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STANDARDIZED MINI-MENTAL STATE EXAMINATION

[SMMSE]

A USER'S GUIDE

Dr. D. William Molloy  
and  
Dr. Roger Clarnette

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1. Cognition testing
2. Cognition screening
3. Cognition measurement instrument

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 Ron and Gina Fraser.

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## 1.0 Introduction

The population is aging. Elderly frail adults are the most rapidly growing group in developed countries. More and more physicians are coming to recognize 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 standardized 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 health-care 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 Standardized 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.

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. Intra-class 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 ( $p < 0.004$ ).

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.

## 2.0 General Guidelines

### 2.1 Set Up

Before setting up, raters ensure that subjects have hearing and vision aids to maximize communication. Hearing is tested by asking "What is your name?" Subjects are advised that they will be asked some questions; "Would it be all right to ask you some questions about your memory?" Raters should have their props ready (pencil and paper). Raters also need a clock to measure time. Laminated cards are provided, printed with "CLOSE YOUR EYES" and the two five-sided figures to standardize these parts of the test.

### 2.2 Administration

The rater introduces the test by saying, "I am going to ask you some questions and give you some problems to solve. Please try to answer as best you can." The SMMSE provides exact verbatim instructions to administer each item in the test. Raters should ask questions exactly as they appear in the SMMSE.

### 2.3 Scoring

Raters are trained to score responses. Some tasks are easier than others. For example, when one reads the statement "Close your eyes," if subjects close their eyes, they score a point. If they do not, they lose a point. Other parts of the test are not so easy. Scoring the spelling of "World" backwards can be problematic given the permutations and combinations of potential responses. Explicit instructions are provided to score this task. Basically, superimpose the answer on the correct template and score the number of letters occurring in the correct order to give the subject the maximum number of points.

Problems can arise in scoring the orientation to place. For example, country, province/state/county, city/town, building and floor are asked in order of size from the largest geo-political unit to the smallest. Decide in advance what will be accepted as correct answers. In general, use the local terms people use to describe their location. In some cases, if county is more important than state, then this is used.

The name of the building may be problematic. We work in the Henderson site of the Hamilton Civic hospitals,

called after Nora Francis Henderson who helped found it. We merged with the Chedoke-McMaster hospitals and are now known as the Hamilton Health Sciences Corporation. We score a correct point for any of these because this is so confusing.

We work on the ground floor, if you come in one entrance. We are in the basement if you come in another. We accept basement, ground or main floor. In the community, the instructions and scoring can be modified to ask "What street is this?" and "What room is this?" or "What number is this house?".

#### 2.4 Time Limits

We have provided time limits for each answer. Raters begin to time from the end of the instruction. Subjects are not told they are being timed and this is measured inconspicuously to avoid added pressure. If the subject takes longer than the allotted time, the rater says "Thank you, that was fine" and proceeds to the next question. If the subject is trying hard to complete a task, for example, the five sided figures and goes over time, the rater does not interrupt until the person is finished and scores the task at the one minute mark. The subject will not score the point if it was not completed during the allotted time period. If subjects give more than one answer, score the last answer only.

#### 2.5 Props

The props are a potential source of variability in the administration and scoring. If it is left to the rater to write out "Close Your Eyes" or to draw the two five-sided figures, they can be hand written on the spur of the moment on scraps of paper. The quality of the example can vary widely. The SMMSE provides the instruction "Close Your Eyes" and the two five-sided figures on opposite sides of a laminated card. They are in large plain font, clearly written and easy to read.

#### 2.6 Registration

The MMSE originally offered three words "Apple," "Table," and "Penny" to test registration and recall. In some cases, where subjects were tested repeatedly, as soon as the rater said "I am going to name three objects and I want you to repeat them back to me," even before they said the words, the subject offered "Apple, Table, Penny." It became obvious that we needed alternate forms of these three words. We created alternate three-word sets with the same word frequency e.g., "Ball, Car, Man" and "Bull, War, Pan." The rater slowly names the three objects to test the subject's ability to register this new information. The rater may not repeat the words, so it is important to say them clearly and control for distractions during this task. The subject is given 20 seconds to repeat them. One point is given for each word correctly recalled after the first administration. The order of recall is not important. After the subject has recalled as many as he or she can, the rater scores the number of correct items recalled.

If the subject has not repeated (registered) the three words, the rater can then help the subject to register the three items for the delayed recall task. The rater says the words at one second intervals and then asks the subject to repeat the words until all three are repeated. The rater can repeat until they are learned, to a maximum of five times. The subject is then advised that he or she will be asked to recall them later. "Remember these words because I am going to ask you to name them later."

#### 2.7 "WORLD"

In this task the subject is asked to spell "World." After successfully spelling it, he or she is asked to spell it backwards. The number of letters in the correct (reverse) order is the score. A simple method of scoring this task and a list of possible answers and examples is provided. (sec. 4.2 Scoring WORLD Backwards)



### 2.8 Serial Sevens

The serial seven task is presented as an alternative to spelling "World" backwards. The two tasks are not equivalent. The serial seven 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.

### 2.9 Watch and Pencil

Subjects are asked to name a watch and pencil. Use a traditional wooden pencil with an eraser on the end. Use a watch with traditional face. "Clock" or "time" are not accepted. Ten seconds are allowed for each.

### 2.10 "No ifs, ands or buts"

Subjects are asked to repeat this phrase. Subjects have ten seconds to respond and must say the phrase verbatim. Raters should enunciate the phrase clearly, because subjects with high frequency hearing loss (presbycusis) may not hear the sibilants and will repeat "No if, and or but." This is a clue that there is high frequency hearing loss and these subjects should have their hearing assessed.

### 2.11 Write Sentence

The subject is given the pencil and paper and asked to write a complete sentence. Thirty seconds are given and the sentence must have a subject, verb and object. Spelling mistakes are ignored.

### 2.12 Overlapping Pentagons

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.

### 2.13 Folding Paper

The rater holds up a piece of paper and says "Take this piece of paper in your (non-dominant) hand, fold the paper in half once with both hands and put it down on the floor." Thirty seconds are allowed and one point is given for each step properly executed. The non-dominant hand is used because people will automatically take objects with their dominant hand. This test is given at the end so the rater can observe the hand that the person used to write in the previous task. If the subject uses the right hand say "Take this piece of paper in your left hand" and vice versa. When you give the instructions, hold the piece of paper out in front of the person, out of reach, and do not allow the person to take the paper until you have given the three instructions. Hold the paper in the subject's midline and push it forward when you have given the instructions, not before.

After each task we recommend using an encouraging remark such as, "Well done! That was very good. Now, if you don't mind, I would like you to"

If the subject asks "How was that?", we usually respond with "Very good." If the subject asks "Are we finished now?" we reply "Almost. You are doing very well. If you don't mind, I would like you to."

**STANDARDIZED MINI-MENTAL STATE EXAM  
(SMMSE)**

**3.0 ADMINISTRATION**

Introduce yourself and try to get the subject's confidence. Before you commence, get the subject's permission to ask questions.

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

If the subject answers incorrectly, score 0. Do not hint, prompt, or provide any physical clues such as head shaking. Do not ask the question again.

If the subject answers "What did you say?", do not explain or engage in conversation. Simply repeat the question to a maximum of three times.

If the subject interrupts e.g. "What is this for?" - just reply: I will explain in a few minutes, when we are finished. Now if we could just proceed please...."

If the subject exceeds the time limit, but seems to be struggling with an answer, do not cut them off. Allow them to answer the question, but mark them accordingly e.g. score 0 for not answering within the allowed time limit.

The following equipment is required to administer the instrument:

- a watch
- a pencil
- blank paper
- "CLOSE YOUR EYES" card
- copy of two 5-sided figures,  
intersecting to make a 4-sided figure

**Section 1 - Orientation**

[Allow 10 seconds for each reply]

[Score 1 point for each correct answer]

Say: *I am going to ask you some questions and give you some problems to solve. Please try to answer the best that you can.*

1. Ask: **What year is this?**  
[Accept exact answers only, taking the last answer given]
2. Ask: **What season is this?**  
[During last week of old season or the first week of a new season, accept either season]
3. Ask: **What month is this?**  
[On the first day of the month or, on the last day of the month, accept either month]
4. Ask: **What is today's date?**  
[Accept previous or next day's date, e.g. on the 7th, accept the 6th or 8th.]
5. Ask: **What day of the week is this?**  
[Accept exact answers only]
6. Ask: **What country are we in?**  
[Accept exact answers only]
7. Ask: **What province/state/county are we in?**  
[Accept exact answers only]
8. Ask: **What city/town/etc. are we in?**  
[Accept exact answers only]

9. (In Home)  
Ask: **What is the street address of this house?**  
[Accept street name and house number, or equivalent in rural areas]

(In Community or clinic)

- Ask: **What is the name of this building?**  
[Decide ahead of time what is a reasonable, acceptable answer, and accept that answer only]

10. (In Home)  
Ask: **What room are we in?**  
[Accept exact answers only]

(In Community)

- Ask: **What floor of the building are we on?**  
[Accept exact answers only]

## Section 2 - Cognition

11. Say: **I am going to name three objects. After I have said all three objects, I want you to repeat them. Remember what they are, because I am going to ask you to name them again in a few minutes.**

[Say them slowly at approximately 1 second intervals]

Ball Car Man

For repeated use: Bell Jar Fan  
Bill Tar Can  
Bull War Pan

Say: **Please repeat the three items for me**

[Score 1 point for each correct reply on the **first** attempt.  
Allow 20 seconds for reply, if subject did not repeat all three, repeat until they are learned, or up to a maximum of 5 times, but only score first attempt]

12. Say: **Spell the word WORLD.**  
[Only repeat to a maximum of three times until the subjects understand]  
[You may help the subject to spell it correctly. If the subject cannot spell it, even with assistance, score 0]

Say: **Now spell it backwards please.**

[Allow 30 seconds to spell backwards]  
[Score one point for each letter given in the correct reverse order.]

[See examples of SMMSE spelling 'WORLD' backwards Scoring in 4.2]

13. Ask: **Now what were the three objects that I asked you to remember?**  
[Allow 10 seconds for each reply]  
[Score 1 point for each correct response regardless of order.]

14. [Show wristwatch]  
Ask: **What is this called?**  
[Allow 10 seconds for each reply]  
[Score 1 point for correct response]  
[Accept only wristwatch, watch, or timepiece]

15. [Show pencil]  
Ask: **What is this called?**  
[Allow 10 seconds for each reply]  
[Score 1 point for correct response. Accept "pencil" only]

16. Say: **I'd like you to repeat this phrase after me: "no ifs, ands or buts"**  
[Allow 10 seconds for each reply]  
[Score 1 point for correct repetition - must be exact]

17. [Hand subject the card with 'CLOSE YOUR EYES' on it.]  
Say: **Please read the words on this card and then do what it says.**  
[Allow 10 seconds. Repeat instructions up to three times if necessary]  
[Score 1 point only if subject closes eyes]

18. [Hand subject a pencil and paper.]  
 Say: **Write any complete sentence on that piece of paper for me.**  
 [Allow 30 seconds.]  
 [Score 1 point if the sentence contains a subject, verb and object, and makes sense. Ignore spelling errors]

19. [Place design, pencil, eraser and paper in front of subject]  
 Say: **Copy this design please.**  
 [Allow multiple tries until subject is finished. Allow up to one minute]  
 [Score 1 point if subject has drawn a 4-sided figure between two 5-sided figures]

[See examples of scoring the figure 4.0]

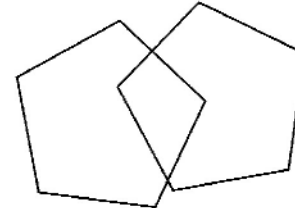
20. [OBSERVE IN WHICH HAND; THE SUBJECT HELD THE PENCIL, or ask if the subject is right, or left-handed. Take a piece of clean, letter- size paper; hold it up in front of the subject]  
 Say: **Take this paper in your right/left hand (opposite to dominant hand), fold it in half once with both hands and put the paper down on the floor.**  
 [Allow 30 seconds]  
 [Score 1 point for each instruction correctly executed, maximum of 3 points]

Total Test Score \_\_\_\_\_  
 Adjusted   
 Score

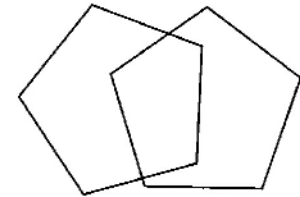
### 4.0 Specific Scoring Guidelines

#### 4.1 Scoring the Figures

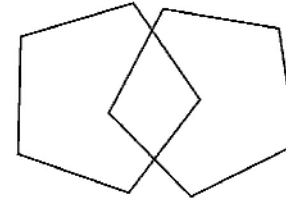
The subject must draw two 5-sided figures intersected by a 4-sided figure.



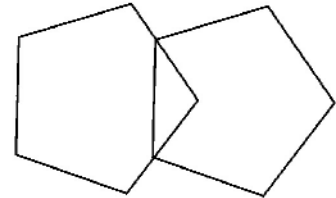
**Correct  
Score 1**



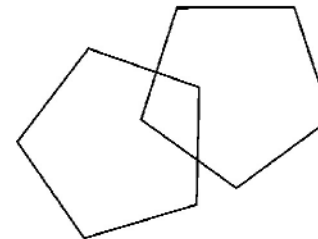
**Incorrect  
Score 0**



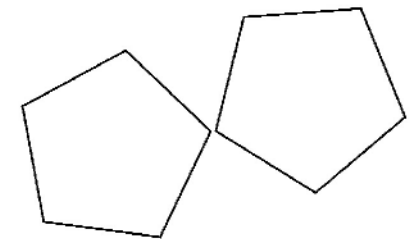
**Correct  
Score 1**



**Incorrect  
Score 0**



**Correct  
Score 1**



**Incorrect  
Score 0**

Time completed: \_\_\_\_\_ (seconds)

## 4.2 Scoring WORLD backwards

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." We suggest the following method because it is so simple and foolproof. 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.

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

## 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
DLLW	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
DLOW	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

DLRPD	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
DRLWE	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
LRO R		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
WORLD					W	1

### Scoring of Serial Sevens:

(write down subject's reply)

Say: **Subtract 7 from 100 and keep subtracting 7 from what's left.**

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:

**99, 86, 79, 72, 65**

✓ ✓ ✓ ✓ ✓

**5 points**

(all correct)

**93, 88, 81, 74, 67**

✓ X ✓ ✓ ✓

**4 points**

(4 correct, 1 wrong)

**92, 85, 78, 71, 64**

X ✓ ✓ ✓ ✓

**4 points**

(4 correct 1 wrong)

**93, 87, 80, 73, 64**

✓ X ✓ ✓ ✓

**3 points**

(3 correct, 2 wrong)

**92, 85, 78, 71, 63**

X ✓ ✓ ✓ X

**3 points**

(3 correct 2 wrong)

**93, 87, 80, 75, 67**

✓ X ✓ X X

**2 points**

(2 correct, 3 wrong)

**93, 87, 81, 75, 69,**

✓ X X X X

**1 point**

(1 correct, 4 wrong)

## 5.0 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:	Multiply by:	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>15</b>	<b>30</b>	<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. Translations of the SMMSE are available. 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.

## 6.0 Total Scores

The SMMSE provides a short, reliable measure of cognition. The level of cognitive impairment helps to quantify the severity of impairment and stage dementia. Serial scores provide useful information about function over time and can be used to measure disease progression and treatment effects.

If a person presents with memory loss and cognitive impairment, analysis of the pattern of scores also helps to pinpoint the specific deficits and provides important clues to the cause of the problem.

Scores of 30 usually indicate no impairment. People who have received a good deal of education, with no obvious sensory, language or communication problems, usually score 30.

SMMSE scores are related to age and education level.

There is an inverse relationship between SMMSE scores and age. People aged 18 to 50 score a median of 29 and those aged 51 to 64 have a median of 28. After 65, there is a steady, gradual decline, so at age 75, the median is about 27 and it falls to 26 by age 80 and beyond.

SMMSE scores are directly related to the level of education and formal schooling. The median is 29 for individuals with at least 9 years of schooling, 26 for those with 5-8 years and 22 for those with 0-4 years of schooling.

In general, scores of 26 to 30 are considered "normal." Scores between 20 and 25 are consistent with mild cognitive impairment. Scores between 10 and 19 are consistent with moderate cognitive impairment. Scores between 0 and 9 are considered severe cognitive impairment.

These are very general rules. The test scores have to be taken in context with the history and other findings. It is unreasonable to expect that this short test is valid and/or reliable in everyone. Consider a fit and healthy 75-year-old retired school teacher. Family complain that she is forgetting names, repeating questions and stories, and

that this is progressive. She scores 27 on the SMMSE which is in the "normal" range. However the three points are lost because she could not remember any of the three words in the recall section, which represents new learning ability. This is a highly significant finding in this woman. Take a careful history from the family and inquire about function in instrumental activities of daily living (IADL) such as managing finances, driving, taking medications, shopping, and cooking. If there is impairment in IADL and the person is repeating questions and stories - this should be investigated further because it is suggestive of early Alzheimer's Disease.

## 7.0 Diagnostic Algorithm

Here is a simple diagnostic algorithm to guide the assessment of older adults presenting with cognitive impairment. Many patients are in denial or lack insight. Take a corroborative history from someone who knows the subject, privately and away from the patient.

1. **Taking the history** (patient and corroborative history privately)
 

Patient aged 40 years or older	YES	↓
Gradual onset memory loss	YES	
Progressive course	YES	
Normal hearing	YES	
  
2. **Screening for short term memory loss**  
 Get the patient to register the three words and then distract by doing "WORLD" backwards. Now ask the patient to remember the three words, e.g. ball, car, man.
 

	YES	↓
--	-----	---
  
3. **Complete SMMSE**  
 Complete SMMSE and stage the deficit.  
 Note the pattern of deficits.
 

	YES	↓
--	-----	---
  
4. **Physical exam**  
 Normal gait, tone, reflexes, power, sensation, and extra-ocular movements
 

	YES	↓
--	-----	---
  
5. **Laboratory screening**  
 Normal B12, TSH, CBC, glucose, Creatinine, ESR and others as indicated.
 

	YES	↓
--	-----	---
  
6. **CT Scan**  
 Consistent with AD
 

	YES	↓
--	-----	---
  
7. **Rule out delirium/depression**  
 Absence of mood change, vegetative signs, loss of weight and/or energy, insomnia, "don't know" answers and anhedonia
 

	YES	↓
--	-----	---
  
8. **Rule out other dementia**  
 Vascular dementia, Lewy body, frontal lobe etc.
 

	YES	↓
--	-----	---
  
9. **Alzheimer disease**  
 Stage and treat
 

	YES	
--	-----	--

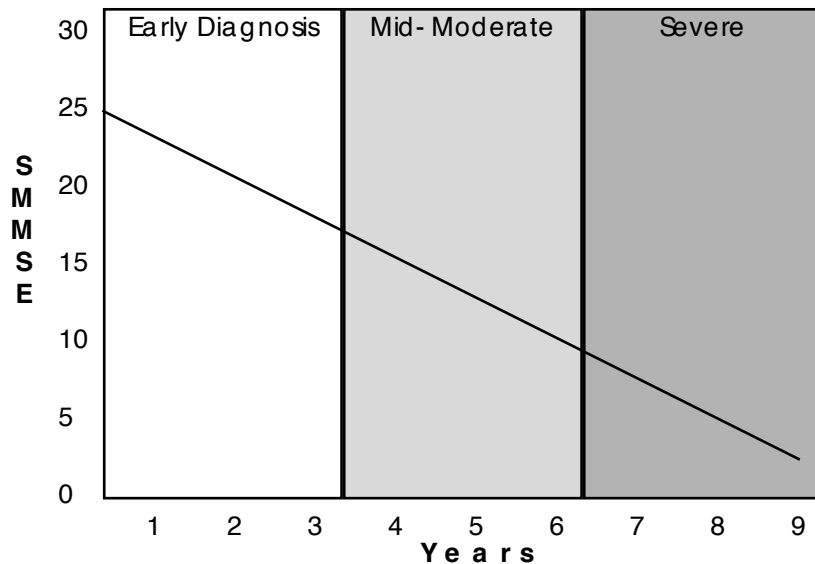
## 8.0 The Alzheimer's Journey

Alzheimer's disease is the most common cause of cognitive impairment in older adults and may be involved in at least 70% of all dementias. In the past, Alzheimer's was considered a diagnosis of exclusion. Now we can make the diagnosis with greater certainty, by taking a careful history, measuring cognitive function, performing a directed physical examination and using specific laboratory tests.

Alzheimer's presents with gradual, progressive short-term memory loss and word-finding difficulties. With aging, there is a progressive loss of short-term memory. Alzheimer's begins very gradually and at the start the changes are mild and subtle.

Nobody is quite sure when Alzheimer's "begins". It may be "present" for many years before it becomes obvious clinically. When memory loss is clinically significant, it starts to impair function. At this stage, it is important to rule out reversible causes of cognitive impairment, such as depression, delirium, hearing loss and hypothyroidism.

The natural history of this disease is shown here. This figure shows the slope of progression of "typical" Alzheimer's. There is significant variability because of differences in age, education level, language skills etc.



## 8.1 SMMSE Total Scores and Disease Progression

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

SMMSE Scores	Area of Functional Impairment			
	30-25 may be	24-21	21-10	9-0
Stage	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 year	2-3 years

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

## 9.0 Using the Pattern of Deficits to Distinguish between the Different Dementias.

Different dementias affect different parts of the brain and cause a variety of cognitive deficits. Each dementia impairs cognition in its own characteristic way. The specific pattern of deficits provides valuable clues to the underlying pathology. Knowledge of these patterns together with the clinical findings, provides important diagnostic clues to the underlying cause of the cognitive impairment.

For example, in Alzheimer's the first deficit is in short-term memory and word-finding. Disorientation to time and place follow. Problems with language occur later in the disease. Alzheimer's is a "cortical" dementia, so changes in gait, tone and swallowing occur late.

Lewy Body dementia impairs visuo-spatial function and an early deficit is apparent in the ability to draw the five-sided figures. Lewy Body disease affects cortical (gray matter) and sub-cortical (white matter) structures, accounting for the early problems with tone and gait.

People with vascular dementia often have diffuse problems in language, orientation and memory which seem to occur simultaneously. Vascular dementias have variable deficits depending on the structures affected.

This is a cortical and sub-cortical pattern.

The pattern of deficits not only provides important clues to the underlying pathological process, but the total score on the SMMSE quantifies the deficit and stages the disease process. This initial score will provide a useful baseline to measure the rate of decline and the effectiveness of treatments over time.

### 9.1 Alzheimer's Disease

In Alzheimer's Disease, the pattern of deficits is very typical and predictable. The first deficit occurs in short-term memory so the person repeats questions and stories. Then the person becomes disoriented to time: date, day, season, month and place. Later, the person has problems spelling "WORLD" backwards. Only then is language affected. These patients often deny that they have any problems with their memory and seem completely unaware of the severity of their problems. Gait or swallowing are not affected until the later stages,

when the person is severely demented. If the person presents with changes in tone, difficulty walking with falls or difficulty swallowing early, then chances are it is not Alzheimer's or there are other problems causing these symptoms and signs.

Progression of the deficits in Alzheimer's typically is as follows:

- 1 Short-term memory loss
2. Disorientation to time, date, day, season, month etc.
3. Can't spell "WORLD" backwards and are disoriented to place
4. Problems with language e.g. three-step command. (difficulty with five-sided figures appear later.)

### Typical features:

Gradual, progressive short-term memory loss, then nominal aphasia (difficulty with names, finding the right noun) --- person repeats statements and questions over and over again. No changes in tone or problems walking or swallowing. CT scan may show atrophy of the medial temporal lobe.

The typical pattern of deficits on the SMMSE is shown. The numbers represents the order of deficits in each domain.

Figure 9.1 Typical sequence of deficits in all domains:

Time	-----4 5 6-----
Place	-----7-----
Registration	-----
World backwards	-----8 9-----
Short term Memory	-----1 2 3
Watch, Pencil	-----
No ifs, ands or buts	-----
Close Your Eyes	----
Sentence	----
Five sided figures	----
Three step Command	-----

Numbers indicate the sequence of deficits in Alzheimer Disease, e.g. the first three points are usually lost in short term memory, next in orientation to time etc.

### 9.2 Vascular Dementia

The relationship between Alzheimer's and vascular dementia is not fully understood. They share many common risk factors. The thinking in this area is evolving. The onset and progression of deficits in Vascular Dementia is more variable and less predictable than in Alzheimer's disease. Many believe that isolated vascular dementia is rare. Vascular dementia frequently coexists with Alzheimer's (mixed dementia) and may modify the progress of the deficits. There are no hard and fast rules, but early problems with language and visuospatial functions suggest vascular or frontal lobe involvement. This pattern of deficits raises suspicion of vascular involvement.

**Figure 9.2** Sequence of deficits in vascular dementia:

Time	-----5-----
Place	-----
Registration	-----
World backwards	-----4-----
Short term Memory	-----3-----
Watch, Pencil	-----
No ifs, ands or buts	-----
Close Your Eyes	----
Sentence	----
Five sided figures	----1
Three step Command	----2-----

Problems drawing the figures or in following the three-step command occur early and at the same time as problems with memory and spelling. The deficits tend to be diffuse, affecting many areas of function such as orientation, memory and language. Language deficits are usually seen much later in Alzheimer's disease. The clinical clues to vascular dementia are step-like progression, history of transient ischaemic attack, stroke, early problems with gait, early incontinence and depression. There may be subtle changes on physical examination such as positive Babinski, unilateral changes in tone, sensation or power. A CT scan may show white matter changes or infarcts.

### 9.3 Lewy Body Dementia

The characteristic feature of Lewy Body Dementia is hallucinations very early in the disease process. Typically, there is spontaneous increased tone. This looks like mild Parkinson's (mild bradykinesia and rigidity), without the tremor. Hallucinations may be exacerbated when treated with Dopamine, so it should be introduced very carefully, if at all. Patients tend to walk "slumped over" to one side. They are often very paranoid, accusing their spouse of having affairs etc. They will see bizarre hallucinations, like children playing or people in the house wearing tuxedos etc. They believe these are real and will talk to them or complain about them.

Symptoms fluctuate, so that one day the person is alert, oriented and appropriate, and the next confused, hallucinating, drowsy and lethargic. These patients fall, and are exquisitely sensitive to neuroleptics. If given neuroleptics, they become very rigid, lethargic, sleepy and experience a dramatic deterioration in function. These patients present with a characteristic constellation of symptoms and signs and often have characteristic deficits in the SMMSE. They develop early visuospatial problems, so it is not surprising that the first deficit on the SMMSE may be difficulty with the five-sided figures.

Later, disorientation to day and date, short-term memory loss and the inability to spell "WORLD" backwards, occur.

Although not absolute, the pattern of cognitive deficit provides valuable clues to the underlying pathology. The history, physical findings and characteristic changes on the SMMSE all help to diagnose their condition.

This pattern of deficits on the SMMSE, with the characteristic history and clinical findings support a diagnosis of Lewy Body dementia:

Time	-----4-----
Place	-----
Registration	-----
World backwards	-----5-----
Short term Memory	-----3-----
Watch, Pencil	-----
No ifs, ands or buts	-----
Close Your Eyes	----
Sentence	----
Five sided figures	----1
Three step Command	----2-----

These patients may improve with anti-cholinesterases like Donepezil, Rivastigmine or Galantamine. For delusions, hallucinations and paranoia, a trial with low doses of Olanzapine may help the hallucinations, paranoia and delusions. They may get worse with Dopamine and this should be introduced carefully, if at all. They may tolerate low dose SSRI if they are depressed.

#### 9.4 Depression

Unlike Alzheimer's disease, these patients often complain of memory loss. When asked questions they will often answer "I don't know". When you get "don't know" or "it doesn't matter," consider depression. When pressed, they may know the answer, but just couldn't be bothered.

They will often complain of low energy, anxiety or somatic complaints in the bowel, saying that there is indigestion or a vague uneasy feeling related to the gastrointestinal tract. Somatic complaints seem refractory to treatment (e.g. arthritis). Some develop somatic delusions and become convinced that they have cancer or something physically wrong, but the doctor won't tell them. They seem to perform much worse than you would expect from the degree of cognitive impairment. For example, a person with mild cognitive deficits does not wash or dress independently. This "disability gap" means they function lower than expected. In conversation, they do not have the obvious word-finding difficulties that the Alzheimer patient exhibits.

They will often experience anhedonia, or lack of pleasure in anything. They will have mood change that they will describe as a physical feeling of being unwell that descends like a cloud they can't shake. This is often worse in the morning and gets better as the day progresses. This diurnal variation is a typical feature of depression.

Other vegetative signs like loss of appetite, loss of energy, sleep disturbance that is characterized by early waking or difficulty falling asleep. They do not wake feeling refreshed; rather early morning may be their worst time. They lose libido and may even consider suicide.

Older adults with depression are at risk from suicide. In depressed, older adults it is important to ask about suicidal ideation. Ask "Did you ever go to bed at night and wish you weren't going to wake up in the morning?" If they answer yes, ask "Did you ever think of killing yourself and ending it all?" If they say yes, ask if they have ever thought how they would do it. If they have thought of a method, such as hanging or overdose, or have suicidal urges e.g. to crash their car into another on the highway, then the suicide risk is significantly increased and they should be referred and monitored closely.

If an anti-depressant is prescribed, it is important to advise patients and families that it will take some time to work e.g. three or four weeks. They should not stop taking the medication if it is not working in a few days or if they feel better after a few weeks. Also, tell them that if they get side effects and stop taking the anti-depressant, they must call you immediately to get a different medication.

Many patients with dementia become depressed. Depression does not exclude dementia. Many people with dementia have depression that may be a feature of dementia and does not respond to treatment.

In the practice of old-age medicine, the SMMSE is a very useful test. But one cannot be dogmatic in using this test alone. The test must be interpreted in the context of other symptoms and signs. Dementia is a heterogeneous disease and these conditions are frequently mixed. For example, Alzheimer's, Lewy body, vascular dementia and depression frequently co-exist. It is important to be aware that not every patient will fit neatly into a convenient diagnostic box. Many are not typical and will be "mixed". In these cases, gather information and keep an open mind as you follow their progress. The "typical" patterns with each disease are presented, but do not be too dogmatic applying these "rules" in practice. Many patients with medical problems have Alzheimer's Disease and it is important to treat the medical conditions and the dementia.

All of the common dementias are progressive. At present there are no treatments available to stop or arrest these diseases, although there is a growing number of drugs that slow the progress and provide symptomatic relief. It is important to have a tentative diagnosis, stage the disease, start treatment and follow carefully to monitor response and progress. The SMMSE is an invaluable tool in this process.

## 10.0 CARE PLAN FOR ALZHEIMER'S DISEASE (and other dementias)

### SMMSE 25-20

#### Mild: Advance Planning, Safety and Early Treatment Will

Powers of Attorney (financial and person care)  
Advanced Health Care Directive (Living Will)  
Use a dosette for medication  
Calendar reminder for appointments (kept by telephone)

Education of Patients and Family by the Alzheimer  
Society Family member to accompany to appointment  
Check Driving  
Check safety in the home (kettles, burners, cooking)

- Consider estrogen therapy in females
- Vitamin E (400 to 1,000 IU, twice daily)
- Consider Enteric-coated Aspirin (325mg once daily)
- Donepezil (Aricept) 5mg-10mg once daily;  
Rivastigmine (Exelon) up to 6mg twice daily or  
Galantamine (Reminyl) up to 12mg twice daily.
- Ginkgo-Biloba (GinkGold or Ginkola ) 40mg-80mg three  
times daily before meals.

### SMMSE 19-11

#### Moderate: Caregiver Support

Family should fill dosette and supervise medication-taking  
Check finances, shopping, diet and safety (getting lost etc.)  
Provide adequate support to family/spouse;  
Homecare supports  
Day Care  
Friendly visitors  
Wandering Person Registry

## SMMSE 10-0

### Severe: Plan for placement in Nursing Home

Consider respite care -  
Day Programs  
In-Home respite care  
Short Stay Respite Care in a Facility  
Nursing Home care  
May require a secure unit  
Support caregiver in re-starting life on their own;  
Grief and bereavement counseling for family.

## 11.0 CARE PLAN FOR SPECIFIC COGNITIVE DEFICITS ON SMMSE:

Another useful facet of the SMMSE is that it helps to highlight deficits in specific domains, e.g., orientation to time or place, language, short term memory or visuo-spatial problems. Awareness of specific defects can direct health care professionals to develop strategies to minimize disability and maximize function

Knowledge of the specific cognitive deficits is also used to develop a specific care plan to target these deficits.

See Table 11.1 (next page) *This table was reproduced with kind permission from Andrea Vertesi.*

**Table 11.1**  
**Care Plan for Specific Cognitive Deficits**

<b>SMMSE Deficit</b>	<b>Deficit</b>
Question 1-5 Orientation to time	Decreased orientation to time
<b>Question 6-10</b> <b>Orientation to place</b>	Decreased orientation to place
Question 11	Decreased registration
Question 12 WORLD	Decreased attention span
Question 13 Recall 3 objects	Decreased short-term memory
Question 14-15 Pencil, Wristwatch	Aphasia, word-finding problem, poor perception
Question 16 Common Phrase	Aphasia, language barrier, decreased hearing
Question 17 Close your eyes	Aphasia, decreased vision, decreased short-term memory
Question 18 3 step command	Apraxia and short-term memory
Question 19 Sentence	Poor memory, decreased perception, physical impairment
Question 20 Copy design	Apraxia, decreased perception

<b>Plan</b>
Use of TV, newspaper, clock, calendar, diary, alarm reminder for medications, dosette for pills, ensure good sleep and hygiene, keep tasks routine.
Use of TV, radio, newspaper, maps, diary, orientation signs, take familiar routes, accompany to appointments and when driving.
Use one step instructions, decrease clutter, use physical cueing along with verbal commands
Simplify instructions and the environment, decrease distractions
Use calendar, diary, clocks and memory aids
Simplify the environment, decrease clutter, explain tasks and explain the use of items
Speak slowly, pronounce words clearly, position yourself so they can see your face when you speak
Simplify commands to one step, use pictures and other visual cues
Simplify instructions to one or two steps, speak slowly and clearly
Help with writing cheques and bills, direct deposit banking, use video or audio tapes instead of writing letters
Decrease clutter, simplify the environment, help with washing and dressing



**12.0 Smmse Scoring Sheet****Section 1**

1. Year	1	6. Country	1
2. Season	1	7. Province/State/City	1
3. Month	1	8. City/town	1
4. Today sdate	1	9. Place	1
5. Day of the week	1	10. Floor of the building	1

**Section 2**

11. Word 1	1	16. No if s, and s or but s	1
Word 2	1		
Word 3	1	17. Subject closes eyes	1
12. DLROW or Serial Sevens	5	18. Sentence	1
13. Word 1	1	19. Four-sided figure in two five-sided figures	1
Word 2	1		
Word 3	1		
14. Wristwatch	1	20. Takes paper in correct hand	1
15. Pencil	1	Folds it in half	1
		Puts it on the floor	1

**Adjusted Score**   
**Total Score**

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### About the Authors.....

#### **Dr. William Molloy**

MB, Bch, BAO, MRCP(I), FRCP(C)

Dr. Willie Molloy was born in Waterford, Ireland and qualified in medicine at University College, Cork, in 1977. He came to Canada in 1981 and trained in geriatrics at the University of Manitoba, the University of Western Ontario and McMaster University.

A consultant geriatrician, he is currently Director of the Memory Clinic and the Geriatric Research Group at Hamilton Health Sciences Corporation and a professor of medicine at McMaster University. He is Editor-in-Chief of Mature Medicine Canada and the author and co-author of numerous books, including "Let Me Decide", the best-selling health and personal care directive & living Will, Common Sense Geriatrics, Vital Choices, What are we going to do now?, Alzheimer's Disease, Set Me Free, Capacity to Decide and The Fine Detail and the A.D. Guide.

He is married to Deborah, and they have two sons, James and Alexander.

#### **Dr Roger Clarnette**

MB, BS, FRACP

Roger was born in Hobart and graduated from Monash University medical School in 1980. He trained in internal medicine and geriatrics at Royal Perth Hospital and then at McMaster University in Ontario with Willie Molloy.

He is at present Consultant Physician in the Dept of Rehabilitation and Aged Care at Osborne Park Hospital and Sr Charles Gairdner Hospital in Perth. He is a member of the Guardianship and Administration Board in Western Australia. He is married to Donna and has two daughters, Catherine and Stephanie, and a son, Henry.

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