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Original article

Premorbid personality traits and neuropsychiatric symptoms in patients with mild cognitive impairment

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Background: Neuropsychiatric symptoms (NPS) are common in patients with mild cognitive impairment (MCI) and associated with greater functional impairment. NPS may precede the onset of cognitive decline. Thus, recognition of NPS will become increasingly important. Premorbid personality traits might be another potential risk factors of NPS in MCI patients. However, there are still restricted numbers of studies with conflicting data.
Objectives: To examine the association between premorbid personality traits and NPS in patients with MCI.
Methods: This is an observational study of adults aged ≥ 50 years with MCI (n = 83). Data collection was performed using a personal information questionnaire, the Thai version of Mini-Mental State Examination (TMSE), Montreal Cognitive Assessment (MoCA), Neuropsychiatric Inventory Questionnaire (NPI-Q) and International Personality Item (IPIP). Demographic data were analyzed by frequency and percentage. The associated factors of NPS were analyzed using Chi-square, *t* - test, univariate and multivariate logistic regression.
Results: Among 83 subjects with the mean age of 72.0 ± 7.1, 61.4% were female. The prevalence of NPS was 67.5%. The most common symptoms were irritability (34.9%), sleep problems (31.3%) and anxiety (26.5%), respectively. Premorbid emotionally stable and agreeableness personality trait were significantly lower in MCI with NPS compared to those without NPS ($P < 0.05$). The low emotionally stable trait was found to be significantly associated with anxiety and sleep problems in MCI patients ($P < 0.05$). After adjusting for age, gender, education, duration of symptoms, MoCA score, history of psychiatric disorder, psychiatric drugs and cognitive enhancing drugs in a multivariate model, low emotionally stable trait was independently associated with NPS in MCI (OR 0.62, 95% CI 0.38 to 1.00).
Conclusions: MCI subjects with NPS differ in their premorbid personality traits compared to those without NPS. The low premorbid emotionally stable could be considered as one risk factor for NPS in MCI patients.

Keywords: Personality trait, mild cognitive impairment, mild neurocognitive disorder, neuropsychiatric symptoms, behavioral and psychological symptoms.

Mild cognitive impairment (MCI) refers to a cognitive deficit in one or more domains without a decline in activities of daily living (ADL). [1] It is an intermediate stage between normal cognitive aging and dementia. MCI is important because it has become increasingly common in older populations and is associated with an increased risk of progression to dementia. Even though there are no proven treatments for cognitive symptoms in MCI, other symptoms should be evaluated and treated to improve quality of life in MCI. [2]

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Neuropsychiatric symptoms (NPS) or behavioral and psychological symptoms (BPS), including mood symptoms (depression, sleep disturbances, anxiety), psychotic symptoms (delusions, hallucinations), and behavioral symptoms (aberrant motor behavior, disinhibition) are common in patients with MCI. [3 - 5] They may be associated with greater functional impairment, more rapid cognitive decline [6], earlier institutionalization and caregiver burden than those without NPS. [7] Moreover, NPS often presents in the earliest clinical stages and may precede the onset of cognitive decline. [8] Thus, recognition of NPS will become increasingly important as preventative strategies and treatments that may be most effective in the early stages of the disease. [9] Many risk factors have been reported for the manifestation of NPS in MCI, for example, male gender, younger age, Caucasian race [10], disease severity [8], domain of cognitive impairment such as dysnomia. [11]

Premorbid personality traits might be another potential risk factors of NPS in neurocognitive disorders. There have been various personality models, including the Five-Factor Model (FFM), as personality characteristic dimensions, which are, namely: 1) neuroticism (tendency to feel negative emotions such as anxiety); 2) extraversion (activity and sociability); 3) openness to experience (broad-mindedness); 4) agreeableness (reflecting likability and friendliness); and, 5) conscientiousness (tendency to be self-disciplined). [12] Previously, positive relationship between premorbid neuroticism and NPS in dementia [13] were reported, whereas premorbid neuroticism and openness to experience were associated with the NPS in MCI.[14] However, some studies have failed to demonstrate links between premorbid personality and NPS. [15] There are still restricted numbers of studies with conflicting data. This research, therefore, aimed to study premorbid personality traits and the involved factors for the NPS in patients with MCI.

Materials and methods

Participants

We recruited 83 subjects aged ≥ 50 years both male and female at the Psychiatric Outpatient Department, King Chulalongkorn Memorial Hospital, Bangkok, Thailand from November 2017 to April 2018. The diagnosis of MCI was made using the criteria of the International Working Group criteria for general MCI[1] and additional inclusion criteria were: 1) TMSE score more than 23; 2) MoCA score less than 25; and 3) normal ADL. Their caregivers, who were ≥ 18 years of age, regular contact with the subjects were assessed. The subjects would be excluded if they met the diagnostic criteria for dementia or active symptoms of psychiatric disorders. All participants and caregivers gave written informed consent prior to participation in this study. This study has been approved by the Ethics Committee or the Institutional Review Board (IRB) of the Faculty of Medicine, Chulalongkorn University, Bangkok, Thailand (COA No. 576/2017), which is in compliance with the International Guideline for Human Research protection as required by the Declaration of Helsinki, The Belmont Report, CIOMS Guideline and International Conference on Harmonization in Good Clinical Practice (ICH-GCP).

Clinical assessment

All subjects were assessed by a psychiatrist using demographic data questionnaire, a semi-structured interview for : 1) personal history about age, gender, marital status, occupation, income, education level; 2) medical history of cognitive symptoms, duration of MCI, ADL, history of medical illness and cognitive enhancing drugs; 3) psychiatric history about history of psychiatric disorders, severity and psychotropic drugs. Neurological/physical and psychiatric examination were comprehensively done. The informants (the subjects' caregivers) were assessed by a semi-structured interview for age, gender, duration and frequency of care.

Cognitive assessment

The Thai Mental State Examination (TMSE) [16] was used as a screening tool for dementia. Subjects were assessed in 6 domains including orientation, registration, attention, calculation, language and recall, with the cut point of 23 out of 30 points indicates dementia. The Thai version of Montreal Cognitive Assessment (MoCA) [17] was used to assess cognitive function in 8 domains, with the total score of 30. One point was added for those who have ≤ 6 years of education. Total scores that are less than 25 indicates mild cognitive impairment. [18]

Personality assessment

The Thai version of International Personality Item (IPIP) [19] was used to access personality traits. There are 60 items, 5 factors of personality traits including emotional stability, extraversion, openness to experience, agreeableness, and conscientiousness, which can be calculated the full score by scoring 10 points on each factor of personality trait. If the score is lower than 5, it means that the personality trait in that factor is low, score 5 - 6 means that the personality trait in that factor is average and more than 6 points means that the personality trait in that factor is high. The emotional stability in this IPIP test has the opposite characteristic of the neuroticism in five-factor model personality. The Thai version of IPIP was completed by subjects' caregivers to describe personality traits of the participants five years prior to MCI diagnosis. The IPIP was highly correlated with the NEO-FFI [20], which was the reliable tool measuring premorbid personality in patients with AD. [21]

Assessment of NPS

The Thai version of Neuropsychiatric Inventory-Questionnaire (NPI-Q) (Hemrungrojn S, *et al*., manuscript in preparation), consists of 12 domains including delusions, hallucinations, agitation or aggression, depression, anxiety, euphoria, apathy, disinhibition, irritability, motor disturbance, nighttime behaviors and changes in appetite. A previous study found that NPI-Q had acceptable level of internal consistency. Caregivers were assessed whether the subjects had these symptoms during the past 4 weeks. If there are ≥ 1 symptom, it means that the subjects has neuropsychiatric symptoms. In each symptom, the severity will be assessed according to the severity level 1 - 3 (mild to severe), total scores are 0 - 36. To evaluate the caregiver distress score in each symptom, there are 5 levels (1 - 5 means "not suffering so much" to "cannot handle the problem"), total scores are 0 - 16 [22]

Statistical analyses

The data were analyzed using SPSS, version 22.0. Descriptive statistic was used to describe general characteristics of participants including frequency, percentage, mean and standard deviation (SD). The associated factors between premorbid personalitytraits and NPS were analyzed by Chi-square test, *t* - test, Fisher's exact test. Significant factors from theoretical review and univariate analysis were entered into multiple logistic regression model and demonstrated as odds ratio (OR) and 95% confident interval (CI) in order to identify the predictors of NPS. A *P*-value of less than 0.05 was considered statistically significant.

Results

Participant characteristics

Demographic data are presented in Table 1. Overall, mean age was 72.0 ± 7.1 years. Most of them were female (61.4%), married (68.7%), had income (71.1%). The education level was 13.7 ± 5.5 years. 81.9% of the subjects retired or having no career. Most of subjects had at least one medical illness (96.4%) and psychiatric disorders (21.7%). Subjects used psychotropic drugs (38.6%) and cognitive enhancing drugs (30.1%). The mean MoCA score were 21.6 ± 3.1.

Table 1. Personal data of patients with mild cognitive impairment (n = 83).

Characteristics	All samples (n = 83)	NPS (n = 56)	Non NPS (n = 27)
Age (years)	72.0 ± 7.1	72.7 ± 7.3	70.6 ± 6.6
Gender (M/F)	32 (38.6)/51 (61.4)	25 (44.6)/31(55.4)	7 (25.9)/20 (74.1)
Marital status			
Single	6 (7.2)	4 (7.1)	2 (7.4)
Married	57 (68.7)	39 (69.6)	18 (66.7)
Widowed	17 (20.5)	12 (21.4)	5 (18.5)
Separated/Divorced	3 (3.6)	1 (1.8)	2 (7.4)
Education level (years)	13.7 ± 5.5	13.8 ± 5.4	13.2 ± 5.8
Current occupation			
No career/Retirement	68 (81.9)	48 (85.7)	20 (74.1)
Government official	1 (1.2)	0 (0.0)	1 (3.7)
Private business/Trading	12 (4.5)	6 (10.7)	6 (22.2)
Employee	2 (2.4)	2 (3.6)	0 (0.0)
Income (yes)	59 (71.1)	41 (73.2)	18 (66.6)
Duration of MCI (years)	4.2 ± 4.6	4.4 ± 5.3	3.8 ± 2.7
History of medical illness	80 (96.4)	55 (98.2)	25 (92.6)
History of psychiatric disorders	18 (21.7)	12 (21.4)	6 (22.2)
Psychotropic drugs	32 (38.6)	22 (39.3)	10 (37.0)
Cognitive enhancing drugs	25 (30.1)	15 (26.8)	10 (37.0)
MoCA	21.6 ± 3.1	21.1 ± 3.4	22.7 ± 2.2
NPI-Q			
Neuropsychiatric symptoms	56 (67.5)	56 (100.0)	-
NPS severity scores	3.5 ± 6.1	3.5 ± 6.1	-
Caregiver distress scores	3.0 ± 3.8	3.0 ± 3.8	-

Data are expressed as n (%) or mean ± SD

Neuropsychiatric symptoms

The prevalence of NPS according to NPI-Q was 67.5%, the mean of NPS severity score was 3.0 ±3.8 and the mean of caregiver distress score was 3.5 ± 6.1. (Table 1) The prevalence of MCI patients with NPS was 67.5%. The most common symptoms were irritability (34.9%), sleep problems (31.3%), anxiety (26.5%) and depression (22.9%) respectively (Table 2).

Premorbid personality

The MCI patients with NPS had significantly lower emotional stability and agreeableness score than those without NPS ($P < 0.05$), whereas conscientiousness, openness, and extraversion score were not significantly different between MCI patients with NPS compared to those without NPS. (Table 3).

When analyzing each domain of NPS, the MCI patients with anxiety and sleep problems had significantly lower emotional stability than those without anxiety and sleep problems ($P < 0.05$), but no significant difference between MCI patients with anxiety and sleep problems compared to those without anxiety and sleep problems (Table 4). Other domains of NPS were not significantly associated with all personality score.

Premorbid Personality Predicting NPS

Results of logistic regression are detailed in Table 5. In univariate analysis, two factors showed a statistically significant association ($P < 0.05$) with neuropsychiatric symptoms in patients with mild cognitive impairment. These included MoCA score (OR 0.80, 95% CI 0.65 to 0.98) and premorbid low emotional stability (OR 0.75, 95% CI 0.60 to 0.95). No significant association was found with age, gender, age, education, duration of symptoms, MoCA score, history of psychiatric disorder, psychiatric drugs, cognitive enhancing drugs and other premorbid personality traits.

After adjusting the factors of variations, i.e., age, gender, age, education, duration of symptoms, MoCA score, history of psychiatric disorder, psychiatric drugs and cognitive enhancing drugs in a multivariate model, premorbid low emotionally stable personality trait was independently significantly associated with neuropsychiatric symptoms of mild cognitive impairment (OR 0.62, 95% CI 0.38 to 1.00, $P < 0.05$).

Table 2. Neuropsychiatric symptoms in patients with mild cognitive impairment (n = 83)

NPS symptoms	n (%)	NPS symptoms	n (%)
Irritability	29 (34.9)	Agitation or aggression	14 (16.9)
Sleep problems	26 (31.3)	Motor disturbance	10 (12.0)
Anxiety	22 (26.5)	Changes in appetite	9 (10.8)
Depression	19 (22.9)	Delusions	7 (8.4)
Apathy	18 (21.7)	Hallucinations	6 (7.2)
Disinhibition	14 (16.9)	Euphoria	5 (6.0)

Table 3. Premorbid personality traits and neuropsychiatric symptoms in patients with MCI.

IPIP Personality score	NPS (n = 56)	No NPS (n = 27)	*P* - value
Emotional stability	5.4 ± 2.3	6.8 ± 2.3	0.012*
Conscientiousness	6.7 ± 1.8	7.1 ± 1.8	0.405
Openness	5.1 ± 2.1	5.8 ± 1.9	0.116
Extraversion	5.9 ± 1.7	6.3 ± 1.5	0.405
Agreeableness	6.8 ± 1.9	7.6 ± 1.4	0.040*

*$P < 0.05$

Table 4. Premorbid personality traits and anxiety and sleep problems in patients with mild cognitive impairment.

IPIP Personality score	Anxiety			Sleep problems		
	Present (n = 22)	Absent (n = 61)	*P* - value	Present (n = 26)	Absent (n = 57)	*P* - value
Emotional stability	5.0 ± 2.4	6.2 ± 2.3	0.047*	4.9 ± 2.7	6.3 ± 2.1	0.020*
Conscientiousness	6.4 ± 1.9	7.0 ± 1.8	0.285	6.9 ± 1.8	6.8 ± 1.8	0.895
Openness	5.3 ± 2.4	5.3 ± 2.0	0.914	5.0 ± 2.4	5.5 ± 2.0	0.332
Extraversion	5.9 ± 1.7	6.1 ± 1.6	0.574	5.9 ± 1.7	6.1 ± 1.6	0.606
Agreeableness	6.8 ± 2.1	7.2 ± 1.6	0.448	6.8 ± 2.1	7.2 ± 1.6	0.324

*$P < 0.05$

Table 5. Predictors of neuropsychiatric symptoms in patients with mild cognitive impairment.

Characteristics	Univariate		Multivariate	
	OR (95%CI)	*P* - value	OR (95%CI)	*P* - value
Age	1.05 (0.98 - 1.12)	0.199	1.19 (1.01 - 1.41)	0.046*
Gender	2.30 (0.84 - 6.32)	0.105	9.94 (1.18 - 83.80)	0.035*
Education	1.03 (0.93 - 1.13)	0.638	1.11 (0.95 - 1.30)	0.186
Duration of MCI	1.03 (0.92 - 1.15)	0.633	1.13 (0.90 - 1.41)	0.303
MoCA score	0.80 (0.65 - 0.98)	0.031*	0.80 (0.58 - 1.09)	0.153
History of psychiatric disorder ddidisorder	1.05 (0.35 - 3.18)	0.934	0.75 (0.06 - 9.76)	0.825
Psychotropic drugs	0.91 (0.35 - 2.35)	0.844	1.19 (0.15 - 9.41)	0.871
Cognitive enhancing drugs	1.61 (0.60 - 4.28)	0.342	8.74 (1.00 - 76.76)	0.051
IPIP Emotionally stable	0.75 (0.60 - 0.95)	0.016*	0.62 (0.38 - 1.00)	0.049*
IPIP Conscientiousness	0.89 (0.69 - 1.61)	0.401	0.87 (0.52 - 1.46)	0.587
IPIP Openness	0.83 (0.66 - 1.05)	0.118	0.62 (0.33 - 1.18)	0.145
IPIP Extraversion	0.88 (0.66 - 1.18)	0.401	1.23 (0.62 - 2.44)	0.552
IPIP Agreeableness	0.76 (0.57 - 1.02)	0.069	1.09 (0.56 - 2.12)	0.798
Constant			0.003	0.410

*$P < 0.05$

Discussion

Our findings demonstrated that approximately two thirds of patients with MCI experienced at least one NPS. This was confirmed with previous systematic review that discovered the prevalence of NPS in the elderly with MCI between 35.0% to 85.0% depending on the NPS observed. [23] The symptoms mostly found were irritability, sleep problems, anxiety, and depression, consistent with previous studies. Edwards ER, *et al*. [24] found that frequent NPS in patients with MCI contained anxiety, insomnia, and depression. Also, Mendez Rubio M, *et al.* [14] confirmed frequent frustration and liability of mood in MCI.

In this study patients with MCI had premorbid personality trait of low emotional stability related to NPS. This was supported the study of Sutin AR, *et al*. [25], suggesting that patients with MCI and premorbid personality trait of high neuroticism had a high risk of NPS. The hypothesis that premorbid personality traits may be related to cognitive decline. was confirmed by a previous study which suggested that high neuroticism often undergo negative emotional problems, with inappropriate responses to stress on account of stress towards their behavioral changes and cognitive impairment. Moreover, another study also described that those with high neuroticism would release more glucocorticoid than ordinary people, resulting in hippocampal atrophy and global atrophy when they get older. Their cerebral gray matter ventral/dorsal-lateral prefrontal cortex orbitofrontal cortex and cerebral white matter reduced in size [26], which may affect cortical function and neuropsychiatric symptoms.

Premorbid personality trait of low agreeableness is related to neuropsychiatric symptoms, in accordance with the study of Archer N, *et al*. [27], pointing that

those with premorbid personality trait of low agreeableness had a high risk of neuropsychiatric symptoms because they did not prefer changes and were barely able to adapt themselves. For these reasons, cognitive impairment brought about amnesia and difficult communication ability. The patients usually did not accept changes and were unsociable, which might increase the risk of neuropsychiatric symptoms and the severity of cognitive impairment.

Having considered the neuropsychiatric symptoms in each type of patients with MCI, we found that patients with premorbid personality trait of low emotional were related to anxiety and sleep problems. This was in agreement with the study of Farnam A, *et al*.[28], that those with high neuroticism simply had a risk of anxiety. Löckenhoff CE, *et al*.[29] found that those with high neuroticism repeatedly had sleep quality problems. Additionally the systemic review study of Katov R, *et al*.[30] showed that 7 in 18 of the studies exhibited that those with high neuroticism obviously had a higher risk of affective and psychiatric disorders than ordinary people throughout their life. NPS are the combination of affective and psychiatric disorders. It, therefore, can be inferred that those with high neuroticism have a high risk of NPS as well. [14, 31]

According to multivariate logistic regression analysis, there were premorbid personality trait of low emotional stability that could predict the rise of NPS in patients with MCI, after adjusting for age, gender, education, duration of symptoms, MoCA score, history of psychiatric disorder, psychiatric drugs and cognitive enhancing drugs. This finding was consistent with the study of Sutin AR, *et al*.[25] in the sense that premorbid personality trait of high neuroticism was the crucial factor predicting the risk of NPS, when other basic factors were controlled, i.e., sex, age, nationality, and education.

The limitations of this study should be acknowledged. First, this is a descriptive study, causal relationships could not be concluded. The instrument for testing premorbid personality traits in the study was used for retrospective assessment, which might be less accurate than the prospective one. Second, the small sample size did not allow separating the MCI group into different subtypes. Finally, the data were collected from only outpatient department, King Chulalongkorn Memorial Hospital, so the findings of the study cannot be generalized to other population groups.

Future researches should be conducted as prospective study, collecting data about personality traits of the MCI patients since no NPS symptoms until it starts to appear with NPS to find causal relationship between NPS and premorbid personality trait. The number of subjects should also be increased and extended to other clinics or communal patients. Further studies about biomarkers or neuroimaging studies of MCI patients with NPS and personality trait could explain the biological mechanisms of premorbid personality traits and NPS.

Conclusion

In conclusion, our findings suggest that NPS is common in MCI. MCI subjects with NPS differ in their premorbid personality traits compared to those without NPS. Lower premorbid emotional stability could be considered as a risk factor for NPS in MCI patients. Additional studies are needed to find causal relationship and determine the biological mechanisms of premorbid personality traits and NPS.

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Conflict of interest

The authors, hereby, declare no conflict of interest.

References

1. Winblad B, Palmer K, Kivipelto M, Jelic V, Fratiglioni L, Wahlund LO, et al. Mild cognitive impairment—beyond controversies, towards a consensus: report of the International Working Group on Mild Cognitive Impairment. J Intern Med 2004;256:240-6.
2. Petersen RC, Lopez O, Armstrong MJ, Getchius TSD, Ganguli M, Gloss D, et al. Practice guideline update summary: Mild cognitive impairment: Report of the Guideline Development, Dissemination, and Implementation Subcommittee of the American Academy of Neurology. Neurology 2018;90:126-35.
3. Vicini Chilovi B, Conti M, Zanetti M, Mazzù I, Rozzini L, Padovani A. Differential impact of apathy and

depression in the development of dementia in mild cognitive impairment patients. Dement Geriatr Cogn Disord 2009;27:390-8.
4. Lyketsos CG, Lopez O, Jones B, Fitzpatrick AL, Breitner J, DeKosky S. Prevalence of neuropsychiatric symptoms in dementia and mild cognitive impairment: results from the cardiovascular health study. Jama 2002;288:1475-83.
5. Modrego PJ, Ferrández J. Depression in patients with mild cognitive impairment increases the risk of developing dementia of Alzheimer type: a prospective cohort study. Arch Neurol 2004;61:1290-3.
6. Somme J, Fernandez-Martinez M, Molano A, Zarranz JJ. Neuropsychiatric symptoms in amnestic mild cognitive impairment: increased risk and faster progression to dementia. Curr Alzheimer Res 2013;10: 86-94.
7. Trivedi SC, Subramanyam AA, Pinto C, Gambhire DD. Neuropsychiatric symptoms in mild cognitive impairment: An analysis and its impact on caregiving. Indian J Psychiatry 2013;55:154-60.
8. Apostolova LG, Cummings JL. Neuropsychiatric manifestations in mild cognitive impairment: a systematic review of the literature. Dement Geriatr Cogn Disord 2008;25:115-26.
9. Gallagher D, Fischer CE, Iaboni A. Neuropsychiatric symptoms in mild cognitive impairment. Can J Psychiatry 2017;62:161-9.
10. Apostolova LG, Di LJ, Duffy EL, Brook J, Elashoff D, Tseng CH, et al. Risk factors for behavioral abnormalities in mild cognitive impairment and mild Alzheimer's disease. Dement Geriatr Cogn Disord 2014;37:315-26.
11. Aniwattanapong D, Tangwongchai S, Supasitthumrong T, Hemrunroj S, Tunvirachaisakul C, Tawankanjanachot I, et al. Validation of the Thai version of the short Boston Naming Test (T-BNT) in patients with Alzheimer's dementia and mild cognitive impairment: clinical and biomarker correlates. Aging Ment Health 2018:1-11.
12. Mirnics Z, Heincz O, Bagdy G, Suranyi Z, Gonda X, Benko A, et al. The relationship between the big five personality dimensions and acute psychopathology: mediating and moderating effects of coping strategies. Psychiatr Danub 2013;25:379-88.
13. Osborne H, Simpson J, Stokes G. The relationship between pre-morbid personality and challenging behaviour in people with dementia: A systematic review. Aging Ment Health 2010;14:503-15.
14. Mendez Rubio M, Antonietti JP, Donati A, Rossier J, von Gunten A. Personality traits and behavioural and psychological symptoms in patients with mild cognitive impairment. Dement Geriatr Cogn Disord 2013;35: 87-97.
15. Brandt J, Campodonico JR, Rich JB, Baker L, Steele C, Ruff T, et al. Adjustment to residential placement in Alzheimer disease patients: does premorbid personality matter? Int J Geriatr Psychiatry 1998;13:509-15.
16. Muangpaisan W, Assantachai P, Sitthichai K, Richardson K, Brayne C. The Distribution of Thai Mental State Examination Scores among Non-Demented Elderly in Suburban Bangkok Metropolitan and Associated Factors. J Med Assoc Thai 2015;98: 916-24.
17. Tangwongchai S, Charernboon T, Phanasuthit M, Akkayagorn L, Hemrungrojn S, Phanthumchinda K, et al. The validity of thai version of the montreal cognitive assessment (MoCA-T). Dement Neuropsychol 2009;3:172. [abstract]
18. Nasreddine ZS, Phillips NA, Bedirian V, Charbonneau S, Whitehead V, Collin I, et al. The Montreal Cognitive Assessment, MoCA: a brief screening tool for mild cognitive impairment. J Am Geriatr Soc 2005;53:695-9.
19. Jatupornphan J, Nimnuan C. Reliability and validity of International Personality Item Pool Thai Version (IPIP-Thai). Chula Med J 2013;57:107-19.
20. Gow AJ, Whiteman MC, Pattie A, Deary IJ. Goldberg's 'IPIP' Big-Five factor markers: Internal consistency and concurrent validation in Scotland. Pers Individ Dif2005;39:317–29.
21. Archer N, Brown R, Boothby H, Foy C, Nicholas H, Lovestone S. The NEO FFI is a reliable measure of premorbid personality in patients with probable Alzheimer's disease. Int J Geriatr Psychiatry 2006;21: 477-84.
22. Kaufer DI, Cummings JL, Ketchel P, Smith V, MacMillan A, Shelley T, et al. Validation of the NPI-Q, a brief clinical form of the Neuropsychiatric Inventory. J Neuropsychiatry Clin Neurosci 2000;12:233-9.
23. Monastero R, Mangialasche F, Camarda C, Ercolani S, Camarda R. A systematic review of neuropsychiatric symptoms in mild cognitive impairment. J Alzheimers Dis 2009;18:11-30.
24. Edwards ER, Spira AP, Barnes DE, Yaffe K. Neuropsychiatric symptoms in mild cognitive impairment: differences by subtype and progression to dementia. Int J Geriatr Psychiatry 2009;24:716-22.
25. Sutin AR, Stephan Y, Luchetti M, Terracciano A. Self-reported personality traits are prospectively associated with proxy-reported behavioral and

psychological symptoms of dementia at the end of life. Int J Geriatr Psychiatry 2018;33:489-94.
26. Low L-F HF, Lackersteen SM. Does personality affect risk for dementia? A systematic review and meta-analysis. Am J Geriatr Psychiatry 2013;21:713-28.
27. Archer N, Brown RG, Reeves SJ, Boothby H, Nicholas H, Foy C, et al. Premorbid personality and behavioral and psychological symptoms in probable Alzheimer disease. Am J Geriatr Psychiatry 2007;15:202-13.
28. Farnam A, Farhang S, Bakhshipour A, Niknam E. The five factor model of personality in mixed anxiety-depressive disorder and effect on therapeutic response. Asian J Psychiatr 2011;4:255-7.
29. Löckenhoff CE, Terracciano A, Ferrucci L, Costa PT, Jr. Five-factor personality traits and age trajectories of self-rated health: the role of question framing. J Pers 2012; 80: 375-401.
30. Kotov R, Gamez W, Schmidt F, Watson D. Linking "big" personality traits to anxiety, depressive, and substance use disorders: a meta-analysis. Psychol Bull 2010;136:768-821.
31. Pocnet C, Rossier J, Antonietti JP, von Gunten A. Personality traits and behavioral and psychological symptoms in patients at an early stage of Alzheimer's disease. Int J Geriatr Psychiatry 2013;28:276-83.