which included subjects who did not exercise regularly. These findings are consistent with recent studies (Sugisawa et al., 1998; Kono and Kanegawa, 1998) showing that the elderly can maintain their physical health and the ability to live independently, both of which are related to instrument ADL and functional ADL, if they exercise regularly or are physically active.

Secondly, we discussed the relationships between exercise behavior and psychological health, and the relationships between functional ADL and psychological health. Many studies have reported the impact of regular physical activity on psychological status as well as the impact of physical activity on physical status (Yaguchi, 1988; O'Connor et al., 1993). However, the results of this study did not associate psychological health with exercise behavior, whereas functional ADL level was positively associated with psychological health. Although recent studies have reported a significant association between the degree of ADL and depression in the elderly (Osada et al., 1995; Ueno et al., 1997), the results of this study suggested that the degree of ADL was positively and significantly associated not only with depression but also with positive psychological health. Moreover, many studies have pointed out the importance of having a social network (e.g., social support) on psychological health in the elderly (Larson, 1978; Kim et al., 1996; 1999). Koyano et al. (1995) reported that functional health status, as assessed by functional ADL, had positive effects on social relations (including social network). This suggests that maintaining ADL during aging expands one’s social network, and expanding one’s social network enhances psychological health.

Finally, psychological health was positively associated with functional ADL. On the other hand, exercise behavior did not associate with psychological health. These results indicated that exercise behavior in the elderly is not a predictor of psychological health; rather, the degree to which a person is able to live independently is an important predictor of psychological health. Consequently, our findings suggest that psychological health in the elderly is directly associated with the ability to live independently, and that it is necessary to exercise regularly in order to maintain this independence.

Further research is necessary to conduct longitudinal, interdisciplinary studies examining the correlations between psychological health on the one hand and, on the other, various indices of human functioning, such as physical health, social network, and ADL.

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