



## **Protocol for PANINI Toolkit**

## Contents

Patient history form.....	3
Mini Nutritional Assessment (MNA®).....	3
Height and weight .....	4
Dual-energy X-ray absorptiometry .....	6
Bioelectrical Impedance Analysis (BIA) .....	6
Circumferences.....	6
Handgrip strength.....	7
Accelerometry .....	8
Short Physical Performance Battery (SPPB, Guralnik, J. M et al., 1994) .....	8
Balance tests eyes closed .....	10
Modified Minnesota Leisure Time Activities (MLTA) Questionnaire (Taylor, H. L et al., 1978) .....	11
The first Fried criteria for frailty .....	12
Fried criteria for frailty (Fried et al., 2001) .....	12
Dietary intake .....	14
Standardised Mini Mental State Examination (SMMSE) .....	14
Socio-demographic questions .....	14
Medication information .....	14
International Physical Activity Questionnaire Short Form (IPAQ, Both, M. L et al., 1999) .....	14
Short Fall Efficacy Scale International (FES-I, Kempen, G. I et al., 2008).....	15
Katz Index of Independence in Activities of Daily Living (Katz ADL, Katz, 1983) .....	15
Geriatric Depression Scale (GDS-15, Sheikh & Yesavage 1986) .....	16
Center for Epidemiologic Studies Depression Scale (CES-D) (adapted) .....	17
Self-administered questionnaires- information .....	17
Additional question for water consumption .....	17
Appendix.....	17

### **Patient history form**

Ask participant if he/ she has or has ever had the medical conditions listed in the Case Report Form (CRF). Check the box of reported medical conditions.

Make sure that participant understands the term and if not, use common language (e.g. mini stroke instead transient ischemic attack).

If medical condition is not listed please write it on the appropriate line (*"other medical conditions"*).

### **Mini Nutritional Assessment (MNA®)**

The MNA is a validated nutrition screening and assessment tool that can identify elderly who are malnourished or at risk of malnutrition.

A guide to completing the Mini Nutritional Assessment is found in the Appendix.

Please fill in the whole MNA form, both the screening and the assessment part.

Fill in the screening score (max 14 points), assessment score (max 16 points) and total assessment (max 30 points).

Check the appropriate "Malnutrition Indicator Score" box.

## Height and weight

Provide a brief introduction to the examination saying: "I will measure your height and weight".

### Weight

- ✓ Ask the participant to take off his/hers shoes and heavy clothes (vest, coat, sweater). Let the participant empty their pockets (wallet, keys, etc.).
- ✓ Calibrate the weight scale before the measurement.
- ✓ Write down the weight in kilograms to the nearest 0.1 kg.

**Note:** Do not correct the weight for the clothes

### Height

- ✓ Direct the participant to the stadiometer platform. Ask him or her to remove any hair ornaments, jewellery, buns, or braids from the top of the head.
- ✓ First, have the participant stand up straight against the backboard with the body weight evenly distributed and both feet flat on the platform. Instruct the participant to stand with the heels together and toes apart. The toes should point slightly outward at approximately a 60° angle.
- ✓ Check that the back of the head, shoulder blades, buttocks, and heels make contact with the backboard.

**Note:** Depending on the overall body conformation of the individual, all four contact points – head, shoulders, buttocks, and heels – may not touch the stadiometer backboard. For example, frequently elderly participants may have kyphosis, a forward curvature of the spine that appears as a hump at the upper back. In particular, dowager's hump is a form of kyphosis that creates a hump at the back of the neck. Additionally, some overweight participants cannot stand straight while touching all four contact points to the backboard. In such instances it is important to obtain the best measurement possible according to the protocol.

- ✓ Second, align the head in the Frankfort horizontal plane. The head is in the Frankfort plane when the horizontal line from the ear canal to the lower border of the orbit of the eye is parallel to the floor and perpendicular to the vertical backboard. Many people will assume this position naturally, but for some participants the examiner may need to gently tilt the head up or down to achieve the proper alignment. Instruct the participant to look straight ahead.
- ✓ Next, lower the stadiometer head piece so that it rests firmly on top of the participant's head, with sufficient pressure to compress the hair. Instruct the participant to stand as tall as possible, take a deep breath, and hold this position. The act of taking a deep breath helps straighten the spine to yield a more consistent and reproducible stature measurement. Notice that the inhalation will cause the headpiece to rise slightly.
- ✓ Record the height to the nearest 0.1 cm.

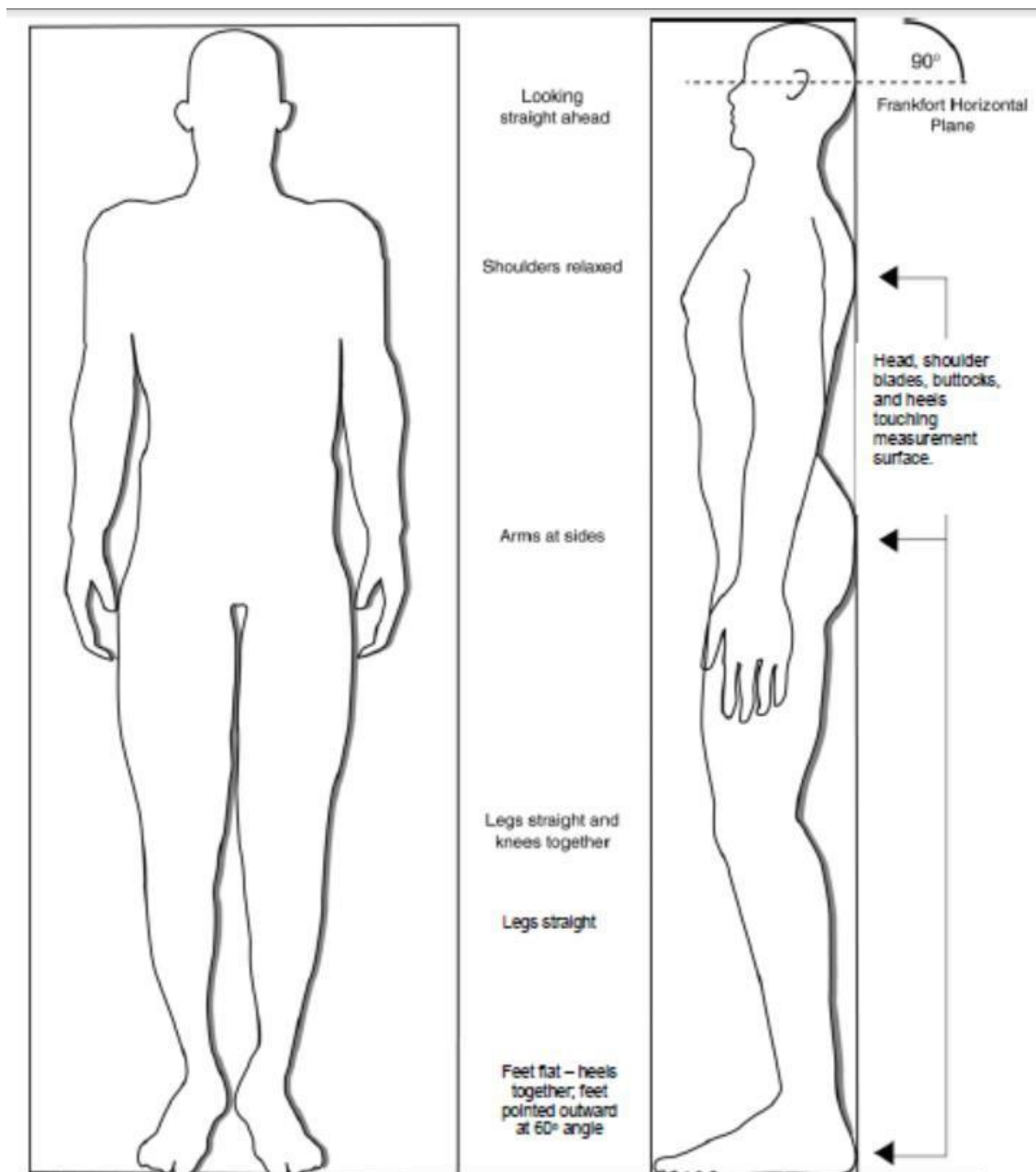


Figure 1 Standing height position

## Dual-energy X-ray absorptiometry

Dual-energy X-ray absorptiometry (DXA) is the golden standard to measure body composition. If the DXA is performed in your study please provide us with the protocol and name of the model you are using. If DXA is not available please do bio-electrical impedance analysis (BIA).

## Bioelectrical Impedance Analysis (BIA)

Bioelectrical impedance analysis (BIA) is a quick and non-invasive technique for measuring body composition.

Start by showing the participant the BIA testing device and explain clearly where you will place the electrodes and what you will be doing. Make sure analyser battery is well charged. Regularly check analyser calibration and patient cables using a standard protocol (see the calibration procedure in your machine's manual). The participant should lie quietly and without motion during the entire test.

**Note:** Check if the participant has a pacemaker. Do not perform the BIA measurement if the participant has a pacemaker

Ask the participant about when he/she had last meal, drink, visit to the toilet and write down the time (time format 0-24h). Write the time of BIA measurement. Fill in the CRF. If the BIA was not possible, write the reason.

## Circumferences

### Waist circumference

- ✓ Stand behind the patient and palpate the iliac crest (the large curving pelvic bone, just below the waist). Palpate and mark the skin on both sides with a horizontal line at its highest point. Palpate the lower rib margin on and mark skin with a horizontal line at the lowest point. Palpate and mark the skin on both sides. Using the tape measure, make a mark (on both left and right side) identifying the mid-point between those made at the iliac crest and the lower rib margin.
- ✓ Apply the tape at the mid-point marks. Ensure the tape is level with the mid-point marks around the waist. The tape should rest on the skin but not indent it.
- ✓ Ask the volunteer to relax, i.e. not to deliberately hold him/herself in or out, and to look straight ahead with arms relaxed at his/her sides. Be prepared to make the measurement and then ask the volunteer to breathe in and then out. As the waist circumference will change the tape so that it sits on the skin all the way round.
- ✓ Make the measurement and read the tape at the end of expiration. Measure to the nearest 0.1cm. and record it in the CRF.

### **Hip circumference**

- ✓ Ask participant to stand with his/her legs together. Apply the blank tape at the widest part, usually between the greater trochanter (top of the thigh bone) and the lower buttock level.
- ✓ Ensure tape is horizontal around the hips. It should rest on the skin but not indent it. Measure to the nearest 0.1cm and record it in the CRF.

### **Calf circumference**

- ✓ Measure the maximal calf circumference on the right calf. While the participant is sitting, place the measuring tape around the calf and move it up and down to locate the maximum circumference in a plane perpendicular to the long axis of the calf.
- ✓ Read the tape to the nearest 0.1cm and record it in CRF.

### **Mid-arm circumference**

- ✓ To reliably measure circumferences and skinfolds on the arm, upper arm length must first be measured and the midpoint located and marked. Direct the participant to turn away from you. Ask him or her to stand upright with the weight evenly distributed on both feet with the non-dominant arm bent 90° at the elbow.
- ✓ Palpate the tip of the acromion (the point of the shoulder) on the non-dominant side and mark with a cross.
- ✓ Palpate the olecranon (tip of the elbow) and mark it with a cross.
- ✓ Put the tape measure on the mark made at the shoulder and drop it down to the tip of the elbow by the side of the arm. Mark a point on the arm halfway between the acromion and olecranon. This marks the vertical level at which the circumference will be measured. It is important that this measurement is made with the arm flexed, otherwise the tape takes an oblique course across the upper arm, and the mid-point is too high up.
- ✓ The participant is then asked to relax, with the arm hanging by his/her side. Place the tape around the upper arm with the tape's upper border on the mark. Ensure tape is horizontal around the arm. Make sure the tape is not pulled too tight. It should rest on the skin, but not indent it.
- ✓ Read the tape to the nearest 0.1cm and record it in CRF.

## **Handgrip strength**

Reliable and valid evaluation of hand strength can provide an objective index of general upper body strength. Illustrate the use of the instrument to the participant prior to testing. Ask participant which hand is the dominant one and write it in the CRF. The participant should be in a standing position, arms at their side, parallel to the body. Keep elbow bent slightly. Administer the test on the right hand. Ask the participant to squeeze the dynamometer with as much force as possible, being careful to squeeze only once for each measurement. Three trials should be made with a pause of about 10-20 seconds between each trial to avoid the effects of muscle fatigue. Administer the test on the left hand as well and fill in the CRF.

## Accelerometry

Provide the details about the protocol used and model of accelerometer if this measure was performed and if yes for how many days, using which model and where the accelerometer was positioned.

## Short Physical Performance Battery (SPPB, Guralnik, J. M et al., 1994)

The short physical performance battery (SPPB) is a group of measures that combines the results of the gait speed, chair stand and balance tests. It has been used as a predictive tool for possible disability and can aid in the monitoring of function in older people. The scores range from 0 (worst performance) to 12 (best performance).

**Note:** Assess the safety and suitability of the participant to perform the tests. If you feel they are too unsteady or weak please do not perform the SPPB measures.

### Balance test

- ✓ Explain “We will now look at your standing balance. We want to know if you can stand unsupported for 10 seconds with your feet in a certain position”. Demonstrate the positions feet together, semi tandem and full tandem (**Error! Reference source not found.**).
- ✓ Explain “Begin with feet together beside each other. I want you to try to stand with your feet together, side by side, for about 10 seconds. 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

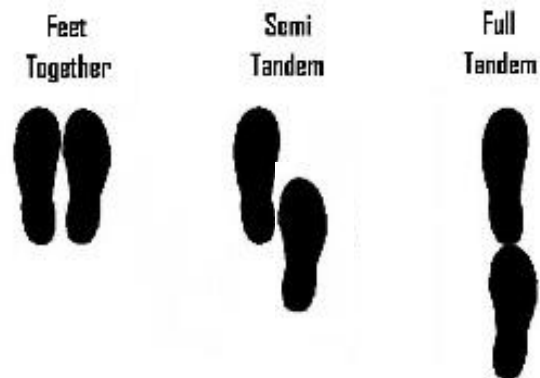


Figure 2 Feet position in balance test

to stop”. 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 let’s go of your arm. If they are able to complete 10 seconds progress to semi-tandem stand.

- ✓ Repeat in semi tandem stand (heel of one foot placed by the big toe of the other foot). Explain “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”. Demonstrate. Begin timing when participant has feet in position and let’s go of your arm. The test is stopped when the participant moves their feet, grasps the interviewer for support, or when 10 seconds has elapsed. Record time on Case Report Form.
- ✓ If they are able to complete 10 seconds progress to tandem stand.
- ✓ Repeat in tandem stand (feet directly in front of each other). Explain “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 seconds.



*You may put either foot in front, whichever is more comfortable for you. Please watch while I demonstrate".* Begin timing when participant has feet in position and let's go of your arm. The test is stopped when the participant moves their feet, grasps the interviewer for support, or when 10 seconds has elapsed. Record time on Case Report Form.

### **Gait speed test**

- ✓ Mark out the distance with a tape measure and put a cone at either end. Place a chair at the other end if you think the participant might require it.
- ✓ Explain *"This is our walking course. If you use a walking aid when walking outside your home, please use it for this test. I want you to walk at your usual pace just as if you were walking down the street to go to the store. Walk all the way past the cone before you stop. I will walk behind you. We will be doing this test two times*
- ✓ *Demonstrate the walk for the participant*
- ✓ Have the participant stand with both feet touching the starting line
- ✓ Press the start button to start the stopwatch as the participant begins walking
- ✓ Walk behind and to the side of the participant
- ✓ Stop timing when one of the participant's feet is completely across the end line
- ✓ Complete scoring on Case Report form
- ✓ After a short break repeat the 4 m walk test and record the time in CRF

### **Chair stand test**

- ✓ If possible use the height adjustable chair and make sure to put the chair on the right height so that the angle of the under and upper leg is 90 degrees
- ✓ Explain *"I want to see how long it takes you to stand up and sit down as quickly as possible 5 times without stopping. 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"*
- ✓ Demonstrate to the patient
- ✓ Perform a pre-test: ask participant to fold arms across chest and try to stand up once from a chair
- ✓ Stand in front of the participant, to prevent the fall
- ✓ If participant was able to do the pre-test, continue with testing
- ✓ Ask the participant if they are ready. If so, begin timing as soon as they bend forward at the hips.
- ✓ Count out loud the number of sits the participant has performed.
- ✓ Stop the stop watch when they have sat down having completed the 5th stand. Also stop if the participant starts to use their arms, or after 1 minute they have not completed the test. Stop if the participant cannot complete 5 rises, and if you are concerned about the participant's safety. Record the number of seconds and the presence of imbalance. Then complete scoring according to outcome measure template in CRF.

Add the scores (possible values from 0 to 12) and write it in the CRF.

### Balance tests eyes closed

- ✓ Explain *“We will now look at your standing balance with your eyes closed. We want to know if you can stand unsupported for 10 seconds with your feet in the same positions as before but with your eyes closed”*.
- ✓ Perform the balance tests in the same way as the balance test in the SPPB protocol, but with the only difference that the eyes are closed
- ✓ If a participant cannot perform position feet together with eyes closed (if he or she steps out) try semi tandem but not full tandem
- ✓ If a participant opens the eyes during the test stop timing
- ✓ White the time for each of three tests in the CRF

## Modified Minnesota Leisure Time Activities (MLTA) Questionnaire (Taylor, H. L et al., 1978)

This questionnaire is adapted to assess low physical activity criterion used in the Fried frailty criteria.

Tell to the participant:

*I am going to read a list of activities. Please tell me which activities you have done in the past two weeks.*

*Have you done this activity in the last two weeks?*

Read each activity on the list.

For each activity checked "Yes", ask the participant the following set of questions:

*How often have you done this activity in the last two weeks?*

When the participant indicates they participate in the activity between 1 and 2 times per week, record the smaller of two numbers.

*What is the average amount of time that you spent per session of this activity?*

Record the response in hours (00-09) and minutes (00-60)). Fill in all blank spaces.

*Over the past year, how many months did you do this activity?*

Record the response in months (01-12).

### Definitions of the activities

**Walking for exercise:** Include only walking that is continuous for 10 or more minutes, and that is planned and sustained. Walking around the house or associated with customary performance of work is not included. Walking that takes 10 minutes or more but is NOT planned and sustained (for example, walking to the store or bus stop, unless as part of a planned exercise routine) is NOT included.

**Moderately strenuous chores:** Include scrubbing, vacuuming, etc., if continuous for 10 or more minutes.

**Mowing the lawn:** Ask for average time to cut lawn with any type of lawn mower, including push, self-propelled, and riding mower. Do not include rest breaks in estimate of time spent mowing lawn.

**Gardening:** Include all activities needed to plant and/or maintain a garden. Ask the participant to estimate the amount of time spent in actual gardening activities, not including rest breaks.

**Golf :** Ask for the number of holes played. Count 1 2 hours for every 9 holes played. As with bowling, it is important to calculate the time rather than accept the participant's estimate.

**Calisthenics/general exercise:** Ask what kind of exercise is done. Do not include activities listed under other codes. Ask for the time spent actually exercising.

The formula to calculate the activity-specific kcal/week

METS intensity score from Ainsworth et al. 2000 (kcal/(kg x hr)) x body weight (kg) x activity duration per session (minutes)/60 x (number of sessions in the last 2 weeks)/2 x (number of months per year)/12

Activity	MET score	Activity	MET score
Walking for exercise	2.0-6.3	Gardening	4.0
Moderately strenuous chores	2.5	Golf	4.5
Mowing the lawn	4.5	Calisthenics/general exercise	3.5

The formulas to calculate the "total kcal/week" expenditure (note: name of activity in the formula (walking, chores etc.) stands for activity-specific kcal/week expenditure calculated previously using the formula above)

For man

Step 1:  $\text{logodds} = 1.885 - 0.009 \times \text{walking} - 0.008 \times \text{chores} - 0.011 \times \text{gardening} - 0.011 \times \text{exercising} - 0.010 \times \text{mowing} - 0.018 \times \text{golfing}$

Step 2:  $\text{Pr}(\text{low phys act}) = \exp(\text{logodds}) / (1 + \exp(\text{logodds}))$

Step 3: Classify as low physical activity if  $\text{Pr}(\text{low phys act}) > 0.537$

For woman

Step 1:  $\text{logodds} = 2.966 - 0.025 \times \text{walking} - 0.026 \times \text{chores} - 0.027 \times \text{gardening} - 0.028 \times \text{exercising} - 0.035 \times \text{mowing} - 0.129 \times \text{golfing}$

Step 2:  $\text{Pr}(\text{low phys act}) = \exp(\text{logodds}) / (1 + \exp(\text{logodds}))$

Step 3: Classify as low physical activity if  $\text{Pr}(\text{low phys act}) > 0.547$

### **The first Fried criteria for frailty**

#### **Weight loss**

- ✓ Ask the participant if he/ she had unintentional loss of weight in previous year.
- ✓ If yes, ask how much in kg
- ✓ If unintentional loss of weight was more or equal to 4.5 kg or at least 5% of the previous year's body weight the participant is positive for this frailty criteria

### **Fried criteria for frailty (Fried et al., 2001)**

The five frailty criteria are weight loss, weakness, poor endurance, slowness and low physical activity.

The sum score of these five criteria classifies people into one of three frailty stages (or groups): not frail (score 0), pre-frail (score 1–2) and frail (score 3–5).

#### **Criteria**

##### **Weight loss**

- ✓ If unintentional loss of weight was more or equal to 4.5 kg or at least 5% of the previous year's body weight the participant is positive for this frailty criteria

##### **Weakness**

- ✓ It is based on BMI and handgrip strength

- ✓ As handgrip is measured previously, look in the table provided in CRF to determine if participant is positive for this criteria

**Poor endurance**

- ✓ This criterion is based on two statements from the CES-D Depression Scale (look in the CRF)

**Slowness**

- ✓ It is based on height and 4 m walking speed
- ✓ Use height previously measured and speed calculated during 4m walk test in SPPB
- ✓ Look in the table provided in CRF to determine if participant is positive for this criteria

**Low physical activity**

- ✓ It is based on the Modified Minnesota Leisure Time Activities (MLTA) Questionnaire and sex
- ✓ Protocol for this questionnaire is explained in this document (see Modified Minnesota Leisure Time Activities (MLTA) Questionnaire)

Write in the CRF for which criteria the participant is positive or negative and sum up the positive criteria.

### **Dietary intake**

The protocol for dietary intake will be available after the food frequency questionnaire is confirmed among the beneficiaries.

### **Standardised Mini Mental State Examination (SMMSE)**

The Mini–Mental State Examination (MMSE) is a 30-point questionnaire that is used extensively in clinical and research settings to measure cognitive impairment.

The Standardised Mini-Mental State Examination was developed to provide clear unequivocal guidelines for administration and scoring. The SMMSE takes less time to administer and has significantly reduced the variability of the MMSE. Directions for administration of the SMMSE and scoring guidelines are found in the Appendix.

### **Socio-demographic questions**

Ask participant to answer the questions as best as he/she can. After getting back the self-administered questionnaires check if all the questions are answered. In the case the questionnaires were not completed by the participant, please note it at the bottom of the CRF (part *Self-administered questionnaires-information*).

### **Medication information**

Make sure the participant understands that he/she should write all the medications (prescription, over the counter, vitamins, minerals, supplements), or non-drug therapy. The abbreviations to be used are found under the table.

### **International Physical Activity Questionnaire Short Form (IPAQ, Both, M. L et al., 1999)**

The guidelines for data processing and analysis of IPAQ Short form are found in the Appendix.

### **Short Fall Efficacy Scale International (FES-I, Kempen, G. I et al., 2008)**

Short Fall Efficacy Scale International (FES-I) is a questionnaire that assesses fear of falling. Participants are asked to rate, on a four-point scale, their concerns about the possibility of falling when performing 7 activities. To obtain a total score for the Short FES -I simply add the scores on all the items together to give a total that will range from 7 (no concern about falling) to 28 (severe concern about falling).

#### **Handling Short FES-I missing data:**

If data is missing on more than one item then that questionnaire cannot be used. If data is missing on no more than one of the seven items then calculate the sum score of the six items that have been completed (i.e. add together the responses to each item on the scale), divide by six, and multiply by seven. The new sum score should be rounded up to the nearest whole number to give the score for an individual.

### **Katz Index of Independence in Activities of Daily Living (Katz ADL, Katz, 1983)**

Katz Index of Independence in Activities of Daily Living is a 6-item index which measures the functional status of older adults.

Katz index is administered as a self-administered questionnaire. To calculate the score, give one point to each activity the participant answered YES. A score of 6 indicates full function, 4 indicates moderate impairment, and 2 or less indicates severe functional impairment.

## Geriatric Depression Scale (GDS-15, Sheikh & Yesavage 1986)

This scale is 15-item self-reported assessment used to screen for depression in the elderly.

To calculate the GDS score look in the CRF and award one point for each answer positive for depression (test answers). Check that all 15 questions are answered.

Scores of 0-4 are considered normal, depending on age, education, and complaints; 5-8 indicate mild depression; 9-11 indicate moderate depression; and 12-15 indicate severe depression.

Time to administer: 5-7 minutes

**The “test answers” column shows test answers which are positive for depression**

Question	Answer	Test answers	Score
1. Are you basically satisfied with your life?	<input type="checkbox"/> YES <input type="checkbox"/> NO	NO	
2. Have you dropped many of your activities and interests?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
3. Do you feel that your life is empty?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
4. Do you often get bored?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
5. Are you in good spirits most of the time?	<input type="checkbox"/> YES <input type="checkbox"/> NO	NO	
6. Are you afraid that something bad is going to happen to you?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
7. Do you feel happy most of the time?	<input type="checkbox"/> YES <input type="checkbox"/> NO	NO	
8. Do you often feel helpless	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
9. Do you prefer to stay at home, rather than going out and doing new things?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
10. Do you feel you have more problems with memory than most?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
11. Do you think it is wonderful to be alive now?	<input type="checkbox"/> YES <input type="checkbox"/> NO	NO	
12. Do you feel pretty worthless the way you are now?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
13. Do you feel full of energy?	<input type="checkbox"/> YES <input type="checkbox"/> NO	NO	
14. Do you feel that your situation is hopeless?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
15. Do you think that most people are better off than you are?	<input type="checkbox"/> YES <input type="checkbox"/> NO	YES	
	Total score:		<input type="text"/> <input type="text"/> /15



### Center for Epidemiologic Studies Depression Scale (CES-D) (adapted)

This is adapted, 2-item scale needed for frailty criteria according to Fried.

Participant answering “*Occasionally or a moderate amount of time (3-4 days)*” or “*Most or all of the time (5-7 days)*” to either of these questions is categorized as frail by the exhaustion criteria.

	Rarely or none of the time (less than 1 day)	Some or a little of the time 1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
I felt that everything I did was an effort				
I could not get going				
	Answers negative for exhaustion criteria		Answers positive for exhaustion criteria	

### Self-administered questionnaires- information

The information if the self-administered questionnaires were completed by participant or with the help of assessor (in case of eye problems, illiteracy etc.) is very important.

When the participant returns the self- administered questionnaires CHECK if the questions were totally completed. Most of the questionnaires are not valid if all of the questions are not answered.

### Additional question for water consumption

Ask the participant how much glasses of water he or she drinks in an average day. Ask how big is the glass in millilitres and multiply it by number of glasses. Write the result in millilitres.

### Appendix

The original instructions for MNA, SMMSE and IPAQ are found below.

# Nutrition Screening

as **easy** as **mna**

A guide to completing the  
Mini Nutritional Assessment (MNA®)



Screen and intervene.  
Nutrition can make a difference.

A screenshot of the Mini Nutritional Assessment (MNA) form, version 3. The form is titled "Mini Nutritional Assessment MNA®" and includes the Nestlé Nutrition Institute logo. It contains various sections for patient information, assessment questions, and a final score. The form is designed to be completed by healthcare professionals to assess a patient's nutritional status. The form includes sections for patient information, assessment questions, and a final score. The form is designed to be completed by healthcare professionals to assess a patient's nutritional status.

# Introduction

## Mini Nutritional Assessment (MNA®)

The MNA® is a screening tool to help identify elderly persons who are malnourished or at risk of malnutrition. This User Guide will assist you in completing the full MNA® accurately and consistently. It explains how the full MNA® and the MNA®-SF differ, how to complete each question and how to assign and interpret the score.

### Introduction:

While the prevalence of malnutrition in the free-living elderly population is relatively low, the risk of malnutrition increases dramatically in the institutionalized and hospitalized elderly.<sup>1</sup> The prevalence of malnutrition is even higher in cognitively impaired elderly individuals and is associated with cognitive decline.<sup>2</sup>

Patients who are malnourished when admitted to the hospital tend to have longer hospital stays, experience more complications, and have greater risks of morbidity and mortality than those whose nutritional state is normal.<sup>3</sup> By identifying elderly persons who are malnourished or at risk of malnutrition either in the hospital or community setting, the MNA® allows clinicians to intervene earlier to provide adequate nutritional support, prevent further deterioration, and improve patient outcomes.<sup>4</sup>

### Full MNA® vs. MNA®-SF

The full MNA® is a validated screening tool that identifies elderly persons who are malnourished or at risk for malnutrition. The full MNA® is the original version of the MNA® and takes 10-15 minutes to complete. The revised MNA®-SF is a short form of the MNA® that takes less than 5 minutes to complete. It retains the accuracy and validity of the full MNA®.<sup>5</sup> Currently, the MNA®-SF is the preferred form of the MNA® for clinical practice in community, hospital, or long term care settings, due to its ease of use and practicality.

The full MNA® is an excellent tool for the research setting. It may provide additional information about the causes of malnutrition in persons identified as malnourished or at risk for malnutrition. However, the full MNA® is not a substitute for a full nutritional assessment done by a trained nutrition professional. Recommended intervals for screening with the MNA® are annually in the community, every three months in institutional settings or in persons who have been identified as malnourished or at risk for malnutrition, and whenever a change in clinical condition occurs.

The MNA® was developed by Nestlé and leading international geriatricians. Well validated in international studies in a variety of settings<sup>6-8</sup>, the MNA® correlates with morbidity and mortality.

### Instructions to complete the MNA®

Enter the patient's information on the top of the form:

- *Name* • *Gender* • *Age*
- *Weight (kg)* – To obtain an accurate weight, remove shoes and heavy outer clothing. Use a calibrated and reliable set of scales. Pounds (lbs) must be converted to kilograms (1 lb = 0.45 kg).
- *Height (cm)* – Measure height without shoes using a stadiometer (height gauge). If the patient is bedridden, measure height by demispan, half arm-span, or knee height (see Appendix 2). Inches must be converted to centimeters (1 inch = 2.54 cm).
- *Date of screen*

# Screening (MNA®)

Complete the screen (Questions A – E) by filling in the boxes with the appropriate numbers. Then, add the numbers together to determine the screening score. A score of 12 or greater indicates the person is well nourished and needs no further intervention. A score of 8-11 indicates the person is at risk of malnutrition. A score of 7 or less indicates the person is malnourished. If the score is 11 or less, you may continue with the remaining questions for additional information on factors that may impact nutritional status.

## Key Points

Ask the patient to answer questions A – E, using the suggestions in the shaded areas. If the patient is unable to answer the question, ask the patient’s caregiver to answer, or check the medical record.

A	
<p>Has food intake declined over the past three months due to loss of appetite, digestive problems, chewing or swallowing difficulties?</p> <p>Score 0 = Severe decrease in food intake 1 = Moderate decrease in food intake 2 = No decrease in food intake</p>	<p>Ask patient or caregiver or check the medical record</p> <ul style="list-style-type: none"><li>· <i>“Have you eaten less than normal over the past three months?”</i></li><li>· If so, <i>“is this because of lack of appetite, chewing, or swallowing difficulties?”</i></li><li>· If yes, <i>“have you eaten much less than before or only a little less?”</i></li></ul>

<p><b>B</b></p> <p>Involuntary weight loss during the last 3 months?</p> <p>Score 0 = Weight loss greater than 3 kg (6.6 pounds)</p> <p>1 = Does not know</p> <p>2 = Weight loss between 1 and 3 kg (2.2 and 6.6 pounds)</p> <p>3 = No weight loss</p>	<p>Ask patient / Review medical record (if long term or residential care)</p> <ul style="list-style-type: none"> <li>· <i>"Have you lost any weight without trying over the last 3 months?"</i></li> <li>· <i>"Has your waistband gotten looser?"</i></li> <li>· <i>"How much weight do you think you have lost? More or less than 3 kg (or 6 pounds)?"</i></li> </ul> <p>Though weight loss in the overweight elderly may be appropriate, it may also be due to malnutrition. When the weight loss question is removed, the MNA® loses its sensitivity, so it is important to ask about weight loss even in the overweight.</p>
<p><b>C</b></p> <p>Mobility?</p> <p>Score 0 = Bed or chair bound</p> <p>1 = Able to get out of bed/chair, but does not go out</p> <p>2 = Goes out</p>	<p>Ask patient / Patient's medical record / Information from caregiver</p> <ul style="list-style-type: none"> <li>· <i>"How would you describe your current mobility?"</i></li> <li>· <i>"Are you able to get out of a bed, a chair, or a wheelchair without the assistance of another person?"</i> – if not, would score 0</li> <li>· <i>"Are you able to get out of a bed or a chair, but unable to go out of your home?"</i> – if yes, would score 1</li> <li>· <i>"Are you able to leave your home?"</i> – if yes, would score 2</li> </ul>
<p><b>D</b></p> <p>Has the patient suffered psychological stress or acute disease in the past three months?</p> <p>Score 0 = Yes</p> <p>2 = No</p>	<p>Ask patient / Review medical record / Use professional judgment</p> <ul style="list-style-type: none"> <li>· <i>"Have you been stressed recently?"</i></li> <li>· <i>"Have you been severely ill recently?"</i></li> </ul>

E	
Neuropsychological problems?	Review patient medical record / Use professional judgment / Ask patient, nursing staff or caregiver
Score 0 = Severe dementia or depression	
1 = Mild dementia	· <i>"Do you have dementia?"</i>
2 = No psychological problems	· <i>"Have you had prolonged or severe sadness?"</i>
	The patient's caregiver, nursing staff or medical record can provide information about the severity of the patient's neuropsychological problems (dementia).

Body mass index (BMI)? (weight in kg / height in m <sup>2</sup> )	Determining BMI
Score 0 = BMI less than 19	BMI is used as an indicator of appropriate weight for height (Appendix 1)
1 = BMI 19 to less than 21	BMI Formula – US Units
2 = BMI 21 to less than 23	· BMI = (Weight in Pounds / [Height in inches x Height in inches] ) x 703
3 = BMI 23 or greater	BMI Formula – Metric Units
	· BMI = (Weight in Kilograms / [Height in Meters x Height in Meters] )
	1 Pound = 0.45 Kilograms
	1 Inch = 2.54 Centimeters
	Before determining BMI, record the patient's weight and height on the MNA® form.
	1. If height has not been measured, please measure using a stadiometer or height gauge (Refer to Appendix 2).
	2. If the patient is unable to stand, measure height using indirect methods such as measuring demi-span, arm span, or knee height. (See Appendix 2).
	3. Using the BMI chart provided (Appendix 1), locate the patient's height and weight and determine the BMI.

4. Fill in the appropriate box on the MNA® form to represent the BMI of the patient.

5. To determine BMI for a patient with an amputation, see Appendix 3.

Note: If the BMI cannot be obtained, discontinue use of the full MNA® and use the MNA®-SF instead. Substitute calf circumference for BMI on the MNA®-SF.

Add the numbers to obtain the screening score.

Screening Score  
(Max. 14 points)

12-14 points: Normal nutritional status

8-11 points: At risk of malnutrition

0-7 points: Malnourished

For proposed intervention, please see the Intervention Algorithm.

You may continue with the remaining questions to complete the full MNA® and obtain additional information on factors that may impact nutritional status.

**Note:**

In the elderly, weight and height are important because they correlate with morbidity and mortality.

Weight and height measurements are often available in the patient record and should be used as a priority. Only when height and/or weight are unavailable, should Calf Circumference (CC) be used instead of BMI.

**Important:** When the Calf Circumference is used to complete the MNA®-SF, do not use the full MNA®. Otherwise, the full MNA® score will be inaccurate due to the Calf Circumference measurement being counted twice – once in the MNA®-SF and again in Question R of the full MNA®.

## Additional Information

<p><b>G</b></p> <p>Lives independently (not in a nursing home)?</p> <p>Score 1 = Yes 0 = No</p>	<p>Ask patient</p> <p>This question refers to the normal living conditions of the individual. Its purpose is to determine if the person is usually dependent on others for care. For example, if the patient is in the hospital because of an accident or acute illness, where does the patient normally live?</p> <p>· <i>"Do you normally live in your own home, or in an assisted living, residential setting, or nursing home?"</i></p>
<p><b>H</b></p> <p>Takes more than 3 prescription drugs per day?</p> <p>Score 0 = Yes 1 = No</p>	<p>Ask patient / Review patient's medical record</p> <p>Check the patient's medication record / ask nursing staff / ask doctor / ask patient</p>
<p><b>I</b></p> <p>Pressure sores or skin ulcers?</p> <p>Score 0 = Yes 1 = No</p>	<p>Ask patient / Review patient's medical record</p> <p>· <i>"Do you have bed sores?"</i></p> <p>Check the patient's medical record for documentation of pressure wounds or skin ulcers, or ask the caregiver / nursing staff / doctor for details, or examine the patient if information is not available in the medical record.</p>



## J

How many full meals does the patient eat daily?

Score 0 = One meal

1 = Two meals

2 = Three meals

Ask patient / Check food intake record if necessary

· *"Do you normally eat breakfast, lunch and dinner?"*

· *"How many meals a day do you eat?"*

A full meal is defined as eating more than 2 items or dishes when the patient sits down to eat.

For example, eating potatoes, vegetable, and meat is considered a full meal; or eating an egg, bread, and fruit is considered a full meal.

## K

Selected consumption markers for protein intake Select all that apply.

· *At least one serving of dairy products (milk, cheese, yogurt) per day?*

Yes ☐ No ☐

· *Two or more servings of legumes or eggs per week?*

Yes ☐ No ☐

· *Meat, fish or poultry every day?*

Yes ☐ No ☐

Ask the patient or nursing staff, or check the completed food intake record

· *"Do you consume any dairy products (a glass of milk / cheese in a sandwich / cup of yogurt / can of high protein supplement) every day?"*

· *"Do you eat beans / eggs? How often do you eat them?"*

· *"Do you eat meat, fish or chicken every day?"*

Score 0.0 = if 0 or 1 Yes answer

0.5 = if 2 Yes answers

1.0 = if 3 Yes answers

L	
Consumes two or more servings of fruits or vegetables per day?	Ask the patient / check the completed food intake record if necessary
Score 0 = No	<ul style="list-style-type: none"> <li>· <i>"Do you eat fruits and vegetables?"</i></li> <li>· <i>"How many portions do you have each day?"</i></li> </ul>
1 = Yes	<p>A portion can be classified as:</p> <ul style="list-style-type: none"> <li>· One piece of fruit (apple, banana, orange, etc.)</li> <li>· One medium cup of fruit or vegetable juice</li> <li>· One cup of raw or cooked vegetables</li> </ul>

M	
How much fluid (water, juice, coffee, tea, milk) is consumed per day?	Ask patient
Score 0.0 = Less than 3 cups	<ul style="list-style-type: none"> <li>· <i>"How many cups of tea or coffee do you normally drink during the day?"</i></li> </ul>
0.5 = 3 to 5 cups	<ul style="list-style-type: none"> <li>· <i>"Do you drink any water, milk or fruit juice? What size cup do you usually use?"</i></li> </ul>
1.0 = More than 5 cups	A cup is considered 200 – 240ml or 7-8oz.

Mode of Feeding?	
Score 0 = Unable to eat without assistance *	Ask patient / Review patient medical record/ Ask caregiver
1 = Feeds self with some difficulty **	<ul style="list-style-type: none"> <li>· <i>"Are you able to feed yourself?" / "Can the patient feed himself/herself?"</i></li> </ul>
2 = Feeds self without any problems	<ul style="list-style-type: none"> <li>· <i>"Do you need help to eat?" / "Do you help the patient to eat?"</i></li> <li>· <i>"Do you need help setting up your meals (opening containers, buttering bread, or cutting meats)?"</i></li> </ul>
	<p>* Patients who must be fed or need help holding the fork would score 0.</p> <p>** Patients who need help setting up meals (opening containers, buttering bread, or cutting meats), but are able to feed themselves would score 1 point.</p> <p>Pay particular attention to potential causes of malnutrition that need to be addressed to avoid malnutrition (e.g. dental problems, need for adaptive feeding devices to support eating).</p>

<p><b>O</b></p> <p>Self-View of Nutritional Status</p> <p>Score 0 = Views self as being malnourished</p> <p>1 = Is uncertain of nutritional state</p> <p>2 = Views self as having no nutritional problems</p>	<p>Ask the patient</p> <ul style="list-style-type: none"> <li>· <i>"How would you describe your nutritional state?"</i></li> </ul> <p>Then prompt <i>"Poorly nourished?"</i>  <i>"Uncertain?"</i>  <i>"No problems?"</i></p> <p>The answer to this question depends upon the patient's state of mind. If you think the patient is not capable of answering the question, ask the caregiver / nursing staff for their opinion.</p>
<p><b>P</b></p> <p>In comparison with other people of the same age, how does the patient consider his/her health status?</p> <p>Score 0.0 = Not as good</p> <p>0.5 = Does not know</p> <p>1.0 = As good</p> <p>2.0 = Better</p>	<p>Ask patient</p> <ul style="list-style-type: none"> <li>· <i>"How would you describe your state of health compared to others your age?"</i></li> </ul> <p>Then prompt <i>"Not as good as others of your age?"</i>  <i>"Not sure?"</i>  <i>"As good as others of your age?"</i>  <i>"Better?"</i></p> <p>Again, the answer will depend upon the state of mind of the person answering the question.</p>
<p><b>Q</b></p> <p>Mid-arm circumference (MAC) in cm</p> <p>Score 0.0 = MAC less than 21</p> <p>0.5 = MAC 21 to 22</p> <p>1.0 = MAC 22 or greater</p>	<p>Measure the mid-arm circumference in cm as described in Appendix 4.</p>
<p><b>R</b></p> <p>Calf circumference (CC) in cm</p> <p>Score 0 = CC less than 31</p> <p>1 = CC 31 or greater</p>	<p>Calf circumference should be measured in cm as described in Appendix 5.</p>

# Final Score

## Final Score

- Total the points from the assessment section of the full MNA® (maximum 16 points).

## Intervention and Monitoring

- For recommended intervention and follow-up monitoring, please refer to Full MNA® Intervention Algorithm.

For more information, go to [www.mna-elderly.com](http://www.mna-elderly.com)

**Nestlé Nutrition Institute**

**MNA® Mini Nutritional Assessment**

**Overview**

**What is the MNA?**

The MNA® is a validated nutrition screening and assessment tool that can identify geriatric patients age 65 and above who are malnourished or at risk of malnutrition. The MNA® was developed nearly 20 years ago and is the most well validated nutrition screening tool for the elderly. Originally comprised of 18 questions, the current MNA® now consists of 6 questions and streamlines the screening process. The current MNA® retains the validity and accuracy of the original MNA® in identifying older adults who are malnourished or at risk of malnutrition. The revised MNA® Short Form makes the link to intervention easier and quicker and is now the preferred form of the MNA® for clinical use.

**Latest news about the MNA®**

- **Call for Papers on the Mini Nutritional Assessment MNA®**  
One of the issues of the *JGIM* in 2012 will be dedicated to publications on the MNA®, Jaeger M Bavel, MD, PhD, Oldenburg, Germany, will serve as guest editor of the MNA issue.  
In the context the following research areas will be of special interest:
  - Epidemiology (i.e. prevalence of malnutrition, geographical and ethnic variations, focus on specific populations - community-living, institutional)
  - Methodology (i.e. the MNA® as a monitoring tool, adaptations of the BM/Cut-off due to ethnicity)
  - MNA® and functionality (i.e. cognitive status, frailty, disability)
  - MNA® based interventionPlease submit your papers by June 30, 2012 to <http://jgim.edmgr.com>
- The MNA® is more sensitive than BMI in early detection of malnutrition and risk for malnutrition in elderly residents in long term care. In an abstract presented at the European Union of Geriatric Medicine Society (EUGMS) 2011 meeting, the MNA® identified a four-fold higher prevalence of at risk residents and a slightly higher prevalence of malnutrition in 3299 elderly residents, compared to the BMI alone, confirming the MNA®-SF is a more suitable tool for detecting nutritional issues in the elderly.
- The MNA® and GMA® Concurrence measuring Tape received the **Good Design Award 2011** from the Japan Institute of Design Promotion (commonly called G-mark accreditation), given for designs that enrich people's lives and society. After the 2011 Japan Earthquake, the MNA®-SF, which may be used in care settings or at home, was used in evacuation centers to quickly and easily detect nutritional status in vulnerable older adults.
- The **Interactive MNA®** is now available in Chinese, English, French, German, Greek, Italian, Sinhala, Spanish, Turkish and Thai. Other languages forthcoming.

**Mini Nutritional Assessment**

**MNA®**

**Nestlé Nutrition Institute**

First name: \_\_\_\_\_ Last name: \_\_\_\_\_

Age: \_\_\_\_\_ Sex: \_\_\_\_\_ MNA® No. \_\_\_\_\_

**Questions**

Question	Yes	No	I don't know
1. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Have you lost weight in the past 3 months due to loss of appetite, digestive problems, eating less?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Do you feel weak or tired?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

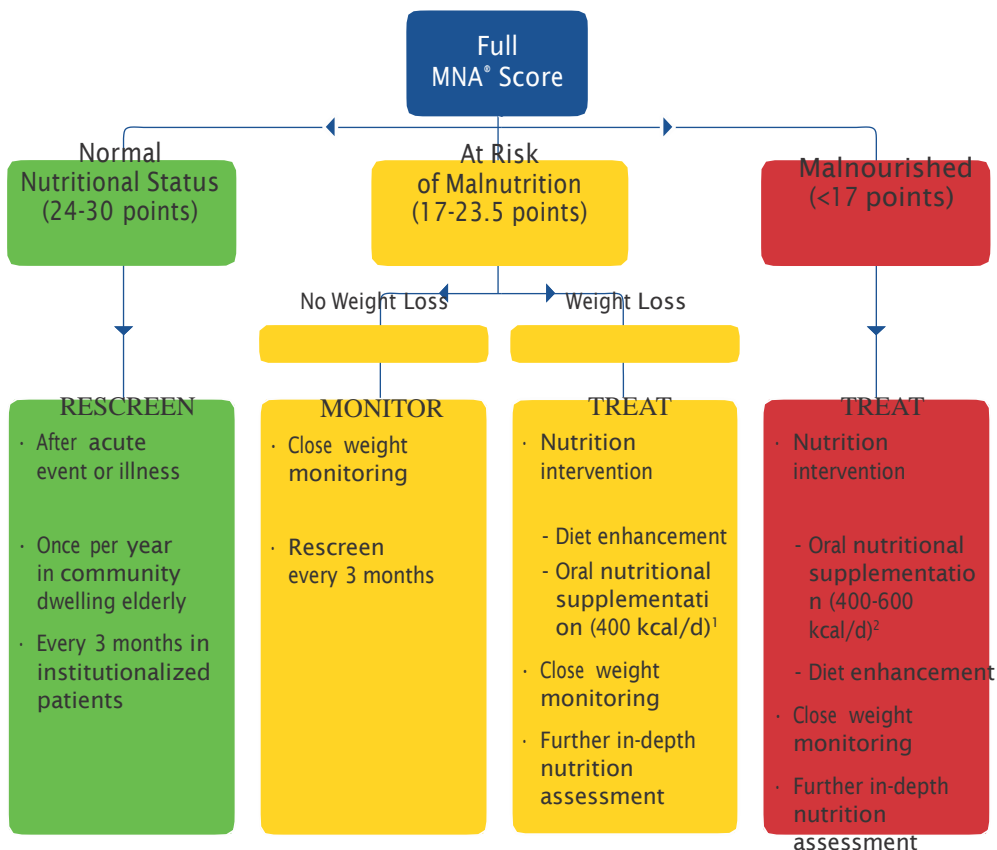
**Final score**

0-14 points: Normal nutritional status  
15-17 points: At risk of malnutrition  
18-24 points: Malnourished

**Comments**

\_\_\_\_\_

# Recommendations for Intervention



1. Milne AC, et al. *Cochrane Database Syst Rev.* 2009;2:CD003288

2. Gariballa S, et al. *Am J Med.* 2006;119:693-699

Appendices

Appendix 1 • Body Mass Index table

		MNA® BMI Table for the Elderly (age 65 and above)																					
		Height (feet & inches)																					
		4'11"	5'0"	5'1"	5'2"	5'3"	5'4"	5'5"	5'6"	5'7"	5'8"	5'9"	5'10"	5'11"	6'0"	6'1"	6'2"	6'3"					
Weight (kg)	45	20	20	19	18	18	17	17	16	16	15	15	14	14	14	13	13	13	100				
	48	21	21	20	19	19	18	17	17	16	16	16	15	15	14	14	14	13	105				
	50	22	22	21	20	20	19	18	18	17	17	16	16	15	15	15	14	14	110				
	52	23	23	22	21	20	20	19	19	18	18	17	17	16	16	15	15	14	115				
	55	24	23	23	22	21	21	20	19	19	18	18	17	17	16	16	15	15	120				
	57	25	24	24	23	22	22	21	20	20	19	19	18	17	17	17	16	16	125				
	59	26	25	25	24	23	22	22	21	20	20	19	19	18	18	17	17	16	130				
	61	27	26	26	25	24	23	23	22	21	21	20	19	19	18	18	17	17	135				
	64	28	27	26	26	24	24	23	23	22	21	21	20	19	19	18	18	18	140				
	66	29	28	27	27	26	25	24	23	23	22	21	21	20	20	19	19	18	145				
	68	30	29	28	27	27	26	25	24	24	23	22	22	21	20	20	19	19	150				
	70	31	30	29	28	28	27	26	25	24	24	23	22	22	21	20	20	19	155				
	73	32	31	30	29	28	28	27	26	25	24	24	23	22	22	21	21	20	160				
	75	33	32	31	30	29	28	28	27	26	25	24	24	23	22	22	21	21	165				
	77	34	33	32	31	30	29	28	27	27	26	25	24	24	23	22	22	21	170				
	80	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23	22	175				
	82	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	23	180				
84	37	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	23	185					
86	38	37	36	35	34	33	32	31	30	29	28	27	27	26	25	24	24	190					
89	39	38	37	36	35	34	32	32	31	30	29	28	27	26	26	25	24	195					
91	40	39	38	37	35	34	33	32	31	31	30	29	28	27	26	26	25	200					
93	41	40	39	38	36	35	34	33	32	31	30	29	29	28	27	26	26	205					
95	42	41	40	38	37	36	35	34	33	32	31	30	29	29	28	27	26	210					
98	43	42	41	39	38	37	36	35	34	33	32	31	30	29	28	28	27	215					
100	44	43	42	40	39	38	37	36	35	34	33	32	31	30	29	28	28	220					
102	45	44	43	41	40	39	37	36	35	34	33	32	31	31	30	29	28	225					
105	47	45	44	42	41	40	38	37	36	35	34	33	32	31	30	30	29	230					
107	48	46	44	43	42	40	39	38	37	36	35	34	33	32	31	30	29	234					
109	48	47	45	44	43	41	40	39	38	37	35	34	34	33	32	31	30	240					
111	49	48	46	45	43	42	41	40	38	37	36	35	34	33	32	32	31	245					
114	51	49	48	46	44	43	42	40	39	38	37	36	35	34	33	32	32	250					
		Height (cm)																					
		150	152.5	155	157.5	160	162.5	165	167.5	170	172.5	175	177.5	180	182.5	185	188	190					
		Weight (pounds)																					
		110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110			
		115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115			
		120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120			
		125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125			
		130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130			
		135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135			
		140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140			
		145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145			
		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150			
		155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155			
		160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160			
		165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165			
		170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170			
		175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175	175			
		180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180	180			
		185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185	185			
		190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190	190			
		195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195	195			
		200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200	200			
		205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205	205			
		210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210	210			
		215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215	215			
		220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220	220			
		225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225	225			
		230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230	230			
		234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234	234			
		240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240	240			
		245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245	245			
		250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250			
		Weight (pounds)																					
		110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110	110			
		115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115	115			
		120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120			
		125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125	125			
		130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130	130			
		135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135	135			
		140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140	140			
		145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145	145			
		150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150	150			
		155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155	155			
		160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160	160			
		165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165	165			

### 2.1 • Measuring height using a stadiometer

1. Ensure the floor surface is even and firm.
2. Have subject remove shoes and stand up straight with heels together, and with heels, buttocks and shoulders pressed against the stadiometer.
3. Arms should hang freely with palms facing thighs.
4. Take the measurement with the subject standing tall, looking straight ahead with the head upright and not tilted backwards.
5. Make sure the subject's heels stay flat on the floor.
6. Lower the measure on the stadiometer until it makes contact with the top of the head.
7. Record standing height to the nearest centimeter.



Accessed at:

[http://www.ktl.fi/publications/ehrm/product2/part\\_iii5.htm](http://www.ktl.fi/publications/ehrm/product2/part_iii5.htm)  
Accessed January 15, 2011.

### 2.2 • Measuring height using demispan

Demispan is the distance from the midline at the sternal notch to the web between the middle and ring fingers along outstretched arm. Height is then calculated from a standard formula.<sup>9</sup>

1. Locate and mark the midpoint of the sternal notch with the pen.
2. Ask the patient to place the left arm in a horizontal position.
3. Check that the patient's arm is horizontal and in line with shoulders.
4. Using the tape measure, measure distance from mark on the midline at the sternal notch to the web between the middle and ring fingers.
5. Check that arm is flat and wrist is straight.
6. Take reading in cm.

Calculate height from the formula below:

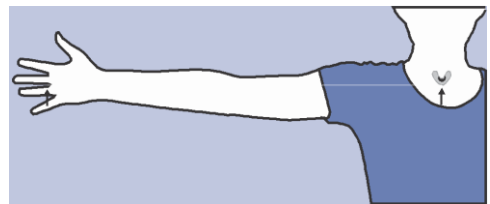
#### Females

Height in cm =  
 $(1.35 \times \text{demispan in cm}) + 60.1$

#### Males

Height in cm =  
 $(1.40 \times \text{demispan in cm}) + 57.8$

#### Demi-span



Source:

Reproduced here with the kind permission of BAPEN (British Association for Parenteral and Enteral Nutrition) from the 'MUST' Explanatory Booklet.  
For further information see [www.bapen.org.uk](http://www.bapen.org.uk)  
([http://www.bapen.org.uk/pdfs/must/must\\_explan.pdf](http://www.bapen.org.uk/pdfs/must/must_explan.pdf))

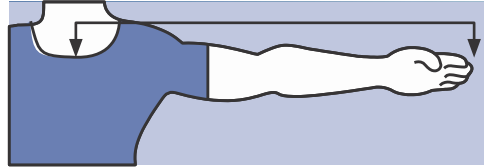
### 2.3 • Measuring height using half arm-span

Half arm-span is the distance from the midline at the sternal notch to the tip of the middle finger. Height is then calculated by doubling the half arm-span.<sup>10</sup>

1. Locate and mark the edge of the right collar bone (in the sternal notch) with the pen.
2. Ask the patient to place the nondominant arm in a horizontal position.
3. Check that the patient's arm is horizontal and in line with shoulders.
4. Using the tape measure, measure distance from mark on the midline at the sternal notch to the tip of the middle finger.
5. Check that arm is flat and wrist is straight.
6. Take reading in cm.

Calculate height by multiplying the half arm-span measurement by 2

Half arm-span



Source:

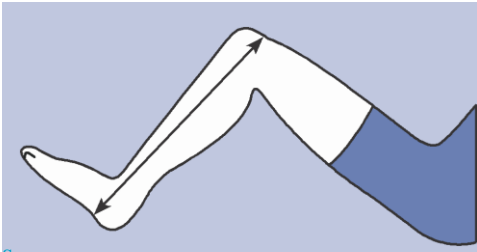
[http://www.rxkinetics.com/height\\_estimate.html](http://www.rxkinetics.com/height_estimate.html).  
Accessed January 15, 2011.





2.4 • Measuring height using knee height

Knee height is one method used to determine stature in the bed- or chair-bound patient and is measured using a sliding knee height caliper. The patient must be able to bend both the knee and the ankle of one leg to 90 degree angles.



Source:  
[http://www.rxkinetics.com/height\\_estimate.html](http://www.rxkinetics.com/height_estimate.html).  
Accessed January 15, 2011.

1. Have the subject bend the knee and ankle of one leg at a 90 degree angle while lying supine or sitting on a table with legs hanging off the side.
2. Place the fixed blade of the knee caliper under the heel of the foot in line with the ankle bone. Place the fixed blade of the caliper on the anterior surface of the thigh about 3.0 cm above the patella.
3. Be sure the shaft of the caliper is in line with and parallel to the long bone in the lower leg (tibia) and is over the ankle bone (lateral malleolus). Apply pressure to compress the tissue. Record the measurement to the nearest 0.1 cm.
4. Take two measurements in immediate succession. They should agree within 0.5 cm. Use the average of these two measurements and the patient's chronological age in the population and gender-specific equations in the table on the right to calculate the subject's stature.
5. The value calculated from the selected equation is an estimate of the person's true stature. The 95 percent confidence for this estimate is plus or minus twice the SEE value for each equation.

Using population-specific formula, calculate height from standard formula:

Population and Gender group	Equation: Stature (cm) =
Non-Hispanic white men (U.S.) <sup>11</sup> [SEE = 3.74 cm]	78.31 + (1.94 x knee height) - (0.14 x age)
Non-Hispanic black men (U.S.) <sup>11</sup> [SEE = 3.80 cm]	79.69 + (1.85 x knee height) - (0.14 x age)
Mexican-American men (U.S.) <sup>11</sup> [SEE = 3.68 cm]	82.77 + (1.83 x knee height) - (0.16 x age)
Non-Hispanic white women (U.S.) <sup>11</sup> [SEE = 3.98 cm]	82.21 + (1.85 x knee height) - (0.21 x age)
Non-Hispanic black women (U.S.) <sup>11</sup> [SEE = 3.82 cm]	89.58 + (1.61 x knee height) - (0.17 x age)
Mexican-American women (U.S.) <sup>11</sup> [SEE = 3.77 cm]	84.25 + (1.82 x knee height) - (0.26 x age)
Taiwanese men <sup>12</sup> [SEE = 3.86 cm]	85.10 + (1.73 x knee height) - (0.11 x age)
Taiwanese women <sup>12</sup> [SEE = 3.79 cm]	91.45 + (1.53 x knee height) - (0.16 x age)
Elderly Italian men <sup>13</sup> [SEE = 4.3 cm]	94.87 + (1.58 x knee height) - (0.23 x age) + 4.8
Elderly Italian women <sup>13</sup> [SEE = 4.3 cm]	94.87 + (1.58 x knee height) - (0.23 x age)
French men <sup>14</sup> [SEE = 3.8 cm]	74.7 + (2.07 x knee height) - (-0.21 x age)
French women <sup>14</sup> [SEE = 3.5 cm]	67.00 + (2.2 x knee height) - (0.25 x age)
Mexican Men <sup>15</sup> [SEE = 3.31 cm]	52.6 + (2.17 x knee height)
Mexican Women <sup>15</sup> [SEE = 2.99 cm]	73.70 + (1.99 x knee height) - (0.23 x age)
Filipino Men <sup>16</sup>	96.50 + (1.38 x knee height) - (0.08 x age)
Filipino Women <sup>16</sup>	89.63 + (1.53 x knee height) - (0.17 x age)
Malaysian men <sup>17</sup> [SEE = 3.51 cm]	(1.924 x knee height) + 69.38
Malaysian women <sup>17</sup> [SEE = 3.40]	(2.225 x knee height) + 50.25

SEE = Standard Error of Estimate<sup>11</sup>

To determine the BMI for amputees, first determine the patient's estimated weight including the weight of the missing body part.<sup>18,19</sup>

- Use a standard reference (see table) to determine the proportion of body weight contributed by an individual body part.
- Subtract the percentage of body weight contributed by the missing body part(s) from 1.0.
- Then, divide the current weight by the difference of 1 minus the percentage of body weight contributed by the missing body part.

Calculate BMI using estimated height and estimated weight.

Example: 80 year old man, amputation of the left lower leg, 1.72 m, 58 kg

1. Estimated body weight: Current body weight ÷ (1 - proportion for the missing leg)  
 $58\text{ (kg)} \div [1 - 0.059] = 58\text{ (kg)} \div 0.941 = 61.6\text{ kg}$

2. Calculate BMI:  
Estimated body weight / body height (m)<sup>2</sup>  
 $61.6 \div [1.72 \times 1.72] = 20.8$

Weight of selected body components

It is necessary to account for the missing body component(s) when estimating IBW.  
Table: Percent of Body Weight Contributed by Specific Body Parts

Body Part	Percentage
Trunk w/o limbs	50.0
Hand	0.7
Forearm with hand	2.3
Forearm without hand	1.6
Upper arm	2.7
Entire arm	5.0
Foot	1.5
Lower leg with foot	5.9
Lower leg without foot	4.4
Thigh	10.1
Entire leg	16.0

References cited:  
Lefton, J., Malone A. Anthropometric Assessment. In Charney P, Malone A, eds. *ADA Pocket Guide to Nutrition Assessment, 2<sup>nd</sup> edition*. Chicago, IL: American Dietetic Association; 2009:160-161.  
Osterkamp LK., Current perspective on assessment of human body proportions of relevance to amputees, *J Am Diet Assoc.* 1995;95:215-218.

## Appendix 4 • Measuring mid arm circumference

1. Ask the patient to bend their non-dominant arm at the elbow at a right angle with the palm up.
2. Measure the distance between the acromial surface of the scapula (bony protrusion surface of upper shoulder) and the olecranon process of the elbow (bony point of the elbow) on the back of the arm.
3. Mark the mid-point between the two with the pen.
4. Ask the patient to let the arm hang loosely by his/her side.
5. Position the tape at the mid-point on the upper arm and tighten snugly. Avoid pinching or causing indentation.
6. Record measurement in cm.
7. If MAC is less than 21, score = 0.  
If MAC is 21-22, score = 0.5.  
If MAC is 22 or greater, score = 1.0.



Source: Moore MC, *Pocket Guide to Nutrition and Diet Therapy*, 1993



Source: PEN Group., *A pocket guide to clinical nutrition: Assessment of nutritional status*, British Dietetic Association. 1997

## Appendix 5 • Measuring calf circumference

1. The subject should be sitting with the left leg hanging loosely or standing with their weight evenly distributed on both feet.
2. Ask the patient to roll up the trouser leg to uncover to calf.
3. Wrap the tape around the calf at the widest part and note the measurement.
4. Take additional measurements above and below the point to ensure that the first measurement was the largest.



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5. An accurate measurement can only be obtained if the tape is at a right angle to the length of the calf, and should be recorded to the nearest 0.1 cm.

### Measuring Calf Circumference in bed-bound persons

1. Have the person being measured lie in supine position with the left knee bent at 90° angle.
2. Slip a loop of the tape measure around the left calf until largest diameter is located.
3. Pull tape so it is just snug but not so tight that tissue is compressed.
4. Read and accurately record measurement to the nearest 0.1 cm. Repeated measurements should agree within 0.5 cm.

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Screen and intervene.  
Nutrition can make a difference.

The image shows a detailed screenshot of the Mini Nutritional Assessment (MNA) form. The form is titled 'Mini Nutritional Assessment MNA' and includes the Nestlé Nutrition Institute logo. It contains various sections for data entry, including patient information, a detailed assessment of food intake, weight loss, mobility, and mental status. The form is designed to be used by healthcare professionals to assess the nutritional status of patients, particularly those who are elderly or at risk of malnutrition. The form includes checkboxes and numerical scales for different criteria, and a final section for calculating the total score and providing recommendations.

# Standardised Mini-Mental State Examination (SMMSE)

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## Introduction

The population is aging. Elderly frail adults are the most rapidly growing group in developed countries. More and more physicians are coming to recognise the importance of cognitive testing in the assessment of older adults. About 10% of people aged 70 or more and a third of those aged 85 and over have dementia. Yet this is often missed, particularly in the early stages.

The “mini-mental” is the most widely used screening test of mental function in this age group. This short booklet describes a standardised version of this test and shows how physicians and other health care professionals can use and interpret it. This short booklet describes some uses that they may not be aware of previously.

Since Dr. Marshall Folstein first developed the Mini-Mental State Examination (MMSE) in 1975, it has become widely used as a screening test for cognitive impairment and it is routinely used as an inclusion/exclusion criterion and outcome measure in clinical trials. The test covers a variety of cognitive domains, including orientation to time and place, short and long term memory, registration, recall, constructional ability, language and the ability to understand and follow commands. This test should never be used alone. It is used in conjunction with a corroborative history.

The test usually takes about ten minutes to complete

and can be used reliably after a short training period by physicians, nurses and other healthcare professionals. The original MMSE had few instructions for administration and scoring. These were left to the discretion of each rater. Different raters developed their own unique styles and techniques of administration and scoring. This led to wide differences and lowered the reliability of the test.

The Standardised Mini-Mental State Examination was developed to provide clear unequivocal guidelines for administration and scoring. The SMMSE takes less time to administer and has significantly reduced the variability of the MMSE.<sup>1,2</sup>

The intrarater variability is significantly lower with the SMMSE (86%,  $P < 0.003$ ) and the interrater variance was reduced by 76%, compared to the MMSE. Intraclass correlation for the MMSE was 0.69 compared to 0.90 for the SMMSE. The mean duration of assessments was 13.4 minutes for the MMSE, compared to 10.5 minutes for the SMMSE ( $p < 0.004$ ).<sup>1</sup>

The instructions for administration and scoring the SMMSE are short and cryptic. Some further background, discussion and explanation of these rules and guidelines may be useful.

The Standardised Mini-Mental State Examination (SMMSE) is the copyright of Dr D.W. Molloy and may not be reproduced without the written consent of the author.

### References:

1. Molloy et al. Reliability of a standardised Mini-Mental State Examination compared with the traditional Mini-Mental state Examination. *American Journal of Psychiatry*, Vol. 14, 1991a, pp.102-105. 2. Molloy et al. Standardized Mini-Mental State Examination, A User's Guide. 1999.

# DIRECTIONS FOR ADMINISTRATION OF THE SMMSE

1. Before the questionnaire is administered, try to get the person to sit down facing you. Assess the person's ability to hear and understand very simple conversation, e.g. What is your name? If the person uses hearing or visual aids, provide these before starting.

2. Introduce yourself and try to get the person's confidence. Before you begin, get the person's permission to ask questions, e.g. Would it be all right to ask you some questions about your memory? This helps to avoid catastrophic reactions.

3. Ask each question a maximum of three times. If the subject does not respond, score 0.

4. If the person answers incorrectly, score 0. Accept that answer and do not ask the question again, hint, or provide any physical clues such as head shaking, etc.
5. The following equipment is required to administer the instrument: A watch, a pencil, reverse of the SMMSE score sheet with CLOSE YOUR EYES written in large letters and two fivesided figures intersecting to make a four-sided figure, and a space for the person to write down a sentence.

6. If the person answers, What did you say?, do not explain or engage in conversation, merely repeat. Merely repeat the same directions a maximum of three times.

7. If the person interrupts (e.g. What is this for?), just reply: I will explain in a few minutes, when we are finished. Now if we could proceed please... we are almost finished.

## Scoring Guidelines

### Scoring WORLD backwards (Question 4)

This task accounts for 17% of the total score. It's essential to score it reliably. There are many different ways and "systems" for scoring WORLD backwards. Originally, Dr. Folstein advised that the score is "the number of letters in the correct order." The authors suggest the following method. Score ORDER not SEQUENCE. Simply write down the correct response: D L R O W. Now place the last five letters the subject said below. Now draw lines between the same letters on the response given and DLROW. These lines MAY NOT CROSS. The person's score is the maximum number of lines that can be drawn, without crossing any.

In SMMSE there are many different ways to score this task, but we have found this method to be simple, reliable and easy to apply.

D	L	R	O	W	
D	L	R	O	W	5
D	L	R	O	W	
L	O	W	R	O	3
D	L	R	O	W	
D	R	R	W	O	3

D	L	R	O	W	
D	R	W	O	D	3
D	L	R	O	W	
D	O	W	R		3
D	L	R	O	W	
L					1

Example to show differences between MMSE and SMMSE scoring

D	L	R	O	W
D	R	L	W	O

MMSE scores order: 1

SMMSE scores sequence: 3

Scoring examples of WORLD spelled backwards

	D	L	R	O	W	Score
D	D					1
DL	D	L				2
DLD	D	L				2
DLDR	D	L	R			3
DLLOR	D	L		O		3
DLLRW	D	L	R		W	4
DLW	D	L			W	3
DLO	D	L		O		3
DLOD	D	L		O		3
DLODR	D	L		O		3
DLOL	D	L		O		3
DLOLD	D	L		O		3
DLOLW	D	L		O	W	4
DLOR	D	L		O		3
DLORD	D	L		O		3
DLORL	D	L		O		3
DLORW	D	L		O	W	4
DLOW	D	L		O	W	4
DLOWD	D	L		O	W	4
DLOWR	D	L		O	W	4
DLR	D	L	R			3
DLRLD	D	L	R			3
DLRLO	D	L	R	O		4
DLRLW	D	L	R		W	4
DLRO	D	L	R	O		4
DLROD	D	L	R	O		4
DLROL	D	L	R	O		4
DLROO	D	L	R	O		4
DLRRD	D	L	R			3
DLRW	D	L	R		W	4
DLW	D	L			W	3
DLWO	D	L			W	3
DLWOR	D	L			W	3
DLWRO	D	L	R	O		4
DO	D			O		2



DOL	D			O		2
DOLD	D			O		2
DOLOW	D			O	W	3
DOLRD	D	L	R			3
DOLRW	D	L	R		W	4
DOLW	D			O	W	3
DOLWR	D			O	W	3
DOR	D			O		2
DORL	D			O		2
DORLD	D			O		2
DORLW	D			O	W	3
DOROL	D		R	O		3
DOROW	D		R	O	W	4
DORW	D			O	W	3
DORWD	D			O	W	3
DORWR	D			O	W	3
DOW	D			O	W	3
DOWLD	D			O	W	3
DOWLW	D			O	W	3
DOWR	D			O	W	3
DOWRL	D			O	W	3
DOWRW	D			O	W	3
DR	D		R			2
DRL	D		R			2
DRLD	D		R			2
DRLO	D		R	O		3
DRLOW	D		R	O	W	4
DRLW	D		R		W	3
DRLWO	D		R		W	3
DRO	D		R	O		3
DROLW	D		R	O	W	4
DROR	D		R	O		3
DROW	D		R	O	W	4
DROWL	D		R	O	W	4
DRW	D		R		W	3
DRWLD	D		R		W	3
DW	D				W	2

DWL	D				W	2
DWLR	D	L	R			3
DWLRO	D	L	R	O		4
DWOLD	D				W	2
DWORD	D				W	2
DWORL	D				W	2
DWROR	D		R	O		3
LD		L				1
LDO		L		O		2
LDORL		L		O		2
LDORW		L	R		W	3
LDOWR		L		O	W	3
LDROW		L	R	O	W	4
LDRWO		L	R		W	3
LDWO		L			W	2
LLRD		L	R			2
LODLO		L		O		2
LORD		L		O		2
LORDW		L		O	W	3
LORL		L		O		2
LORW		L		O	W	3
LOW		L		O	W	3
LOWL		L		O	W	3
LRO		L	R	O		3
LROR		L	R	O		3
LROW		L	R	O	W	4
LWROW		L	R	O	W	4
ODLWR	D	L			W	3
OLD				O		1
OLDW				O	W	2
OLWRD				O	W	2
RDLOW	D	L		O	W	4
RDOLD			R	O		2
RO			R	O		2
W					W	1
WDLRO	D	L	R	O		4
WOLD					W	1

WOLDW				O	W	2
WOR					W	1
WORLD					W	1
WRL					W	1
WRLD					W	1
WROLD					W	1

# Scoring of Serial Sevens

## (Alternative to Question 4)

The serial sevens task is presented as an alternative to spelling “World” backwards. The two tasks are not equivalent. The serial sevens is an easier task, and the scoring is easier. It can be used as an alternate to spelling WORLD backwards in people who are illiterate.

Say: Subtract 7 from 100 and keep subtracting 7 from what’s left (write down subject’s reply).

Once subject starts – do not interrupt – allow him/her to proceed until five subtractions have been made. If subject stops before five subtractions have been made, repeat the original instruction keep subtracting seven from what’s left (maximum 3 times).

### Score as follows:

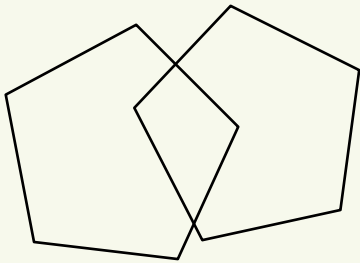
93, 86, 79, 72, 65	5 points
✓✓✓✓✓	(all correct)
93, 88, 81, 74, 67	4 points
✓ X ✓✓✓	(4 correct,1 wrong)
92, 85, 78, 71, 64	4 points
X ✓✓✓✓	(4 correct, 1 wrong)
93, 87, 80, 73, 64	3 points
✓ X ✓✓ X	(3 correct, 2 wrong)
92, 85, 78, 71, 63	3 points
X ✓✓✓ X	(3 correct, 2 wrong)
93, 87, 80, 75, 67	2 points
✓ X ✓ X X	(2 correct, 3 wrong)
93, 87, 81, 75, 69	1 point
✓ X X X X	(1 correct, 4 wrong)

# Scoring the Overlapping Pentagons

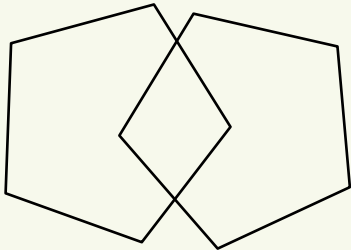
## (Question 11)

Give the subject the pencil, with the eraser, and a clean piece of paper. Examples are provided to score this task. Many older adults draw shaky, wiggly lines with unclear angles that are more curved than straight. These are acceptable, as long as the person has two five-sided figures intersecting to form a four-sided figure.

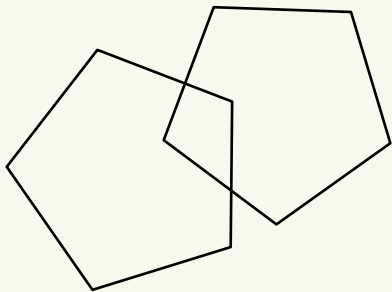
### Correct



Score 1

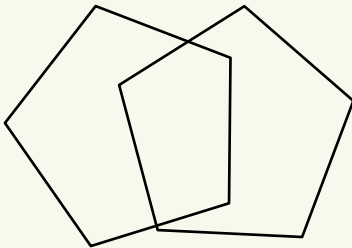


Score 1

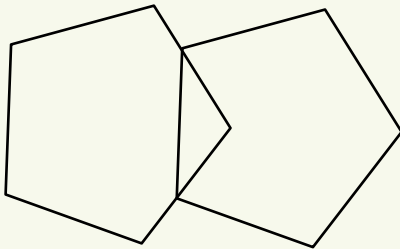


Score 1

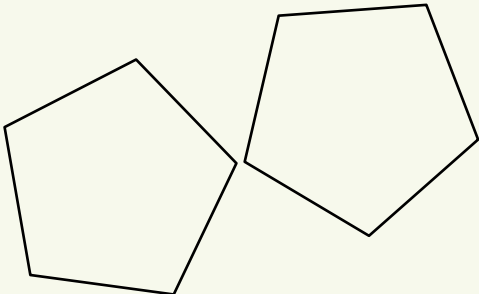
### Incorrect



Score 0



Score 0



Score 0

# Adjusting Scores

It is important to score the test as fairly as possible for everyone. People who have physical, non-cognitive disabilities should not score lower just because they are physically unable to perform certain tasks. For example, an arm amputee obviously cannot “fold the paper in half once with both hands” as item 20 directs. Modify the test by asking the subject to take the paper in his or her hand, crumple it up and throw it on the floor. If the test cannot be modified, then omit the task. If an item has been omitted because of physical disability, it is important to take this into account when scoring the test. The score from this task is subtracted from the total score (30) to give a new total. The person’s score is then adjusted to this new total score.

Here is the formula for calculating adjusted scores:

Formula	Actual Score	X30	Maximum Obtainable Score
Explanation	Add up the score on all the items that the person was physically able to do.	Multiply the actual score by 30	The total points of all the items that a person can physically do is the maximum obtainable score. Take the number from the previous box and divide it by the maximum obtainable score to get the final SMMSE score.
Example	A blind person cannot read “Close Your Eyes”, write a sentence or copy the two five-sided figures. These items (17, 18 and 19) are omitted. The maximum score of these three items is 3 points.		
Process	Person’s total score on test is:  <b>15</b>	Multiply by:  <b>30</b>	Person could not do items 17, 18 or 19. Maximum obtainable score on these items is 3. Subtract 3 from 30 = 27. Divide by this number.  <b>27</b>
Calculation	$(15 \times 30) / 27 = 16.66$ Final SMMSE score (after rounding) is <b>17</b>		

*Note: SMMSE scores are provided in whole numbers, so fractions are rounded off in the conventional manner. For 0.5 or greater, round up to the next higher whole number. For 0.49, or lower, round down to the next lower whole number.*

The following are examples of disabilities that may exempt people from certain tasks in the SMMSE.

Physical disabilities:

The disability should be permanent. Sometimes people have temporary physical problems that effect SMMSE performance. In these cases, let the problem resolve before testing them. Some physical problems may take months to resolve and it may not be practical to wait. In these cases, carefully document the situation and proceed. Examples of physical disabilities include: amputation, chronic deformity from arthritis, paralysis of limbs, blindness/poor vision even with glasses, permanent hearing loss even with functioning hearing aid.

Language:

Sometimes language difficulties impair a person’s ability to perform certain tasks on the SMMSE. If English is not the subject’s first language, try to score the person in his or her first language. It can be difficult to decide when to exempt a person from certain tasks. One approach is to try as many of the tasks as possible to evaluate the person’s performance. If the subject seems to understand some questions easily and others not, this is likely due to cognitive impairment. If the person has consistent problems understanding the questions, it is likely due to language difficulties and the score can be adjusted accordingly. If in doubt, get a translator or give the test in his or her native language. Make sure you are not missing hearing impairment.

Speech:

Some people have severe speech problems, so their scores are out of proportion to their overall level of function. They score lower because they cannot answer within the prescribed time limits. Some may reverse words and may say “Winter” when they mean “Summer”. These deficits unfortunately bias the test against these people. It is important to be consistent and adhere to the rules of administration, observing the time limits and scoring guidelines. Note can be made of these factors and performance in non-cognitive tests, like ADL function, should be assessed.

Education:

Low education or education in a language other than English can affect scores. Generally, these limitations should not exempt a person from some of the SMMSE tasks. Note should be made that these factors may cause lower scores and the final total may not reflect the person’s true cognitive function. The person’s disability should be clearly noted on the SMMSE score sheet. Items that are affected by this disability should also be clearly noted. The calculation of the adjusted score is done at the bottom of the SMMSE score sheet.

# SMMSE Total Scores and Disease Progression

SMMSE Scores, Stages of Disease and Areas of Impairment in Alzheimer’s Disease

Area of Functional Impairment

SMMSE Scores	30 - 25	24 - 21	21 - 10	9 - 0
Stage	May be Normal	Mild/Early	Moderate	Severe
ADL		problems with driving, finances, shopping	assistance with dressing, grooming, toileting	problems with eating, walking
Communication		word-finding, repeating, goes off topic, loses track	sentence fragments, “empty” speech, vague terms (i.e. this, that)	speech disturbances (i.e. slurring, stuttering)
Memory	subjective problems with names or misplacing objects	three item recall orientation (time then place)	WORLD spelling, language and 3 step command	all areas show obvious deficits
	Years	2-4 years	2-3 years	2-3 years

These are general guidelines to the progression of the disease. There is much individual variability.

## Notes



# **Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)**

## **– Short and Long Forms**

**November 2005**

### **Contents**

- 1. Introduction**
  - 2. Uses of IPAQ Instruments**
  - 3. Summary Characteristics of Short and Long Forms**
  - 4. Overview of Continuous and Categorical Analyses of IPAQ**
  - 5. Protocol for Short Form**
  - 6. Protocol for Long Form**
  - 7. Data Processing Rules**
  - 8. Summary Algorithms**
- 
- |                    |  |
|--------------------|--|
| <b>Appendix 1.</b> | <b>At A Glance IPAQ Scoring Protocol – Short Forms</b> |
| <b>Appendix 2.</b> | <b>At A Glance IPAQ Scoring Protocol – Long Forms</b>  |



## 1. Introduction

This document describes recommended methods of scoring the data derived from the telephone / interview administered and self-administered IPAQ short and long form instruments. The methods outlined provide a revision to earlier scoring protocols for the IPAQ short form and provide for the first time a comparable scoring method for IPAQ long form. Latest versions of IPAQ instruments are available from [www.ipaq.ki.se](http://www.ipaq.ki.se).

Although there are many different ways to analyse physical activity data, to date there is no formal consensus on a 'correct' method for defining or describing levels of physical activity based on self-report population surveys. The use of different scoring protocols makes it very difficult to compare within and between countries, even when the same instrument has been used. Use of these scoring methods will enhance the comparability between surveys, provided identical sampling and survey methods have been used.

## 2. Uses of IPAQ Instruments

IPAQ short form is an instrument designed primarily for population surveillance of physical activity among adults. It has been developed and tested for use in adults (age range of 15-69 years) and until further development and testing is undertaken the use of IPAQ with older and younger age groups is not recommended.

IPAQ short and long forms are sometimes being used as an evaluation tool in intervention studies, but this was not the intended purpose of IPAQ. Users should carefully note the range of domains and types of activities included in IPAQ before using it in this context. Use as an outcome measure in small scale intervention studies is not recommended.

## 3. Summary Characteristics of IPAQ Short and Long Forms

1. IPAQ assesses physical activity undertaken across a comprehensive set of domains including:
  - a. leisure time physical activity
  - b. domestic and gardening (yard) activities
  - c. work-related physical activity
  - d. transport-related physical activity;
2. The IPAQ **short** form asks about three specific types of activity undertaken in the four domains introduced above. The specific types of activity that are assessed are walking, moderate-intensity activities and vigorous-intensity activities.
3. The items in the **short** IPAQ form were structured to provide separate scores on walking, moderate-intensity and vigorous-intensity activity. Computation of the total score for the short form requires summation of the duration (in minutes) and frequency (days) of walking, moderate-intensity and vigorous-intensity activities. Domain specific estimates cannot be estimated.

4. The IPAQ **long** form asks details about the specific types of activities undertaken within each of the four domains. Examples include walking for transportation and moderate-intensity leisure-time activity.
5. The items in the **long** IPAQ form were structured to provide separate domain specific scores for walking, moderate-intensity and vigorous-intensity activity within each of the work, transportation, domestic chores and gardening (yard) and leisure-time domains. Computation of the total scores for the long form requires summation of the duration (in minutes) and frequency (days) for all the types of activities in all domains. Domain specific scores or activity specific sub-scores may be calculated. Domain specific scores require summation of the scores for walking, moderate-intensity and vigorous-intensity activities within the specific domain, whereas activity-specific scores require summation of the scores for the specific type of activity across domains.

#### **4. Overview of Continuous and Categorical Analyses of IPAQ**

Both categorical and continuous indicators of physical activity are possible from both IPAQ forms. However, given the non-normal distribution of energy expenditure in many populations, it is suggested that the continuous indicator be presented as median minutes/week or median MET–minutes/week rather than means (such as mean minutes/week or mean MET-minutes/week).

##### **4.1 Continuous Variables**

Data collected with IPAQ can be reported as a continuous measure. One measure of the volume of activity can be computed by weighting each type of activity by its energy requirements defined in METs to yield a score in MET–minutes. METs are multiples of the resting metabolic rate and a MET-minute is computed by multiplying the MET score of an activity by the minutes performed. MET-minute scores are equivalent to kilocalories for a 60 kilogram person. Kilocalories may be computed from MET-minutes using the following equation:  $\text{MET-min} \times (\text{weight in kilograms}/60 \text{ kilograms})$ . MET-minutes/day or MET-minutes/week can be presented although the latter is more frequently used and is thus suggested.

Details for the computation for summary variables from IPAQ short and long forms are detailed below. As there are no established thresholds for presenting MET-minutes, the IPAQ Research Committee propose that these data are reported as comparisons of median values and interquartile ranges for different populations.

##### **4.2 Categorical Variable: Rationale for Cut Point Values**

There are three levels of physical activity proposed to classify populations:

1. Low
2. Moderate
3. High

The algorithms for the short and long forms are defined in more detail in Sections 5.3 and 6.3, respectively. Rules for data cleaning and processing prior to computing the algorithms appear in Section 7.

Regular participation is a key concept included in current public health guidelines for physical activity.<sup>1</sup> Therefore, both the total volume and the number of days/sessions are included in the IPAQ analysis algorithms.

The criteria for these levels have been set taking into account that IPAQ asks questions in all domains of daily life, resulting in higher median MET-minutes estimates than would have been estimated from leisure-time participation alone. The criteria for these three levels are shown below.

Given that measures such as IPAQ assess total physical activity in all domains, the “leisure time physical activity” based public health recommendation of 30 minutes on most days will be achieved by most adults in a population. Although widely accepted as a goal, in absolute terms 30 minutes of moderate-intensity activity is low and broadly equivalent to the background or basal levels of activity adult individuals would accumulate in a day. Therefore a new, higher cutpoint is needed to describe the levels of physical activity associated with health benefits for measures such as IPAQ, which report on a broad range of domains of physical activity.

### **‘High’**

This category was developed to describe higher levels of participation. Although it is known that greater health benefits are associated with increased levels of activity there is no consensus on the exact amount of activity for maximal benefit. In the absence of any established criteria, the IPAQ Research Committee proposes a measure which equates to approximately at least one hour per day or more, of at least moderate-intensity activity above the basal level of physical activity. Considering that basal activity may be considered to be equivalent to approximately 5000 steps per day, it is proposed that “high active” category be considered as those who move at least 12,500 steps per day, or the equivalent in moderate and vigorous activities. This represents at least an hour more moderate-intensity activity over and above the basal level of activity, or half an hour of vigorous-intensity activity over and above basal levels daily. These calculations were based on emerging results of pedometers studies.<sup>2</sup>

This category provides a higher threshold of measures of total physical activity and is a useful mechanism to distinguish variation in population groups. Also it could be used to set population targets for health-enhancing physical activity when multi-domain instruments, such as IPAQ are used.

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<sup>1</sup> Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of American Medical Association* 1995; 273(5):402-7. and U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, The Presidents' Council on Physical Fitness and Sports: Atlanta, GA:USA. 1996.

<sup>2</sup> Tudor-Locke C, Bassett DR Jr. How many steps/day are enough? Preliminary pedometer indices for public health. *Sports Med.* 2004;34(1):1-8.

### **'Moderate'**

This category is defined as doing some activity, more than the low active category. It is proposed that it is a level of activity equivalent to “half an hour of at least moderate-intensity PA on most days”, the former leisure time-based physical activity population health recommendation.

### **'Low'**

This category is simply defined as not meeting any of the criteria for either of the previous categories.

## **5. Protocol for IPAQ Short Form**

### **5.1 Continuous Scores**

Median values and interquartile ranges can be computed for walking (W), moderate-intensity activities (M), vigorous-intensity activities (V) and a combined total physical activity score. All continuous scores are expressed in MET-minutes/week as defined below.

### **5.2 MET Values and Formula for Computation of MET-minutes/week**

The selected MET values were derived from work undertaken during the IPAQ Reliability Study undertaken in 2000-2001<sup>3</sup>. Using the Ainsworth et al. Compendium (*Med Sci Sports Med* 2000) an average MET score was derived for each type of activity. For example; all types of walking were included and an average MET value for walking was created. The same procedure was undertaken for moderate-intensity activities and vigorous-intensity activities. The following values continue to be used for the analysis of IPAQ data: Walking = 3.3 METs, Moderate PA = 4.0 METs and Vigorous PA = 8.0 METs. Using these values, four continuous scores are defined:

Walking MET-minutes/week = 3.3 \* walking minutes \* walking days

Moderate MET-minutes/week = 4.0 \* moderate-intensity activity minutes \* moderate days

Vigorous MET-minutes/week = 8.0 \* vigorous-intensity activity minutes \* vigorous-intensity days

Total physical activity MET-minutes/week = sum of Walking + Moderate + Vigorous MET-minutes/week scores.

### **5.3 Categorical Score**

#### **Category 1 Low**

This is the lowest level of physical activity. Those individuals who not meet criteria for Categories 2 or 3 are considered to have a 'low' physical activity level.

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<sup>3</sup> Craig CL, Marshall A, Sjostrom M et al. International Physical Activity Questionnaire: 12 country reliability and validity *Med Sci Sports Exerc* 2003;August

## **Category 2 Moderate**

The pattern of activity to be classified as 'moderate' is either of the following criteria:

- a) 3 or more days of vigorous-intensity activity of at least 20 minutes per day  
**OR**
- b) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day  
**OR**
- c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum Total physical activity of at least 600 MET-minutes/week.

Individuals meeting at least one of the above criteria would be defined as accumulating a minimum level of activity and therefore be classified as 'moderate'. See Section 7.5 for information about combining days across categories.

## **Category 3 High**

A separate category labelled 'high' can be computed to describe higher levels of participation.

The two criteria for classification as 'high' are:

- a) vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 MET-minutes/week  
**OR**
- b) 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total physical activity of at least 3000 MET-minutes/week.

See Section 7.5 for information about combining days across categories.

## **5.4 Sitting Question in IPAQ Short Form**

The IPAQ sitting question is an additional indicator variable of time spent in sedentary activity and is not included as part of any summary score of physical activity. Data on sitting should be reported as median values and interquartile ranges. To-date there are few data on sedentary (sitting) behaviours and no well-accepted thresholds for data presented as categorical levels.

## **6. Protocol for IPAQ Long Form**

The long form of IPAQ asks in detail about walking, moderate-intensity and vigorous-intensity physical activity in each of the four domains. Note: asking more detailed questions regarding physical activity within domains is likely to produce higher prevalence estimates than the more generic IPAQ short form.

## 6.1 Continuous Score

Data collected with the IPAQ long form can be reported as a continuous measure and reported as median MET-minutes. Median values and interquartile ranges can be computed for walking (W), moderate-intensity activities (M), and vigorous-intensity activities (V) within each domain using the formulas below. Total scores may also be calculated for walking (W), moderate-intensity activities (M), and vigorous-intensity activities (V); for each domain (work, transport, domestic and garden, and leisure) and for an overall grand total.

## 6.2 MET Values and Formula for Computation of MET-minutes

### Work Domain

Walking MET-minutes/week at work =  $3.3 * \text{walking minutes} * \text{walking days at work}$

Moderate MET-minutes/week at work =  $4.0 * \text{moderate-intensity activity minutes} * \text{moderate-intensity days at work}$

Vigorous MET-minutes/week at work =  $8.0 * \text{vigorous-intensity activity minutes} * \text{vigorous-intensity days at work}$

Total Work MET-minutes/week = sum of Walking + Moderate + Vigorous MET-minutes/week scores at work.

### Active Transportation Domain

Walking MET-minutes/week for transport =  $3.3 * \text{walking minutes} * \text{walking days for transportation}$

Cycle MET-minutes/week for transport =  $6.0 * \text{cycling minutes} * \text{cycle days for transportation}$

Total Transport MET-minutes/week = sum of Walking + Cycling MET-minutes/week scores for transportation.

### Domestic and Garden [Yard Work] Domain

Vigorous MET-minutes/week yard chores =  $5.5 * \text{vigorous-intensity activity minutes} * \text{vigorous-intensity days doing yard work}$  (**Note:** the MET value of 5.5 indicates that vigorous garden/yard work should be considered a moderate-intensity activity for scoring and computing total moderate intensity activities.)

Moderate MET-minutes/week yard chores =  $4.0 * \text{moderate-intensity activity minutes} * \text{moderate-intensity days doing yard work}$

Moderate MET-minutes/week inside chores =  $3.0 * \text{moderate-intensity activity minutes} * \text{moderate-intensity days doing inside chores}$ .

Total Domestic and Garden MET-minutes/week = sum of Vigorous yard + Moderate yard + Moderate inside chores MET-minutes/week scores.

### Leisure-Time Domain

Walking MET-minutes/week leisure =  $3.3 * \text{walking minutes} * \text{walking days in leisure}$

Moderate MET-minutes/week leisure =  $4.0 * \text{moderate-intensity activity minutes} * \text{moderate-intensity days in leisure}$

Vigorous MET-minutes/week leisure =  $8.0 * \text{vigorous-intensity activity minutes} * \text{vigorous-intensity days in leisure}$

Total Leisure-Time MET-minutes/week = sum of Walking + Moderate + Vigorous MET-minutes/week scores in leisure.

### **Total Scores for all Walking, Moderate and Vigorous Physical Activities**

Total Walking MET-minutes/week = Walking MET-minutes/week (at Work + for Transport + in Leisure)

Total Moderate MET-minutes/week total = Moderate MET-minutes/week (at Work + Yard chores + inside chores + in Leisure time) + Cycling Met-minutes/week for Transport + Vigorous Yard chores MET-minutes/week

Total Vigorous MET-minutes/week = Vigorous MET-minutes/week (at Work + in Leisure)

**Note:** Cycling MET value and Vigorous garden/yard work MET value fall within the coding range of moderate-intensity activities.

### **Total Physical Activity Scores**

An overall total physical activity MET-minutes/week score can be computed as:

Total physical activity MET-minutes/week = sum of Total (Walking + Moderate + Vigorous) MET-minutes/week scores.

This is equivalent to computing:

Total physical activity MET-minutes/week = sum of Total Work + Total Transport + Total Domestic and Garden + Total Leisure-Time MET-minutes/week scores.

As there are no established thresholds for presenting MET-minutes, the IPAQ Research Committee proposes that these data are reported as comparisons of median values and interquartile ranges for different populations.

## **6.3 Categorical Score**

As noted earlier, regular participation is a key concept included in current public health guidelines for physical activity.<sup>4</sup> Therefore, both the total volume and the number of day/sessions are included in the IPAQ analysis algorithms. There are three levels of physical activity proposed to classify populations – 'low', 'moderate', and 'high'. The criteria for these levels are the same as for the IPAQ short [described earlier in Section 4.2]

### **Category 1 Low**

This is the lowest level of physical activity. Those individuals who not meet criteria for Categories 2 or 3 are considered 'low'.

### **Category 2 Moderate**

The pattern of activity to be classified as 'moderate' is either of the following criteria:

- d) 3 or more days of vigorous-intensity activity of at least 20 minutes per day

**OR**

- e) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day

**OR**

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<sup>4</sup> Pate RR, Pratt M, Blair SN, Haskell WL, Macera CA, Bouchard C et al. Physical activity and public health. A recommendation from the Centers for Disease Control and Prevention and the American College of Sports Medicine. *Journal of American Medical Association* 1995; 273(5):402-7. and U.S. Department of Health and Human Services. *Physical Activity and Health: A Report of the Surgeon General*. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, The Presidents' Council on Physical Fitness and Sports: Atlanta, GA:USA. 1996.

- f) 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total physical activity of at least 600 MET-minutes/week.

Individuals meeting at least one of the above criteria would be defined as accumulating a moderate level of activity. See Section 7.5 for information about combining days across categories.

### **Category 3 High**

A separate category labelled 'high' can be computed to describe higher levels of participation.

The two criteria for classification as 'high' are:

- a) vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 MET-minutes/week
- OR**
- b) 7 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum Total physical activity of at least 3000 MET-minutes/week.

See Section 7.5 for information about combining days across categories.

## **6.4 IPAQ Sitting Question IPAQ Long Form**

The IPAQ sitting question is an additional indicator variable and is not included as part of any summary score of physical activity. To-date there are few data on sedentary (sitting) behaviours and no well-accepted thresholds for data presented as categorical levels. For the sitting question 'Minutes' is used as the indicator to reflect time spent in sitting rather than MET-minutes which would suggest an estimate of energy expenditure.

IPAQ long assesses an estimate of sitting on a typical weekday, weekend day and time spent sitting during travel (see transport domain questions).

### **Summary sitting variables include**

Sitting Total Minutes/week = weekday sitting minutes\* 5 weekdays + weekend day sitting minutes\* 2 weekend days

Average Sitting Total Minutes/day = (weekday sitting minutes\* 5 weekdays + weekend day sitting minutes\* 2 weekend days) / 7

**Note:** The above calculation of 'Sitting Total' excludes time spent sitting during travel because the introduction in IPAQ long directs the responder to NOT include this component as it would have already been captured under the Transport section. If a summary sitting variable including time spent sitting for transport is required, it should be calculated by adding the time reported (travelling in a motor vehicle) under transport to the above formula. Care should be taken in reporting these alternate data to clearly distinguish the 'total sitting' variable from a 'total sitting – including transport' variable.



## **7. Data Processing Rules**

In addition to a standardized approach to computing categorical and continuous measures of physical activity, it is necessary to undertake standard methods for the cleaning and treatment of IPAQ datasets. The use of different approaches and rules would introduce variability and reduce the comparability of data.

There are no established rules for data cleaning and processing on physical activity. Thus, to allow more accurate comparisons across studies IPAQ Research Committee has established and recommends the following guidelines:

### **7.1 Data Cleaning**

- I. Any responses to duration (time) provided in the hours and minutes response option should be converted from hours and minutes into minutes.
- II. To ensure that responses in 'minutes' were not entered in the 'hours' column by mistake during self-completion or during data entry process, values of '15', '30', '45', '60' and '90' in the 'hours' column should be converted to '15', '30', '45', '60' and '90' minutes, respectively, in the minutes column.
- III. In some cases duration (time) will be reported as weekly (not daily) e.g., VWHRS, VWMINS. These data should be converted into an average daily time by dividing by 7.
- IV. If 'don't know' or 'refused' or data are missing for time or days then that case is removed from analysis.

**Note:** Both the number of days *and* daily time are required for the creation of categorical and continuous summary variables

### **7.2 Maximum Values for Excluding Outliers**

This rule is to exclude data which are unreasonably high; these data are to be considered outliers and thus are excluded from analysis. All cases in which the sum total of all Walking, Moderate and Vigorous time variables is greater than 960 minutes (16 hours) should be excluded from the analysis. This assumes that on average an individual of 8 hours per day is spent sleeping.

The 'days' variables can take the range 0-7 days, or 8, 9 (don't know or refused); values greater than 9 should not be allowed and those cases excluded from analysis.

### **7.3 Minimum Values for Duration of Activity**

Only values of 10 or more minutes of activity should be included in the calculation of summary scores. The rationale being that the scientific evidence indicates that episodes or bouts of at least 10 minutes are required to achieve health benefits. Responses of less than 10 minutes [and their associated days] should be re-coded to 'zero'.

## **7.4 Truncation of Data Rules**

This rule attempts to normalize the distribution of levels of activity which are usually skewed in national or large population data sets.

In IPAQ short - it is recommended that all Walking, Moderate and Vigorous time variables exceeding '3 hours' or '180 minutes' are truncated (that is re-coded) to be equal to '180 minutes' in a new variable. This rule permits a maximum of 21 hours of activity in a week to be reported for each category (3 hours \* 7 days).

In IPAQ long – the truncation process is more complicated, but to be consistent with the approach for IPAQ short requires that the variables total Walking, total Moderate-intensity and total Vigorous-intensity activity are calculated and then, for each of these summed behaviours, the total value should be truncated to 3 hours (180 minutes).

When analysing the data as categorical variable or presenting median and interquartile ranges of the MET-minute scores, the application of the truncation rule will not affect the results. This rule does have the important effect of preventing misclassification in the 'high' category. For example, an individual who reports walking for 10 minutes on 6 days and 12 hours of moderate activity on one day could be coded as 'high' because this pattern meets the '7 day' and "3000 MET-min" criteria for 'high'. However, this uncommon pattern of activity is unlikely to yield the health benefits that the 'high' category is intended to represent.

Although using median is recommended due to the skewed distribution of scores, if IPAQ data are analysed and presented as a continuous variable using mean values, the application of the truncation rule will produce slightly lower mean values than would otherwise be obtained.

## **7.5 Calculating MET-minute/week Scores**

Data processing rules 7.2, 7.3, and 7.4 deals first with excluding outlier data, then secondly, with recoding minimum values and then finally dealing with high values. These rules will ensure that highly active people remain classified as 'high', while decreasing the chances that less active individuals are misclassified and coded as 'high'.

Using the resulting variables, convert time and days to MET-minute/week scores [see above Sections 5.2 and 6.2; METS x days x daily time].

## **7.6 Calculating Total Days for Presenting Categorical Data on Moderate and High Levels**

Presenting IPAQ data using categorical variables requires the total number of 'days' on which all physical activity was undertaken to be assessed. This is difficult because frequency in 'days' is asked separately for walking, moderate-intensity and vigorous-intensity activities, thus allowing the total number of 'days' to range from a minimum

of 0 to a maximum of 21 'days' per week in IPAQ short and higher in IPAQ long. The IPAQ instrument does not record if different types of activity are undertaken on the same day.

In calculating 'moderately active', the primary requirement is to identify those individuals who undertake activity on at least '5 days'/week [see Sections 4.2 and 5.3]. Individuals who meet this criterion should be coded in a new variable called "*at least five days*" and this variable should be used to identify those meeting criterion b) at least 30 minutes of moderate-intensity activity and/or walking; and those meeting criterion c) any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of 600 MET-minutes/week.

Below are two examples showing this coding in practice:

- i) an individual who reports '2 days of moderate-intensity' and '3 days of walking' should be coded as a value indicating "*at least five days*";
- ii) an individual reporting '2 days of vigorous-intensity', '2 days of moderate-intensity' and '2 days of walking' should be coded as a value to indicate "*at least five days*" [even though the actual total is 6].

The original frequency of 'days' for each type of activity should remain in the data file for use in the other calculations.

The same approach as described above is used to calculate total days for computing the 'high' category. The primary requirement according to the stated criteria is to identify those individuals who undertake a combination of walking, moderate-intensity and or vigorous-intensity activity on at least 7 days/week [See section 4.2]. Individuals who meet this criterion should be coded as a value in a new variable to reflect "*at least 7 days*".

Below are two examples showing this coding in practice:

- i) an individual who reports '4 days of moderate-intensity' and '3 days of walking' should be coded as the new variable "*at least 7 days*".
- ii) an individual reporting '3 days of vigorous-intensity', '3 days moderate-intensity' and '3 days walking' should be coded as "*at least 7 days*" [even though the total adds to 9] .

## **8. Summary algorithms**

The algorithms in Appendix 1 and Appendix 2 to this document show how these rules work in an analysis plan, to develop the categories 1 [Low], 2 [Moderate], and 3 [High] levels of activity.

**IPAQ Research Committee  
November 2005**

# APPENDIX 1

## At A Glance IPAQ Scoring Protocol (Short Forms)

### Continuous Score

Expressed as MET-min per week: MET level x minutes of activity/day x days per week

#### *Sample Calculation*

#### **MET levels**

Walking = 3.3 METs

Moderate Intensity = 4.0 METs

Vigorous Intensity = 8.0 METs

#### **MET-minutes/week for 30 min/day, 5 days**

$3.3 \times 30 \times 5 = 495$  MET-minutes/week

$4.0 \times 30 \times 5 = 600$  MET-minutes/week

$8.0 \times 30 \times 5 = 1,200$  MET-minutes/week

**TOTAL = 2,295 MET-minutes/week**

Total MET-minutes/week = Walk (METs\*min\*days) + Mod (METs\*min\*days) + Vig (METs\*min\*days)

### Categorical Score- three levels of physical activity are proposed

#### 1. **Low**

- No activity is reported **OR**
- Some activity is reported but not enough to meet Categories 2 or 3.

#### 2. **Moderate**

Either of the following 3 criteria

- 3 or more days of vigorous activity of at least 20 minutes per day **OR**
- 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day **OR**
- 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of at least 600 MET-minutes/week.

#### 3. **High**

Any one of the following 2 criteria

- Vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET-minutes/week **OR**
- 7 or more days of any combination of walking, moderate- or vigorous-intensity activities accumulating at least 3000 MET-minutes/week

Please review the full document “Guidelines for the data processing and analysis of the International Physical Activity Questionnaire” for more detailed description of IPAQ analysis and recommendations for data cleaning and processing [[www.ipaq.ki.se](http://www.ipaq.ki.se)].

## APPENDIX 2

### At A Glance IPAQ Scoring Protocol (Long Forms)

#### Continuous Score

Expressed as MET-minutes per week: MET level x minutes of activity/day x days per week

#### *Sample Calculation*

##### **MET levels**

Walking at work= 3.3 METs

Cycling for transportation= 6.0 METs

Moderate yard work= 4.0 METs

Vigorous intensity in leisure= 8.0 METs

##### **MET-minutes/week for 30 min/day, 5 days**

$3.3 \times 30 \times 5 = 495$  MET-minutes/week

$6.0 \times 30 \times 5 = 900$  MET-minutes/week

$4.0 \times 30 \times 5 = 600$  MET-minutes/week

$8.0 \times 30 \times 5 = 1,200$  MET-minutes/week

**TOTAL = 3,195 MET-minutes/week**

#### Domain Sub Scores

Total MET-minutes/week at **work** = Walk (METs\*min\*days) + Mod (METs\*min\*days) + Vig (METs\*min\*days) at work

Total MET-minutes/week for **transportation** = Walk (METs\*min\*days) + Cycle (METs\*min\*days) for transportation

Total MET-minutes/week from **domestic and garden** = Vig (METs\*min\*days) yard work + Mod (METs\*min\*days) yard work + Mod (METs\*min\*days) inside chores

Total MET-minutes/week in **leisure-time** = Walk (METs\*min\*days) + Mod (METs\*min\*days) + Vig (METs\*min\*days) in leisure-time

#### Walking, Moderate-Intensity and Vigorous-Intensity Sub Scores

Total **Walking** MET-minutes/week = Walk MET-minutes/week (at Work + for Transport + in Leisure)

Total **Moderate** MET-minutes/week = Cycle MET-minutes/week for Transport + Mod MET-minutes/week (Work + Yard chores + Inside chores + Leisure) + Vigorous Yard chores MET-minutes

**Note:** The above is a total moderate activities only score. If you require a total of all moderate-intensity physical activities you would sum Total Walking and Total Moderate

Total **Vigorous** MET-minutes/week = Vig MET-minutes/week (at Work + in Leisure)

#### Total Physical Activity Score

**Total** Physical Activity MET-minutes/week = **Walking** MET-minutes/week + **Moderate** MET-minutes/week + Total **Vigorous** MET-minutes/week

Continued.....

**Also**

**Total** Physical Activity MET-minutes/week = Total MET-minutes/week (at Work + for Transport + in Chores + in Leisure)

**Categorical Score- three levels of physical activity are proposed**

**1. Low**

No activity is reported **OR**

- a. Some activity is reported but not enough to meet Categories 2 or 3.

**2. Moderate**

Either of the following 3 criteria

- a. 3 or more days of vigorous-intensity activity of at least 20 minutes per day **OR**
- b. 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day **OR**
- c. 5 or more days of any combination of walking, moderate-intensity or vigorous-intensity activities achieving a minimum of at least 600 MET-min/week.

**3. High**

Any one of the following 2 criteria

- Vigorous-intensity activity on at least 3 days and accumulating at least 1500 MET-minutes/week **OR**
- 7 or more days of any combination of walking, moderate- or vigorous- intensity activities accumulating at least 3000 MET-minutes/week

Please review the full document “Guidelines for the data processing and analysis of the International Physical Activity Questionnaire” for more detailed description of IPAQ analysis and recommendations for data cleaning and processing [[www.ipaq.ki.se](http://www.ipaq.ki.se)].

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