



1. Short Physical Performance Battery (SPPB), 65+

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2. Instrument Description and Administration Instructions

Purpose of the assessment:

Evaluates lower limb function in older adults. ¹ A total of three items include:

- Balance test; Standing balance, side-by-side stand, semi-tandem stand and tandem stand for about 10 seconds.
- Gait speed; Time to walk 4 meters at the participant's habitual pace.
- Chair stand; Stand up and sit down 5 times as quickly as possible (start in sitting, stop in standing).

Type of assessment:

- Test for physical function of lower extremity.
- Performance-based functional test, and is used as an outcome measure.
- Clinician-rated.
- Predicts a gradient risk of fall risk, mortality, nursing home admission, mobility and disability.

Administration instructions:

Full testing instructions are retrieved from

http://www.mcroberts.nl/wp-content/uploads/2016/11/SPPB_form.pdf ²

- It is recommended that the instructions are rehearsed.
- Patients performs three tasks.
- Each task is rated on an ordinal scale of 0 to 4.
- Maximum score is 12, minimum is 0.
- 4 meter walk test (4 MWT) is done twice, the faster of the two walks are registered.

The Norwegian translation and standardization procedures are retrieved from: [SPPB på norsk](#) ³ In the appendix, a m/s calculation for walking, as well as an alternative test for sit-to-stand (STS) where the person is allowed to rise and sit with the use of chair handles, has been added. While these are additions, they are not scored and do not change the total score of the SPPB. However, the STS information can inform decision-making. The 4 MWT can be used separately as a gait speed test ³.

Standardization procedures (as described on www.mcroberts.nl above):

- Perform the tests in the same order as they are presented in the protocol.
- *Balance*; demonstrate the task, then support one arm while participants position their feet, then release the support and begin timing.
- *Walking speed*; demonstrate the walk, have the participant stand with both feet touching the starting line, then start the stopwatch as the participant begins walking. A walking aid may be used during the walking test. Walking should be performed at the patient's normal pace.
- *Chair stand*; the straight-backed chair is placed next to a wall. Ask the participant to fold their arms

across their chest and stand up once. If successful, ask the participant to stand up 5 times as quickly as possible. Time from the initial sitting position to the final standing position. A chair with armrests should be used.

ICF Domain: Activity.

Measurement Area: Physical function.

3. Considerations for Clinical Use

Indications for use:

- Assessment of overall physical functioning ⁴.
- Assessment of lower extremity physical performance status ^{5,6}.
- Assessment of a patient's change over time in physical performance ⁷.
- Prognostic information about falls, incident disability, hospital admission and all-cause mortality ^{8,9}.

Considerations:

- The knowledge expert group recommends calculating gait speed from the 4 meter walk. Instructions are provided in the administration instructions above.

Recommended assessment:

- In the field of performance-based functional tests, SPPB is recommended for older community-dwelling persons ⁴.
- SPPB presents the best balance between mobility coverage, measurement properties and applicability to acute care or intensive geriatric rehabilitation unit ⁷.
- SPPB is a predictor of long term disability or institutionalization ¹⁰.
- SPPB scores of ≤ 6 are associated with a higher fall rate in older people of both genders (odds ratio 3,46 to 3,82, described below) ⁹.

Knowledge Expert group recommendation:

- The SPPB test may be used on institutionalized or frail community-dwelling frail older adults.
- The SPPB can inform decision-making as a screening test or to predict future events;
 - Screening-test for lower limb function, see below for more information.
 - Informs prognosis and predicts future events related to mobility disability, falls, death, general health, and institutionalization. Depending on the patient's score, information about the future events and prognosis should be communicated to the care team, physicians, patient, and caregivers.
- SPPB can identify possible deficits in balance, ambulation, and transfers. If lower scores are identified, consider use of a more sensitive measure to track change over time in these areas;
 - Deficits in balance;
 - Patients working on dynamic balance while walking: Mini-BESTest.
 - Patients working on static and dynamic sitting and standing balance: Berg Balance Scale.
 - Deficits in gait speed; Use gait speed as a timed measure.
 - Deficits in transfers; Use the 5 times sit to stand as timed measure or the 30-second chair stand.
- Considerations; Studies included only patients who could ambulate with or/without walking aid; Some

studies included patients who could stand with 1 person assist but could walk without assistance. Using similar criteria clinical practice would assist with appropriate application of the measure.

4. Interpretation of Results

Standard Error of Measurement (SEM):

Frail elderly (Norwegian version of the SPPB);

- SPPB summary score; SEM = 0.28 points¹¹.
- Balance subscore; SEM = 0,51 points¹¹.
- Walking subscore; SEM = 0.23 points¹¹.
- STS Subscore; SEM = 0.39 points¹¹.
- 4 MWT; SEM = 0.06 m/s¹² (0.14 m/s¹¹ is also published, but we do not recommend using the SEM for gait speed instead we recommend using the one published by Perera¹²).

Older adults, including stroke rehabilitation;

- SPPB summary score; SEM = 1.42 points¹².
- 4 MWT; SEM = 0.04 m/s¹².

Minimum Detectable Change (MDC):

Frail elderly (Norwegian version of the SPPB);

- Summary score; MDC₉₅ = 0.8 and MDC₉₀ = 0.7¹¹.
- Balance subscore; MDC₉₅ = 1.4 and MDC₉₀ = 1.2¹¹.
- Walking subscore; MDC₉₅ = 0.6 and MDC₉₀ = 0.5¹¹.
- STS Subscore; MDC₉₅ = 1.1 and MDC₉₀ = 0.9¹¹.
- 4 MWT; MDC₉₅ = 0.39 m/s and MDC₉₀ = 0.33 m/s¹¹ (but we do not recommend using this MDC; instead use MCID for gait speed of 0.08 to .11 m/s published by Perera¹² see MCID section below).

Hip-fracture patient; MDC₉₀ = 3.42^{4,13} points.

Minimal Clinical Important Difference (MCID):

Older adults, including stroke rehabilitation;

SPPB summary score, substantial meaningful change = 1 point¹².

- SPPB summary score, substantial meaningful change;
 - 0.99 points with an anchor to walk 1 block (~200 meters)¹².
 - 1.88 points with an anchor to go up/down a flight of stairs¹².
- 4 MWT, substantial meaningful change = 0.08 to 0.11 m/s, depending on the anchor¹².

Normative Values:

- Not established for SPPB.

Cut-off scores:

The SPPB score categories are 0 – 6 (low score), 7 – 9 (middle score), and 10 – 12 (high score) points^{1,6}.

SPPB score \leq 10:

- Predicts all-cause mortality (systematic review and meta-analysis; association between poor performance on the SPPB an all-cause mortality remains highly consistent regardless of follow-up length, participant age, and geographic area)⁸.
- Future declines in mobility (Odds ratio 3.38, 95% confidence interval 1.32 – 8.65 compared to those

who score a 12; sensitivity = 0.69; specificity = 0.84; defined by the loss of the ability to walk 400 m)¹⁴.

Frailty in high functioning adults with normal mobility¹⁵

SPPB score	Sensitivity	Specificity
<4	1.9	100
≤6	3.8	96.8
≤8	51.9	69.6
≤10	100	0

SPPB score < 5:

- Predictive of 12-month mortality (Poor area under the curve = 0.66; sensitivity = 0.66; specificity = 0.62¹⁶).
- Predictive of 12-month functional decline (Poor area under the curve = 0.69; sensitivity = 0.60; specificity = 0.69¹⁶).
- Predictive of 12-month re-hospitalization (Poor area under the curve = 0.49; sensitivity = 0.42; specificity = 0.63¹⁶).

Gait speed:

0.0 – 0.6 sec. = Frail; Increased fall risk, malfunction, and institutionalization. Reduced indoor & outdoor Mobility³.

0.6 – 1.0 sec. = Initial malfunction; Increased risk for functional failure, self-reliance in ADL, reduced outdoor Mobility³.

>1.0 sec. = Normal function; No increased risk or limitations in ADL and mobility³.

5. Clinical Utility

Cost: Free.

Equipment required: Stopwatch, measuring tape and a standard height chair (make note about the height).

Number of items: 3.

Time to administer: 10- 15 minutes⁴.

Training required: Yes.

6. Application to specific patient diagnoses

Populations reviewed in this summary:

Older people, community dwellers, hospitalized older adults, people discharged from hospital, people with dementia, hypertension, diabetes, prior diagnosis of cardiovascular disease, previous diagnosis of cerebrovascular disease, and hip fracture.

7. Psychometric Properties:

Reliability: (Excellent: ICC \geq 0.75; Adequate: 0.4 to 0.74; Poor: <0.4)

Test-retest reliability: (see cutoff scores above)

- Community-dwelling persons; retest = 5-6 weeks, excellent reliability (ICC = 0.92)¹⁷:
 - Balance; adequate reliability (ICC = 0.71).
 - Walk; excellent reliability (ICC = 0.86).
 - Chair-stand: excellent reliability (ICC = 0.76).

- Community-dwelling persons; retest = 12-13 weeks, excellent reliability (ICC = 0.88) ¹⁷.
- Community-dwelling persons; retest = 19-20 weeks, excellent reliability (ICC = 0.91) ¹⁷.
- Community-dwelling persons; excellent reliability (ICC = 0.88 - 0.92) ^{17,18}.
- Community-dwelling persons; retest = 6 months, excellent reliability (ICC = 0.76) ¹⁷.
- Community-dwelling persons; retest = 36 months, adequate reliability (ICC = 0.51) ¹⁷.

- Frail elderly with dementia; excellent test-retest reliability (ICC = 0.84) ¹¹.
- Frail elderly with no dementia; excellent test-retest reliability (ICC = 0.91) ¹¹.
- Frail elderly summary score; excellent reliability (ICC = 0.92) ¹¹.

Internal consistency: (Excellent: Cronbach's alpha > 0.8; Adequate: < 0.8 and >0.7; Poor: <0.7)

- Community – dwelling persons; poor to excellent internal consistency (r = 0.67 – 0.83) ⁴.
- Community-dwelling persons; adequate internal consistency (r = 0.76) ¹.

Validity:

Predictive validity:

Falls		
Score	Odds Ratio	Interpretation
SPPB 0 – 6 vs 12	3.46	Women with score 0-6 are 3.46 times more likely to be recurrent fallers ⁹
SPPB 0 – 6 vs 12	3.82	Men with score 0-6 is 3.82 times more likely to be recurrent fallers ⁹
Gait speed < 0.75 m/sec	2.11	Women with a gait speed < 0.75 m/s is 2.11 times more likely to be recurrent fallers ⁹ (not significant in men)
Chair-stand >16.7 sec	1.94 women 2.75 men	Taking longer than 16.7 sec to complete five times chair-stand; 1.94 times more likely woman to be a recurrent faller and 2.75 times more likely for a man ⁹
Semi-tandem for 10 sec	2.33	Women not able to maintain a semi-tandem position for more than 10 sec were 2.33 times more likely to be recurrent fallers ⁹
Mobility Impairment: Defined as functional status and/or physical performance		
Score	Odds Ratio	Interpretation
SPPB ≤ 7 vs. 12	32.14	score ≤ 7 is 32.14 times more likely to have a mobility impairment ^{4,14}
SPPB = 8 vs. 12	9.16	score 8 is 9.16 times more likely to have a mobility impairment ^{4,14}
SPPB = 9 vs. 12	9.11	score 9 is 9.11 times more likely to have a mobility impairment ^{4,14}
SPPB = 10 vs. 12	4.23	score 10 is 4.23 times more likely to have a mobility impairment ^{4,14}
Mobility Related Disability		
Score	Odds Ratio /Relative Risk	Interpretation
SPPB 1-4 vs. 9-11	OR = 4.8	score 1-4 is 4.8 times more likely to have a mobility related disability ^{4,5}
SPPB 5-8 vs. 9-11	OR = 2.4	score 5-8 is 2.4 times more likely to have a mobility related disability ^{4,5}
SPPB 4-6 vs.10-12	RR = 2.9 – 4.9*	score 4-6 is 2.9-4.9 times more likely to have a mobility related disability ^{4,6}
SPPB 7-9 vs.10-12	RR = 1.5-2.1	score 7-9 is 1.5-2.1 times more likely to have a mobility related disability ^{4,6}

At 1 year follow up

SPPB 4-6 vs.10-12	RR=5.0	score 4-6 is 5 times more likely to have a mobility related disability ^{4,19}
SPPB 7-9 vs.10-12	RR=2.1	score 7-9 is 2.1 times more likely to have a mobility disability ^{4,19}
At 4 years follow up		
SPPB 4-6 vs.10-12	RR= 4.9	score 4-6 is 4.9 times more likely to predict disability 4 years later ^{4,10,19}
SPPB 7-9 vs.10-12	RR=1.8	score 7-9 is 1.8 times more likely to have a mobility related disability ^{4,19}
ADL Disability		
Score	Relative Risk	Interpretation
SPPB 4-6 vs. 10-12	3.4 – 7.4*	Score 4-6 is 3.4-7.4 times more likely to have ADL disability ^{4,6}
SPPB 7-9 vs. 10-12	1.2-2.0*	Score 7-9 is 1.2-2 times more likely to have ADL disability ^{4,6}
At 1 year follow up		
SPPB 4-6 vs. 10-12	5.7	Score 4-6 is 5.7 times more likely to have ADL disability ^{4,19}
SPPB 7-9 vs. 10-12	2.1	Score 7-9 is 2.1 times more likely to have ADL disability ^{4,19}
At 2 years follow up		
SPPB 1-4 vs. 9-11	6.2	Score 1-4 is 6.2 times more likely to have ADL disability ^{4,5}
SPPB 5-8 vs. 9-11	2.0	Score 5-8 is 2 times more likely to have ADL disability ^{4,5}
At 4 years follow up		
SPPB 4-6 vs. 10-12	4.2-7.1	Score 4-6 is 4.2-7.1 times more likely to have ADL disability ^{4,19}
SPPB 7-9 vs. 10-12	1.3-1.6	Score 7-9 is 1.3-1.6 times more likely to have ADL disability ^{4,19}
Institutionalization		
Score	Relative Risk	Interpretation
SPPB ≤ 5	3.4 (males) 2.8 (females)	Males with a score of 5 or less are 3.4 times more likely to be institutionalized. Females with a score of 5 or less are 2.8 times more likely to be institutionalized ^{1,10}
SPPB + 1 point	NA	Each 1 point increase in the baseline SPPB score has 21% relative decrease in the risk of nursing home placement, and a 5% decrease in the risk of hospitalization ^{10,20}
General Health Improvement		
	Odds Ratio	Interpretation
SPPB	0.80	SPPB was significantly associated with functional decline after discharge from acute care hospitals ¹⁶
Patients perception	2.03	Patient are 2 times more likely to of having a 12 week Global Assessment of Improvement score ≥ 8 for a 1 SD increase in performance/self-report score ^{4,13}
Investigator's perception	2.85	Patient are 2.85 times more likely to of having a 12 week Global Assessment of Improvement score ≥ 8 for a 1 SD increase in performance/self-report score ^{4,13}
Mortality		
Score	Hazard Ratio /Odds Ratio	Interpretation
SPPB +1 point	NA	Each 1 point increase in the baseline SPPB score has 12% relative decrease in the risk of death ^{10,20}
SPPB = 0 - 4	NA	The lower scores were more frequently observed in patients who died during follow-up for 1 year (65.7%) compare to survivors (38.3%) ¹⁶
SPPB = 5 - 8	HR = 0.70	SPPB score qualified as an independent predictor of mortality after

		discharge from acute care hospitals ¹⁶
SPPB = 9 - 12	HR = 0.47	SPPB score qualified as an independent predictor of mortality after discharge from acute care hospitals ¹⁶
SPPB = 7-9 vs 10-12	OR = 1.50	Score 7-9 have 1.5 times the risk of all-cause mortality ⁸
SPPB = 4-6 vs 10-12	OR = 2.14	Score 4-6 have 2.14 times the risk of all-cause mortality ⁸
SPPB = 0-3 vs 10-12	OR = 3.25	Score 0-3 have 3.25 times the risk of all-cause mortality ⁸

*Range for different sites.

Concurrent validity: (excellent > 0.6; adequate is 0.31 to 0.59; poor ≤ 0.30)

- ADL-disability:
 - Excellent correlation with overall function ($r = 0.65$) ⁴.
 - Excellent correlation with basic lower extremity function ($r = 0.63$) ⁴.
 - Excellent correlation with advanced lower extremity function ($r = 0.67$) ⁴.
 - Adequate correlation with disability component limitation ($r = 0.37$) ⁴.
 - Adequate correlation with personal care ($r = 0.55$) ⁴.
- Mobility:
 - Excellent correlation with gait speed ($r = 0.84$) ⁴.
 - Excellent correlation with physical mobility ($r = 0.65$) ⁴.
 - Excellent correlation with physical performance ($r = 0.71$) ⁴.
 - Excellent correlation with 400-m walk and mobility disability ($r = 0.74$, AUC = 0.75) ¹⁸.
- Strength and Power:
 - Adequate correlation with lower extremity power ($r = 0.55$) ⁴.
 - Adequate correlation with leg extensor strength ($r = 0.44$) ⁴.
 - Adequate correlation with grip strength ($r = 0.37$) ⁴.
- Health-related Quality of Life, SF-36:
 - Adequate to excellent correlation with physical function ($r = 0.48 - 0.67$) ⁴.
 - Excellent correlation with role physical ($r = 0.60$) ⁴.
- Self-reported vs. performance-based measures ^{4,13}:
 - Excellent correlation between the SPPB total score and the AM-PAC Physical Mobility ($r = 0.65$) ^{4,13}.
 - Excellent correlation between the SPPB total score and the SF-36 Physical Function ($r = 0.65$) ^{4,13}.
 - Adequate correlation between the SPPB total score and the SF-36 LE Strength ($r = 0.44$) ^{4,13}.
 - Adequate correlation between the SPPB total score and the SF-36 LE Power ($r = 0.55$) ^{4,13}.
 - Poor to adequate correlation between the SPPB and other SF-36 (non-physical) domains ($r = 0.27$ to 0.50) ^{4,13}.

Floor and ceiling effects:

(Excellent = No floor/ceiling effects; Adequate = Floor/ceiling effects in less than < 20% of population; Poor = floor/ceiling effects for > 20% of population)

- Floor effects:

- Community-dwelling persons: Excellent/adequate, no to minimal floor effects = 0 - 7% scored 0 points ⁴.
- Older people with and without dementia: Adequate, minimal floor effect for summary score = 6.6% scored 0 ¹¹.
- Older people with and without dementia: Poor, substantial floor effect on balance subscale = 27,9 % scored 0 points (test 1 and 2), and chair-stand = 59 % (test 1) and 49% (test 2) scored 0 points ¹¹.
- Ceiling Effects:
 - Community-dwelling persons: Adequate, minimal ceiling effects = 2-16% scored 12 points ⁴.
 - Older people with and without dementia: Adequate, minimal ceiling effect for summary score = 1,6 % scored 10 ¹¹.

8. Documentation and Clinical Decision-Making Tips:

Sample goals:

- MDCs, MCIDs can be incorporated into the goal:
 - Patient will demonstrate improved balance by improving the SPPB balance subscore from 2 to 4. (Rationale: Utilizes MDC of 1.4 points for the balance subscale, needs to demonstrate 2 point gait to exceed MDC).
 - Patient will demonstrate improved physical function by improving the SPPB overall score from a 6 to 8 points. (Rationale: Utilizes MCID that is ~1 – 2 points, depending on the study).
- Predictors can also be used for goals, as they provide important thresholds for recovery:
 - Patient will increase the SPPB total score to > 7 to demonstrate a decreased risk of recurrent falls. (Rationale: Women with score 0-6 are 3.46 times more likely to be recurrent fallers than patients who score a 12).
 - Patient will demonstrate improved mobility by increasing the SPPB score from a 6 to 10 (Rationale: score 4-6 is 2.9 – 4.9 times more likely to have a mobility related disability than a patient who scores between a 10 and 12).

Components to include in documentation:

SHORT PHYSICAL PERFORMANCE BATTERY (SPPB): Total score =.../12 points.

Balance test: .../4 points. The patient can/cannot stand for... sec. in side-by-side-stand/ semi-tandem stand /tandem stand.

Gait speed test: .../4 points. The patient walks 4 m. in ... sec. (=... m/s)

Chair stand test: .../4 points. The patient is/is not able to stand up 5 times in ... sec.

INTERPRETATION:

Include your interpretation of the results in the medical record.

Example; if the patient have a total SPPB score 4/12 points it indicates a poor physical function, reduced ADL function, mobility impairment and increased risk of falling.

Worksite related recommendations:

To be filled out by knowledge ambassador.

Location of instrument in medical record:

Physiotherapy report in DIPS/local electronic journal system.

9. Links to other relevant resources:

Websites:

English instructions and score sheet; http://www.mcroberts.nl/wpcontent/uploads/2016/11/SPPB_form.pdf
Norwegian instructions and score sheet: [SPPB på norsk](#)

Online presentations: [Short Physical Performance Battery \(SPPB\)](#)

Other KT resources: [Kunnskapsoppsummeringer fra RKR - Sunnaas sykehus](#)

10. Sample:

Study sample:

- Corsonello et al., 2012: N = 506 patients discharged from acute care hospitals, aged 70 years or more. CASP: 11/11 points.
- Freiburger et al., 2012 (systematic review): N = 78 articles, 12 instruments. CASP: 9/10 points.
- Gawel et al., 2013 (systematic review): 5 articles, 3 evaluated the capability of the SPPB to predict long term disability and 2 used the SPPB to predict hospitalization. CASP: 10/10 points.
- Guralnik et al., 2000: n= 4588, all white and Hispanic community-dwelling people, non-disabled at baseline. CASP: 11/12 points.
- Guralnik et al., 1995: N = 1122 with no disability, able to walk 0,8 km and climb stairs without assistance, living in the community, 71 years or older. CASP: 11/11 points.
- Guralnik et al., 1994: N = 5000, community-dwelling older adults age 71+. CASP: 12/12 points.
- Latham et al., 2008: N = 108 people with a hip fracture. Inpatient and outpatient rehabilitation facilities in Norway, The United Kingdom, Sweden, Israel, Germany, the United States, Denmark and Spain. CASP: 12/12 points.
- Mijnders et al., 2013 (systematic review): N = 62 articles, measurement properties of tools to measure muscle mass, strength, and physical performance. CASP: 9/10.
- Miller et al., 2008: N= 998 community dwelling African Americans, aged 49 – 65. CASP: 11/11 points.
- Olsen and Bergland, 2017: N= 61, mean age 88 years, 82 % women, people with dementia (n= 24) and without dementia (N= 37). CASP: 11/12 points.
- Ostir et al., 1998: N = 3050 noninstitutionalized Mexican Americans aged 65 – 99. CASP: 12/12 points.
- Ostir et al., 2002: N = 1002 moderate to severely disabled older women, 65+. CASP: 12/13 points.
- Pavasini et al., 2016 (systematic review and meta-analysis): 17 studies, N= 16534, mean age 76 years. 47 % had hypertension, 9 % diabetes, 39 % prior diagnosis of cardiovascular disease and 5 % had previous diagnosis of cerebrovascular disease. CASP: 10/10 points.
- Perera et al., 2006: 3 data sets, Older persons with mild to moderate mobility limitations N= 100, community-dwelling older adults N = 457, stroke survivors N= 100. CASP: 12/13 points.
- Soares Menezes et al., 2017 (systematic review): Older adults during hospitalization. CASP: 10/10 points.
- Vasunilashorn et al., 2009: N = 542 who completed 400 m walk at baseline, aged 65 and older. CASP: 11/12 points.
- Verghese et al., 2010: N = 539 high functioning, community living, older adults, aged 70 and older. CASP: 10/11 points.
- Veronese et al., 2014: N = 2710 older-aged people. CASP: 13/13 points.

Literature

1. Guralnik JM, Simonsick EM, Ferrucci L, et al. A short physical performance battery assessing lower extremity function: association with self-reported disability and prediction of mortality and nursing home admission. *Journal of gerontology*. 1994;49(2):M85-94.
2. Short Physical Performance Battery Protocol and Score Sheet. http://www.mcroberts.nl/wp-content/uploads/2016/11/SPPB_form.pdf.
3. Bergh S, Lyshol H, Selbæk G, Strand BH, Taraldsen K, P. T. Short Physical Performance Battery (SPPB). 2013; <http://legeforeningen.no/Fagmed/Norsk-geriatrisk-forening/Nyheter/2013/SPPB-pa-norsk/>.
4. Freiburger E, de Vreede P, Schoene D, et al. Performance-based physical function in older community-dwelling persons: a systematic review of instruments. *Age and ageing*. 2012;41(6):712-721.
5. Ostir GV, Markides KS, Black SA, Googwin JS. Lower Body Functioning as a Predictor of Subsequent Disability Among Older Mexican Americans. *Journal of Gerontology: MEDICAL SCIENCES*. 1998;53A(6):491-495.
6. Guralnik JM, Ferrucci L, Pieper CF, et al. Lower extremity function and subsequent disability: consistency across studies, predictive models, and value of gait speed alone compared with the short physical performance battery. *The journals of gerontology Series A, Biological sciences and medical sciences*. 2000;55(4):M221-231.
7. Soares Menezes KVR, Auger C, de Souza Menezes WR, Guerra RO. Instruments to evaluate mobility capacity of older adults during hospitalization: A systematic review. *Archives of gerontology and geriatrics*. 2017;72:67-79.
8. Pavasini R, Guralnik J, Brown JC, et al. Short Physical Performance Battery and all-cause mortality: systematic review and meta-analysis. *BMC Med*. 2016;14(1):215.
9. Veronese N, Bolzetta F, Toffanello ED, et al. Association between Short Physical Performance Battery and falls in older people: the Progetto Veneto Anziani Study. *Rejuvenation Res*. 2014;17(3):276-284.
10. Gawel J, Vengrow D, Collins J, Brown S, Buchanan A, Cook C. The short physical performance battery as a predictor for long term disability or institutionalization in the community dwelling population aged 65 years old or older. *Physical Therapy Reviews*. 2013;17(1):37-44.
11. Olsen CF, Bergland A. "Reliability of the Norwegian version of the short physical performance battery in older people with and without dementia". *BMC Geriatr*. 2017;17(1):124.
12. Perera S, Mody SH, Woodman RC, Studenski SA. Meaningful change and responsiveness in common physical performance measures in older adults. *J Am Geriatr Soc*. 2006;54(5):743-749.
13. Latham NK, Mehta V, Nguyen AM, et al. Performance-Based or Self-Report Measures of Physical Function: Which Should Be Used in Clinical Trials of Hip Fracture Patients? *Arch Phys Med Rehabil*. 2008;89.
14. Vasunilashorn S, Coppin AK, Patel KV, et al. Use of the Short Physical Performance Battery Score to predict loss of ability to walk 400 meters: analysis from the InCHIANTI study. *The journals of gerontology Series A, Biological sciences and medical sciences*. 2009;64(2):223-229.
15. Verghese J, Xue X. Identifying frailty in high functioning older adults with normal mobility. *Age and ageing*. 2010;39(3):382-385.
16. Corsonello A, Lattanzio F, Pedone C, et al. Prognostic significance of the short physical performance battery in older patients discharged from acute care hospitals. *Rejuvenation Res*. 2012;15(1):41-48.
17. Ostir GV, Volpato S, Fried LP, et al. Reliability and sensitivity to change assessed for a summary measure of lower body function: results from the Women's Health and Aging Study. *J Clin Epidemiol*. 2002;55(9):916-921.
18. Mijnders DM, Meijers JM, Halfens RJ, et al. Validity and reliability of tools to measure muscle mass, strength, and physical performance in community-dwelling older people: a systematic review. *J Am Med Dir Assoc*. 2013;14(3):170-178.
19. Guralnik JM, Ferrucci L, Simonsick EM, Salive ME, Wallace RB. Lower-extremity function in persons over the age of 70 years as a predictor of subsequent disability. *N Engl J Med*. 1995;332(9):556-561.
20. Miller DK, Wolinsky FD, Andresen EM, Malmstrom TK, Miller JP. Adverse outcomes and correlates of change in the Short Physical Performance Battery over 36 months in the African American health project. *The journals of gerontology Series A, Biological sciences and medical sciences*. 2008;63(5):487-494.