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NOTES FOR FITNESS AND HEALTH PROFESSIONALS

Functional Fitness Assessment in Clinical and Elderly Populations

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Abstract

The purpose of this article is to outline a series of brief physical measures (heart rate, blood pressure, body composition, aerobic fitness, upper body musculoskeletal fitness, and lower extremity function), that in combination, function as a quick and easy to administer assessment of health-related functional fitness for elderly and clinical populations. The assessment results are intended to provide health practitioners with valuable information concerning the current health status, as well as the functional abilities of their clients to facilitate individualized counselling and safe and appropriate exercise prescription. **Health & Fitness Journal of Canada 2010;3(2):32-38.**

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Background

The assessment of health-related physical function is an essential component of patient treatment, management, and progression when dealing with elderly patients living with or without chronic disease and or disability (Guralnik et al., 1994). Health-related physical fitness encompasses the components of physical fitness that are related to health status, including cardiovascular fitness, musculoskeletal fitness, body composition, and metabolism (Warburton et al., 2006b).

Traditionally, physical fitness assessments (e.g., maximal treadmill and cycle ergometer protocols, submaximal step tests (e.g., CSEP mCAFT (85% of maximum), and 1RM strength tests) have been oriented to younger healthy asymptomatic populations, and take considerable effort to complete (Rikli and Jones, 1999). These tests are not recommended for the frail elderly, who may live with one or more chronic conditions or disabilities. Functional fitness encompasses the major components of health-related physical fitness; however, the measures specifically relate to an individual's ability carry out his or her normal daily activities. A number of test batteries have been developed to assess the concept of "functional fitness" which inherently relates to an individual's physical mobility and ability to live independently (Pepin et al., 2004).

This article will outline the use of the following measures: Pre-screening and preliminary instructions for participants, heart rate, blood pressure, body composition (height, weight, body mass index (BMI), waist circumference (WC), aerobic fitness (6 minute walk test), upper body musculoskeletal fitness (grip strength), and lower extremity function (short physical performance battery).

Methods

Pre-screening and Preliminary Instructions for Participants

It is essential that all individuals undergoing a fitness assessment are pre-screened for participation and understand what they will encounter on the day of the assessment, (CSEP, 2003). Allowing participants an opportunity to ask questions prior to the assessment will help to put them at ease and will lower the chances of miscommunication leading to an unplanned outcome or adverse event.

Pre Appraisal Screening

Screening should include the administration of the Physical Activity Readiness Questionnaire (PAR-Q+) and professional observation (e.g., patient limitations: illness, oedema, dyspnea). Measurement of resting heart rate (bpm) and blood pressure (mmHg) should be taken following five minutes of seated rest.

Individuals should be temporarily prohibited from participating in the appraisal if they: answered yes to one or more of the questions on page one of the PAR-Q+ and are unable to be screened back in by pages two or three of the PAR-Q+ (or a qualified health professional), are ill or have a fever, have significant difficulty breathing at rest, cough persistently, are currently on medications contraindicated for the assessment, or have considerable lower extremity swelling (CSEP, 2003). Participants who are screened out in the pre-appraisal should be directed to a qualified exercise professional (such as a CSEP Certified Exercise Physiologist®) or the ePARmed-X+ and if required referred to their physician for a medical examination and

clearance before proceeding with the appraisal.

Preliminary Instructions for Clients

Create a brief fact sheet or send an email to the patient/client outlining these instructions:

Please adhere to the following conditions for the appraisal:

- ***Dress Requirements:*** Shorts and short-sleeved or sleeveless shirt/blouse should be worn. Running shoes are the recommended footwear.
- ***Food and Beverages:*** Do not eat for at least two hours prior to your appraisal. Also refrain from drinking caffeine beverages for two hours and alcoholic drinks for six hours prior to the appraisal. If you are hungry have juice, or fruit prior.
- ***Smoking:*** Do not smoke during the two hours prior to the appraisal.
- ***Physical Activity:*** Strenuous physical activity should be avoided for six hours prior to the appraisal.
- ***Note:*** Failing to adhere to the above conditions may affect your results negatively

Adapted From: (CSEP, 2003). *The Canadian Physical Activity, Fitness & Lifestyle Approach, 3rd Edition.*

Body Composition or Anthropometry

Body Mass Index Refined by Waist Circumference (WC) provides a quick and easy estimate of body composition and chronic disease risk (Janssen et al., 2002).

Body Mass Index (BMI)

BMI can be calculated as the ratio of body weight in kilograms divided by height in meters squared (kg/m^2).

Body Mass (Weight) Procedure

Weight should be measured with a valid and reliable digital spring scale designed for research settings. Participants should be instructed to step onto the scale without footwear and in light clothing (shorts and a T-shirt or blouse for women). Weight will be recorded in kilograms to the nearest 0.1kg (CSEP, 2003).

Standing Height Procedure

Measure height with a valid and reliable wall mounted or stand-alone

stadiometer. Participants should stand erect, arms hanging by their sides, barefoot, feet together, heels and back touching the wall or portable stadiometer. Instruct participants to look straight ahead, stand as tall as possible and take a deep breath. At the point of maximal inhalation the height measurement should be taken to the nearest 0.5 cm (CSEP, 2003).

Waist Circumference Procedure

Instruct the participant to stand erect with their arms crossed over their chest in a relaxed fashion. It is preferable that the measurement be taken directly against the skin if the participant is comfortable doing so; otherwise, a minimum of clothing can be worn. The waist circumference measurement should be taken at the uppermost lateral border of the iliac crest on the right side of the body (McGuire and Ross, 2008). Following a normal inhalation, the measurement should then be taken at the end of normal expiration to the nearest 0.5 cm.

Aerobic Fitness and Functional Activity Capacity

The 6 Minute Walk Test (6MWT) has been used primarily for assessing persons with respiratory disease (Butland et al., 1982; Poulain et al., 2003; Redelmeier et al., 1997) and heart failure (Gordon H. Guyatt et al., 1985; Lipkin et al., 1986). It can also be used to assess functional exercise capacity in healthy asymptomatic elderly populations (Troosters et al., 1999) and is collectively regarded as a measure of functional status that represents the capacity to carry out ambulatory activities related to daily living. This measure is simple, quick and easy to administer requiring minimal technical expertise, little equipment, and

is reasonably non-intimidating to participants.

6 Min Walk Test Procedure

REQUIRED EQUIPMENT: marked course (cones, colour tape), movable chair, writing utensil, and stopwatch.

OTHER EQUIPMENT CONSIDERATIONS: Safety Equipment (supplemental oxygen, blood pressure cuff, Heart Rate Monitor, Rating of Perceived Exertion (RPE) Scale, Automated Electronic Defibrillator (AED) and telephone).

OTHER SUPPLEMENTARY EQUIPMENT: worksheet, lap counter.

Plot a course in an area with a flat surface, free of obstacles with a distance of 20-50 meters (average is 30 meters). If possible, have the participant wear a heart rate monitor (still in place from resting measures) to increase the quality of monitoring. Acquaint the participant with RPE scale (Borg, 1982) and instruct them that you will ask their RPE and heart rate (if applicable) values every minute. Instruct the participant for the 6MWT as follows (American Thoracic Society, 2002):

“The object of this test is to walk as far as possible for 6 minutes. You will walk back and forth in this hallway. Six minutes is a long time to walk, so you will be exerting yourself. You will probably get out of breath or become exhausted. You are permitted to slow down, to stop, and to rest as necessary. You may lean against the wall while resting, but resume walking as soon as you are able. You will be walking back and forth around the cones. You should pivot briskly around the cones and continue back the other way without hesitation. Now I’m going to show you. Please watch the way I turn without hesitation.” Demonstrate by walking one lap yourself. Walk and pivot

around a cone briskly. "Are you ready to do that? I am going to use this counter to keep track of the number of laps you complete. I will click it each time you turn around at this starting line. Remember that the object is to walk AS FAR AS POSSIBLE for 6 minutes, but don't run or jog. Start now, or whenever you are ready."

Once initiated, do not talk to anyone during the test, ensure to monitor the participant and count the laps in succession. At the end of each minute ask the participant for their RPE and HR (if applicable) and recite the following standardized encouragement/instructions: "You are doing well ("or keep up the good work"). "You have x minutes to go" (American Thoracic Society, 2002). If the participant stops during the test and needs to rest, instruct them: "you can lean against the wall if you would like; then continue walking whenever you feel able." If the participant decides to stop walking, have them rest in a chair, note the final distance walked, and indicate the reason for termination. Let the participant know when there are 15 seconds remaining and that when you say stop, they are to stay in place and you will come to them to record the final distance, RPE, and HR (if applicable).

Distance walked is the main outcome measure for the 6MWT; however, predictive maximal aerobic capacity equations are available for clinical populations (Cahalin et al., 1996) and have been generated by our research group for healthy asymptomatic adult populations (Burr et al. 2011, submitted for publication).

Upper Body Musculoskeletal Fitness

The musculoskeletal system provides individuals with the capability to engage in physical activity pursuits and active

lifestyle behaviours. Improvements or decrements in musculoskeletal fitness are of significant importance to the elderly, disabled, and or diseased populations as they serve to increase or decrease the capacity to execute activities of daily living (e.g., household cleaning, shovelling snow, carrying shopping bags) and therefore, provide functional independence (Warburton et al., 2001a; Warburton et al., 2001b). Improvements in musculoskeletal fitness (strength and endurance) may have a positive and significant impact on the risk factors for cardiovascular disease; namely, blood based lipid and lipoprotein profiles, hypertension, abdominal obesity, RMR, and glucose homeostasis (Warburton, et al., 2001a). In addition, poor hand grip strength is a predictor of disability in elderly populations and is an inexpensive, simple and easy to administer test that can function as a screening tool to identify individuals at risk for loss of functional independence or disability (Giampaoli et al., 1999).

Grip Strength Procedure

REQUIRED EQUIPMENT: Hand Grip Dynamometer

The participant should stand holding the dynamometer (with the grip adjusted to the second knuckle) with their arm abducted 45° from their body. Instruct the participant to squeeze as vigorously as possible and to exert maximal force. Two measurements should be taken for each hand with the maximum score recorded to the nearest kilogram (CSEP, 2003).

Lower Extremity Function

The assessment of lower extremity function is essential when dealing with clinical elderly populations and provides valuable information concerning

functional status (Guralnik et al., 1994). The short physical performance battery (SPPB) is an open source, simple 5 minute battery of tests developed by the National Institute of Aging. The SPPB assesses balance, strength, endurance, and gait via the following measures: semitandem stand, side-by-side stand, tandem stand, repeated chair stands and time to walk 8 feet (Guralnik et al., 1994). To obtain a training compact disc which includes complete instructions on the administration of the battery, a scoring sheet, safety tips, and background publications that support the methods, follow this link: <http://www.grc.nia.nih.gov/branches/ledb/sppb/>. See Appendix for the detailed SPPB procedure.

Conclusion

The selected measures indicated above provide the healthcare provider, fitness practitioner, and researcher with a range of simple and easy to execute measures. In combination, these measures provide objective insight into the functional fitness of their patients, participants or clients. These measures can be completed in less than thirty minutes and can be used to track progression, facilitate goal setting and behavior change counselling sessions, and in-turn, increase quality of care.

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Functional Fitness Assessment

Appendix

Short Physical Performance Battery (SPPB)

1. Repeated Chair Stands

Instructions: Do you think it is safe for you to try and stand up from a chair five times without using your arms? Please stand up straight as quickly as you can five times, without stopping in between. After standing up each time, sit down and then stand up again. Keep your arms folded across your chest. Please watch while I demonstrate. I'll be timing you with a stopwatch. Are you ready? Begin

Grading: Begin stop watch when subject begins to stand up. Count aloud each time subject rises. Stop the stopwatch when subject has straightened up completely for the fifth time. Also stop if the subject uses arms, or after 1 minute, if subject has not completed rises, and if concerned about the subject's safety. Record the number of seconds and the presence of imbalance. Then complete ordinal scoring.

Time: _____ sec (if five stands are completed)

Number of Stands Completed: 1 2 3 4 5

Chair Stand Ordinal Score: _____

0 = unable

1 = > 16.7 sec

2 = 16.6-13.7 sec

3 = 13.6-11.2 sec

4 = < 11.1 sec

2. Balance Testing

Begin with a semitandem stand (heel of one foot placed by the big toe of the other foot).

Individuals unable to hold this position should try the side-by-side position. Those able to stand in the semitandem position should be tested in the full tandem position. Once you have completed time measures, complete ordinal scoring

a. Semitandem Stand

Instructions: Now I want you to try to stand with the side of the heel of one foot touching the big toe of the other foot for about 10 seconds. You may put either foot in front, whichever is more comfortable for you. Please watch while I demonstrate.

Grading: Stand next to the participant to help him or her into semitandem position. Allow participant to hold onto your arms to get balance. Begin timing when participant has the feet in position and lets go.

Circle one number

2. Held for 10 sec

1. Held for less than 10 sec; number of seconds held _____

0. Not attempted

b. Side-by-Side stand

Instructions: I want you to try to stand with your feet together, side by side, for about 10 sec. Please watch while I demonstrate. You may use your arms, bend your knees, or move your body to maintain your balance, but try not to move your feet. Try to hold this position until I tell you to stop.

Grading: Stand next to the participant to help him or her into the side-by-side position. Allow participant to hold onto your arms to get balance. Begin timing when participant has feet together and lets go.

Grading

2. Held for 10 sec

1. Held for less than 10 sec; number of seconds held _____

0. Not attempted

c. Tandem Stand

Instructions: Now I want you to try to stand with the heel of one foot in front of and touching the toes of the other foot for 10 sec. You may put either foot in front, whichever is more comfortable for you. Please watch while I demonstrate.

Grading: Stand next to the participant to help him or her into the side-by-side position. Allow participant to hold onto your arms to get balance. Begin timing when participant has feet together and lets go.

Grading

2. Held of 10 sec

1. Held for less than 10 sec; number of seconds held _____

0. Not attempted

Balance Ordinal Score: _____

0 = side by side 0-9 sec or unable

1 = side by side 10, <10 sec semitandem

2 = semitandem 10 sec, tandem 0-2 sec

3 = semitandem 10 sec, tandem 3-9 sec

4 = tandem 10 sec

3. 8' Walk (2.44 meters)

Instructions: This is our walking course. If you use a cane or other walking aid when walking outside your home, please use it for this test. I want you to walk at your usual pace to the other end of this course (a distance of 8'). Walk all the way past the other end of the tape before you stop. I will walk with you. Are you ready?

Grading: Press the start button to start the stopwatch as the participant begins walking. Measure the time take to walk 8'. Then complete ordinal scoring.

Time: _____ sec

Gait Ordinal Score: _____

0 = could not do

1 = >5.7 sec (<0.43 m/sec)

2 = 4.1-6.5 sec (0.44-0.60 m/sec)

3 = 3.2-4.0 (0.61-0.77 m/sec)

4 = <3.1 sec (>0.78 m/sec)

Summary Ordinal Score: _____

Range: 0 (worst performance) to 12 (best performance).

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