A Comparison of Life Satisfaction, Functional Ability, Physical Characteristics, and Activity Level Among Older Adults in Various Living Settings

Jan M. Schroeder, Karen L. Nau, Wayne H. Osness, and Jeffrey A. Potteiger

Measurements of functional ability, balance, strength, flexibility, life satisfaction, and physical activity were compared among three populations of older adults (age 75–85 years). Sixty-nine subjects performed the Physical Performance Test (PPT), timed Up and Go, 1 repetition maximum (1RM) leg press and extensions, and Modified Sit and Reach. The Physical Activity Questionnaire for the Elderly and Satisfaction With Life Scale were also completed. No difference was found among the groups for life satisfaction. Individuals living in a nursing facility had poorer PPT scores, dynamic balance, leg extension strength, leg press strength, flexibility, and physical activity than individuals living in assisted-care facilities and the community. Assisted-care individuals had significantly lower PPT scores and leg strength than community-living individuals. The decline of ADL performance and physical activity may be accounted for by loss of strength, balance, and flexibility, all associated with a loss of independence.

Key Words: strength, balance, flexibility, activities of daily living

As the number of older adults increases, the goals of the health care system for the elderly are shifting from diagnosis and cure to maintenance of independent living. As individuals age, their functional ability decreases (Booth, Weeden, & Tseng, 1994; Evans & Rosenberg, 1991; Reed, Pearlmutter, Yochum, Meredith, & Mooradian, 1991), which increases disability. If the disability becomes severe, it may prevent the individual from living independently and thereby necessitate costly, long-term care.

It has been shown that as individuals grow older, there is an age-related decline in activities of daily living (ADLs) (Dickerson & Fisher, 1993; Falconer et

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cal., 1992), balance (Bohannon, Larkin, Cook, Gear, & Singer, 1984; Winter, Patla, Frank, & Walt, 1990), muscular strength (Larsson, Grimby, & Karlsson, 1979; Phillips, Bruce, Newton, & Woledge, 1992; Reed et al., 1991), and flexibility (Bassey, Morgan, Dallosso, & Ebrahim, 1989; Germain & Blair, 1983). However, persons who maintain a high level of physical activity generally are stronger, are more flexible, and have better balance than their sedentary counterparts (Kuta, Parizkova, & Dycka, 1970; Voorrips, Lemmink, Van Heuvelen, Bult, & Van Staveren, 1993). The extent to which elderly persons can live independently in the community depends on their ability to perform these and related basic daily tasks. In addition, because persons living in assisted-care and nursing facilities have some or all of their daily needs provided for them, they become even less active and therefore are at greater risk for declines in strength, balance, and flexibility.

Few studies have compared the functional abilities and physical characteristics of elderly persons living dependently in a nursing facility or assisted-care facility and those living independently in the community. Marino, Finch, and Guthrie (1983) determined that community-dwelling older adults walked with higher walking velocities and longer strides than older adults at high risk for living dependently and those currently living dependently. Cunningham, Paterson, Himann, and Rechnitzer (1993) indicated that independently living individuals showed significantly greater flexibility, strength, and walking speed compared to individuals living dependently. Sonn and Asberg (1991) determined that older adults who lived independently scored higher on ADL tests than those who lived dependently.

Due to the limited research on the differences in physical parameters among the three older adult populations, it remains to be determined whether individuals living in nursing and assisted-care facilities are less functional than community-living older adults, and if so, to what degree. Therefore, the purpose of this investigation was to quantify the functional ability, balance, muscular strength, flexibility, and life satisfaction of older adults, 75–85 years of age, living in one of three residential settings: a nursing facility, an assisted-care facility, and independently in the community.

Methods

SUBJECTS

The subjects (N = 69) were recruited from nursing facilities (n = 23), assisted-care facilities (n = 23), and the community (n = 23). Two community settings, three assisted living facilities, and four nursing facilities were used to recruit volunteers for this investigation. The nursing facility participants were the most difficult to identify due to the criteria we set. We defined a nursing facility as a setting in which the individuals needed 24-hr nursing supervision. These facilities would offer medical treatment under the supervision of licensed nurses, and at least one registered nurse must be on duty during the day. Individuals were confined to a bed for some portion of the day and/or incontinent. Assisted living was defined as a facility where medication could be monitored for an individual but not administered. The individual must be able to transfer from his or her bed to a wheelchair independently. One to three meals may be served per day. A community living setting was defined as one in which the individual lived independently in his or her
own home. Minimal assistance may be used for such things as house cleaning or shopping.

To be included in this study, participants had to obtain a physician’s approval, had to be ambulatory for at least a short distance (22.9 m, 75 ft) with or without an assistive device, could have no serious cognitive impairments such as middle-stage dementia or Alzheimer’s disease, as determined by a physician, and had to have lived in their current setting for at least 3 months. The subjects received a verbal explanation of the study and then gave their written informed consent prior to data collection. In addition, each subject completed a health history form prior to testing.

TESTING PROCEDURES

All subjects were transported to the laboratory for testing. Upon entering the laboratory, the subject was weighed using a digital electronic scale. Height in centimeters was measured and recorded from a measuring scale mounted to a wall. A list of daily prescription medications and highest achieved education level were recorded from the health history form. Activity level was assessed by the Physical Activity Questionnaire for the Elderly (Voorrips, Ravelli, Dongelmans, Deurenberg, & Van Staveren, 1991). The subjects were asked, in one-on-one interviews, to report their habitual physical activity over the past 1 year. The questionnaire consisted of three sections pertaining to household activities, sport activities, and leisure-time activities. The items relating to household activities used a 4- to 5-point rating scale. Sports and leisure-time activities included the type of activity, hours per week engaged in the activity, and number of months in the year in which the activity was normally performed. Reliability ($r = .89$) was established by Voorrips et al. (1991).

Life satisfaction was assessed with the Satisfaction with Life Scale (SWLS) (Deiner, Emmons, Larsen, & Griffin, 1985). SWLS is a self-report scale containing five items in which the subjects rate the extent to which they agree with each item. A 7-point Likert scale was used. A single score was calculated from the five items. The reliability ($r = .82$) of the scale was reported by Deiner et al. (1985).

After completion of the paperwork, the subjects rested for 5 min and then performed a seven-item Physical Performance Test (PPT) (Reuben & Sui, 1990) to determine functional ability. Subjects were timed for each item/task (e.g. picking up an object from the floor, donning a jacket, walking, writing a sentence, etc.) and a PPT score was calculated from the recorded times. The subjects were given two trials to complete each item, with no prior practice, and the best of the two trials was recorded for analysis. Normally used assistive devices were permitted. Reuben and Sui (1990) established a high reliability ($r = .79$) for the test on a population of older adults.

After a 5-min rest, each subject performed the timed Up and Go test to assess dynamic balance (Podsiadlo & Richardson, 1991). Initially, the subject sat in a chair with armrests. The subject rose from the chair, walked around a cone that was placed 3 m in front of the chair, returned to the chair, and sat down. The time recorded to complete the task was measured. Reliability ($r = .99$) of this test was established by Podsiadlo and Richardson (1991).

After the test for dynamic balance, the subject was given a 5-min rest and then was tested for muscular strength using a 1 repetition maximum (1RM) measure for
the bilateral knee extension and double leg press. The 1RM was determined on Universal machines. The 1RM was defined as the maximum resistance that could be performed for the muscle group one time through the full range of motion. Individual range of motion was determined by having the subject perform a repetition with no weight applied. Each subject performed a warm-up of 10 repetitions with no weight. Incremental loads were added until failure occurred despite verbal encouragement to exert maximal effort. Failure was defined as a lift falling short of the full range of motion on at least two attempts spaced 45 s apart. The 1RM measurements for the knee extension and leg press were repeated 1 week later, and the best of the two scores was used as the measurement. The reliability for this protocol was established by Fiatarone et al. (1994) in a population of frail elderly nursing facility adults and by Morganti et al. (1995) in community-dwelling older adults (r = .85 and r = .88, respectively).

The final test performed by the subjects was the Modified Sit and Reach test for flexibility of the low back and hamstrings. The subject assumed a seated position with the head, back, and hips against a wall and the feet against a sit and reach box (30.5 cm high). A sliding measurement scale with a range of 0 to 70 cm was placed on the box. The subject was instructed to place hand over hand and reach out level with the scale. During the initial reach, the subject’s head and back remained in contact with the wall. The sliding measurement scale was moved along the top of the box until the zero point of the scale was even with the tips of the fingers. This was referred to as the finger-to-box distance. After the relative zero point was established, the subject reached forward as far as possible down the scale with arms extended and palms down. Two practice trials were allowed before recording the reach scores for three trials. The final score was an average of the three trials. This protocol is highly reliable (r = .97) (Hopkins & Hoeger, 1992).

STATISTICAL ANALYSIS

One-way ANOVAs were used to identify whether significant differences occurred among the three samples of older adults for the physical activity questionnaire, SWLS, PPT, Up and Go, 1RM for leg press and leg extension, flexibility, and demographic variables. Statistical significance was set at an alpha level of \( p < .05 \). If a significant \( F \) value was obtained, appropriate post hoc procedures were used to identify differences between groups. Values are reported as mean ± SD in the table describing the subject characteristics. Values are reported as mean ± SE for the testing parameters.

Results

The descriptive characteristics of the subjects are displayed in Table 1. There were no significant differences among the groups in age, height, weight, education level, and number of daily medications. Of the 69 subjects who participated in the study, only one nursing facility individual currently smoked.

Satisfaction with life scores were not significantly different, \( F(2, 66) = 1.52, \ p = .23 \), among individuals living in the community, assisted-care facilities, or nursing facilities (Table 2).
Table 1 Descriptive Characteristics of the Subjects

<table>
<thead>
<tr>
<th></th>
<th>Community</th>
<th>Assisted-care facility</th>
<th>Nursing facility</th>
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<tr>
<td></td>
<td>(n = 23)</td>
<td>(n = 23)</td>
<td>(n = 23)</td>
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<tr>
<td>Age (years)</td>
<td>79.9 (M), 3.3 (SD)</td>
<td>81.0 (M), 2.7 (SD)</td>
<td>80.4 (M), 2.7 (SD)</td>
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<tr>
<td>Height (cm)</td>
<td>154.3 (M), 11.0 (SD)</td>
<td>151.8 (M), 8.7 (SD)</td>
<td>153.8 (M), 10.3 (SD)</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>65.1 (M), 11.1 (SD)</td>
<td>64.3 (M), 14.2 (SD)</td>
<td>68.5 (M), 14.7 (SD)</td>
</tr>
<tr>
<td>Education level (years)</td>
<td>10.9 (M), 4.9 (SD)</td>
<td>13.5 (M), 3.2 (SD)</td>
<td>12.0 (M), 2.8 (SD)</td>
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<tr>
<td>Number of daily medications</td>
<td>1.7 (M), 1.5 (SD)</td>
<td>1.4 (M), 1.4 (SD)</td>
<td>2.4 (M), 2.2 (SD)</td>
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<tr>
<td>Female:male ratio</td>
<td>19:4 (M)</td>
<td>21:2 (M)</td>
<td>20:3 (M)</td>
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</table>

Note. There were no significant differences among the groups for any of the variables listed.

Table 2 One-Way ANOVA Results for Life Satisfaction, Physical Activity, Functional Ability, and Physical Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Community</th>
<th>Assisted-care facility</th>
<th>Nursing facility</th>
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<tr>
<td></td>
<td>(M), (SD)</td>
<td>(M), (SD)</td>
<td>(M), (SD)</td>
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<tr>
<td>Life satisfaction</td>
<td>30.7 (M), 0.8 (SD)</td>
<td>28.2 (M), 1.3 (SD)</td>
<td>29.5 (M), 1.0 (SD)</td>
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<td>Physical activity level</td>
<td>7.6 (M), 1.1 (SD)</td>
<td>6.8 (M), 1.4 (SD)</td>
<td>1.2* (M), 0.3 (SD)</td>
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<tr>
<td>PPT</td>
<td>21.7 (M), 0.4 (SD)</td>
<td>19.6* (M), 0.9 (SD)</td>
<td>11.5* (M), 1.0 (SD)</td>
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<tr>
<td>Dynamic balance (s)</td>
<td>9.8 (M), 1.8 (SD)</td>
<td>11.6 (M), 1.0 (SD)</td>
<td>16.8* (M), 1.8 (SD)</td>
</tr>
<tr>
<td>Leg press strength (kg)</td>
<td>30.7 (M), 2.9 (SD)</td>
<td>22.5* (M), 2.7 (SD)</td>
<td>20.0* (M), 3.1 (SD)</td>
</tr>
<tr>
<td>Leg extension strength (kg)</td>
<td>28.1 (M), 6.1 (SD)</td>
<td>20.7* (M), 2.8 (SD)</td>
<td>17.6* (M), 2.6 (SD)</td>
</tr>
<tr>
<td>Flexibility (cm)</td>
<td>28.3 (M), 1.7 (SD)</td>
<td>29.7 (M), 1.6 (SD)</td>
<td>19.3* (M), 1.8 (SD)</td>
</tr>
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</table>

Note. Significant differences \((p \leq .05)\) between nursing facility older adults and assisted-care and community-living older adults. *Significant differences \((p \leq .05)\) between assisted-care and community-living individuals.

A significant difference existed among the groups for self-reported physical activity level, \(F(2, 66) = 27.17, p = .00\) (Table 2). Physical activity level was lower in individuals living in nursing facilities as opposed to those living in the community or assisted-care facilities. There was no significant difference between the assisted-care and community-dwelling individuals.

There was a significant difference in functional ability as determined by the Physical Performance Test, \(F(2, 66) = 45.94, p = .00\), among the three groups of older adults (Table 2). Individuals living in nursing facilities had lower PPT scores than those living in the community or assisted-care facilities. In addition, assisted-care older adults had lower PPT scores than community-living older adults.
A significant difference existed among the groups for dynamic balance as determined by the timed Up and Go, $F(2, 64) = 8.66, p = .00$ (Table 2). Individuals living in a nursing facility had higher dynamic balance scores (poorer balance) than individuals who lived in the community or assisted-care facilities. There was no significant difference in dynamic balance between individuals who lived in the community and assisted-care facilities.

Lower body strength as established by leg press, $F(2, 54) = 27.17, p = .00$, and leg extension activities, $F(2, 54) = 24.95, p = .00$, showed significant differences among the three groups of older adults (Table 2). Leg press strength was greater for individuals living in the community than individuals living in assisted-care facilities or nursing facilities. Assisted-care individuals also had greater leg press scores than individuals living in nursing facilities. Similar results were recorded for leg extension strength.

The results for the modified Sit and Reach test also indicated a significant difference among the groups, $F(2, 66) = 10.77, p = .00$ (Table 2). Flexibility was less for individuals living in nursing facilities as compared to the community and assisted-care individuals. There was no difference in flexibility between community living and assisted-care older adults.

**Discussion**

The data from this investigation indicate that differences in functional ability, physical activity level, dynamic balance, lower body strength, and flexibility exist among same-aged older adults living in nursing facilities, assisted-care facilities, and the community. In similar investigations conducted previously (Cunningham et al., 1993; Sonn & Asberg, 1991), the subjects living independently were significantly younger than the subjects living dependently. Since age was not controlled for, it was not clear whether the observed differences were due to chronological age or functional differences. In the present investigation, there were no significant differences in age among the three older adult populations. Therefore, differences measured in this study cannot be attributed to age differences among the groups.

Our results support work by Sonn and Asberg (1991) which suggests that there is a significant difference in functional ability among the three groups of older adults. In contrast, there was no difference in self-reported physical activity between assisted-care and community-living individuals. This may be because physical activity level was measured by self-report whereas functional ability was measured directly. While these two tests were designed to measure different parameters, the self-report physical activity tool seems to be less sensitive for detecting differences between groups than the directly measured functional ability test. The direct measurement of physical capabilities provides an objective measure of an individual’s performance (Reuben & Sui, 1990).

The differences among the groups are most likely due to multiple factors. Some changes in ability can be a result of primary aging, while other changes may be attributed to the reduced activity level that often accompanies aging (Herman, 1992). The loss of strength, flexibility, and balance that occurs with aging is due in part to disuse resulting from a relatively inactive lifestyle. As stated by Boreham and Murphy (1992), an increasing number of older adults will be living at or near their
thresholds of physical ability due to the age-related loss of muscle mass and concomitant exercise intolerance. Clinically, one observes a decreased ability to engage in physical activity in the elderly due to decreased muscle strength (Brooks & Faulkner, 1994).

In individuals living in nursing facilities, we found that not only were their physical activity levels lower than assisted-care and community-living individuals, their strength levels were also lower. With aging, we expect to see a decrease in strength due to a loss of motor unit number and muscle fibers (Lexell, Downham, & Sjostrom, 1986). However, age was controlled for in this study. Therefore, the differences in strength among the groups should not be due chronological age. Frontera, Meredith, O’Reilly, Knutgen, and Evans (1988) found that strength due to an increase in muscle fiber area increased with an increase in activity. It is not known whether these individuals are weaker because they are less active or they are less active because they are weaker. No matter where the initial deficit occurs, the decline in one tends to lead to a decline in the other. Therefore, the lower strength levels in the nursing facility residents as compared to assisted-care and community-living older adults may partially account for differences in physical activity level. An additional factor in the decreased activity level in nursing facility residents may be that the staff at the facility preferred to perform certain tasks for the individual, as it may take the individual longer to perform them. The individual may become reliant on the facility staff and will no longer perform activities due to a learned helplessness.

The significant differences found in strength and flexibility between community-living adults and those in nursing facilities were similar to the findings of Cunningham et al. (1993). Those investigators found that older adults living independently had greater flexibility and strength than older adults living dependently. As an individual ages, flexibility decreases due to an increased rigidity of tissue, attributed to tighter cross-linkage within and between collagen fibers (LaBella & Paul, 1965).

The relationship between flexibility and physical activity observed in this study is in agreement with Voorrips et al. (1993), who found that more active older adults had greater flexibility than less active older adults. Activity will cause minor distentions in the tissues surrounding the joint, which allows for greater flexibility (Brooks & Fahey, 1985).

The differences in functional ability scores among the groups may be accounted for by lower levels of strength in the individuals living in assisted-care and nursing facilities. Lower levels of flexibility and balance observed in nursing facility older adults may also contribute to their functional ability scores being the poorest among the groups. Other investigators have found functional ability scores to be closely related to strength (Gersten, Ager, Anderson, & Cenkovich, 1970; Kim & Tanaka, 1995; Laukkonen et al., 1994), flexibility (Gersten et al., 1970; Kim & Tanaka, 1995), and balance (Kim & Tanaka, 1995; Laukkonen et al., 1994).

Although dynamic balance has not been previously studied in comparison to other groups, the poorer balance scores in nursing facility individuals as compared to assisted-care or community-living individuals in our study may possibly be explained by the accompanying lower leg strength. A loss of lower leg strength is an important factor in the decline of dynamic balance (MacRae, Reinsch, & Tobis, 1989; Spirduso, 1994). Poorer balance is also related to a diminished physical
activity level. As physical activity decreases, the individual may lack the confidence to take the risk to maintain balance. Bohannon et al. (1994) speculated that some limitations in balance may be due to an older adult’s unwillingness or inability to do what is necessary to maintain balance.

In summary, differences in physical activity level, functional ability, balance, strength, and flexibility do exist among older adults who live in nursing facilities, assisted care facilities, and the community. However, in our study only differences in lower body strength and functional ability were observed between those living in the community and those living in assisted-care facilities. From this cross-sectional design, it is impossible to tell whether the decline in functional ability and physical activity is accounted for by the loss of strength, balance, and flexibility, or whether, in fact, it is just the opposite. Although there are data to support both, a longitudinal design is the only way to fully address this issue. While one may see inevitable age-related decreases in flexibility, strength, balance, functional ability, and activity level, an individual should strive to offset that decline by remaining as physically active as possible throughout life.

References


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