SUBJECTIVE MEMORY DECLINE AND OBJECTIVELY ASSESSED MEMORY ABILITY AMONG OLDER PEOPLE: A CROSS-SECTIONAL STUDY

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ABSTRACT

Objective: The purpose of this study was to explore whether the objectively assessed memory is correlated with the self-rated memory, and does the self-rated memory ability differ among ages.

Methods: Data was obtained from the Evergreen project. A total of 558 people aged between 72 and 92 years were included in the current study. In order to examine the complexity of the relationships between self-rated memory and objective memory ability of the older people, cognitive functioning was assessed by metacognitive self-evaluations and Mini-D cognitive screening test.

Main Results: Mini-D sum score and self-rated memory decline was significantly correlated ($p < .001$). People with lower Mini-D score had 1.40 times the odds of having self-rated memory decline (95% CI= .90-2.18) compared to the individuals with higher Mini-D sum score (>=34). No significant age difference for self-rated memory ability was found (OR=.99, 95% CI= .61-1.43).

Conclusion: Objectively assessed memory correlated modestly, but significantly with self-rated memory. Old individuals with lower objectively assessed memory ability are not more likely to experience self-rated memory decline. Self-rated memory decline did not differ with age.

Keywords: Older people, aging, memory, cognition.

CONTENTS

1. INTRODUCTION

It is a common phenomenon that memory ability declines with the increasing age among human beings. Advanced age has been considered as the mother of forgetfulness. (Aiken 1995) The most commonly reported aging symptoms among the older people are the complaints of memory loss (Dobbs & Rule 1987).

Normal memory changes while aging include, but is not limited to, the appearance of daily forgetful behaviors, like location information (where is my car key?), important temporal information (forget birthday, anniversary et al.), names of things (familiar people or object) and action and purpose (Did I take medicine?). The behaviors which indicate pathological memory aging, include forgetting the name or existence of well-known family members or close-friends, confusion in time, space and orientation (where am I?), having difficulties in simple motor tasks (Cherry 2010). In general, pathological memory aging indicates abnormality on physical or psychological aspects (Cherry& Smith 1998).

Usually, older people may feel they know something even if they cannot recall it. According to Baddeley (1997), Hart was the first one to investigate the feeling of knowing, and found that those who reported a higher feeling of knowing, even if they could recall the answers, still are much more likely to have a correct recognition than those who only had a low feeling of knowing. The study results of metamemory are still inconsistent, some researchers claim that the older people can evaluate their memory well based on their life experience, or they might slightly over estimate their memory ability. But others think old people are likely to underestimate their memory and tend to passively have a negative view of maintaining or improving of their memory ability. (Ruoppila & Suutama 1997)

According to George (2000), Gilewski and Zelinski pointed out there are correlations between memory complaints and memory performance in healthy older people, and the complaints of memory impairments might be a subsequent signal of dementia. There is no relationship between memory complaints and objectively tested memory performance in the advanced period of Alzheimer's disease, because the patients might deny their memory deficit. In Jungwirth's study (2004), 160 out of 302 (53%) individuals did not report any self-rated memory decline, in other words, one of two

subjects complained their memory decline. In Balash's research (2010), 257 out of 341subjects reported subjective memory decline. In Montejo's study (2011), Subjective Memory Complaints (SMC) range from 24% in the 65-69 age group to 57% in the 90 age group. Many studies have found out that the factors related to SMC might be age, education, gender, stress, cognitive performance, complaint, disease, depression, anxiety et al. Overall, depression can be found as the most frequent topic of the research and many more studies have found evidence for the statement that depression is an important factor that can influence subjective memory complaints (Balash 2010; Jungwirth 2004; Heun & Hein 2005; Schmand & Jonker 1997; Clarnette & Almeida 2001; Glodzik-Sobanska et al. 2007; Montejo et al. 2011; Brustrom & Ober 1998). Age is another significant factor of SMC, and older adults report memory complaints much more frequently than younger adults (Sunderland et al. 1986; Schaie & Sherry 2002; Montejo et al. 2011; Brustrom & Ober 1998). In addition, cognitive performance and anxiety are also relevant factors of SMC (Balash 2010; Jungwirth 2004; Schmand et al. 1997; Jessen et al. 2007). Stress is a factor related to SMC in Potter's study (2009). Specially, diseases like Alzheimer's (AD) disease are correlated with perceived memory impairment. While, some patients with AD realize they have significant memory difficulties, but others absolutely deny they have any memory difficulties (Brustrom & Ober 1998). People with epilepsy frequently complain poor memory, and subjective memory shows a stronger relationship with anxiety and depression than objective memory (Hall et al. 2008). About eleven years ago, Clarnette (2001) used a cross-sectional study to investigate clinical characteristics relevant for subjective memory impairment, and found that the cognitive component (CAMCOG) score and word-finding difficulties were associated with memory complaints.

Some researchers believe that self-perceived memory decline is a potential indicator of memory decline (Taylor 1992; Glodzik-Sobanska 2007). Many cross-sectional studies argue that subjective memory impairment (SMI) belongs to depression, personality and physical morbidity, meanwhile, majority of the longitudinal studies suggest that SMI is a predictor of future cognitive decline. The correlation between self-rated memory impairment and cognitive performance is weak in healthy old people, due to the confounding factors like depression. (Jessen et al. 2007)

Besides inconsistent terminologies of self-rated memory ability, an independent association between SMC and objective cognitive impairment has not been found in cross-sectional studies, but longitudinal studies have found a strong correlation between SMC and the subsequent development of dementia or cognitive decline over periods of one to seven years (Paradise et al. 2011). Here in my study, in order to provide scientific evidence of the relationships between subjective and objective memory ability, I am focusing on subjective memory decline, and to find out coexisting factors of self-rated memory decline.

2. NORMAL AGING OF MEMORY

2.1 The structure of memory

Analogies used to explain memory are referred to as models. These models tend to compare the organization of memory with computers (Parkin 1987, 5). Multistore model provides a basic explanation of how memory system is organized. It has both psychological and physiological evidence to support this model (Parkin 1987). Memory is seen as a series of 'stores', each representing a different stage in the progress of processing information. New information enters into a 'sensory store' for the first time, a form of memory which is only confirmed by contemporary library technology. In the stage of sensory storage, information has to undergo a basic process of identification before it goes into short-term store (STS). STS is a place for control; it decides what information is attended to and how information processes, as well as controls the retrieval of existing memory. STS can only hold a certain amount of information. Once information enters into STS, it has one of the two destinies: either it can be transferred into long-term store (LTS), or it can be forgotten. (Parkin 1987)

Nowadays there are many theories on memory, but there is only a little consensus on which theory is correct among those numerous theories in this field (Pawlik & Rosenzweig 2000). Most of the psychologists agree that there are at least three processes in the course of learning and remembering: "acquisition or learning, encoding or storage, and recall or retrieval" (Aiken 1995). Memory is commonly divided into three systems: sensory memory, short-term memory (including primary memory and working memory) and long-term memory (including procedural memory, episodic memory and semantic memory) (Schaie & Sherry 2002). However, Merriam et al. argue that "working memory could be as part of long-term memory, as part of or the same as short-term memory, or as the mediator between sensory memory and either long- or short- term memory (Merriam et al., 2007)."

We could consider a system simply as a series of correlated processes. Memory systems are made up of the major subdivisions of the entire organization of the memory complex. They are structures of more primary operating components. Some operating components are unique, some are shared by all systems, and some are only shared by

certain systems. Different learning and memory conditions require different concatenations of components from one or more systems. Procedural memory can make people retain learned connections between stimuli and responses. Semantic memory enables people to recall states and to construct mental models of the world. (Tulving 1985) Today we think episodic memory is not just a psychological but rather one of the major neurocognitive memory systems. Episodic memory is the only memory system that oriented to the past, and allows people to re-experience past experience consciously. (Tulving 2002)

2.2 Normal aging and memory

"No single variety of human memory is completely immune to the negative influence of aging on its performance (Bäckman et al. 2001, 349)." Age-related declines have been found in task assessing procedural memory, episodic memory, semantic memory, and short-term memory. The most consensus of age-related impairment was observed in the domain of episodic memory. (Bäckman et al. 2001) There are no large age differences in storage or in the amount of information retained in primary memory, but research on working memory shows age differences and age dependance (Schaie & Sherry 2002).

In general, long-term memory decline is slight or nonexistent in semantic memory functioning, but large age related depletion is observed in episodic memory. A possible explanation for this might be because episodic memory is for specific events; sematic memory is for general knowledge (Craik & Jennings 1992).

2.3 Assessment of objective memory performance

There are several commonly used tests for objective memory performance. Mini-D test: This test has been invented at the Neurology Clinic of the Helsinki University Central Hospital from a large test-battery which is based on Luria's Neuropsychological theory; it covers major functions of cognition. Mini-D test was developed for dementia screening, the advantage of this method is that it is relatively short (takes about 15 to 20 minutes) and easy to conduct as well. Orientation, memory and learning, reasoning, visual perception and numeric ability are included in this test, the total score consists of

35 items, and range from 0 to 43. (Ruoppila & Suutama 1997) However, this test is not widely used yet.

The Mini-Mental State Exam (MMSE): ‘The MMSE is a brief, structured test of mental status that takes around 10 minutes to complete, which was introduced by Marshall Folstein and others in 1975, it examines overall cognitive function, as well as orientation, word recall, attention and calculation, language abilities, and visuospatial capacity. The scores on the MMSE range from 0 to 30, scores less than 10 basically indicate a severe impairment, scores between 10 and 19 indicate moderate dementia, and scores of 25 or higher are considered as normal. (Rosenzweig 2010) However, MMSE too has some disadvantages, firstly it cannot explore mild cognitive impairment and cannot record the change of cases with severe dementia, second disadvantage is that age, education, culture and socioeconomic background can bring various bias in the MMSE’s score (Lancu & Olmer 2006).

A slightly modified German version of Fuld Objective Memory Assessment (FOME): it is used to evaluate individuals' objective memory performance; this method is a frequently used standard test of episodic memory (Jungwirth 2004).

There is another way to estimate memory functioning, Snitz and others (2008) used Discrimination Index (D) which originates from classical theory to discriminate participants’ good or poor memory function by evaluating specific everyday memory symptoms.

3. METACOGNITION

We involve in metacognitive activity every day; metacognition enables us to become successful learners, and it is also related to intelligence. Metacognition is relevant in effectively controlling higher stage of thinking and related to learning process, such as planning how to deal with a given study task. 'Metacognition' is usually considered as 'thinking about thinking', but the definition is not that simple. Although this term has been used in educational psychology for many decades, there is a debate about what exactly metacognition is. One of the reason for this confusion is due to the fact that currently there are many terms used to describe the same basic phenomenon (e.g. self-regulation), or one aspect of that phenomenon (e.g. meta-memory), and those terms are usually used interchangeably in literature. (Livingston 1997)

Metamemory refers to people's knowledge and beliefs of their own memory and memory processes in general. Metamemory is a multidimensional phenomenon and refers to at least 4 main dimensions: factual knowledge about how memory functions and utilizes memory strategies; memory monitor; memory self-efficacy; and memory relevant affect. The biggest age difference was found in memory self-efficacy. Memory self-efficacy refers to people's belief in their own memory capacity. The belief includes perceived control over memory, perceived change in memory capacity and anxiousness about memory. Only a weak correlation was found between belief of self-efficacy and true memory performance. (Schaie & Wills 2002) "Metamemory can be seen as a simple theory of one's own memory, which directly and indirectly affects learning performance and motivation (Ruuoppila & Suutama 1997, 47)."

4. SUBJECTIVE MEMORY IMPAIRMENT

Subjective memory decline is fairly common among older people, according to Paradise and his colleagues (2011), the estimates of SMC prevalence varied considerably, from 11% in a population aged 65-85 years old people to over 88% in a population aged over 85 years old in community level. In other community-based samples of the older people, the prevalence rate of SMC ranged from about 22% in a population of 65-84 years old people (Jonker et al. 1996 as cited in Mol et al. 2006, 432) to over 50% in a population of individuals aged 65 years and older (Blazer et al. 1997 as cited in Mol et al. 2006, 432), depends on how memory complaints were assessed and sample selection (Jonker et al. 2000 as cited in Mol et al. 2006, 432). A significant correlation had been found between depression, memory performance and complaints about poor memory, the same for both normal and demented adults (Schaie & Sherry 2002). Some studies state subjective memory impairment (SMI) may be a predictor of future dementia (O' Brien & Beats 1992; Schmand et al. 1997; Jessen et al. 2007). Sobanska's study (2007) found that memory impairment can be a predictor of future memory decline.

However, there is no consensus on how to define SMI, and its definitions vary widely in terms of the types of questions used to identify SMI and other features with regard to memory complaints included in the definition. Different methods have been utilized to define or determine SMI in previous research due to no consistent standard exists. This inconformity leads to some might use a simple question to determine SMI, while others may use a set of criteria or a set of questions. These different methods of assessing self-rated memory complaints may correlate with one another, but they may not be equivalent. (Abdulrab & Heun 2008) Here in this review, different terms refer to self-rated memory were used, and the initial expressions of authors were retained in order to avoid unnecessary misunderstanding.

As regards the studies on the relationships between SMI and objective memory impairment, one study found that the relationships between self-report memory capacity and laboratory memory test performance are weak (Taylor 1992). Schaie's research (2002) argued that memory complaints are normal but not always correctly relate to an

objective test of memory performance. For example, in Jungwirth's research (2004), she found SMI have no relationships with objective memory performance.

4.1 Assessment of subjective memory

Various approaches have been utilized to determine the existence of SMI, they include a simple question, or a set of questions/criteria (Abdulrab & Heun 2008, 322). Different from SMI, different method can be used to explore SMC.

Of those using a single question to determine SMI, the answer could be a yes/no response; a scaled/grade response (Abdulrab & Heun 2008). For example, in Jungwirth's study (2004), subjective memory complaints were measured by the following method. First, the question 'Do you have memory complaints in the last 2.5 years?' was asked. Answers were coded into four categories: no; sometimes, but is no problem; yes, is a problem; yes, is a serious problem. Second, the subject were asked four any changes of specific areas in everyday memory. In the review of Abdulrab and Heun (2008), two articles asked whether participants felt their memory problems were disturbing their daily life or causing troubles, and one of which asked them to compare their memory ability with previous memory of their earlier life.

Memory Assessment Clinics Questionnaire (MAC-Q) is a subjective memory questionnaire which includes a six-item questionnaire needs testers to assess their memory compare with what it is like in their high school age based on a five point scale in a special environment. The higher score indicate a greater memory complaint. (Wolf et al. 2004)

Subjective memory evaluation is a standardized questionnaire which developed to assess all aspects of subjective memory performance (Snitz 2008). This questionnaire makes an interview for the participant with a psychological priority evaluation, and it also includes 14 items to evaluate perceived changes during the past year. The responses of 14 memory relevant items are dichotomized, and 1 stands for 'worse', 0 stands for 'same' or 'better than last year', and the sum of the score ranges from 0 to 14, with the increasing score indicating more decline in activities.

Subjective Memory Complaints scale is formed by an interview which combining the Geriatric Mental State Schedule (GMS), the MMSE, and a set of questions on memory complaints which stem from the Cambridge Mental Disorders of the Elderly Examination (CAMDEX) (Schmand et al. 1997, 373).

4.2 Correlated factors of subjective memory complaints

For the factors that correlated with subjective memory complaints, no consensus was obtained in this field. According to previous studies, the factors related to Subjective Memory Complaints might be age, education, gender, stress, cognitive performance, complaint, disease, depression, anxiety.

Overall, depression is the most frequent topic of the research and studies have found evidence for the statement that depression is an important factor that can influence subjective memory complaints (Balash 2010; Jungwirth et al. 2004; Heun & Hein 2005; Schmand & Jonker 1997; Clarnette & Almeida 2001; Glodzik-Sobanska et al. 2007; Montejo et al. 2011; Brustrom & Ober 1998). Schaie and Sherry (2002) found an important correlation between depression, memory performance and complaints, this finding is consistent with Surprenant and Neath's finding (2007), there is a significant correlation between evaluated memory ability and reported depression, people think their memory ability is not good or decline are more likely to feel depression.

Age is a significant factor of SMC, and older adults report memory complaints much more frequently than younger adults (Sunderland et al. 1986; Schaie & Sherry 2002; Montejo et al. 2011; Brustrom & Ober 1998). In addition, cognitive performance and anxiety are also relevant factors of SMC (Balash 2010; Jungwirth et al. 2004; Schmand et al. 1997; Jessen et al. 2007).

The mostly mentioned outcome of SMC is dementia. Many researchers argue that SMC is a predictor of future dementia (Sobanska et al. 2007; Jessen et al. 2007; O' Brien 1992); one mentioned memory impairment can lead to mild cognitive impairment (MCI) and another one reported the outcome of memory complaints is memory decline. Specially, diseases like Alzheimer's disease (AD) have been found to be related to perceived memory impairment, although there might be some bias. For example, some patients with AD do realize they have significant memory difficulties, but others

absolutely deny they have any memory difficulties (Brustrom & Ober 1998) and people with epilepsy frequently complaint their poor memory. Subjective memory shows a stronger relationship with anxiety and depression than objective memory shows (Hall et al. 2008). About eleven years ago, Clarnette (2001) used a cross-sectional survey to investigate clinical characteristics relevant of subjective memory impairment, and found the cognitive component (CAMCOG) score and word-finding difficulties were associated with memory complaints. But some researchers believe that self-perceived memory decline is a potential indicator of memory decline (Taylor 1992; Glodzik-Sobanska 2007). Stress is found to be a factor related to SMC in Potter et al.'s study (2009). However, one study argues that subjective memory decline has nothing to do with age, gender, cognitive performance, education, marriage, employment and life style (Balash 2010).

5. AIM OF THE STUDY

The purpose of this cross-sectional study is to explore the correlation between self-rated memory and assessed memory ability among older people and to find out whether age difference is existed in self-rated memory decline?

Main research questions include:

1. Does self-rated memory ability differ between ages?
2. Does objectively assessed memory correlate with self-rated memory?

6. METHODOLOGY

6.1 Participants

The participants in this study were from the Evergreen project which investigated 75- and 80-year-old residents (N=679) of the city of Jyväskylä in Central Finland in winter 1990. The aim of this project was to describe the predictors and levels of health and functional capacity among old people. (Heikkinen 1997)

A total of 663 subjects were in the database at the beginning of this study, according to the aim of this study, after excluding the subjects who were without both mini-D score and self-rated memory change data (about 14.8% of them did not have data on this item), of the total 558 participants were included in this analysis. There were 372 participants in the 72~82 age group and 186 participants in the 83~92 age group.

6.2 Self-rated memory test

Self-rated memory was assessed by asking "How do you feel your memory has changed?" Participants were given five items to choose from: 1 = clearly better; 2 = better; 3= stable, 4 = somewhat worse and 5= clearly worse. When analyzing between groups with different self-rated health, data were grouped into two categories: 1= no decline (clearly better, better and stable) and 2= decline (somewhat worse and clearly worse).

6.3 Mini-D cognitive screening test

Mini-D has been developed at the Neurology Clinic of the Helsinki University Central Hospital from a larger test-battery, the D-test, which is based on Luria's neuropsychological theory and covers major cognitive functions. The Mini-D was constructed for dementia screening purposes, it could be easily utilized and relatively short (takes about 15 to 20 minutes), and it can also detect mild dementia. The Mini-D includes 35-item, the items examine orientation, memory and learning, reasoning, visual perception and numeric ability. Most of the items need information verbally by the participants, only a few of them requiring the use of paper and pencil. The sum score of Mini-D test is range from 0 to 43, usually the sum score is used, but it is possible to evaluate each sub scores. (Ruoppila & Suutama 1997) Here in this study, we utilized the

lowest one third (Mini-D sum score <34) of the Mini-D score as a cut-off score for bad memory and good memory performance.

6.4 Self-rated functional capacity and change in health

The item change in health in this study refers to change in health since 1988, both self-rated functional capacity and change in health were recorded by asking question "How do you feel your functional capacity had changed?" and "How do you feel your health has changed since 1988?" respectively. And this information was obtained from questionnaires used as part of the Evergreen project.

6.5 Statistical analysis

All data were analyzed using the Statistical Package for The Social Sciences (SPSS 19.0 for Windows). Only those individuals' with full data were included in the statistical analyses. ANOVA was used to compare Mini-D score between two age groups and presence of memory decline. Spearman's correlation was utilized to analysis correlations of the study variables. Cross-tabulation was used to compare the basic characteristics of the old people who with and without self-rated memory decline. Binary logistic regression analysis was used to assess the odds of perceived memory decline for those with lower third Mini-D sum score and those with higher two third scores.

7. RESULTS

The basic characteristics of two cohort age groups are shown in Table 1. In the older cohort, a smaller proportion were male (35% in 72-82 age group, 28% in 83-92 age group), the educational level was lower in the older age group, but the self-rated memory decline did not differ according to age (P=.292). A statistically significant difference was observed between the two age groups in the Mini-D sum score (P< .001), although there was no big numerical difference between the Mini-D sum score.

TABLE1 . The basic characteristics of two cohort age groups, N = 558

	Age (years)		*P* (Chi-square)
	72~82 (n=372)	83~92 (n=186)	
Gender (%)			0.097
Men	35	28	
Education (%)			0.026
＜Primary	5	11	
Primary	80	73	
Secondary	8	10	
University	8	6	
Marital status (%)			0.003
Single	11	13	
Married/cohabitating	34	24	
Widowed	47	59	
Divorced	8	3	
Living arrangement (%)			<.000
Independently[a]	90	73	
Dependently[b]	10	27	
Self-rated memory decline			0.292
Yes	31	26	
No	69	74	
Mini-D test score (mean/SD)	36 (5.4)	33 (6.8)	<.001 (ANOVA)

[a]: living at home or old age home but independently. [b]: Living in old age home or hospital et al. and receiving help.

Table 2 shows the means of Mini-D score of self-rated memory decline in two cohort groups. In the younger age group, the mean of mini-d score were both 36 for participants whose self-rated memory decline were ‘worse’ and ‘no decline’ (table 2), but they were statistically different (P= .010) due to the big difference in standard deviations (SD= 4.1 in “worse” category and SD=5.9 in “no decline” category), It means two-third of the mini-d sum score lie between 30.1 (36-4.1) and 41.9 (36+4.1) for people who rated their memory as “no decline”, which indicated people who rated their memory as “no decline” had more variation of Mini-D sum score than people who rated their memory as “worse”. In the older age group, the mean of Mini-D sum score between participants who rated their memory change as ‘worse’ and ‘no decline’ was not statistical different (P=.099). While comparing the two age group’s Mini-D sum score via independent sample t-test, a big difference was found (P< .001).

TABLE 2. The means of Mini-D score of self-rated memory decline in two cohort groups according to ANOVA.

	Age group								
	72-82 years (N=372)			83-92 years (N=186)			Total		
	Mean	SD	p	Mean	SD	p	Mean	SD	p
Self-rated Memory decline			.010			.099			.001
Worse	36	4.1		34	4.9		36	4.6	
No decline	36	5.9		32	7.3		35	6.6	

Table 3 shows the correlation of the study variables, Mini-d sum score and self-rated memory decline was weakly but statistically significantly correlated (r= -.15, p<.001); Mini-d sum score had medium correlation with age (r= -.32, p<.001) and education (r= -.43, p<.001). Self-rated memory decline also correlated significantly with change in health (r= -.25, p<.001).

TABLE 3. Spearman's correlations of the study variables.

Variables	1	2	3	4	5
1. **Age**	-				
sig. (2-tailed)	-				
2. **Education in years**	-.16	-			
sig. (2-tailed)	<.001	-			
3. **Mini-d sum score**	-.32	.43	-		
sig. (2-tailed)	<.001	<.001	-		
4. **Self-rated memory change**	.11	-.05	-.15	-	
sig. (2-tailed)	.010	.236	<.001	-	
5. Change in health	.15	-.10	-.11	.25	-
sig. (2-tailed)	<.001	.024	.009	<.001	-

Table 4 presents the characteristics of the older people with and without subjective memory impairment. No age difference was found between people with and without self-rated memory decline, statistically significant difference was found in Mini-D sum score between people with and without self-rated memory decline (p=.039).For people whose health change was worse since 1988, majority (77%) of them reported SMC, and this difference was statistically significant (p<.001) compare with old individuals whose health was improved since 1988. The same phenomenon happened to self-rated function capacity, a big proportion (82%) of people who rated their function capacity as poor reported SMC. This difference was also statistically significantly different while (p<.001) compared with old individuals whose self-rated functional capacity was good.

TABLE 4. The characters of the older people who with and without self-rated memory decline.

		Self-rated memory decline		p (Chi-square)
		Yes N (%)	No N (%)	
Age group				.292
	72-82	258 (69)	114(31)	
	83-92	137(74)	49(26)	
Gender				.105
	Men	137(75)	45(25)	
	Women	258(69)	118(31)	
Mini-D cut-point score				.039
	<33	263(68)	123(32)	
	>=34	132(77)	40(23)	
Self-rated functional capacity				<.001
	Good	81(56)	63(44)	
	Fair	235(74)	83(26)	
	Poor	79(82)	17(18)	
Change in health				<.001
	Improved	8(42)	11(58)	
	Stable	89(59)	62(41)	
	Worse	294(77)	90(23)	

(Table 5) No age difference was found in self-rated memory decline. Women showed an odds ratio of 1.42 (95%CI= .94-2.16) of having self-rated memory decline compared to men. People with lower Mini-D score had 1.40 times the odds for having self-rated memory decline (95% CI= .90-2.18) compared with those individuals with higher Mini-D sum score (>=34); and for people whose self-rated function capacity were fair had 2.41 times the odds of having self-rated memory decline (95%CI= 1.23-4.70); people's health were stable since 1988 showed 3.78 times the odds for having self-rated memory decline (95%CI= 1.43-9.97) compared to those health improved since 1988.

TABLE 5. Logistic regression of self-rated memory decline (Odds for having self-rated memory decline).

	OR	95% CI
Age	.99	(.61-1.43)
Gender		
Men	1	
Women	1.42	(.94-2.16)
Mini-D cut-point score		
>=34	1	
< 33	1.40	(.90-2.18)
Self-rated functional capacity		
Good	1	
Fair	2.41	(1.23-4.70)
Poor	1.32	(.72-2.41)
Change in Health		
Improved	1	
Stable	3.78	(1.43-9.97)
Worse	1.75	(1.13-2.72)

8. DISCUSSION

The current study demonstrated that objective memory performance correlated with self-rated memory ability, although the correlation was weak ($r=.15$, $p<.001$). This result was consistent with Taylor's, who reported that the relationships between self-report memory capacity and laboratory memory test performance was weak (Taylor 1992). There was one study which reported that subjective memory complaints or perceived memory impairment has moderate agreement with actual memory ability (Sunderland et al. 1986). Paradise and his colleagues' longitudinal study found a strong correlation between subjective memory complaints and the subsequent development of dementia or cognitive decline over periods of one to seven years (Paradise et al. 2011). However, Jungwirth and his colleagues (2004) found no relationships between subjective memory complaints and objective memory impairment. Schaie and Sherry claimed that subjective memory complaints were not always correlate with objective tests of memory performance (Schaie & Sherry 2002, 317).

There may be three major reasons for why there is no consensus on the relationships between self-rated memory and assessed memory ability. One is due to no consistency in how to define SMI in research or clinical practice fields (Abdulrab 2008, 321). There is no standard criteria for self-rated memory decline even though they are indicate the same meaning, for example, some authors use 'perceived memory impairment', some of them use 'subjective memory impairment' and some of them use 'subjective memory complaints'. A second possible explanation could be that memory decline occurs at different levels, people with different cognition levels often view things quite differently. It is too subtle to access memory decline subjectively, for example, those with low cognition cannot evaluate their memory correctly anymore, and people with high cognition ability in their early adulthood might feel the decline easily, while their memory ability declines to normal level in later adulthood. Only those who experience rapid or relatively large declines might be able to assess their memory change more accurately (Zelinski et al. 2001, 250). A third reason could be that due to the potential disadvantages of the methods which used to test actual memory, and those disadvantages could introduce bias to the research outcomes. For example, age and education can introduce bias to the score if MMSE is used as a tool to identify SMI (Lancu & Olmer 2006).

Current study also indicates that older individuals with lower objectively assessed memory ability are not more likely to experience self-rated memory decline by logistic regression, which was not correspond with the result of Spearman's correlation. This was because of in Spearman's correlation, I utilized continuous sum score of Mini-D test, but categorized sum score were utilized in logistic regression (Mini-D sum score <33 or >=34). Therefore, bias might exist while we compare individuals with lower and higher objectively assessed memory ability. For example, people with sum score of 33 were seem as in the lower ability group, and people with sum score of 34 were in the higher ability group, but actually their memory ability did not differ too much.

These data show that self-rated memory ability is not statistically significantly different between age groups. A study by Balash (2010) supports my result. He argues that subjective memory decline has nothing to do with age, gender, cognitive performance, education, marriage, employment and life style. However, many other studies showed that age was significant factor of SMC, and older adults report memory complaints much more frequently than younger adults (Sunderland et al. 1986; Brustrom & Ober 1998; Schaie & Sherry 2002; Montejo et al. 2011). The reason why no age differences were found might be because people with true memory problems seem to conceal their condition. On the other hand, Schaie and Sherry (2002) claimed the extent of memory difficulties among old people might be magnified by the elderly themselves as well as by relatives and specialists.

A factor that is necessary to take into account is, according to Surprenant and Neath (2007), Anderson and Craik argue that self-initiated activities show a large decline with aging in the prospective memory articles, and is the same as the decline shows in recall and context, both of them are sensitive to the amount of available environmental support in a situation. Environmental support could be a sensitive factor that might influence people's memory performance, and then effect on their subjective judge of memory. Because it is possible that people with more environmental support can perform better than others without enough environmental support, and the group of people without enough environmental support might complain about their poor memory performance much more, but if they can receive the support they might perform much better on memory aspect, this may enhance their confidence of their own memory which would return help to reduce their subjective memory complaints. According to Balota

(2000), Craik claimed that the extent of age-rated differences will depend upon the nature of task demands. Age-related memory differences will be minimized if the task demands are more stimulus-driven and with environmental support. On the country, age-related differences will be large if the task is less supported by the environment, because then it requires more self-initiated recall processes. This could also explain why age differences are larger in episodic memory tasks. (Balota 2000)

One tricky thing in self-rated study is that even if the answer of the questions is "bad/worse", we still cannot determine that this person is with negative attitude, because the questionnaire utilized in our research had questions just like "how do you feel about your memory, does it worse or better or stable compare with when you were younger?", and with no other tools to make sure whether the participants' answer was positive or negative. For example, his/her objective memory could be "very bad/terrible", however he/she still positively answered the questionnaire as "bad/worse", in this case, the thing we can do is to study the surface of the phenomenon of the self-rated questions. Hence, more effort should be focus on the psychological aspect, in other words, pay more attention to determine whether the answer is positive or negative. Otherwise the study of self-rated memory could only stay in the place of stereotype.

The strength of this study is that it uses different statistical methods to analysis the same research question, which gives a broad, multi-faceted view of the subject matter. However, some methodological limitations in this study should be acknowledged. First, the cut-off point value for the Mini-d sum score was not clearly stated in the literature; hence we utilized the lowest one-third cut-off point score to distinguish relatively bad and good cognition. Using alternative cut-off point might lead to different outcomes. The optimal cut-off point to screen for dementia use should be explored in the future studies. Second, the clinical health status of the participants in this study was not analyzed. Third, the current study relies on cross-sectional rather than on longitudinal data, and therefore it cannot establish a causal relationship between age and self-rated memory ability change and cohort-rated effects should be taken into account.

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