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# Summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Domains** | **Suggested tool** | **Remarks from (co)investigators (if any)** | **Implement in v1.0 app?** | **Type of Test** |
| Physical Frailty | [Frailty Phenotype Questionnaire](#_Appendix:_Frailty_Phenotype)  (Click link, or see Appendix FP.1) |  | Yes (6 items) | Subjective questionnaire |
| Physical Frailty | [IPAQ-E](#_Appendix_FP.3:_International)  (Click the link, or see Appendix FP.3) | Inactivity will be measured using 2 items in the FPQ. | Yes (4 items) | Subjective questionnaire |
| Physical Frailty | [SARC-F](#_Appendix_FP.4:_SARC-F)  (Click the link, or see Appendix FP.4) | **Qns**  We are concern of construct validity if we claim to be screening for physical frailty with the use of a sarcopenia screening tool. Especially when we based our conceptualisation of physical frailty based on Fried’s phenotype.  **Ans**  Dr. Tay: SARC-F.  Physical frailty and sarcopenia are strongly correlated, although I agree the presence of sarcopenia is strictly not part of Fried's phenotype. The concept of frailty refers to multi-system impairment, whereas sarcopenia refers specifically to loss of muscle mass and function. Sarcopenia is of much research interest in public health, given the link with inactivity (hence the relevance of IPAQ-E), with exercise and nutrition having the potential to reverse it. One possible way to approach it is to classify it under the physical frailty domain, but as a separate sarcopenia subdomain. Or you can also remove it if there's too many tests.  Dr. Ong: do agree with Matthew, but if were to simplify and targeted specifically to frailty, a simple chair stand test would be sufficient for good correlation to physical frailty, as well as sarcopenia. Better to use SPPB if can be digitalized as screening tool as that will include balance and gait speed. Adding IPAQ questionnaire I think would be useful for patient as feedback for them to motivate them perform more exercises | Yes (5 items) | Subjective questionnaire |
| Physical Frailty | SPPB [Chair-stand Test](#_Appendix:_Short_Physical)  (Click link, or see Appendix FP.2) | Gait-speed test from the SPPB cannot be run accurately in the current v1.0 app (the computer vision is not able to accurate detect the distance) | Yes | Objective task |
| Physical Frailty | SPPB [Balance tests](#_Appendix:_Short_Physical)  (Click link, or see Appendix FP.2) |  | Yes | Objective task |
| Mild Cognitive impairment (Cognitive frailty) | [Clock Draw Test](#_Appendix_FC.1:_Clock)  (Click link, or see Appendix FC.1) | Not implemented, because of scoring needs some work, and precision drawing may be hard on the phone screen. | No | Objective task |
| Mild Cognitive impairment (Cognitive frailty) | [AD8 Dementia Screening Interview](#_Appendix_FC.2:_AD8)  (Click link, or see Appendix FC.2) | **Qns**: We are using both Kelaiditi et al.’s and Ruan et al’s definition of cognitive frailty, which both exclude dementia as a criterion (i.e., if someone has dementia, the individual is probably beyond cognitively frail). Does AD8 also screen for mild cognitive impairment? Or mild neurocognitive disorder as re-categorised by DSM-5?  **Ans:**  Dr. Tay: There is a Singapore study (PMID: 30661859) which looks at this. It seems to be an effective screening tool for dementia, although only reasonable accuracy for mild dementia defined as CDR<0.5. (AUC 0.69, sensitivity 0.62, and specificity 0.73)  Informant questionnaire - AD8, IQCODE. I think there are some considerations here. AMT, CDT were designed to be interviewer administered tests (performed in adequate setting with the correct tools), and I'm hesitant and unsure whether test validity will be void if it is self-administered via an app. I don't have expertise to comment on this. SCD-Q has not been validated locally.  Just a thought - what do you think about self administered AD8? There is 1 local study in which participant AD8 was performed, though it was less accurate than informant AD8 (PMID: 23380993)  Generally speaking, informant questionnaires have been validated locally with good results. One option is for the app user to find a family member/good friend to fill up the questionnaire.  Dr. Ong: Cognitive frailty – AMT is the most common and easiest tool to use in clinical practise. AD8 is mainly use for mild dementia screening specifically. Do take note of ‘practice effects’ as it is going to incorporate into mobile apps for patient to do serial assessment for any cognitive impairment screening. Probably multiple screening tools may be needed. Caregiver/family members to interview and assist in administration would be good idea if validity is a concern (for AD8 and AMT). I personally not familiar with SCD-Q too.  In general, cognitive impairment screening is complex and involve various domain, comprehensive assessment usually require a trained personnel to be done face to face. I think as long as there’s few sensitive screening tools that able to target some of the cognitive domain should be sufficient, main idea is for the patient to seek early medical review for in-depth assessment and evaluation. | Yes  (8 items; implement it as a self-administered version) | Subjective questionnaire |
| Mild Cognitive impairment (Cognitive frailty) | [Abbreviated Mental test](#_Appendix_FC.3:_Abbreviated)  (Click link, or see Appendix FC.3) | **Qns** :The initial concern of using CDT was the limited number of cognitive domains that it measures to identify mild cognitive impairment/ mild neurocognitive disorder. Will AMS be a better alternative, or is ECAQ the better alternative?  **Ans**  Dr. Tay: MCI. Realized that I made a typo - it should be AMT - Abbreviated Mental Test, not AMS in my previous email. I have added the Singapore version of the AMT by Suresh et al in the document instead which is contextually more relevant. It may be more suitable for community use, and in fact has been used in the community with the AD8 in a Singapore study (PMID: 36004002). If forced to choose between AMT and ECAQ, AMT is more widely used. Agree ECAQ has fallen out of favor. | Yes  10 items | Objective test |
| Mild Cognitive impairment (Cognitive frailty) | [Elderly Cognitive Assessment Questionnaire (ECAQ)](#_Appendix_FC.4:_Elderly)  (Click link, or see Appendix FC.4) | See above. | No |  |
| Subjective Cognitive Impairment (Cognitive frailty) | [Subjective Cognitive Decline Questionnaire](#_Appendix_FC.5:_Subjective)  (Click link, or see Appendix FC.5) | Used to measure Subjective-cognitive decline to classify the Pre-MCI SCD (Ruan et al., 2015 version of cognitive frailty).  What are the other measurements of subjective cognitive decline? | KiV (24 item)  To implement it as an optional module | Subjective questionnaire |
| Subjective Cognitive Impairment (Cognitive frailty) | [Informant Questionnaire on Cognitive Decline in the Elderly](#_Appendix_FC.6:_Informant)  (Click link, or see Appendix FC.6) | **Dr Ong/Dr. Tay** The app will: be a self-screening tool, so an informant questionnaire may not be suitable, unless we rephrase them to a first-person statement, which will be somewhat similar to the SCD-Q (they both assess learning, memory, and execution). | No |  |
| Social Frailty | [Social Frailty Questionnaire](#_Appendix_FS.1:_Social)  (Click link, or see Appendix FS.1) |  | Yes (8 item) | Subjective questionnaire |
| Social Frailty | [Tilburg Frailty Indicator (social frailty scale)](#_Appendix_FS.2:_Tilburg)  (Click link, or see Appendix FS.2) |  | Yes (2 item)  There were 3 items, but 1 item is identical to the social frailty questionnaire | Subjective questionnaire |
| Social network | [LSNS-6](#_Appendix_FS.3._)  (Click link, or see Appendix FS.3) | Social network is one of the domains of social frailty, as defined by Bunt et al. | Yes (6 item) | Subjective questionnaire |
| Loneliness | [ULCA-3](#_Appendix_FS.4._)  (Click link, or see Appendix FS.4) |  | Yes (3 item) | Subjective questionnaire |
| Mood | [GSD-15](#_Appendix_O.1:_Geriatric)  (Click link, or see Appendix O.1) | How should we link the interpretation of the score with the 3 domains of frailty (physical, cognitive, and social) | Yes (15 item) | Subjective questionnaire |
| Nutrition | [SNAQ](#_Appendix_O.2:_Simplified)  (Click link, or see Appendix O.2) | See above. | Yes (4 item) | Subjective questionnaire |

# Standards for Mobile Health-related Apps

**Source:** https://mhealth.jmir.org/2020/3/e13057/PDF

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Category and Criterion** | | **How did we evaluate?** | **What’s our finding?** | **Did we satisfy the criteria?** |
| **Usability** | |  |  |  |
|  | The app has been tested by potential users before being made available to the public. |  |  |  |
|  | It has instructions or some kind of assistance for use. |  |  |  |
|  | It is easy to use (i.e., navigation is intuitive). |  |  |  |
|  | It follows the recommendations, patterns, and directives in the official manuals of the different operating systems (Android, iOS, or others). |  |  |  |
|  | The interface design follows the same pattern. That is, all graphic elements (typographies, icons, and buttons) have a consistent appearance. The function of each element (navigation menu, lists, and photo gallery) is clearly identified. |  |  |  |
|  | The functionality is adapted to the purpose of the app. |  |  |  |
|  | The information of the app must be able to be accessed in the shortest possible time. All users must be able to access all resources regardless of their capabilities. |  |  |  |
|  | The app can be consulted in more than one language. All languages adapt appropriately to the content interface. |  |  |  |
| **Privacy** | |  |  |  |
|  | The app gives information about the terms and conditions of purchases in the app and personal data recorded. |  |  |  |
|  | It gives information about the kind of user data to be collected and the reason (the app must only ask for user data that is essential for the app to operate). It gives information about access policies and data treatment and ensures the right of access to recorded information. It describes the maintenance policy and the data erasure procedure. It gives information about possible commercial agreements with third parties. |  |  |  |
|  | It guarantees the privacy of the information recorded. It requires users to give their express consent. It warms of the risks of using the app. |  |  |  |
|  | It tells users when it accesses other resources of the device, such as their accounts or their social network profile. |  |  |  |
|  | It takes measures to protect minors in accordance with the current legislation. |  |  |  |
|  | Confidential user data are protected and anonymised, and there is a privacy mechanism so that users can control their data. |  |  |  |
| **Security** | |  |  |  |
|  | The app has encryption mechanisms for storing, collecting, and exchanging information. It has password management mechanisms. |  |  |  |
|  | The cloud services used have the relevant security measures. It states the terms and conditions of cloud services. |  |  |  |
|  | The authorisation and authentication mechanisms protect the users’ credentials and gives access to their data. It limits access to data that is only necessary for the user. |  |  |  |
|  | It detects and identifies cybersecurity vulnerabilities, possible threats, and the risk of being exploited. It applies the appropriate security measures to cybersecurity vulnerabilities in the face of possible threats. |  |  |  |
| **Appropriateness and suitability** | |  |  |  |
|  | The end users for whom the app is designed are explicitly indicated or actually intuitable (the name identifies the app) to the audience to whom it is set out. |  |  |  |
|  | The benefits and advantages of using the app are explained. |  |  |  |
|  | The app has been validated or created by experts (e.g., a group of specialised professionals, a health organisation, or a scientific society). |  |  |  |
| **Transparency and content** | |  |  |  |
|  | The app identifies the authors of the content and their professional qualifications. |  |  |  |
|  | It gives transparent information about the owners’ identity and location. |  |  |  |
|  | It gives information about its sources of funding, promotion and sponsorship, and possible conflicts of interests. Any third parties or organizations who have contributed to the app development are clearly identified. |  |  |  |
|  | It uses scientific evidence to guarantee the quality of the content. It is based on ethical principles and values. |  |  |  |
|  | The sources of the information are indicated. Concise information is given about the procedure used to select the content. |  |  |  |
| **Safety** | |  | | |
|  | The possible risks to users are identified. Users are warned that the app does not intend to replace the services provided by a professional. |  |  |  |
|  | Potential risks for users caused by bad usage or possible adverse effects are explained. |  |  |  |
| **Technical support and updates** | |  |  |  |
|  | It gives a warning if updates modify or affect how the app functions. It gives a warning if updates can influence insensitive data. |  |  |  |
|  | Frequent security updates are guaranteed. Every time an update of a third-party component is published, the change is inspected, and the risk evaluated. |  |  |  |
|  | The frequency with which the content of the app is revised or updated is shown. |  |  |  |
|  | Users have support mechanisms (email, phone, and contact form) for solving doubts, problems, or issues related to the health content, and technical support. |  |  |  |
| **Technology** | |  |  |  |
|  | It works correctly. It does not fail during the use (e.g., blocks). Functions are correctly retrieved after context changes (e.g., switch to another app and return), external interruptions (e.g., incoming calls or messages), and switching off the terminal. |  |  |  |
|  | It does not waste resources excessively: battery, central processing unit, memory, data, or network. |  |  |  |
|  | It can work in flight mode and deal with network delays and any loss of connection. |  |  |  |
|  | It supports multiple versions of data structures or formats (e.g., to support different operating systems). |  |  |  |

# Physical Frailty

## Suggested Measurement and Rationale

The most frequently used measurement of frailty is based on Fried’s phenotype of frailty (Bouillon et al, 2013; Buta, 2016). One of the popular frailty phenotype-based measurement is the **FRAIL** scale (Morley et al., 2012), but it has since been criticised of deviating from Fried’s phenotype by replacing the physical inactivity component with illness (Kim et al., 2020). As a response, the Frailty Phenotype Questionnaire (**FPQ**) was then developed to truthfully reflect Fried’s phenotype of frailty (Kim et al., 2020). The FPQ has been shown to be a better early frailty detection tool than the FRAIL scale in Singapore (Chia et al., 2022).

In contrast with the FRAIL scale and the FPQ, which are observer- or self-reported measurement, the Short Physical Performance Battery (**SPPB**) is one of the objective frailty assessments (Cesari, et al., 2017; Huang & Lam, 2021; Xie et al., 2017). The SPPB (short physical performance battery) uses performance tasks (balance, gait speed, chair sit-to-stand tests) to evaluate lower extremity functioning of older adults.

The IANA (International Academic Nursing Alliance) taskforce recommended to use **gait speed** as an evaluation for frailty in research and clinical practice (Abellan van Kan et al., 2008). Evidence suggested the gait speed (over 4 meters) is predictive of adverse outcome of community-dwelling older adults (Pamoukdjian et al., 2015). Furthermore, the classification of frailty based on the SPPB scores and the Fried’s frailty phenotype-based method were found to have moderate agreement (Pritchard et al., 2017). However, test of gait speed may not be easily self-administered given that the test requires a considerable space and preparation (i.e., individual has to mark the start and end of a linear 4-meter walk space), and therefore, a stationary test (e.g., balance or chair stand test) would be easier to implement as a self-administered self-screening measure.

The European Working Group on Sarcopenia in Older People (EWGSPOP2; Cruz-Jentoft et al., 2019) and the Asian Working Group for Sarcopenia (AWGS2019; Chen et al., 2020) guidelines suggested to use the **5-times sit-to-stand test** to assess lower limb strength to screen for sarcopenia (e.g., muscle weakness). The test measures the time taken for individuals to stand 5 times from a sitting position (straight-backed on an armchair) with their aims folded across their chest with knees bent at a right angle. The performance score of the sit-to-stand test of lower body strength has been found to be one of the best indicators of frail status after the tests of gait speed (Navarrete‑Villanueva et al., 2021).

Therefore, we should consider using FPQ as a self-report tool, and using the sit-to-stand test (SPPB protocol) as an objective performance measurement for frailty screening for the SSHR app. The two tests were not known to be subjected to copyrights from any testing company.

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## Appendix FP.1: Frailty Phenotype Questionnaire

**Note:** Use Chia et al’s (2022) localised version

|  |  |  |  |
| --- | --- | --- | --- |
| **S/N** | **Kim et al.’s (2020) version** | **Chia et al.’s (2022) version (adapted from Kim et al. (2020)** | **Answer options and scoring** |
| 1  Fatigue/ Exhaustion | During the past week, I felt that everything I did was an effort | During the past week, I felt that everything I did was an effort | **Options**  A ~ Rare (less than 1 day/week)  B ~ Sometimes (1-2 days/week)  C ~ Often (3-4 days/week)  D ~ most (over 5 days/week)  **Scoring**  0 = option A or B  1 = option C or D |
| 2  Resistance | By yourself and not using aids, do you have any difficulty walking up 10 stairs without resting? | Difficulty walking up 10 stairs without resting | **Options**  A ~ No  B ~ yes  **Scoring**  0 = option A  1 = option B |
| 3  Ambulation | Do you have any difficulty walking one lap of a playground track (400m) | Difficulty walking 400m (e.g., 1 lap of a running track) | **Options**  A ~ not difficult at all  B ~ a bit difficulty  C ~ very difficult  D ~ unable to do it at all  **Scoring**  0 = option A, B, or C  1 = options D |
| 4  Inactivity | 1. During the past week, how often did you participate in moderate physical activities that make you slightly more breathless than usual such as rapid walking, carrying a light item, cleaning, infant care? (Excluding regular walking) 2. During the past week, how often did you engage in vigorous physical activities, such as vigorous sports, carrying 20 kg or more weights, carrying items up a set of stairs, digging, construction labouring? | 1. During the past week, how often did you participate in moderate physical activities that make you breath somewhat harder than usual, such as brisk walking, gardening, cleaning, bicycling at regular pace, or infant care? (Excluding regular walking) 2. During the past week, how often did you engage in vigorous physical activities, such as vigorous sports, heavy lifting, carrying items up a set of stairs, aerobics, jogging/running or fast bicycling? | **Options**  A ~ More than once per week  B ~ Never  **Scoring**  0 = not 1 (below)  1 = option B for both questions |
| 5  Loss of weight | Was there an unintended weight loss of 4.5kg in the past year? | Loss of >= 5% in the last year | **Options**  A ~ no  B ~ yes  **Scoring**  0 ~ option A  1 ~ option B |

**Overall scoring:** Sum of 5 scores

1. 0 = robust
2. 1 to 2 = pre-frail
3. 3 to 5 = frail

## Appendix FP.2: Short Physical Performance Battery (SPPB)

**Note:** We only implement balance test and chair stand test. We will not implement the gait speed test in V1.0 of the application, due to the limitations of the computer vision in accurately detecting distance.

1. Balance tests (The participant must be able to stand unassisted without the use of a cane or walker.)
   1. Side-by-side stand (stand with your feet together, side-by-side, for about 10 seconds)
   2. Semi-tandem stand (stand with the side of the heel of one foot touching the big toe of the other foot for about 10 seconds)
   3. Tandem stand (stand with the heel of one foot in front of and touching the toes of the other foot for about 10 seconds)
2. ~~Gait speed test (normal walk of 3m or 4m). Use of a cane or walker is allowed)~~
   1. ~~First gait speed test (walk to the other end of the course at your usual speed)~~
   2. ~~Second gait speed test (repeat the walk)~~
3. Chair stand test
   1. Single chair stand (to stand up from a chair once without using your arms)
   2. Repeated chair stand (to stand up from a chair five ~~times~~ without using your arms)

**Suggested Protocol of Chair-stand Test**

1. See for full information, selected key information is presented below:
   1. **Standard height chair** (43-45 cm, 17-18 inches) with a **backrest.**
   2. Using the same chair height is recommended for ongoing assessments to capture change in the patient.
   3. The chair should be free-standing.
   4. Subjects are allowed to place their feet comfortably under them during testing.
   5. it is permissible to allow the individual to move forward in the chair until their feet are flat on the floor.
   6. patient is instructed to **sit with arms folded** across their chest and with **back against the chair**. A patient with hemiplegia can have the **impaired arm at his/her side or in a sling.**
   7. the patient should be encouraged to **avoid touching his/her trunk to the backrest between each repetitio**n to minimize utilization of momentum to complete the sit to stand.

**Scoring for SPPB (**<https://geriatrictoolkit.missouri.edu/SPPB-Score-Tool.pdf>**)**

1. Balance test
   1. Side-by-side stand
      1. 1 point if held for 10 seconds
      2. 0 point if held for lesser than 10 seconds, or not attempted
   2. Semi-tandem stand
      1. 1 point if held for 10 seconds
      2. 0 point if held for lesser than 10 seconds, or not attempted
   3. Tandem stand
      1. 2 points if held for 10 seconds
      2. 1 point if held for 3 to 9.99 seconds
      3. 0 point if held for lesser than 3 seconds or not attempted
2. ~~Gait speed test~~
   1. ~~For 4-meter walk~~
      1. ~~4 points if time is less than 4.82 seconds~~
      2. ~~3 points if time is between 4.82 and 6.20 seconds~~
      3. ~~2 points if time is between 6.21 seconds and 8.70 seconds~~
      4. ~~1 point if time is more than 8.70 seconds~~
      5. ~~0 point if not attempted~~
   2. ~~For 3-meter walk~~
      1. ~~4 points if time is less than 3.62 seconds~~
      2. ~~3 points if time is between 3.62 and 4.65 seconds~~
      3. ~~2 points if time is between 4.66 seconds and 6.52 seconds~~
      4. ~~1 point if time is more than 6.52 seconds~~
      5. ~~0 point if not attempted~~
3. Chair stand test
   1. Repeated chair stand
      1. 4 points if time is 11.19 seconds or less
      2. 3 points if time is between 11.20 seconds and 13.69 seconds
      3. 2 points if time is between 13.70 seconds and 16.69 seconds
      4. 1 point if time is 16.70 seconds or more
      5. 0 point if not attempted or completes stands in more than 60 seconds
4. **~~Overall scoring:~~** ~~Sum of 3 scores~~
   1. ~~10 ~ 12 = robust~~
   2. ~~3 ~ 9 = possible sarcopenia but no mobility disability indicates frailty~~
   3. ~~0 ~ 2 = sarcopenia and mobile disability~~

**Scoring for gait speed (if you choose not to use SPPB scoring guide)**

1. Gait speed > 1.0m/s represents normal gait speed, gait speed <= 1.0m/s represents reduced physical performance (Chen et al., 2020). No known cut-offs score to differentiate between frail and prefrail.
2. Height has been found to affect gait speed in a sample of Singaporeans. Taller individuals tend to have faster gait speed (Pua et al., 2022a). A gender-age-height adjusted predicted-to-observed gait-speed ratio (GS%) is suggested to be used to compare to the threshold cut-off score instead (Pua et al., 2022b).

**Scoring for Chair-stand test (if you choose not to use SPPB scoring guide)**

* + - 1. A gait speed of 1.0 m/s has been found to be concordant to a 5-time chair sit-to-stand time of 11.6 seconds (Chen et al., 2020). Therefore, they recommended a cut-off time-of-completion of 12 seconds or longer for reduced physical performance. No known cut-offs score to differentiate between frail and prefrail.

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## Appendix FP.3: International Physical Activity Questionnaire – Elderly (IPAQ-E)

|  |  |  |
| --- | --- | --- |
| **S/N** | **Items (see screenshot below for the original image)** | **Options** |
| 1 | The first question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.  During the **last 7 days**, how much time did you spend sitting on a week day? | <Q1h> **hours** <Q1m> **minutes per day** |
| 2 | Think about the time you spent walking in the last 7 days. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.  During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?  If <Q2d> != 0, How much time did you usually spend walking on one of those days? | A ~ No walking  B ~ <Q2d> Days  <Q2h> **hours** <Q2m> **minutes per day** |
| 3 | During the last 7 days, on how many days did you do moderate physical activities like gardening, cleaning, bicycling at a regular space, swimming or other fitness activities.  Think *only* about those physical activities that you did for at least 10 minutes at a time. Do not include walking.  If <Q3d> != 0, How much time did you usually spend doing moderate physical activities on one of those days? | A ~ No moderate physical activity  B ~ <Q3d> Days  <Q3h> **hours** <Q3m> **minutes per day** |
| 4 | During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, heavier garden or construction work, chopping words, aerobics, jogging/running of fast bicycling?  Think *only* about those physical activities that you did for at least 10 minutes at a time.  If <Q4d> != 0, How much time did you usually spend doing vigorous physical activities on one of those days? | A ~ No vigorous physical activity  B ~ <Q4d> Days  <Q4h> **hours** <Q4m> **minutes per day** |

**Scoring**



## Appendix FP.4: SARC-F Screen for Sarcopenia

|  |  |  |
| --- | --- | --- |
| **Components** | **Questions** | **SARC-F Score** |
| Strength | Did you experience any difficulty in lifting or carrying 10 pounds (4.5kg)? | None = 0 Some = 1 Great difficulty or unable to lift = 2  Score: \_\_\_\_ |
| Assistance in walking | Did you experience any difficulty in walking across a room? | None = 0 Some = 1 Great difficulty, use aids, or unable to walk = 2  Score: \_\_\_\_ |
| Rising from a chair | Did you experience any difficulty in transferring from a chair or bed? | None = 0 Some = 1 Great difficulty or unable to transfer without help = 2  Score: \_\_\_\_ |
| Climbing stairs | Did you experience any difficulty in climbing a flight of 10 steps? | None = 0 Some = 1 Great difficulty or unable to climb = 2  Score: \_\_\_\_ |
| Falls | Did you experience any falls in the past year? | None = 0 1–3 falls = 1 4 or more falls = 2  Score: \_\_\_\_ |
| Total (sum) score: \_\_\_\_ (>=4 predictive of sarcopenia) | | |

**Overall scoring:** Sum of 5 scores

1. < 4 ~ robust
2. >=4 ~ risk for developing sarcopenia

## Appendix: Other Known Measurements

1. Comprehensive Frailty Assessment Instrument (CFAI) – physical subscale
   1. de Witte et. al (2013), based on Gobben’s (2010) integral model of frailty
   2. Physical sub-scale (4 self-report items)
      1. less demanding activities
      2. walking up a hill or stairs
      3. bending or lifting
      4. going for a walk
2. Edmonton Frailty Scale – physical task
   1. Rolfson et. al (2006), theory unknown (likely cumulative deficit model)
   2. Functional performance
      1. Timed get-up-and-go
3. Groningen Frailty Index – physical items
   1. Steverink et. al (2001), theory unknown
   2. Daily activities (5 self-report items)
      1. shopping
      2. walking outdoors
      3. dressing and undressing
      4. going to the toilet
      5. physical fitness
4. Tilburg Frailty Indicator – physical subscale
   1. Gobbens et. al (2020), their own integral model of frailty
   2. Physical subscale (8 self-report items)
      1. Do you feel physically healthy?
      2. Have you lost a lot of weight recently without wishing to do so (a lot = 6kg or more during the last 6 months or 3kg or more during the last month)
      3. difficulty in walking
      4. difficulty maintaining your balance
      5. poor hearing
      6. poor vision
      7. lack of strength in your hands
      8. physical tiredness

# Cognitive Frailty

## Suggested Measurement and Rationale

Kelaiditi et al. (2013) proposed to characterize cognitive frailty as a simultaneous manifestation of physical frailty and cognitive impairment, with the exclusion of concurrent Alzheime’'s Disease dementia or other form of dementias. They proposed to use the Clinical Dementia Rating (CDR) to classify individuals who exhibit mild cognitive impairment (CDR = 0 represents normal cognitive functioning, CDR = 0.5 represents cognitive impairment). However, they also acknowledge that a comprehensive cognitive assessment to measure executive functions and memory should be used to evaluate cognitive impairment (e.g., MoCA, MMSE, ASAD-Cog).

The definition of cognitive frailty was further refined by Ruan et al. (2015) by their proposal of two subtypes of cognitive frailty with connection to pre-frail and frail: potentially reversible cognitive frailty, and reversible cognitive frailty. The degree of cognitive impairment of individual with potentially reversible cognitive frailty should be of mild cognitive impairment (MCI; as defined by Kelaiditi et al., 2013), while individual with reversible cognitive frailty is characterized by a pre-MCI subjective cognitive decline (**SCD**).

SCD is defined as having self-experienced persistent decline in cognitive capacity compared with previously normal status and unrelated to any acute event including illness or substance use (SCD-I Working Group, 2014, as cited in Ruan et al., 2020). Ruan et al. (2020) suggested the use of the Subjective Cognitive Decline Questionnaire to screen for SCD, and the use of the Rapid Cognitive Screen (RCS) for assessment of MCI.

The table below shows the combinations of physical frailty and cognitive status, and their relations to the definitions of cognitive frailty proposed by Kelaiditi et al. (2013) and Ruan et al. (2015).

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Physical Frailty** | | |
| **Cognitive Status** (without concurrentdiagnosis of dementia) | Robust | Pre-frail | Frail |
| Normal | N/A | N/A | N/A |
| Pre-MCI SCD | N/A | Ruan et al.’s (2015) definition of reversible cognitive frailty | Ruan et al.’s (2015) definition of reversible cognitive frailty |
| MCI | N/A | Ruan et al.’s (2015) definition of potentially reversible cognitive frailty | Ruan et al.’s (2015) definition of potentially reversible cognitive frailty  Kelaiditi et al.’s (2013) definition of cognitive frailty |

**Clock-Drawing Test as Objective Test**

MMSE has been found to be the most commonly used tool for the measurement of cognitive impairment in the cognitive frailty research (Azzapardi et al., 2018). The MMSE consists of tasks or questions on orientation, registration, attention and calculation, recall, language, and copying. However, it should be noted that MMSE is copyrighted by PAR (Psychological Assessment Resource) and a license has to be purchased for its use (Newmann & Feldman, 2011). Other challenges of selecting an objective test other than licensing fee is the need for trained personnel to administer the test (i.e., not self-administered).

Reviews on measurement of mild cognitive impairment also found the Clock Drawing Test (CDT) to be the more frequently used tool in the literature, other than MMSE, among other tests (Chun et al, 2021; Lin et al., 2013). The CDT is a global measurement of multiple domains of cognitive function, including attention, working memory, visuospatial abilities, and executive functions (Mainland & Shulman, 2013).

The test takers are given a pre-drawn circle and are instructed to complete the clock by filling it with the numbers and place the hour and minute hands to indicate a specific time. The CDT is traditionally a paper-and-pencil test. Ehreke et al. (2010) advised against the use of CDT to screen for MCI, but the digital implementation of CDT has been found to perform as well as, if not better, than the paper-and-pencil version in the classification of MCI, with an average sensitivity (true positive rate) of 86% and specificity (true negative rate) of 92% (Chan et al., 2022).

An implementation challenge, other than the digital technical aspect of it, is the choice of CDT administration and scoring protocol (see Spenciere et al, 2017, for a review) that maximises the screening accuracy in our research. The cut-off score for MCI detection depends on the scoring protocol. Rakusa et al (2018) suggested a simplified scoring protocol (1 point for a properly placed number 12; 1 point for properly placed numbers 3, 6 and 9; and 1 point each for properly placed clock hands) and proposed a cut-off score of 3 (over 4) and above as healthy individual (non-MCI).

The CDT is in the public domain (see <https://www.cgakit.com/m-1-clock-test>).

**Subjective Cognitive Decline Questionnaire (SCD-Q; Part 1: MyCog Form) as Subjective Measure**

A recent systematic review of existing self-reported subjective cognitive decline measurements concluded that the measurements lack development and validation standards (Ibnidris et al., 2022). Therefore, adopting Ruan et al.’s (2015) suggestion to use the SCD-Q to screen for pre-MCI subjective cognitive decline may be optimal. The SCD-Q is a 24-item scale that assess self-perceived change in language, memory, and executive function within a 2-year timeframe (Rami et al., 2014). It has a self-reported (Part 1: MyCog) and a separate informant-report (Part 2: TheirCog) section, and the response options are dichotomous (yes/no). A cut-off score of 7 was suggested to be used for the self-reported section to indicate cognitive decline. No known copyright.

|  |  |  |
| --- | --- | --- |
| **SCDQ**  **CDT** | SCDQ (0 ~ 6) | SCDQ (7 ~ 24) |
| CDT (3 ~ 4) = non-MCI | Non-MCI + non-SCD (normal) | **Non-MCI + SCD** |
| CDT (0 ~ 2) = MCI | **MCI + non-SCD** | **MCI + SCD** |

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## Appendix FC.1: Clock Drawing Test

This circle represents a clock face. Please put in the numbers so that it looks like a clock and

then set the time to 10 minutes past 11.

A picture containing lamp

Description automatically generated

## Appendix FC.2: AD8 Dementia Screening Interview

|  |  |
| --- | --- |
| **S/N** | **Items (see screenshot below for original image)** |
| 1 | Problems with judgement (e.g., problems making decisions, bad financial decisions, problems with thinking). |
| 2 | Less interest in hobbies/activities. |
| 3 | Repeats the same things over and over (questions, stories, or statements) |
| 4 | Trouble leaning how to use a tool, appliance, or gadget (e.g., VCR, computer, microwave, remote control). |
| 5 | Forgets correct month or year. |
| 6 | Trouble handling complicated financial affairs (e.g., balancing checkbook, income taxes, paying bills) |
| 7 | Trouble remembering appointments. |
| 8 | **Daily** problems with thinking and/or memory. |

**Instructions:** Has there been a change in the last several years caused by cognitive (thinking and memory) problems.

**Options for all 8 items:**

1. Yes (a change)
2. No (no change)
3. N/A (don’t know)

**Scoring:**

1. Count the number of items rated “Yes”

**Cut-off score using participant self-rated AD8**

* Normal: 0 ~ 1
* Cognitive impairment: 2 and above

Table

Description automatically generated

**Reference**

Chin R, Ng A, Narasimhalu K, Kandiah N. Utility of the AD8 as a Self-Rating Tool for Cognitive Impairment in an Asian Population. American Journal of Alzheimer’s Disease & Other Dementias®. 2013;28(3):284-288. doi:10.1177/1533317513481090

## Appendix FC.3: Abbreviated Mental Test

Table

Description automatically generated

The optimal cut-off of AMT adjusted for education is 6/8 (screen positives were defined as AMT score ≤6 among those with ≤6 years of formal education, or AMT score ≤8 among those with >6 years of formal education), which has been previously validated in Singapore (Sahadevan et al., 2000).

## Appendix FC.4: Elderly Cognitive Assessment Questionnaire (ECAQ)

A picture containing text

Description automatically generated

## Appendix FC.5: Subjective Cognitive Decline Questionnaire (SCD-Q; Part 1: MyCog Form)

***Below is a list of activities. Please answer YES if you believe you perform them WORSE than roughly two years ago***.

1. I find it harder to learn new telephone numbers. (Yes = 1; No = 0)  
2. I find it harder to find personal possessions (keys, telephone, utensils, etc.).  
3. I find it harder to describe the plots of films.  
4. I find it harder to remember doctor’s appointments.   
5. I find it harder to follow the plot of a book.   
6. I’m worse at recalling the details of a recent family event.  
7. I find it harder to remember the result of a recent sporting event.  
8. I find it harder to remember sums of money (payments or debts).  
9. I find it harder to remember the details of a conversation.  
10. I find it harder to remember things without using strategies (lists, diary, etc.).  
11. I find it harder to remember the details of recent news.  
12. I find it harder to remember famous people’s names.  
13. I find it harder to remember the names of people I’ve met recently.  
14. I find it harder to remember street and city names.  
15. I’m worse at finding the word I want to use in a conversation.  
16. I find it harder to understand things the first time someone says them.  
17. I find it harder to remember the names of places I’ve visited recently.  
18. I find it harder to concentrate on what I am doing.  
19. I’m worse at planning things that aren’t part of my daily routine (travel, excursions, etc.).  
20. I find it harder to use electronic devices.   
21. I find it harder to start new or different things  
22. I find it harder to start conversations.   
23. I find it harder to do mental arithmetic.   
24. I find it harder to do more than one thing at once without getting agitated

## Appendix FC.6: Informant Questionnaire on Cognitive Decline in the Elderly (IQCODE)

Multiple versions available, see <https://nceph.anu.edu.au/research/tools-resources/informant-questionnaire-cognitive-decline-elderly>

This is the short 16-item version:

1. Remembering things about family and friends e.g. occupations, nirthdays, addresses

2. Remembering things that have happened recently

3. Recalling conversations a few days later

4. Remembering his/her address and telephone number

5. Remembering what day and month it is

6. Remembering where things are usually kept

7. Remembering where to find things which have been put in a different place from usual

8. Knowing how to work familiar machines around the house

9. Learning to use a new gadget or machine around the house

10. Learning new things in general

11. Following a story in a book or on TV

12. Making decisions on everyday matters

13. Handling money for shopping

14. Handling financial matters e.g. the pension, dealing with the bank

15. Handling other everyday arithmetic problems e.g. knowing how much food to buy, knowing how long between visits from family or friends

16. Using his/her intelligence to understand what's going on and to reason things through

## Appendix: Other Known Measurements

1. Montreal Cognitive Assessment (MoCA)
   1. Nasreddine et al (2005), developed based on expert’s opinion on mild cognitive impairment
   2. Cognitive domains
      1. Visuospatial/Executive,
      2. Naming,
      3. Memory,
      4. Attention,
      5. Language,
      6. Abstraction,
      7. Delayed Recall
      8. Orientation (to time and place)
2. Mini Mental State Examination (MMSE)
   1. Folstein et al (1975), test of cognitive function
   2. Cognitive domains
      1. Visuospatial
      2. Language
      3. Concentration
      4. Working memory
      5. Orientation
3. Alzheimer’s Disease Assessment Scale – cognitive subscale (ADAS-Cog)
   1. Rosen et al (1984), theory unknown, measure cognitive and non-cognitive of Alzheimer’s disease
   2. Cognitive subscale (tasks)
      1. Memory
         1. Word recall
         2. Word recognition
         3. Remembering instructions
         4. orientation
      2. Language
         1. Naming (fingers and objects)
         2. Word finding difficulty.
         3. Following oral commands
         4. Expressive language
         5. comprehension
      3. Praxis
         1. Constructional (drawing task)
         2. Ideational (actions sequence)
4. Clinical Dementia Rating (CDR)
   1. Berg (1988), measure severity of dementia
   2. Cognitive domain (doctor’s evaluation)
      1. Memory
      2. Orientation
      3. Judgement and problem solving
      4. Community affairs
      5. Home and hobbies
      6. Personal care
5. Edmonton Frail Scale – cognitive task
   1. Rolfson et al (2006), theory unknown (likely cumulative deficit model)
   2. Cognition (task)
      1. Draw-a-clock task

## Appendix: Comparison of Cognitive Domains in Cognitive Tests

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **DSM-5 Domains** | **MMSE** | **MoCA** | **CDT** | **AMT** | **ECAQ** | **AD8** |
| Language | Y | Y | N | N | N | N |
| Learning and memory | Y | Y | N | Y | Y | Y |
| Social cognition | N | N | N | N | N | N |
| Perceptual-motor function | Y | Y | Y | N | N | N |
| Executive function | Y | Y | Y | N | N | Y |
| Complex attention | Y (serial 7) | Y | N | Y | N | Y |

DSM-5 domains: <https://escholarship.org/content/qt77g8t63q/qt77g8t63q_noSplash_59d7fbd60fc063e6dba5c393fe7ea300.pdf?t=qiico5>

Domains of MMSE vs. MoCA: <https://bmcpsychiatry.biomedcentral.com/articles/10.1186/s12888-021-03495-6/tables/1>

MMSE = Mini Mental State Exam

MoCA = Montreal Cognitive Assessment

CDT = Clock-draw test

AMT = Abbreviated Mental State

ECAQ = Elderly Cognitive Assessment Questionnaire

# Social Frailty

## Methodology

The electronic searchers were performed on October 4, 2022. The electronic databases searched were MEDLINE, EMBASE, CINAHL, PsycINFO, and Web of Science. The complete search strategy used in EMBASE (see Table 1) was adapted to the other sources. The references were then screened for duplications in EndNote X9 and they were then imported into the Covidence web application for a secondary duplication screening. A total of 1561 records were included in the review.

Table 1. Search strategy used in EMBASE and adapted to the other electronic sources

|  |  |
| --- | --- |
| Strategy | Descriptors |
| 1 | frailty/ |
| 2 | (frail\* or“"frailty syndrom”" or prefrail or“"pre frai”").ab,ti. |
| 3 | 1 or 2 |
| 4 | “"frailty assessment”" or“"frailty criteria”" or“"frailty inde”" or“"frailty indicator”" or“"frailty instrument”" or“"frailty measure”" or“"frailty phenotype”" or“"frailty scale”" or“"frailty score”").ab,ti. |
| 5 | ((assess\* or identif\* or instrument? or tool? or recogni\* or screen\* or measur\* or detect\* or factor?) adj4 frail\*).ab,ti. |
| 6 | 4 or 5 |
| 7 | 3 and 6 |
| 8 | exp aged/ |
| 9 | “"aged patient”" or“"aged peopl”" or“"aged person”" or“"aged subject”" or elders or elderly or seniors or“"older adult”" or“"older patient”" or“"older peopl”" or“"older person”" or“"older subject”" or“"old ag”" or“"older adulthoo”" or“"late adulthoo”" or geriatric or senium).ab,ti. |
| 10 | “"aged 6”" or“"aged 6”" or“"aged 7”" or“"aged 7”" or“"aged 8”").ab,ti. |
| 11 | 8 or 9 or 10 |
| 12 | 7 and 11 |
| 13 | (social or socio\*).ab,ti. |
| 14 | 12 and 13 |
| 15 | limit 14 to English language and yr”"2018–- 202”") |

The following criteria were used to screen the 1561 records to be included in the data extraction:

1. Inclusion criteria
2. Reference to social frailty as a variable in the title or abstract, or
3. Studies that describe the development of a social frailty measurement (or part of a multidimensional measurement), or
4. Studies that assess or identify social frailty using either a single-dimension or multi-dimensional scale
5. Exclusion criteria
6. Study that does not contain information on the measurement of social frailty, or
7. Study that translates a measurement from a source language to another target language, or
8. Study that describes protocol of studies, or
9. Study that contains reviews of published papers (e.g., systematic reviews, scooping reviews, narrative reviews, etc.)

Five reviewers independently screened and selected the abstract and full-text of the records. Each record was screened by two independent reviewers. Cases of disagreement were resolved by consensus. The data extraction was carried out independently by a pair of reviewers using a pre-prepared form, disagreements were resolved by a third reviewer.

## Results (as of 16 March, 2023)

The electronics search returned a total of 2032 records. After removing duplicates (n = 468), 1554 records remained. These records were reviewed against the inclusion/exclusion criteria and irrelevant studies (n = 1187) were removed, resulting in 354 studies. The reading of these 354 remaining full-text led to exclusion of 168 studies (mainly for not containing information on the measurement of social frailty; 153/168 \* 100%= 91%). Accordingly, 186 studies were included in the full-text data extraction (see Figure 1).

Data extraction is currently on-going.

|  |
| --- |
|  |
| Figure 1. Study flow diagram |

## Appendix FS.1: Social Frailty Questionnaire

This questionnaire was put together by Pek et al. (2020) by initially combining items from various social frailty scales based on Bunt’s framework of frailty, and running and EFA to reduce the items to eventually 8:

* five items from Makizako et al. and Tsutsumimoto et al.
* two items from Tanaka et al.; and
* two items from Teo et al.

|  |  |  |
| --- | --- | --- |
| **S/N** | **Items** | **Options & Scoring** |
| 1 | Do you sometimes visit your friends? | Yes = 0  No = 1 |
| 2 | Do you turn to family or friends for advice? | Yes = 0  No = 1 |
| 3 | Do you have someone to confide in? | Yes = 0  No = 1 |
| 4 | Do you go out less frequently compared with last year? | Yes = 1  No = 0 |
| 5 | Do you eat with someone at least one time in a day? | Yes = 0  No = 1 |
| 6 | Are you limited by your financial resources to pay for needed medical service? | Yes = 1  No = 0 |
| 7 | Do you live alone? | Yes = 1  No = 0 |
| 8 | Do you talk with someone every day? | Yes = 0  No = 1 |

**Scoring:** Sum of 5 scores

1. 0 to 1= robust
2. 2 to 3 = pre-frail
3. 4 to 8 = frail

**Reference**

Pek, K., Chew, J., Lim, J. P., Yew, S., Tan, C. N., Yeo, A., Ding, Y. Y., & Lim, W. S. (2020). Social Frailty Is Independently Associated with Mood, Nutrition, Physical Performance, and Physical Activity: Insights from a Theory-Guided Approach. International journal of environmental research and public health, 17(12), 4239. https://doi.org/10.3390/ijerph17124239

## Appendix FS.2: Tilburg Frailty Indicator (TLI)

The Tilburg Frailty Indicator (TFI) is a self-report user-friendly questionnaire for assessing multidimensional frailty (physical, psychological, social) among community-dwelling older people.

Social frailty items

1. Do you live alone (yes, no) [**Not used, already in the social frailty scale in FS.1**]
2. Do you sometimes miss having people around you? (Yes, sometimes, No)
3. Do you receive enough support from other people (Yes, No)

|  |  |  |
| --- | --- | --- |
| **S/N** | **Items** | **Options & Scoring** |
| 1 | Do you live alone? [no need to ask, get the response from FS.1 Q7] | Yes = 1  No = 0 |
| 2 | Do you sometimes miss having people around you? | Yes = 1  Sometimes = 0.5  No = 0 |
| 3 | Do you receive enough support from other people? | Yes = 0  No = 1 |

**Scoring:** Sum of 3 scores (no known cut-off score)

**Reference**

Gobbens, R. J., Boersma, P., Uchmanowicz, I., & Santiago, L. M. (2020). The Tilburg Frailty Indicator (TFI): New Evidence for Its Validity. Clinical interventions in aging, 15, 265–274. https://doi.org/10.2147/CIA.S243233

## Appendix FS.3. Lubben social network scale (LSNS-6)

|  |  |
| --- | --- |
| **S/N** | **Items** (see screenshot below for the original image) |
| 1 | How many relatives do you see or hear from at least once a month |
| 2 | How many relatives do you feel at ease with that you can talk about private matters? |
| 3 | How many relatives do you feel close to such that you can call on them for help? |
| 4 | How many of your friends do you see or hear from at least once a month? |
| 5 | How many friends do you feel at ease with that you can talk about private matters? |
| 6 | How many friends do you feel close to such that you could call on them for help? |

**Options for all items**

1. None
2. One
3. Two
4. Three or four
5. Five to eight
6. Nine or more

**Scoring:** Sum of 6 scores

1. 0 to 1= robust
2. 2 to 3 = pre-frail
3. 4 to 8 = frail

**Cut-off**

* Total score < 12 ~ at risk of social isolation
* Total score >= 12 ~ Normal

Text, letter

Description automatically generated

## Appendix FS.4. UCLA (loneliness Scale)

|  |  |
| --- | --- |
| **S/N** | **Items** (see screenshot below for the original image) |
| 1 | How often do you feel that you lack companionship? |
| 2 | How often do you feel left out? |
| 3 | How often do you feel isolated from others? |

**Options for all items**

1. Hardly ever
2. Some of the time
3. Often

**Scoring:** Sum of 3 scores

**Cut-off**

* Total score: 3 to 5 ~ not lonely
* Total score: 6 to 9 ~ Lonely

Text

Description automatically generated

Reference: <https://www.icmha.org/wp-content/uploads/2020/02/UCLA-Loneliness-Scale.pdf>

# Other Suggested Additional Constructs

## Appendix O.1: Geriatric Depression Scale (GSD-15)

|  |  |  |
| --- | --- | --- |
| **S/N** | **Items** | **Options & Scoring** |
| 1 | Are you basically satisfied with your life? | Yes = 0, No = 1 |
| 2 | Have you dropped many of your activities and interests? | Yes = 1, No = 0 |
| 3 | Do you feel that your life is empty? | Yes = 1, No = 0 |
| 4 | Do you often get bored? | Yes = 1, No = 0 |
| 5 | Are you in good spirits most of the time? | Yes = 0, No = 1 |
| 6 | Are you afraid that something bad is going to happen to you? | Yes = 1, No = 0 |
| 7 | Do you feel happy most of the time? | Yes = 0, No = 1 |
| 8 | Do you often feel helpless? | Yes = 1, No = 0 |
| 9 | Do you prefer to stay at home, rather than going out and doing new things? | Yes = 1, No = 0 |
| 10 | Do you feel you have more problems with memory than most? | Yes = 1, No = 0 |
| 11 | Do you think it is wonderful to be alive now? | Yes = 0, No = 1 |
| 12 | Do you feel pretty worthless the way you are now? | Yes = 1, No = 0 |
| 13 | Do you feel full of energy? | Yes = 0, No = 1 |
| 14 | Do you feel that your situation is hopeless? | Yes = 1, No = 0 |
| 15 | Do you think that most people are better off than you are? | Yes = 1, No = 0 |

**Instructions:** Choose the best answer for how you felt over the past week

**Scoring (sum of the scores):**

* Score >= 10 ~ depression
* Score = 5 ~ 9 ~ risk of depression
* Score < 5 ~ normal

Text

Description automatically generated

## Appendix O.2: Simplified Nutritional Appetite Questionnaire (SNAQ)

|  |  |  |
| --- | --- | --- |
| **S/N** | **Items** | **Options & Scoring** |
| 1 | My appetite is | 1. Very poor 2. Poor 3. Average 4. Good 5. Very good |
| 2 | When I eat | * + - 1. I feel full after eating only a few mouthful       2. I feel full after eating about a third of a meal       3. I feel full after eating over half a meal       4. I feel full after eating most of the meal       5. I hardly ever feel full |
| 3 | Food tastes | * + - 1. Very bad       2. Bad       3. average       4. Good       5. very good |
| 4 | Normally I eat | * + - 1. less than one meal a day       2. one meal a day       3. two meals a day       4. three meals a day       5. more than three meals a day |

**Instructions:** Complete the questionnaire by selecting your answers.

**Scoring (sum of the 4 scores):**

* score < 14 ~ risk of at least 5% weight loss within six months
* score >= 14 ~ normal

Text

Description automatically generated

**Reference:**

Wilson, M. M., Thomas, D. R., Rubenstein, L. Z., Chibnall, J. T., Anderson, S., Baxi, A., Diebold, M. R., & Morley, J. E. (2005). Appetite assessment: simple appetite questionnaire predicts weight loss in community-dwelling adults and nursing home residents. The American journal of clinical nutrition, 82(5), 1074–1081. https://doi.org/10.1093/ajcn/82.5.1074