1 **Supplementary Material 3**

2 Clinical data include Hamilton anxiety scale (HAMA), Hamilton depression scale

3 (HAMD) [1] and functional activities questionnaire (FAQ)[2]. Neuropsychological

4 evaluations include mini-mental state examination (MMSE) [3], AVLT[4], shape trails test

5 (STT) [5], symbol digit modalities test (SDMT) [6], Boston naming test (BNT) [7], and

6 complex figure test (CFT)[8]. The evaluation details are as follows[9]:

7 **Hamilton Anxiety Scale (HAMA)**

8 This test includes 14 items: 1 Anxious mood; 2 Tension; 3 Fears; 4 Insomnia; 5

9 Intellectual retardation; 6 Depressed mood; 7 General somatic symptoms (muscular);

10 8 General somatic symptoms (sensory); 9 Cardiovascular symptoms; 10 Respiratory

11 symptoms; 11 Gastrointestinal symptoms; 12 Genito-urinary symptoms; 13

12 Autonomic symptoms; 14 Behavior at interview. Each item is divided into 5 levels: 0-

13 asymptomatic; 1 mild; 2 moderate; 3 severe; 4 extremely severe. Total scale score

14 (items 1-14) is 56. No anxiety:0~7; Possible anxiety:7~14; There must be anxiety:

15 14~21; There must be obvious anxiety: 21~29; Severe anxiety: >29.

16

17 **Hamilton Depression Scale (HAMD)**

18 This test includes 24 items: 1 Depressed mood; 2 Guilt feelings; 3 Suicidal thoughts;

19 4 Initial insomnia (difficulty falling asleep);5 Middle insomnia (sleeping lightly); 6

20 Early morning awakening; 7 Work and interests; 8 Psychomotor retardation (refers to

21 slowed thinking and speech, difficulty concentrating, reduced initiative); 9 Agitation;

22 10 Psychological anxiety; 11 Somatic anxiety (refers to physiological symptoms of

23 anxiety, including dry mouth, abdominal bloating, diarrhea, hiccups, abdominal

24 cramps, palpitations, headache, hyperventilation and sighing, frequent urination, and

25 sweating); 12 Gastrointestinal symptoms; 13 General somatic symptoms; 14 Sexual

26 symptoms (such as decreased libido and menstrual irregularities); 15 Hypochondriasis;

27 16 Loss of weight; 17 Insight (self-awareness); 18 Diurnal variation (if symptoms

28 worsen in the morning or evening, specify which, and rate the degree of variation); 19

29 Depersonalization or derealization (feeling unreal or having delusions of unreality);

30 20 Paranoid symptoms; 21 Obsessive symptoms (obsessive thoughts and compulsive

31 behaviors); 22 Feeling of incapacity; 23 Hopelessness; 24 Self-esteem feelings. Each

32 item is divided into 5 levels: 0- asymptomatic; 1 mild; 2 moderate; 3 severe; 4

33 extremely severe. Normal:0~8; Possible depression: 8~20; Diagnosed depression:

34 21~35; Severe depression:>35.

35

36 **Functional Activities Questionnaire (FAQ)**

37 FAQ reflecting daily living abilities. This FAQ includes a total of 10 questions, with

38 each question encompassing two dimensions: accuracy and completion speed. Each

39 dimension consists of five levels, represented as 0, 1, 2, 3, and 9. A score of 9

40 indicates that the task is not applicable or cannot be completed.

41

42 **Mini-Mental State Examination (MMSE)**

43 This test is similar to the English language version of the MMSE, and is scored out of

44 30.

45

46 **Auditory Verbal Learning Test (AVLT)**

47 The examiner read out 12 two-character words. Each group of 12 words contained

48 three different categories with four words in each. The different word types were

49 presented randomly with 1-s intervals between the words. Immediately after the entire

50 list had been presented, the participant was asked to recall the words. This learning

51 and recall phase were repeated three times. The participant was given a 5-min

52 non-verbal test, and was then asked to recall the 12 words for the fourth time. Next,

53 the participant completed another 20-min non-verbal task, and was then asked to

54 recall the word list for the fifth time (AVLT-long delayed recall, AVLT-LR or

55 AVLT-N5). Finally, the participant was shown the word list.

56

57 **Shape Trails Test (STT)**

58 The shape trails test parts A and B: in the STT-A, the participant is asked to connect a

2

59 series of Arabic numbers (1-25) in their numerical order. In the Chinese version of the

60 STT-B, Arabic digits (1-25) are surrounded by either a square or a circle, and the

61 participant is asked to connect the digits in a sequence such that the shapes

62 surrounding the digits alternate. We recorded the time taken to complete the task.

63

64 **Symbol Digit Modalities Test (SDMT)**

65 In this test, the participant was asked to match a series of symbols to corresponding

66 digits according to a symbol-digit pairing illustration. We recorded the number of

67 items

68 correctly completed within 90 s. After 90 s, the participant was asked to recall the

69 symbols that corresponded to each digit [known as SDMT-incidental learning

70 (SDMT-IL); i.e., participants were not told in advance that they would be asked to

71 recall the information].

72

73 **Boston Naming Test (BNT) (30-item version)**

74 In this test, the participants were asked to name the subjects of 30 pictures with no

75 time limit; the total possible score was 30.

76

77 **Complex Figure Test (CFT)**

78 Participants were asked to copy a visual figure (CFT-copy), then to draw the figure

79 from memory after approximately 25 min had passed (CFT-delayed recall, CFTLR).

80 We used the scoring standard established by Taylor in 1981, with a total possible

81 score of 36.

82

83 **Quality Control of Data Collection**

84 Ensuring the accuracy and reliability of our data is of utmost importance to us, and we

85 took several steps to maintain high standards of quality control:

86 1)   Dual independent data entry: To mitigate the risk of data entry errors, we adopted

87 a dual-entry system. This involved two distinct operators entering the same data

3

88 independently, with any discrepancies being identified and rectified through a

89 rigorous verification process.

90 2) Specialized training for data entry staff: Our team underwent a comprehensive

91 training regimen that covered both the use of our data entry software and a deep dive

92 into the cognitive assessments and scales utilized in our study, ensuring their

93 understanding of the significance, scoring ranges, and coding rules for each scale.

94 3) Systematic quality assurance procedures: We periodically sampled entered data

95 for quality checks, comparing them against original records to ensure accuracy. This

96 process allowed us to maintain continuous oversight and implement immediate

97 corrections where necessary.

98 4) Continuous process evaluation: The data entry process was subject to ongoing

99 evaluation through regular review meetings. These meetings allowed our team to

100 address any challenges promptly and refine our data entry methodologies as needed.

101 5) Comprehensive audit trails: The audit trail functionality of our data entry system

102 documented every action, from initial data entry to subsequent modifications. This

103 level of transparency and traceability was instrumental in ensuring the integrity of our

104 data entry process.

105

106 Table S3-1. Normal range of score for each cognitive function assessment scale.

Indicators	Age Group		
	50-59	60-69	70-79
HAMD		8	
HAMA		7	
MMSE		24	
AVLT	24	22	19
AVLT_N5	5	4	3
BNT		22	
STT_B, Middle School	180	200	260
STT_B, University	180	190	220
SDMT_correct		34	
CFT_copy	33	31	30

107 AVLT: Auditory verbal learning test; AVLT_N5: Auditory verbal learning test, long-term delay

108 recall; BNT: Boston naming test; HAMA: Hamilton Anxiety Scale; HAMD: Hamilton depression

109 scale; MMSE: Mini-Mental State Examination; STT_B: Shape trails test, part B; SDMT_correct:

4

Supplemental material

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J Neurol Neurosurg Psychiatry

110 Symbol digit modalities test, correct number; CFT_copy: Complex figure test, copy part.

111

112 In our study, individuals participate in daily low-intensity walking exercises. Sleep

113 duration was determined according to the following two questions[10]: (1) How many

114 minutes of actual sleep on average did you get at night (this may be shorter than the

115 number of hours you spent in bed) during the past 6 months? (2) How many minutes

116 on average did you take a nap after lunch during the past 6 months?

117

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144