Mini−Mental State Examination의 한국 노인 정상규준 연구[*]

이동영[1) · 이강욱[2) · 이정희[2) · 김기웅[1) · 주진형[3)
윤종철[4) · 김성윤[5) · 우성일[6) · 우종인[4) †

A Normative Study of the Mini−Mental State Examination in the Korean Elderly[*]

Dong Young Lee, M.D., Ph.D.,[1)] Kang Uk Lee, M.D., Ph.D.,[2)] Jung Hie Lee, M.D., Ph.D.,[2)]
Ki Woong Kim, M.D., Ph.D.,[1)] Jin Hyeong Jhoo, M.D.,[3)] Jong Chul Youn, M.D.,[4)]
Sung Youn Kim, M.D., Ph.D.,[5)] Sung Il Woo, M.D., Ph.D.,[6)] Jong Inn Woo, M.D., Ph.D.[4) †]

국문초록

연구목적

　　　　　　　MMSE in the Korean version of the CERAD assessment packet(MMSE- KC)
　　　　　　　　　　　　　　　　　　　　,　　　　　　　MMSE- KC
　　　　　　　　　　　.

방 법

　　　　60~90　　　　　618　　　MMSE- KC　　　　　. MMSE- KC
　CERAD- K　　　　　　　　　　　　　　　　　　　　　　,
　,　　　　　　　　　　　　　　　　　　　　　　.　　　　　MMSE- KC

[1)]
Department of Neuropsychiatry, Kyunggi Provincial Hospital for the Elderly, Yongin
[2)]
Department of Neuropsychiatry, Kangwon National University College of Medicine, Chunchon
[3)] *Department of Neuropsychiatry, Anyang Metro Hospital, Anyang*
[4)]
Department of Psychiatry, Seoul National University College of Medicine & Clinical Research Institute, Seoul National University Hospital, Seoul
[5)] *Department of Psychiatry, Asan Medical Center, Seoul*
[6)]
Department of Psychiatry, Soon Chun Hyang University Hospital, Seoul
†*Corresponding author*

MMSE- KC

결 과

1) 60   MMSE- KC   .

                              MMSE- KC
                          .   , 60   ,
     ,   MMSE- KC   .
2)   24
     MMSE- KC   5, 25, 75   ,
     .
3)   MMSE- KC   ,
                                    .

결 론

                        MMSE- KC
                    MMSE- KC   .

중심 단어 MMSE- KC· MMSE·   .   .   .   .

서   론

1975   Folstein
(Mini- Mental State Examination   MMSE)   MMSE

                                            .[1- 3] MM-
SE   .

                                    ,

                                    MMSE

    [4]   [5]   [6]

        [7) 8]

MMSE   ,
,   (percentile)   (norm)
        [9- 13]   MMSE   . MMSE

        ,   MMSE

        ,

                                        .[14]
                            ,   ,
                                [15) 16)   MMSE
                ,   ,   ,   ,   ,

                                [17) 18]   [16) 19- 21]   [16]
                                [22) 23]

                                            ,   [24]
                                        [5]
                                    ,

MMSE   1988

.4)25- 27)   ,

MMSE

. ,

,28)

. ,

MMSE

6

,

29)

.   ,   MMSE

.

CERAD(Consortium to Establish
a Registry of Alzheimer's Disease)   (CE-
RAD- K)   CERAD

8   ,

, 15   , MMSE,

,   ,   ,   ,

CERAD- K

.30)   CERAD- K

8

.

, MMSE

,   , MMSE

MMSE   .

연구대상 및 방법

1. 연구대상

.

,   ,

,

,

6

1997 1   2000   9

335   1999   6   2000

4

,28)   283 ,   618   60

.

1) 임상평가를 통한 배제 기준의 적용

Lee   30)

CERAD- K

.   ,

,   , 60

,   ,   ,

,   Blessed

(SBT- K)31)
Blessed   (activity of daily
living)   , 2

.

.

4

(consensus case conference)

,

.

DSM-   32)   ,

,

,

,   ,

,   ,

. ,   ,

.

2. 검사도구 : MMSE-KC

Lee   CERAD- K   CE-   .   ,
RAD   MMSE   10   MMSE- KC
              ,   MMSE- KC(MMSE in the Ko-
rean version of the CERAD assessment packet)   .
                                              .[30]   CE-
RAD   MMSE(CERAD- MMSE)   ## 4. MMSE-KC 검사 점수에 영향을 미치는 변인 분석
   Folstein (1975)   MMSE

   Folstein MMSE   .   ,   ,
   MMSE- KC   CERAD- MMSE   ,
        ,   ,   ,
                                       MMSE- K[5]   MMSE- KC
           .   ,   , '   .   ,
       ,   MMSE- K   (univariate analysis)
                             . '   ,
       ,   (   ),
              (,   ,   )   MMSE- K   (multivariate analysis)
                             .   ,   .
                         MMSE-   ,
K   Pearson   ,
    , MMSE- KC   Folstein MMSE   CE-   t- test   .
RAD- MMSE   ,
                     .   , Folstein MMSE   (multiple linear regression)
                         (serial   2   .   1(stage 1)
subtraction)   (WORLD)   ,
              , CERAD- MMSE
                     .   MMSE-   3
KC   '   ',
              ,   CERAD- MM-   ,   2(stage 2)   ,   ,
SE   . MMSE- KC
        .   0.05
                                                                          .
3. MMSE-KC의 시행
   MMSE- KC   CERAD- K   ,   1   2
                                                  (R^2)
                 (,   .
)   .   60
        MMSE- KC   (60   )
       , Lee   CERAD- K   . 60

( )

50 60

[16]

30

140/90mmHg

[33] ,

.

1

, 6

.

.

5. 정상 규준 값의 산출 및 산출된 규준의 타당도 검증

1) 정상규준 산출

5 (percentile), 25
(lower quartile), , 75 (upper quartile), , ,
.

2) 규준 타당도 검증

( ) 60
61
MMSE- KC
(DSM-)
5

. 5

kappa . McKhann

5 [34].
61 .

Table 1. Demographic and clinical characteristics of the subjects participating in the normative study of the MMSE-KC

	Men	Women	Total
Number	209	409	618
Age(yr)	73.6± 6.3[†]	71.2± 6.0	72.0± 6.3
60- 64	6(2.9)[‡]	48(11.7)	54(8.7)
65- 69	61(29.2)	143(35.0)	204(33.0)
70- 74	58(27.8)	103(25.2)	161(26.1)
75- 79	45(21.5)	71(17.4)	116(18.8)
80- 84	27(12.9)	29(7.1)	56(9.1)
85- 89	10(4.8)	14(3.4)	24(3.9)
90	2(1.0)	1(0.2)	3(0.5)
Education(yr)	7.8± 5.4	4.8± 4.0	5.9± 4.8
0	37(17.7)	125(30.6)	162(26.2)
1- 3	8(3.8)	39(9.5)	47(7.6)
4- 6	68(32.5)	159(38.9)	227(36.7)
7- 9	26(12.4)	40(9.8)	66(10.7)
10- 12	29(13.9)	35(8.6)	64(10.4)
13	41(19.6)	11(2.7)	52(8.4)
Previous rural residence	79(37.8)	224(54.8)	303(49.0)
Hypertension	90(43.1)	162(39.6)	252(40.8)
Diabetes	17(8.1)	49(12.0)	66(10.7)
Alcohol users (lifetime)	129(61.7)	27(6.6)	156(25.2)
Alcohol user (current)	92(44.0)	24(5.9)	116(18.8)
Smoker (lifetime)	133(63.6)	34(8.3)	167(27.0)
Smokers (current)	81(38.8)	24(5.9)	105(17.0)

† Mean±S.D   ‡ Number(percent)

6. 통계 분석 프로그램

SPSS version 9.0 for windows .

연 구 결 과

1. 연구대상자의 특성

1 . 618
72.0± 6.3 , 73.6±
6.3 , 71.2± 6.0
(t= 4.6, p< 0.01).
65~ 79

(78.5%; 77.6%),

(^{2}= 22.8, df= 6, p< 0.01).
5.9± 4.8 ,
7.8± 5.4 4.8± 4.0
(t= 7.8, p< 0.01).
30.6% 17.7%

(^{2}=
68.0, df= 5, p< 0.01).

49.0% , 37.8%, 54.8%

(^{2}= 15.3, df= 1, p< 0.01). ,
40.8%, 10.7%

,   .
61.7%, 6.6%(^{2}= 219.8, df= 1, p< 0.01),
44.0%, 5.9%(^{2}= 129.6, df=
1, p< 0.01)
.   63.6%,
8.3%(^{2}= 211.9, df= 1, p< 0.01),
38.8%, 5.9%(^{2}= 103.8, df= 1, p< 0.01)
.
30 (4.9%),
588 (95.1%)

.

2. MMSE-KC 점수에 영향을 미치는 변인 분석결과
1) 단변인분석 결과
, MMSE- KC
, (r= - 0.41, p< 0.01)
(r= 0.55, p< 0.01) . , MM-
SE- KC
(t= 6.49, p< 0.01), (t= 2.99, p< 0.01)
(t= 2.76, p< 0.01)
MMSE- KC
.

, , ,
MMSE- KC .

2) 다중 회귀 분석 결과
1(stage 1) , , 3

Table 2. Multiple linear regression of age, education, sex and other variables on the MMSE-KC score

		SE( )	R2	p
Stage 1			0.41*	
Age	- 0.21	0.02		0.00064*
Education	0.34	0.03		0.00063*
Sex	1.32	0.28		0.00030*
Stage 2			0.43*	
Age	- 0.23	0.02		0.00084*
Education	0.34	0.03		0.00075*
Sex	1.70	0.36		0.00010*
Lifetime alcohol use	- 0.08	0.59		0.056
Current alcohol use	- 0.08	0.59		0.056

Note , parameter estimate SE( ), standard error of parameter estimate R², variance explained by each model
Variables written in bold characters were included in the final model
* p<0.0001

, 2(stage 2) ,
,

. 2
. 2 (R2) 1
,
MMSE- KC

, ,
MMSE- KC ,
MMSE- KC 10.0%, 30.4%, 2.3%
.

4. 정상규준 자료산출 및 규준표 작성
MMSE- KC
,
, .
(cell)
,
60~ 74 , 65~ 79 , 70~ 84 , 75~ 90
.

(overlapping age
table)
$^{35)}$
(midpoint age) 67 , 72 , 77 , 82

513

Table 3. Mean, standard deviation, and selected percentiles of the MMSE-KC by age, educational level, and sex in the normal Korean elderly

Educational level(years)	Male			Female		
	0- 3	4- 6	7	0- 3	4- 6	7
Age(years)						
60- 74*						
N	20	40	65	92	137	65
Mean	24.9	27.3	28.1	23.7	26.4	28.2
Sd	2.7	2.2	1.7	3.5	2.6	1.5
5th Percentile	18.0	23.1	24.3	16.0	20.9	25.0
Lower quartile	23.0	25.0	27.0	22.0	25.0	27.0
Median	25.0	27.5	29.0	24.0	27.0	29.0
Upper quartile	26.0	29.0	29.0	26.0	28.0	29.0
65- 79**						
N	30	53	81	120	131	67
Mean	24.6	26.9	28.0	22.5	26.2	27.7
Sd	3.3	2.4	1.7	3.9	2.8	1.9
5th Percentile	17.5	23.0	24.1	15.0	20.5	24.2
Lower quartile	23.0	25.0	27.0	20.0	24.0	26.0
Median	25.0	27.0	28.0	23.0	27.0	28.0
Upper quartile	26.0	29.0	29.0	25.0	28.0	29.0
70- 84***						
N	31	43	56	97	64	42
Mean	24.5	26.3	27.9	21.2	25.9	27.0
Sd	3.2	2.7	1.7	4.1	2.9	2.1
5th Percentile	17.0	21.2	24.0	14.9	20.0	23.0
Lower quartile	23.0	24.0	27.0	18.0	24.0	25.8
Median	25.0	26.0	28.0	22.0	26.0	27.0
Upper quartile	26.3	28.0	29.0	24.0	28.0	29.0
75- 90****						
N	25	28	31	72	22	21
Mean	23.7	25.5	27.2	19.5	24.9	26.2
Sd	4.3	2.9	1.6	4.1	3.0	2.2
5th Percentile	13.5	20.5	24.0	13.7	20.0	20.0
Lower quartile	22.3	23.3	25.5	16.0	23.0	25.0
Median	24.5	25.0	27.0	19.0	24.0	26.0
Upper quartile	26.8	28.0	28.0	22.5	27.5	28.0

* Normative data from this age range are used for persons whose ages range from 60 to 69 years
** Normative data from this age range are used for persons whose ages range from 70 to 74 years
*** Normative data from this age range are used for persons whose ages range from 75 to 79 years
**** Normative data from this age range are used for persons whose ages range from 80 to 90 years

. 4

. , .

60~ 74 , 65~ 79 , 70~ 84 , 75~ 90 , (0~ 3),
60~ 69 , (4~ 6), (7) .
70~ 74 , 75~ 79 , 80~ 90 3 MM-

SE- KC   ,   ,   24

5   (percentile), 25   ,   , 75   .

,   ,   .   ,   MMSE

5. 산출된 정상규준의 타당도 검증 결과

[5)9)10)12-15)37)38)]

            61   .

MMSE- KC   ,

kappa   0.63

. 61

10   ,   51   .   . [14)]

     51

5   5.9%(3   )   Liu [43)]   MMSE

                                       (6   )   ,

.

고 찰

                                 ,   (3) .

MMSE- KC

MMSE- KC

.   MMSE- KC   ,   7

,   .   , 60   .

     ,   MMSE- KC   MMSE   [9)10)12)13)]

         .   [37)38)]

[11-14)36-38)]   [11)16)37-42)] MMSE   6

,   .

MMSE- K   .   '

MMSE- K   (fluid intelligence)'   50   60

[14)15)]   ,   [5)]   [16)]   60

MMSE- K

,   MMSE- K   60

                                .   .   60

                                   MMSE- KC

     .   ,   ,   .

    ,   ,   [17)44)]

                                       .

515

, Battersby [45]   [55]

(retention)

, Kuusisto [18]   ,

                                                                              [56]   .

          .   -

                    ,   ,

                                                                                                              .

[19- 21) 46- 51)   ,

  MMSE- KC   .

                              .   -

                                                      .   ,

                              DSM-   (protective effect)

                                                            23) 24) 57)

                                                                                                        58) 59)

                              .   60)

                    ,

                                                                                                                    .

              .   ,   ,   MMSE- KC

                              MMSE,   .

,   ,   ,   ,   ,

                              Vanhanen [52]

                                                                        .

          .

              MMSE- KC   . Pauker[35]

          ,

          ,

                                                                    .   60~ 74   75~ 90

    . ,   ,

                                        .   74   75

                    ,   1~ 2

                              16)   .   ,   ,

                    ,

              ,   .   ,

53) 54)   ,

                                                                                        .   Mayo' s

516

Older Americans Normative Studies(MOANOS pro-   ,   ,   ,   MM-
ject)   SE- KC
                                        [61-65]   .

                                                                                                        MM-SE- KC
     .   5
                                                NINCDS-   5.9%   5%
ADRDA   .
                    (   )   ,
            5   (percentile)   '
     [34]   ,   ,
            MMSE   ,
     60~69   0~3 , 4~6 , 7   '   '
                            17/18 , 22/23 , 23/24 ,   .   '   ,
        15/16, 20/21, 24/25   .'   ,
     .   MMSE
     23/24   ,[1]   ,

     ,   .   ,
                                        (false positive rate)   65   5%   80
                                .   2   20%   ,[8]
                                1
                                                        2
                                                                                                                                '
                                                                        ,   '   ,
                    ,   '   ,
            .   .   NI-
                    5   MMSE   NCDS- ADRDA
                                                                        '   (normal control
                                                                group)'   [34]   ,
                    ,   ' Aging-
     MMSE- KC   Associated Cognitive Decline(AACD)'
                                                                                                            '
            .   (relatively healthy sample)'
                                                                                                        [67]
                                                                                            .
                        MMSE- KC
                                                                                                    ,
            kappa   ,   , kappa
            0.63   . Landis & Koch[66]   .
                kappa   0.61~0.80   ,   48.9%   60
     (Substantial)   .   ,

Table 4. Comparison of the demographic variables and mean test scores on the MMSE-KC among the different sources of study subjects

	Volunteers from welfare centers in Seoul	Volunteers from hospitals in Seoul	Volunteers from prevalence study in Seoul	Volunteers from hospitals in non-Seoul area
Number	241	50	283	44
Age(year) *	68.9± 4.2	70.4± 5.9	74.7± 6.5	73.2± 5.6
Education(year) *	6.7± 4.3	9.3± 5.6	4.3± 4.4	6.0± 5.5
Sex(male/female ratio) **	39/202	24/26	130/153	16/28
Mini mental state exam†	25.7± 3.6	25.9± 3.6	24.7± 3.6	24.6± 4.3

Mean± S.D, if not otherwise specified   *   p<0.01, by ANOVA   **   p<0.01, by χ^2 test
†   No significant difference among the 4 sources of study subjects by ANCOVA adjusting age, education and sex

,

.   .

,   MMSE- KC

.   ,

,   6

,   .   , 60   ,

                                                              ,   MMSE-

.   KC   .

,   ,

MMSE   24   MMSE-

,   KC   5, 25, 75   ,

[15]   MM-

SE- KC   .   ,   MMSE- KC

4   ,

,   ,   ,   .

                                                                          ,   MMSE- KC

,   MMSE- KC

, MMSE- KC   .

,

(analysis of covariance)   **참고문헌**

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결   론

        60

MMSE- KC

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A Normative Study of the Mini-Mental State Examination in the Korean Elderly

**Dong Young Lee, M.D., Ph.D., Kang Uk Lee, M.D., Ph.D., Jung Hie Lee, M.D., Ph.D.,
Ki Woong Kim, M.D., Ph.D., Jin Hyeong Jhoo, M.D., Jong Chul Youn, M.D.,
Sung Youn Kim, M.D., Ph.D., Sung Il Woo, M.D., Ph.D., Jong Inn Woo, M.D., Ph.D.**

Department of Neuropsychiatry, Kyunggi Provincial Hospital for the Elderly, Yongin

This study aimed to determine the variables significantly related to the MMSE in the Korean version of the CERAD assessment battery（MMSE-KC）and present the normative information of the test in the Korean elderly.

The MMSE-KC was administered in a standardized manner to 618 healthy volunteers aged 60 to 90 who were recruited from 4 dementia clinics, 2 elderly welfare centers and 1 community population. The elderly with serious neurological, medical and psychiatric disorders including dementia and major depression were excluded through clinical evaluation using CERAD-K clinical assessment protocol. Univariate and multivariate analyses were performed to determine the variables significantly related to the MMSE-KC score.

Age, educational level, and sex were found to have statistically significant effect on the test score. Based on this result, overlapping age normative table（60 to 74, 65 to 79, 70 to 84, and 75 to 90 years of age）with 3 educational strata（0 to 3 years, 4 to 6 years, and 7 years and more）separately for both male and female were developed. For resulting 24 normative units, 5 percentile, lower quartile, median, upper quartile, mean and standard deviation were calculated.

The normative data from this study can be widely used as reference values to objectively interpret the MMSE-KC scores of the Korean elderly.

KEY WORDS：MMSE-KC · MMSE · Norm · Age · Education · Sex.

□ 부　　록 □

MMSE-KC
Mini-Mental Status Examination
in the Korean Version of the CERAD Assessment Packet

검사자는 "

.　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　."라는 말로 검사를 시작한다.

1.	?	0	1	9
2.	?	0	1	9
3.	?	0	1	9
4.	?	0	1	9
5.	? [피검자가 음력을 사용하면 음력으로 묻는다.]	0	1	9
6.	/　/　　?	0	1	9
7.	/　/　?	0	1	9
8.	/　/　?	0	1	9
9.	?	0	1	9
10.	?	0	1	9

11.

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　　　　　　,　　　,

[문항 11은 첫 응답으로만 평가한다.　첫 응답에서 물건의 이름을 모두
말하지 못하는 경우는 문항 13의 지연 회상을 정확하게 검사하기 위해'물건
이름을 불러주고 기억하도록 하는 과정'을 3회까지 반복할 수 있다.]

＿＿＿	0	1	9
＿＿＿	0	1	9
＿＿＿	0	1	9

12.

　　　　　　　　　　　.

　　　　　　,　　　　,

[피검자가 글자를 순서대로 바르게 말할 수 있도록 필요하다면 이 단어를
몇 차례 반복하여 말해 줄 수 있다.]

　　　　　　　　.　　　　　　　　　　　　　　　　　　.

[피검자의 답을 위의 네모 칸에 기록한다. 점수는 뒷편에 제시한 기준에 따라
계산하여 우측 네모 칸에 기록한다.]

13.

               .

            _____   0   1   9

            _____   0   1   9

            _____   0   1   9

14. [열쇠를 보여주며]   ?   0   1   9

   [도장을 보여주며]   ?   0   1   9

   [실제 열쇠와 도장을 보여준다.]

15.   .

              .

            "_____"   0   1   9

   [한 번만 말해주고 반복하지 않는다.]

16.   .

                    .

                 .   ,

              ,   .

   [지시를 끝낸 후에 종이를 건네 준다. 지시를 반복하거나 옆에서 도와주면 안 된다.]

            _____   0   1   9

             _____   0   1   9

             _____.   0   1   9

17. [겹친 오각형 그림을 가리키며]   0   1   9

      .   .

18.   ?   0   1   9

19.

        ?   0   1   9

                                              / 30

MMSE-KC 채점기준

문항 5   .

문항 10   ,   "   " "   "
          ,"   " "   "   .

문항 12   '   '   5   .
              5   .

          1)
          2)
          3)
          4)   2

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문항 17
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문항 18   "   ","   "   .

문항 19   . ,"   ","   ","   ","   "
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