Development and Validation of Criterion-Referenced Clinically Relevant Fitness Standards for Maintaining Physical Independence in Later Years

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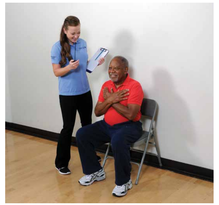
Abstract

Purpose. To develop criterion-referenced fitness standards for older adults that predict the level of capacity needed for maintaining physical independence into later life. The proposed standards were developed for use with a previously validated test battery for older adults—the Senior Fitness Test (SFT) (Rikli & Jones, 1999a; 2013). ***Methods.*** Following established measurement protocols, a criterion measure to assess physical independence was identified. Next, scores from a subset of 2,140 'moderate-functioning' older adults from a larger cross-sectional database, together with findings from longitudinal research on physical capacity and aging, were used as the basis for proposing fitness standards (cut point scores on the SFT) associated with having the ability to function independently. A follow-up study on a subsample of older adults (N = 82) was conducted to test the standards for their accuracy (validity) and consistency (reliability) as predictors of physical independence. ***Results.*** Performance standards are presented for men and women ages 60-94 indicating the level of fitness associated with remaining physically independent until late in life. Reliability and validity indicators for the standards ranged between .79 and .97. ***Implications.*** The proposed standards provide health professionals with easy-to- use, previously unavailable methods for evaluating physical capacity in older adults relative to that needed for physical independence. Most importantly, the standards can be used in establishing clinically relevant fitness goals for older adults and in planning interventions that target specific areas of weakness, thus reducing risk for premature loss of mobility and independence.



Introduction

A key factor in preserving mobility and independence in later years is maintaining the fitness capacity (e.g. strength, endurance, agility, and balance) needed to perform normal everyday activities—to do simple housework, climb steps, lift and carry objects, get in and out of chairs or transportation vehicles, and walk far enough in and around stores, buildings, and parking lots to do one's own shopping and errands. Unfortunately, limited information is available regarding the fitness level needed for maintaining physical independence, particularly information that is easily interpreted by most health professionals, program leaders, or by older adults themselves.

Purpose

The purpose of this research is to establish criterion fitness standards for five items in a previously validated, easy-to-use field test of functional fitness for older adults – the Senior Fitness Test (SFT, Figure 1), standards that are associated with the level of fitness needed to remain mobile and physically independent until late in life (90+).

Methods

Procedures involved three steps: 1) use of the Composite Physical Function scale (CPF) in Table 1 to assess the functional abilities needed for maintaining physical independence; 2) use of a subset of scores (N=2,140) from a large previously published cross-sectional study of older adults ages 60-94 (Rikli & Jones, 1999b), together with findings from longitudinal research, to establish the fitness fitness standards (cut point scores on the SFT) associated with having the CPF abilities needed to function independently; 3) analysis of validity and reliability data to determine the accuracy and consistency of the standards as predictors of physical independence.

Results/Discussion

Fitness standards for older men and women ages 60-94 (Table 2) are proposed based on the actual fitness scores obtained by age-adjusted moderate-functioning older adults as defined in Table 1, with adjustments made as needed to reflect other relevant information in the literature, especially that indicating a greater rate of decline when performance is tracked longitudinally versus cross-sectionally. It was important that standards be set high enough so that a person's level of fitness would not decline below that needed for physical independence until late in life (90+) despite normal age-related changes. Follow up reliability and validity indicators of between .79 and .97 suggest that the standards are reasonably consistent and accurate as predictors of physical independence.

Conclusion

The proposed standards appear to have sufficiently strong empirical and rationale support to justify their use by both researches and practitioners as estimates of the level of fitness associated with remaining mobile and physically independent until late in life. The standards provide the first of their type, easy to interpret reference points which can be used in conjunction with previously published normal range of performance indicators (Figure 2) in planning interventions to target specific areas weakness, thus reducing the risk of premature loss of mobility and independence (Rikli & Jones, 1999b; 2012; 2013).

Figure 1. Brief description of Senior Fitness Test Items

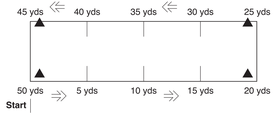
30-Second Chair Stand
(lower body strength)

Number of full stands in 30 seconds with arms folded across chest.

30-Second Arm Curl
(upper body strength)

Number of bicep curls in 30 seconds holding hand weight (women 5 lbs, 2.27 kg; men 8 lbs, 3.63 kg)

6-Minute Walk
(aerobic endurance)



Number of yards/meters walked in 6 minutes around a 50-yard (45.7 meter) course.

2-Minute Step Test
(alternate aerobic endurance test)

Number of full steps in 2 minutes, raising each knee to a point midway between the patella (kneecap) and iliac crest (top hip bone).

8-Foot Up-and-Go
(agility/dynamic balance)

Number of seconds to get up from a seated position, walk 8 feet (2.44 m), turn, and return to seated position.

Table 1 *Composite Physical Function (CPF) Scale*

Instructions: Indicate your ability to do each of the following by circling appropriate response. Your response should indicate whether you "can do" these activities, not if you actually "do" the activities.

	Can do on own without help	Can do with help	Cannot do
a. Take care of own personal needs, such as dressing yourself	2	1	0
b. Bathe yourself, using tub or shower	2	1	0
c. Walk outside (1 or 2 blocks)	2	1	0
d. Do light household chores, such as cooking, dusting, washing dishes, sweeping a walkway	2	1	0
e. Climb up and down a flight of stairs	2	1	0
f. Do own shopping and errands (walk approx 3-4 blks; 400 yds)	2	1	0
g. Lift and carry 10 pounds (bag of groceries)	2	1	0
h. Walk 1/2 mile (6-7 blocks)	2	1	0
i. Walk 1 mile (12-14 blocks)	2	1	0
j. Lift and carry 25 pounds (medium to large suitcase)	2	1	0
k. Do heavy household activities, such as scrubbing, floors, vacuuming, raking leaves	2	1	0
l. Do strenuous activities, such as hiking, digging in garden, moving heavy objects, bicycling, aerobic dance activities, strenuous calisthenics.	2	1	0

CPF Rating Scale:

High (Advanced) functioning—those able to perform all 12 activities without assistance (CPF score of 24)

Moderate functioning-- those with current ability to perform at least 7 activities (score of 14) without assistance, thus meeting commonly recognized requirements for physical independence—able to take care of personal needs, do light housework, walk 3-4 blocks, do own shopping, etc.

Low functioning (at risk)-- those unable to meet requirements for moderate functioning, thus indicating a person may be 'at risk' for losing physical independence.

Moderate functioning, age-adjusted scoring: (for use when projecting future rather than current ability[a])

Ages 90 and up: CPF score of 14 (able to perform at least 7 activities without assistance)
Ages 80-89: CPF score of 16 (able to perform at least 8 activities without assistance)
Ages 70-79: CPF score of 18 (able to perform at least 9 activities without assistance)
Ages 60-69: CPF score of 20 (able to perform at least 10 activities without assistance)

[a] The age-adjusted (higher) scoring requirements for a moderate rating for those younger than 90 are to allow for an anticipated decline in functional ability level that is similar to the 10-15% commonly reported rate of physiological decline per decade in older adults, thus creating a standard for 'moderate' functioning that reflects "projected" ability for independent functioning in later years (90+), rather than current ability to function independently.

Table adapted from "The Reliability and Validity of a 6-Minute Walk Test as a Measure of Physical Endurance in Older Adults," 1998, Journal of Aging and Physical Activity, 6, 363-375.

Figure 2. SFT performance charts showing both normal range of scores and criterion fitness standards.

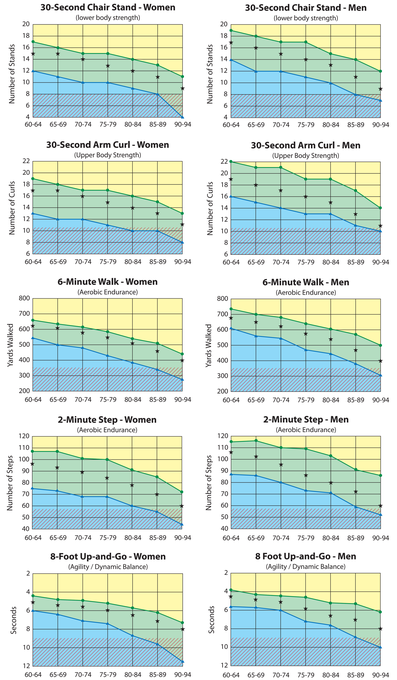
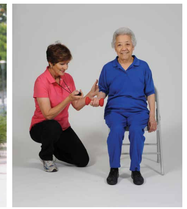


Table 2 *Criterion Fitness Standards for Maintaining Physical Independence in Older Adults*

	Age Groups						
	60-64	65-69	70-74	75-79	80-84	85-89	90-94
Lower body strength (# chair stands in 30 s)							
Women	15	15	14	13	12	11	9
Men	17	16	15	14	13	11	9
Upper body strength (# arm curls in 30 s)							
Women	17	17	16	15	14	13	11
Men	19	18	17	16	15	13	11
Aerobic Endurance (yds walked in 6 min)							
Women	625	605	580	550	510	460	400
Men	680	650	620	580	530	470	400
Alternate Aerobic End. (# steps in 2 min)							
Women	97	93	89	84	78	70	60
Men	106	101	95	88	80	71	60
Agility/dynamic balance (8-ft up-and-go, sec)							
Women	5.0	5.3	5.6	6.0	6.5	7.1	8.0
Men	4.8	5.1	5.5	5.9	6.4	7.1	8.0

Note. The proposed fitness standards were developed for use with the Senior Fitness Test (SFT) battery (Rikli & Jones, 2001;2013). The standards are based on actual SFT scores obtained by moderate-functioning older adults in a previously published cross-sectional data base (Rikli & Jones, 1999b), with scores adjusted as appropriate to reflect other relevant information in the literature including an increased rate of decline over the years when performance is tracked longitudinally versus cross-sectionally.