

CLINICAL REPORT

Modifying a functional obstacle course to test balance and mobility in the community

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Abstract—A previously reported functional obstacle course (FOC) developed to assess elderly persons with and without balance and mobility impairment was used in a hospital-based study of 237 participants. A new modified version of the FOC was developed for use in a community-based study, by placing some obstacles next to walls instead of between parallel bars. These modifications eliminate the need for parallel bars or for extra personnel to interchange the obstacles. We were concerned that the modifications could affect performance scores, because touching or holding onto the now eliminated parallel bars could influence FOC scores under the original scoring system. To determine the effect of these modifications on FOC performance, we tested 36 volunteers, (18 fallers [falls within last year] and 18 non-fallers), on the modified parts of the old and new versions of the FOC. Random testing order and inter-trial rests were used. For both the old and new FOC versions, we summed quality and task completion time scores from the six modified obstacles (artificial turf, carpet, pine bark, sand, up ramp and down ramp) to create scores for quality and time. Our hypothesis was that there would be no performance difference between the original and modified obstacle course. Using a two-factor repeated-measures

analysis of variance, we found no difference in quality scores between the two FOC versions and no effect of an interaction between faller status and the course versions. We did find that the time was approximately 2 seconds longer for the new version; however, the time increase was the same for fallers and non-fallers. These data show that fallers and non-fallers have comparable performance on both versions of the FOC; however, to compare the two obstacle courses we recommend an adjustment of 2 seconds in time scores. The obstacle course modifications will facilitate more extensive and efficient use of the obstacle course as a research tool to assess balance and mobility.

Key words: *accidental falls, aged, equilibrium, functional assessment.*

INTRODUCTION

Impairment of balance and mobility is common among older persons, and it often contributes to instability and falling. Falls may result in physical injury (1) and secondary complications, such as serious psychological sequelae (2,3), activity limitation (4), functional impairment (5,6), premature institutionalization (7), and excess mortality (8).

Over the past few years, promising interventions, such as therapeutic exercise, have been proposed to prevent or

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reduce falls and fall-related sequelae by improving various aspects of balance and mobility (9). In recent years, health care in general and VA health care in particular has shifted markedly to an outpatient, ambulatory setting. Accordingly, future studies focusing on prevention of balance and mobility problems among elderly persons are more likely to take place in community-based settings such as ambulatory clinics, community center activity rooms, churches, nursing home day rooms, and private homes. Therefore, it is pertinent to have ways to evaluate these interventions that can be used validly and reliably in the community setting. Because many older persons with significant risk for fall-related complications experience only one or two falls in a given year, assessing the impact of an intervention on such a person using pre- versus post-intervention falls as the main outcome measure would take months to determine. Furthermore, an assessment that primarily focuses on falls could miss important information about daily function and interaction with one's physical environment. The need still exists for simple, valid, and reliable methods to test functional balance and mobility. This is especially true when evaluating the response to intervention efforts.

We developed and previously reported (10) a functional obstacle course (FOC). The FOC is a valid and reliable method of testing balance and mobility, as demonstrated in a hospital-based study of 237 community-dwelling elderly persons. However, we needed to redesign the FOC for use in community-based studies where we could assess elderly persons using limited resources and staff. The FOC fits into community settings with one relatively large space available, such as community center and church activity rooms, and nursing home day rooms, rather than private homes.

The original design of the FOC included the use of two sets of motorized adjustable-height parallel bars that persons walk between while negotiating six of the obstacles. The FOC was designed for use in a rehabilitation clinic or research setting where parallel bars are usually present. Use of the parallel bars in the FOC was also intended to maximize safety. The main disadvantage of using the parallel bars in the FOC in a community-based research study is the lack of portability of bars from the institution where they are available to the community. Therefore, to conduct community research, parallel bars would need to be purchased for location at the community site. The bars are costly, approximately \$1200 to \$1500. Also, in the original version of the FOC, several obstacles (flooring surfaces and ramps) must be moved in and out of the parallel bars in advance of participant testing. This moving, which requires

at least two persons, can be physically demanding for the clinical or research staff, especially when testing several research participants with relatively good mobility who can walk through the FOC rapidly. Therefore, modifications needed to be made for use of the FOC in community-based research studies.

We planned to use the FOC to conduct balance and mobility testing in a larger community-based study involving hundreds of participants from a network of 14 senior citizen centers and senior apartment buildings in central Arkansas. It was important to bring the research study closer to the participants because it was difficult for many of them to come to a hospital setting. The logistics of this planned study included transport of the FOC to at least 14 different locations with different room dimensions. We planned to change locations approximately every 2 weeks, using a staff of three or four researchers. The FOC would be set up, moved, and disassembled daily. Use of an FOC that includes parallel bars under these conditions would be extremely impractical. Moving the bars in our hospital required four individuals, partial disassembly, heavy lifting, transport by a specialized moving cart, and reassembly. To facilitate the planned community-based testing, we slightly modified part of the original FOC layout, equipment and scoring system to facilitate easier setup, administration and transport.

The purpose of this investigation was to compare the concurrent performance of a sample of community-dwelling elderly persons on both the original and modified versions of the FOC and to determine if the previously found performance differences between fallers and non-fallers are preserved using the new version of the FOC. Our hypothesis was that there would be no differences in performance between the original and modified versions of the FOC for fallers and non-fallers.

METHODS

Study Participants

Participants were a convenience sample of 36 consecutive volunteers recruited from among respondents to 300 mailings sent to individuals in a computer database of approximately 50,000 elderly veterans enrolled in any outpatient clinic in our VA medical center with a central Arkansas area zip code. Spouses of veterans we contacted also were asked to volunteer. Eligible participants were elderly (age 65 or older); ambulatory with or without the use of a cane or walker for at least 30 feet, community-

dwelling (not living in a nursing home); and able to comprehend instructions and give informed consent to participate in the study.

A self-reported history of one or more fall(s) in the 12 months prior to study entry was obtained from all potential volunteers. We defined a fall as any involuntary change from a position of bipedal support (standing, walking, bending, reaching, etc.) to a position of no longer being supported by both feet, accompanied by (partial or full) contact with the ground or floor. Eighteen consecutive eligible volunteers with a history of one or more falls (fallers) and 18 consecutive eligible volunteers without a history of falls (non-fallers) were enrolled into the study.

Obstacle Course Configuration

For the purposes of this study, participants were tested on the original and modified versions of the FOC. Testing on the original FOC was set up within a physical therapy gym in a large (69 square meters) area dedicated for this purpose. Testing on the modified FOC was conducted in a room of similar dimensions and an adjacent hallway. We set up the FOC in a space that was comparable to the community spaces we knew were available, such as day rooms and community center or church activity rooms. All FOC testing areas had adequate fluorescent lighting and uncarpeted vinyl tile floors.

Obstacle Course Testing Procedure

For both FOC versions, all participants were instructed to complete the course at a comfortable pace. Participants were encouraged to wear their preferred footwear and use their usual assistive devices or walking aids (if any). A transfer safety belt was placed around the participant's waist during testing and at least one staff member, unaware of the participant's fall status, remained in close proximity. The staff members also were unaware of the intent of the study so as not to bias the participants.

All participants were read written instructions that included the request not to touch or hold onto anything unless they felt more comfortable doing so. Instructions for the original FOC have been previously reported (10). The instructions for the modified FOC tested in this study are included in **Appendix A**.

A trial walk through the obstacle course was demonstrated by a staff member. Each participant was then asked to walk through both obstacle courses. Which course was performed first by the participants was determined at random (coin flip). A minimum 15-minute rest period was imposed between obstacle courses for each participant.

Obstacle Course Modifications

The FOC consists of 12 simulations of functional mobility tasks or situations commonly encountered at home. Four stations have different floor textures. The four different textures are achieved by placing plywood flooring panels (61 cm × 2.44 m) covered with carpet or turf or a long, shallow tray (61 cm × 2.44 m × 5.1 cm) filled with pine bark chips or sand on the course pathway. Two stations have graded surfaces (up and down ramps). Two stations have different types of stairs. The stairs included are two standard types of exercise stairs commonly used in rehabilitation settings. Four stations require discrete functional tasks including opening a door, sitting in and rising from a chair, walking between and around an obstacle and stepping over obstacles in a pathway.

We modified the previously reported FOC (10) for testing in the community by placing six obstacles, artificial turf, carpet, pine bark, sand, and up and down ramps, next to a wall or another object instead of in their original location between parallel bars (examples appear in **Figures 1–3**). We set up the modified FOC with the same sequence of obstacles and the same inter-obstacle distances reported previously (10): (1) door, (2) artificial turf, (3) objects, (4) carpet, (5) low steps, (6) pine bark, (7) cones, (8) sand, (9) chair, (10) high steps, (11) up ramp, (12) down ramp.

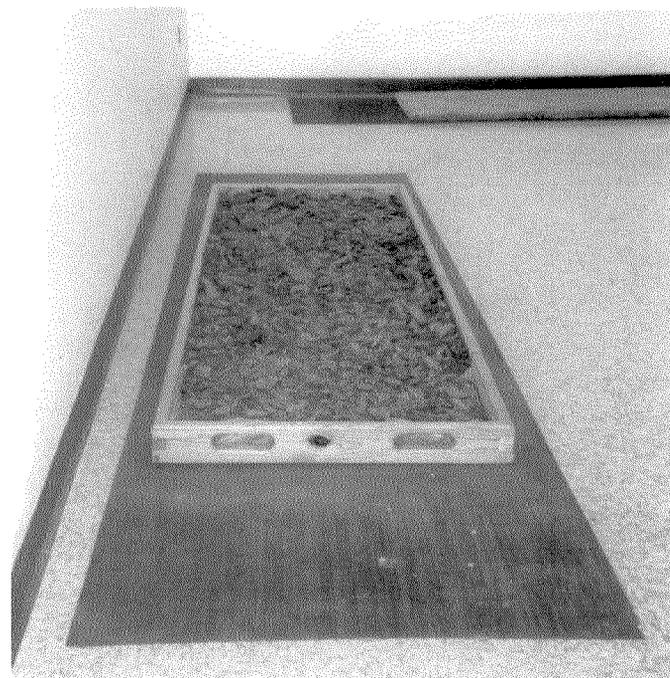


Figure 1. Pine Bark obstacle in shallow tray on rubber mat (Carpet obstacle appears in background).

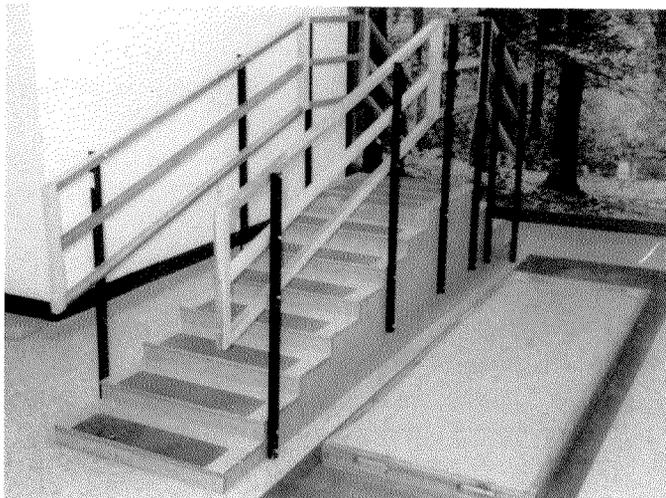


Figure 2.
Sand obstacle (right) in shallow tray on rubber mat located next to the Stairs obstacle (left).

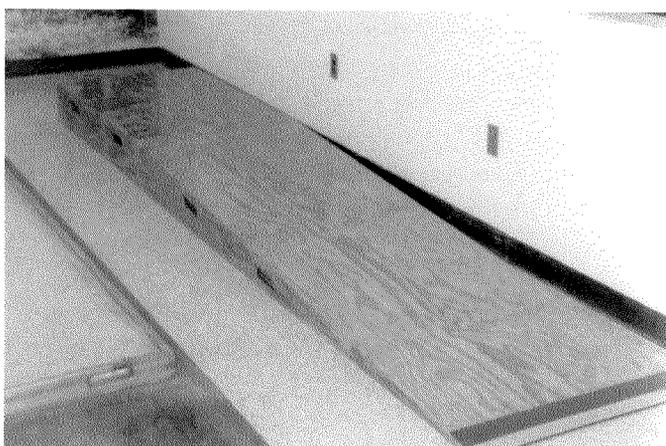


Figure 3.
Ramp obstacle (up and down) located next to a wall.

On the original FOC, the base of the parallel bars had a 1.2-m wide by 3.7-m long by 3-cm thick platform covered by a 0.6-m wide by 3.7-m long black rectangular non-skid rubber mat. Some of the original FOC obstacles were placed on the mat and platform between the parallel bars. On the modified FOC, the parallel bars and platforms were eliminated, but we retained the non-skid mats and placed them under all obstacles that were formerly placed between parallel bars. The mats were parallel to and 15 cm away from testing room walls.

Although retaining the mats in the modified FOC was primarily a safety measure, some of the original scoring involved recording the time when the participant first made contact with the platform. In the modified scoring

system, contact with the mat was substituted for the platform contact. Even without a platform to step up on, the mat in the modified FOC served as a visual transition from the floor to the actual obstacle. For the modified FOC, we also widened obstacles that had been placed between parallel bars in the original version from 61 cm to 91 cm to better accommodate walking aids.

In the modified FOC configuration, the ramp was placed parallel to the exercise stairs used in the original obstacle course, so that the stairway railings could be easily touched or grasped. Participants who might need to hold onto the parallel bars for support in the original FOC could lean on the wall or the stairs, if necessary. Previously reported inter-obstacle distances were used for both FOC versions.

Functional Obstacle Course Scoring System

We videotaped all FOC performances. A trained rater was unaware of participants' falling status. When reviewing the videotapes, the rater could recognize that the obstacle courses were different. However, we scrambled the tapes such that there was no pattern to the order of participants or obstacle course, thus reducing any potential bias. The rater scored all the videotaped FOC performances for quality and obtained FOC time scores from the recorder display (10–12). Time scores were measured identically for both FOC versions. All individual quality scores ranged from unable to complete the task without assistance (0) to no observed difficulty or unsteadiness (3). For the modified FOC, quality scores could be fractional intervals within the original (0 to 3) scale, and reaching for or touching the tester, a wall, or stairs was substituted for reaching for or touching the parallel bars. The quality scoring was developed from pilot testing based on the types of quality errors a person could make. A modified FOC scoring sheet is included in **Appendix B**.

For this testing we only assessed the performance in the 6 obstacles modified in this study. We summed the six quality and 6 task-completion time scores to create two total scores—one for quality and one for time. We did this for both the original and modified FOC versions. Higher quality scores indicate greater steadiness, and lower time scores indicate faster FOC completion time.

Statistical Analysis

We used SPSS Version 7.5 for Windows for data analysis. We summarized all of the variables with descriptive statistics. Ordinal FOC quality scores were

treated as continuous variables for the purpose of this analysis. A two-factor repeated-measures analysis of variance (ANOVA) was used with obstacle course version and faller/non-faller status as the two factors. Two separate analyses were done for time and quality scores.

RESULTS

The mean age of all participants was 72.2 years ($sd=4.46$) with fallers' mean age being 72.1 years ($sd=5.1$) and non-fallers' being 72.2 years ($sd=3.9$). Sixty-one percent of the group was male, and males comprised 67 percent of the fallers and 55.6 percent of the non-fallers. Twenty-six (72.2 percent) of the 36 participants were veterans (24 men and 2 women).

Table 1 reports the results from the original and modified obstacle courses for the two groups. There was a significant difference between fallers and non-fallers regarding time, with fallers being slower ($p<0.001$). Also, there was a significant difference in courses ($p=0.014$), with the modified course taking 55.67 seconds ($sd=13.10$) to complete and the old course only taking 53.42 seconds ($sd=10.85$). The modified course was a little more than 2 seconds longer on average. However, there was no interaction between faller status and obstacle course version, indicating that the modifications did not differentially affect either the fallers or the non-fallers

Table 1.

Obstacle course time in seconds and quality scores for the original and the modified courses for 18 fallers and 18 non-fallers: means (SD).

Variable	Fallers	Non-Fallers
Time		
Original	62.28 (7.09)	44.56 (5.06)
Modified	64.44 (12.87)	46.89 (4.97)
Quality		
Original	11.39 (2.30)	16.61 (2.20)
Modified	11.53 (2.35)	16.58 (1.96)

Maximum quality score for individual obstacles = 3; maximum total quality score = 18.

($p=0.92$).

For quality, there also was a significant difference between fallers and non-fallers ($p<0.001$) with the non-fallers scoring consistently higher than the fallers. There was no significant difference between the modified and

original obstacle course for the quality score ($p=0.51$). Also, there was no significant interaction between obstacle course version and fall status for the quality score ($p=0.33$). The effect size for quality was so small on the difference in obstacle courses (0.06 for fallers and 0.014 for non-fallers) that a sample size of thousands would be required to detect statistical difference at this level of effect.

DISCUSSION

Our major concern is whether or not the modified obstacle course can be substituted for the original obstacle course. Our findings support that the two courses are very comparable and that we would be comfortable recommending the use of the modified obstacle course as a replacement for the original obstacle course, making an adjustment for a 2-second increase in time for the modified course.

First, our results support that the anticipated differences found between fallers and non-fallers are maintained with the modified version. This is an important finding when using the obstacle course to detect the effect of interventions. Although the modifications provide a different type of safety measure to individuals completing the course, the results did not adversely affect fallers when compared to non-fallers. As a result, we feel comfortable that the modifications affect all obstacle course users similarly.

Second, we found that the quality scores do not differ between the two versions of the obstacle course. The modifications required changes in the scoring to indicate the need for support using the wall rather than the parallel bars. These changes seemed to have had no effect on the scoring. Therefore, we feel that the qualitative aspects of performance can be scored easily with appropriate changes in the scoring schema.

Third, although we did find that individuals completed the six stations of the modified FOC in a little over 2 seconds longer than they completed the same stations in the original FOC version, we do not find the time difference to be clinically meaningful. Also, in research studies the difference is likely to be minimal given that the overall time for the entire obstacle course ranges around 3 minutes for non-fallers and 6 minutes for fallers (11,12). We have two explanations that we considered feasible for the time difference. First, the wider obstacles in the modified obstacle course allowed participants to take less

direct paths through the obstacles, and that may account for the slight increase in time. Second, the time may be greater in the modified obstacle course than the original course due to the loss of a sense of security present with the parallel bars. We would recommend an adjustment of 2 seconds if researchers were comparing modified FOC times to original FOC times.

The obstacle course modifications will facilitate more extensive and efficient use of the obstacle course as a research tool to assess balance and mobility. The modified course is less costly and less time-consuming to set up. The modified obstacle course is also easier to breakdown and store than the original course. As with the original course, we have experienced no participant safety difficulties with the modified course. Our experience indicates that the FOC poses minimal risk to participants and staff if other safety measures (pre-performance instruction, safety belts, a spotter in close proximity, obstacles placed next to walls) are followed. We recommend the use of the modified obstacle

course in future work as a functional means of assessing balance and mobility and the effectiveness of interventions, and in place of the original FOC.

ACKNOWLEDGMENTS

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APPENDIX A.

INSTRUCTIONS TO PARTICIPANTS WALKING THROUGH THE MEANS FUNCTIONAL OBSTACLE COURSE (MODIFIED VERSION)

GENERAL INSTRUCTIONS TO ALL PARTICIPANTS:

“This obstacle course is designed for us to get some idea how you get around by using some obstacles that you may come across at home. There are 12 obstacles, all contained in this room except for one which is out in the hallway. I will walk through the course myself first, so you can see what you will be doing. I will also be walking right next to you at all times to remind you what is next. This is not a race! It is most important that you complete the course safely. We would like you to go at the speed that is most comfortable for you. We are interested in knowing what your ‘natural’ pace is. Some will take longer than others to finish. Someone will follow us to videotape you so we can see how you did later.”

“When you walk through the course, if you have a cane or walker, use it if you want to, but don’t use it if you don’t need it. Also, when walking past walls and other objects, try not to touch or hold on to anything unless you need to for support. But, if you feel safer or more comfortable holding on, it’s O.K. Try to complete all parts of the course if you can. However, if there is something that you feel you cannot do safely, just let me know and we can move on to the next part. I will have you wear a safety belt that I can grab to prevent you from falling, if necessary. But, I will not hang on to you unless I think you are about to fall. Because I need to watch out for your safety, I am not supposed to hold a conversation with you while you are walking through the course.”

INVESTIGATOR: Proceed to walk through the course yourself while the participant watches.

[READ THE INSTRUCTIONS BELOW FOR EACH STATION TO THE PARTICIPANT WHILE WALKING THROUGH] After the walk through, ask if there are any questions. If not, start the participant at the first station and read the following.

INVESTIGATOR TO PARTICIPANT: “Before we begin, please turn to the camera and state your name.”

Station #1: DOOR OPENING

INVESTIGATOR TO PARTICIPANT: "Please open the door and walk through the doorway yourself and go toward the parallel bars with the green carpeting. I will follow you, but don't worry about holding the door open for me."

Station #2 ARTIFICIAL TURF

INVESTIGATOR TO PARTICIPANT: "Walk across the green carpeting, completely off of the mat, turn around and walk back across in the opposite direction. Remember, don't touch anything unless you need to, but if you want to, that's O.K."

Station #3 OBJECTS (BOLSTERS)

INVESTIGATOR TO PARTICIPANT: "Now walk over to these three objects lying on the floor and carefully step over them, one at a time. Then turn around and walk back over them the same way."

Station #4 CARPET

INVESTIGATOR TO PARTICIPANT: "Walk across the carpeted surface, completely off of the mat, turn around and walk back across in the opposite direction. Remember, don't touch anything unless you need to, but if you want to, that's O.K."

Station #5 SHALLOW STEPS

INVESTIGATOR TO PARTICIPANT: "Now over to the left end of the steps. These steps are low. Walk up to the top of the steps, turn around and walk back down this same side. Try not to hold on to the rails unless you need to, but if you want to hold on, that's O.K."

INVESTIGATOR TO PARTICIPANT: "ARE YOU OK?" (If yes, continue)

Station #6 PINE BARK

INVESTIGATOR TO PARTICIPANT: "Now walk across the pine bark chips, step out of the tray and walk completely off of the mat, turn around step back in and and walk back across the pine bark in the opposite direction. Remember, be careful stepping in and out and try not to touch anything unless you need to, but if you want to, that's O.K."

Station #7 CONES [DEMONSTRATE HOW TO WEAVE IN AND OUT OF CONES]

INVESTIGATOR TO PARTICIPANT: "Next, let's go outside in the hallway where the yellow cones are. There is a line on the floor around this area. Please try to walk around the cones without touching them and stay inside the lines. If you are using a cane or walker, please try not to cross the lines or touch the cones with it."

Station #8 SAND

INVESTIGATOR TO PARTICIPANT: "Now over here, there is a tray filled with sand. Walk across the sand and step out of the tray, but not completely off of the mat. Then turn around, step back in the tray and walk back across the sand. Try not to hold on to anything unless you need to, but if you want to hold on, that's O.K."

Station #9 CHAIR

INVESTIGATOR TO PARTICIPANT: “Now walk over to the chair. Turn with your back to the chair and sit down, without using your hands, if you don’t have to use your hands. As soon as you are ready, stand back up again, without using your hands if you can, but if you need to use your hands to help push yourself up, that’s O.K.”

Station #10 **STEEP STEPS**

INVESTIGATOR TO PARTICIPANT: “Now over to the other end of the stairs. Just like before, walk up the steps to the top, turn around and walk back down this way. Don’t hold on unless you need to, but if you want to hold on, that’s O.K.”

“ARE YOU OK?” (If yes, continue) “THIS IS THE LAST OBSTACLE COMING UP.”

Station #11 **UP-RAMP** and Station #12 **DOWN RAMP**

INVESTIGATOR TO PARTICIPANT: “Now over to the ramp. Walk up the ramp to the level part and turn around. Then walk back down the ramp to where you started. Once you are back down the ramp and back on the floor, that’s the end.”

“GOOD JOB!”

APPENDIX B.

MEANS FUNCTIONAL OBSTACLE COURSE (FOC) PERFORMANCE DATA SHEET (MODIFIED VERSION)

PARTICIPANT NAME: _____ EVALUATION DATE: _____

TAPE REVIEW DATE: _____ REVIEWER NAME: _____

COURSE RUNNING TIME: Begins at the start of the first station and ends with the end of the last station. When scoring, deduct appropriate time for any investigator-initiated delay(s) and participant-requested rest periods.

1. **DOOR OPENING:** (Start time = moment hand touches door; Stop at moment participant completely passes the closing door)

TIME = _____

QUALITATIVE:

Participant refuses or is unable to complete this station = 0

Two or more of the following: unsteady; difficulty opening door; uses other hand for support; cannot clear doorway before the closing door swings back = 1 Minor difficulty opening door or clearing doorway in time = 2 No difficulty opening door or clearing doorway = 3

QUALITATIVE SCORE = _____

2. **ARTIFICIAL TURF:** (Start time = moment lead foot touches the mat; stop at moment both feet are on floor and completely off the mat)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Hands actually touch the wall/person/object and/or are used for support after both feet are on the artificial turf or for 50 percent or more of the time = 1 Hands touch only when entering/exiting artificial turf or for <50 percent of the time = 1.5 Arm(s) abducted/elevated in "guarding" position but not touching the wall/person/object; and/or irregular body motion after both feet are on the artificial turf; or >50 percent of the time = 2 Guarding or irregular motion only when entering/exiting the artificial turf, or for <50 percent of the time = 2.5 Arms at sides; no touching of the wall/person/object; smooth motion = 3

QUALITATIVE SCORE = _____

3. **OBJECTS:** (Start time = moment lead foot leaves ground to step over first object; stop = trailing foot on ground after stepping over last object)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Touches any object while attempting to step over = 1 Excessively high stepping (heel elevates beyond the opposite mid-tibia); or circumduction, but no foot-object contact = 2 Adequate clearance (heel below opposite mid-tibia); no touching = 3

QUALITATIVE SCORE = _____

4. **CARPET:** (Start time = moment lead foot touches the mat; stop when trailing foot touches the floor completely off the mat)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Hands actually touch the wall/person/object and/or are used for support after both feet have touched the carpet or for 50 percent or more of the time = 1 Hands touch only when entering/exiting carpet or for <50 percent of the time = 1.5 Arm(s) abducted/elevated in "guarding" position but not touching the wall/person/object; and/or irregular body motion after both feet are on the carpet or >50 percent of the time = 2 Guarding or irregular motion only when entering/exiting carpet or for <50 percent of the time = 2.5 Arms at sides; no touching of the wall/person/object; smooth motion = 3

QUALITATIVE SCORE = _____

5. **SHALLOW STEPS:** (Start when lead foot contacts first step; end when trailing foot hits floor after descending the last step)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Two or more of the following: hands touch railing; hands used for support unsteady, or apprehensive motion; "single stepping"(= trailing foot comes up to same step as lead foot) simultaneously or when going up and down = 1 Two or more of the above occur but NOT simultaneously; or when going up or down, but not both = 1.5 Either hands make only initial contact with railing; or irregular motion with "single stepping" when going up and down = 2 Above occur(s) but only when going up or down, but NOT both = 2.5 No hands on rails; alternate stepping (trailing foot advances to step beyond lead foot) [No errors] = 3

QUALITATIVE SCORE = _____

6. **PINE BARK:** (Start time = moment lead foot touches the mat; stop = moment both feet are on floor and completely off the mat)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Hands actually touch the wall/person/object and/or are used for support after both feet are in the pine bark or hands touch for >50 percent of the time = 1 Hands touch only when entering/exiting pine bark or for <t50 percent of the time = 1.5 Arm(s) abducted/elevated in "guarding" position but not touching the wall/person/object; and/or irregular body motion after both feet are in the bark or for >50 percent of the time = 2 Guarding or irregular motion only when entering/exiting bark or for <50 percent of the time = 2.5 Arms at sides; no touching of the wall/person/object; smooth motion = 3

QUALITATIVE SCORE = _____

7. **CONES:** Start time when lead foot crosses baseline; stop when trailing foot exits cone baseline area and contacts floor.

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Foot or assistive device touches any line; AND touches cone(s) = 1 Foot or assistive device touches any line OR cone(s) [Not both] = 2 Feet and assistive device remains within lines; cones untouched [No errors] = 3

QUALITATIVE SCORE = _____

8. **SAND:** (Start time = moment lead foot touches the black mat; stop at moment both feet are on floor and completely off the mat)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Hands actually touch the wall/person/object and/or are used for support after both feet are in the sand or hands touch for >50 percent of the time = 1 Hands touch only when entering/exiting sand or for <50 percent of the time = 1.5 Arm(s) abducted/elevated in "guarding" position but not touching the wall/person/object; and/or irregular body motion after both feet are in the sand or for >50 percent of the time = 2 Guarding or irregular motion only when entering/exiting sand or for <t50 percent of the time = 2.5 Arms at sides; no touching of the wall/person/object; smooth motion = 3

QUALITATIVE SCORE = _____

9. **CHAIR:** (Start time = moment descending motion begins; stop when fully erect after standing)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Any use of upper extremities AND hesitation/irregular descending or arising motion [Two errors] = 1 Any use of upper extremities OR hesitation/irregular motion [not both] = 2 Smooth descent and arising; no use of upper extremities [no errors] = 3

QUALITATIVE SCORE = _____

10. **STEEP STEPS:** (Start time = moment lead foot contacts first step; end when trailing foot touches floor after descending from last step)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Two or more of the following: hands touch railing; hands used for support; unsteady motion or hesitation; "single stepping" pattern (= trailing foot comes up to same step as lead foot before another step is taken) = 1 Two or more of the above occur but NOT simultaneously or when going up or down, but not both = 1.5 Either: hands make only initial contact with railing; or irregular motion or "single stepping" [One error only] = 2 Above occur(s) but only when going up or down, but NOT both = 2.5 No hands on rails; alternate stepping (= trail foot advances to step beyond lead foot) [No errors] = 3

QUALITATIVE SCORE = _____

11. **UP-RAMP:** (Start time = moment lead foot touches ramp; stop = moment both feet are on level part of ramp)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Hands actually touch the wall/person/object and/or are used for support >50 percent of the up-ramp = 1 Hands touch only when entering ramp or when turning; or for <50 percent of the up-ramp = 1.5 Arm(s) abducted/elevated in "guarding" position but not touching the wall/person/object; and/or irregular body motion >50 percent of the up-ramp = 2 Guarding or irregular motion only when entering ramp or turning; or for <50 percent of the up-ramp = 2.5 Arms at sides; no touching of the wall/person/object; smooth motion = 3

QUALITATIVE SCORE = _____

12. **DOWN-RAMP:** (Start time = moment lead foot touches down ramp; stop when both feet are on floor and completely off the ramp)

TIME = _____

QUALITATIVE: Participant refuses or is unable to complete this station = 0 Hands actually touch the wall/person/object and/or are used for support = 1 Hands touch only when turning or exiting ramp; or for <50 percent of the down ramp = 1.5 Arm(s) abducted/elevated in "guarding" position but not touching the wall/person/object; and/or irregular body motion >50 percent of the down ramp = 2 Guarding or irregular motion only when turning or exiting ramp; or for <50 percent of the down ramp = 2.5 Arms at sides; no touching of the wall/person/object; smooth motion = 3

QUALITATIVE SCORE = _____

TOTAL RUNNING TIME (in seconds): _____ TOTAL QUALITATIVE SCORE (SUM OF 12 STATION SCORES): _____

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