THE STUDY OF PSYCHOMETRIC PROPERTIES OF COGNISTAT THAI VERSION

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ABSTRACT

The objective of this research was to assess the Sensitivity, Specificity, Predictive value and Reliability of Cognistat screening test compare to Thai Mental State Examination (TMSE).

The sample size consisted of 50 Dementia patients from Prasart Neurological Institute, Thailand and 50 volunteer elderly people from Ban Bang Kae Social Welfare Development Center for Older Persons and retested to assess the reliability in a group of 30 using the Cognistat test to evaluate cognitive function and Thai Mental State Examination, TMSE to evaluate their Dementia condition and a 2Q test to screen for depression.

Results revealed that Cognistat was found to have superior sensitivity over TMSE (92% versus 82%) but inferior specificity (34% versus 70%) Cognistat had a Positive Predictive Value of 58% and a Negative Predictive Value of 80%. Cognistat had good test-retest reliability (Kappa = .63 and .55) as well as good internal consistency reliability (α= .829, .769). Results showed that Cognistat was a qualified screening test, suitable for evaluating cognitive functions in dementia patients. On the other hand, TMSE was more convenient and accurate. However, the use of TMSE or Cognistat depends upon the objective of the evaluation.

KEY WORDS: COGNISTAT / TMSE / SENSITIVITY / SPECIFICITY / RELIABILITY / DEMENTIA

42 pages

การศึกษาคุณสมบัติการวัดของแบบคัดกรอง Cognistat ฉบับภาษาไทย

THE STUDY OF PSYCHOMETRIC PROPERTIES OF COGNISTAT THAI VERSION

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บทคัดย่อ

วัตถุประสงค์ของการวิจัย เพื่อศึกษาค่าความไว(sensitivity), ค่าจำเพาะ(Specificity), ค่าพยากรณ์(Predictive Value) และ ค่าความเที่ยง(Reliability) ของแบบคัดกรอง Cognistat เปรียบเทียบกับ TMSE

วิธีวิจัยกลุ่มตัวอย่างประกอบด้วยผู้ป่วยภาวะสมองเสื่อมจากสถาบันประสาทวิทยาจำนวน 50 คน และกลุ่มผู้สูงอายุปกติเป็นอาสาสมัครจากศูนย์จัดพัฒนาสวัสดิการสังคมบ้านบางแคจำนวน 50 คน ทำการทดสอบซ้ำเพื่อหาค่าความเที่ยงจำนวนกลุ่มละ 30 คน เครื่องมือที่ใช้ในการวิจัยประกอบด้วยแบบคัดกรอง Cognistat ใช้เพื่อประเมิน Cognitive function แบบทดสอบสมรรถภาพทางสมองของไทย (Thai Mental State Examination : TMSE) เพื่อประเมินภาวะสมองเสื่อม และ แบบคัดกรองภาวะซึมเศร้า 2 คำถาม (2Q) เพื่อคัดกรองภาวะซึมเศร้า

ผลการวิจัยพบว่าแบบทดสอบ Cognistat มีความไว(Sensitivity) ในระดับสูงกว่าเมื่อเทียบกับแบบทดสอบ TMSE (92% VS 82 %) แต่ค่าจำเพาะกลับน้อยกว่าแบบทดสอบ TMSE (34% VS 70%) แบบทดสอบ Cognistat มีค่าพยากรณ์บวก (Positive Predictive Value) เท่ากับ 58% และค่าพยากรณ์ลบ (Negative Predictive Value) เท่ากับ 80% ซึ่งอยู่ในระดับที่ดี มีค่าความเที่ยงในระดับที่ดี จากการทดสอบซ้ำ (kappa = .63 และ .55) และการคำนวณค่าความเชื่อมั่นภายใน (α = .829, .769) แสดงให้เห็นว่าแบบทดสอบ Cognistat เป็นแบบประเมิน cognitive function ที่มีคุณภาพ เหมาะที่จะนำมาเป็นแบบคัดกรองภาวะสมองเสื่อม (Dementia) แต่เมื่อเปรียบเทียบกับแบบ ทดสอบ TMSE พบว่าแบบทดสอบ TMSE ยังคงเป็นเครื่องมือที่ใช้ง่ายกว่าและให้ผลแม่นยำกว่าแบบทดสอบ Cognistat ทั้งนี้ การเลือกใช้แบบทดสอบขึ้นอยู่กับวัตถุประสงค์ของการนำแบบทดสอบไปใช้งาน

42 หน้า

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CHAPTER I
INTRODUCTION

1.1 Background and significance of the problem

Nowadays, technology has been moving fast forward especially medical and healthcare. Decentralization of health system is highly beneficial for patient treatment which leads to reduction in mortality rate and increasing in life span. Therefore, Thailand population structure has been changed. Proportion of population aged 60 and over has increased from 9.4% in the year 2000 to 20% in 2025 and it tends to increase continuously until we facing "Population Ageing" state. The elderly have to face many changes in terms of physical, emotional and cultural. However, the most obvious change is physical changes especially nervous system and brain function that effects on cognitive. In some cases, changes could get more serious and develop "Dementia" as a result. Epidemiology studies found that 5-10% of population aged 65 and over has developed dementia and tends to increase as they get older. Dementia patients are not only having cognitive abnormality but also causing malfunction on their daily life. Dementia becomes a major problem among elderly and also have a direct affect on their family as well.

Normally Dementia cannot be cured completely and it also needs constant attention which results in an expensive treatment. However, if we can treat the patients since the first stage, it can help slow down the problem. Therefore, the most important part in preventing dementia is diagnosis. Nowadays, there are various methods to diagnose the problems such as MRI, PET or CT Scan and neuropsychological test.

Neuropsychological test is another choice of a precise diagnosis and it is use widespread throughout the USA and Europe. The Screening test is highly beneficial in the treatment and diagnosis of dementia condition since it is fast, inexpensive and highly accurate. In Thailand, the use of neuropsychological screening test is widespread for example MMSE-Thai 2002 (Mini-mental status examination;

Thai version), TMSE (Thai mini-mental status examination), MoCA (Montreal Cognitive Assessment). Although there are many types of screening tests in Thailand but there's still a limitation in some tests. From Lomholt RK research found that MMSE gives accurate diagnosis in cognitive impairment patients that has moderate to severe dementia condition but shouldn't be used with MCI patients. In Thailand, MMSE is used widely and considered as the standard all over the world. It is developed to use with Thai people. However neuropsychological screening test shows only total scores which is not possible to clearly identify the area of impairment in dementia patient. However the Neurobehavioral Cognitive Status Examination is a tool that shows the score in each profile and can identify the patient's area and level of impairment. Moreover, the scores will be easier to evaluate in order to give a precise diagnosis.

From Robin Barr and Burton research found that cognistat is one of the top 20 tools that been used widely among neurologists in the USA and Canada and also been used more often than MMSE (The Northern California Neurobehavioral Group, Ice, 2007.[Online]). Cognistat has the strong advantage that, it does not consume much time when doing the tests. For patients who do not have dementia, it would take only 10 minutes and for those who develop dementia, it would take no more than 20-30 minutes, which will be suitable for clinical used or Bed-side Instrument (C.J. Lamarre, 1994). Although Cognistat uses similar amount of time as other types of popular screening tests, it could give more thorough results compare to the others. In other countries, Cognistat has been used in the clinics and on research with many types of patient especially brain damaged patients (R.J. Kiernan et al, 2008). Some research found that it can screen dementia patients from 80% to 100%. However, although cognistat has already been translated to Thai version, there is no research regarding the quality of this tool. Therefore, researcher/I is/am interested in applying cognistat test to suit Thai patients and use the Thai version to test the property of this cognistat test in elderly. This research will help create the option and the efficiency in the use of cognistat and can help increase the efficiency in dementia's evaluation and diagnosis.

1.2 Research Question

Does Cognistat in Thai version have Validity and Reliability in a credible level to be used in elderly and dementia patients in Thailand?

1.3 Research Objective

1. To study Sensitivity, Specificity and Predictive value of Cognistat in Thai version.
2. To study Reliability of Cognistat in Thai version.

1.4 Benefits

1. To learn Psychometric of Cognistat in Thai version when used with Thai elderly.
2. To help create the option in using neuropsychological screening test to psychiatry and neurology industry.
3. To use as a research data and develop as a knowledge in the future.

1.5 Variable

Independent Variable is

Normal brain function in normal Thai elderly and brain disease condition in Dementia patient.

Dependent Variable is

Cognistat score which are Language, Construction, Memory, Calculation and Reasoning. Score from TMSE

1.6 Definitions of terms

1. The neurobehavioral Cognitive Status Examination (cognistat) defines as a test that use to evaluate basic brain function include Language, Construction, Memory, Calculation and Reasoning in which Attention, Level of Consciousness and Orientation is evaluated separately. The ability of each brain function will result in Average, Mild, Moderate or Severe level respectively.

2. Thai-Mental State Examination or TMSE has developed from MMSE (Mini Mental State Examination) from Folstein and team. Train the Brain Forum Thailand has used to diagnose dementia condition which takes 10-15 minutes to evaluate and consisted of 6 subtests; orientation (6 points), registration (3 points), attention (5 points), calculation (3 points), recall (3 points), language (10 points).

3. Thai Elderly in this research defines as those with 60 years of age and up. They can divided into two groups which are those that has no psychiatric illness and Dementia patients as per DSM-IV criteria that has no other underlying psychiatric disorder.

4. Dementia defines as a brain disease condition that decrease cognitive ability which result in long term or short term memory loss and abnormality in at least one higher cortical function (aphasia, apraxia, agnosia) and deficiency in executive function. All those symptoms have to correspond with the diagnosis criteria of American Psychiatric Association as Diagnosis and Statistical Manual of Mental Disorders or DSM-IV which divided into dementia of the Alzheimer's type, Vascular Dementia, Dementia due to general medical condition, Substance-induced persisting Dementia, Dementia due to Multiple Etiologies and Dementia not otherwise specified.

5. Validity defines as the accuracy of the tool used in evaluation. This research is to classify dementia patients and normal people (Discriminant Validity) compare to TMSE by studying Sensitivity and Specificity.

6. Reliability defines as the stability of the tool when evaluating and each evaluation is independent. In this research, Test-Retest Reliability and Internal Consistency have been used.

CHAPTER II
LITERATURE REVIEW

This is the study of Psychometric properties of Cognistat Thai version in community dwelling elderly and dementia patients which has compiled meaning, concept, theory and relevant research to use as a guidance in this study and discussion that are

1. Psychometric Properties of Psychological Test
    - Validity
    - Binary classification: Sensitivity and Specificity
    - Reliability
2. The Neurobehavioral Cognitive Status Examination or Cognistat
    - Cognistat score criteria for Dementia diagnosis
    - Psychometric properties of cognistat
3. Cognitive Functions
    - Attention / concentration
    - Memory
    - Higher-Order Cognitive function
    - cognitive functions evaluation and Cognistat
4. Dementia
    - Incident
    - Cause of Dementia
    - Symptoms
    - Diagnosis Criteria
    - Disease progressions

2.1 Psychometric properties of Psychological Test

The study of Psychometric properties has involved theory, concept and strategy/method in psychological evaluation. Generally, it could evaluate both in group or individual. It is aimed at studying the structure, step, development and ability in screening as per theory of that particular tool. Therefore, knowledge and awareness in the study of Psychometric properties can help explain the scores, standard, strength and weakness of the evaluation which would give the reliable result and can be utilized effectively. Normally, the evaluation properties will be studied in 5 categories as Standardization, Reliability, Validity, Difficulty index and Discriminating power. However, it depends whether in which area and what purposes we need to study. It does not have to be very thoroughly. For Psychometric properties, we mainly study the validity and reliability in order to identify the quality of the test.

Validity

Validity is the quality of the tools used in order to reach the purpose of evaluation (RattanaSiripanich, 2010). Each test has different intention for evaluation depending on the test's objective (Sucheera Pattrayutawatra, 2002). Validity calculation can divided into 3 categories

1. Content Validity is a test that can evaluate in accordance with the objectives of the test (content part). Experts or specialists will verify whether the questions used have covered all the content and meanings of the variable. Normally, content validity will not be in statistic format but it mainly used the judgment of the expert (Rattana Siripanich, 1990).

2. Criterion Related Validity is to test whether the tool has validity as per standard criteria. Criterion Related Validity will be in statistic format which is Correlation. This will indicate relation between the results from the test based on external criterion and external criteria. It is predicted fact concerning what we want to measure (concurrent validity) or will be measuring (predictive validity) (Sucheera Phattharayuttawat, 2002; Rattana Siripanich, 1990).

2.1 Concurrent Validity is the ability of the test to indicate whether examinee has a character or ability as per external criteria which usually are standard criteria that have been accepted.

2.2 Predictive Validity is the ability of the test to indicate the upcoming result. The test itself will be a prediction and validity is a criteria. Both variable will show linear Regression. If variable and result has a close relation, it shows that the test has a good predictive validity and beneficial in screening or predicting results or behavior in the future.

3. Construct Validity refers to whether a test correlates with the hypothesis. Meanwhile it has to be conform to questionnaire behavior and measuring purposes. To obtain a construct validity, the test has to be significantly correspond with the specify theory. There are many method in evaluating construct validity (Sucheera Phatharayuttawat, 2002; Puangrat Taweerat, 1997)

3.1 Known-group technique is provided when a test can discriminate between a group of individuals known to have superior ability and a group who have less ability. Those with superior ability are expecting to have higher scores than a group known to have less ability.

3.2 Internal Consistency is a method of measuring validity between scores of each question and total scores or measuring relation between each question.

3.3 Multitrait-Multimethod Validity is examining the relation with other standard tests that evaluated the same topic. If the scores from both tests are similar, it means that the test has construct validity which can categorize into Convergent Validity and Discriminant Validity.

3.4 Factor Analysis is a statistic method used to analyze factor by lowering number variables to easily describe the test factor and can also indicate construct validity of the test when receive the main factor.

Binary Classification

This method is used to evaluate the classifying property of the test that has to classify the examinees in to two groups. Most screening test usually adopts this statistic to evaluate the ability of the test by using Sensitivity and Specificity as a

quality indication. Generally, neurological test is created to detect any brain abnormality and resulted in either Positive or Negative. Although, the test cannot precisely indicate patient's abnormality, it can demonstrate result as follows

- True Positive (TP): Sick people correctly identified as sick
- False Positive (FP): Healthy people incorrectly identified as sick
- True Negative (TN): Healthy people correctly identified as healthy
- False Negative (FN): Sick people incorrectly identified as healthy

Sensitivity of a test is the proportion of people that are known to have disease who tested positive for it

$$\text{Sensitivity} = \frac{TP}{TP + FN}$$

Specificity of a test is the proportion of people that are known not to have disease who will test negative for it

$$\text{Specificity} = \frac{TN}{TN + FP}$$

From a Theoretical point of view, a good screening test should achieve 100% sensitivity (correctly identified the patients) and 100% specificity (correctly screen healthy people from the test). However, in reality both numbers has reverse variation. If one has a high score, the other one would have a low score. Therefore, the user that has to choose a test that has sensitivity and specificity suit their purposes.

Normally, finding sensitivity and specificity value is categorized in Discriminant Validity but sometimes the method is similar to Concurrent Validity which can possibly categorize as Criterion Related Validity as well. However, for an easy understanding and more direct to the purpose of the measurement, this research is classified sensitivity and specificity as part of Discriminant Validity.

Predictive Value indicates the chance or probability of disease prevalence. Normally, the first time usage of screening test or diagnosis test would have to

evaluate in order to find out whether it has the high predictive value or low predictive value. Predictive value can categorized as follow

1. Positive Predictive Value is the proportion of people who tested positive and truly sick.

$$PPV = \frac{\text{True positive x 100}}{\text{all positive test}}$$

2. Negative Predictive Value is the proportion of people who tested negative and truly healthy.

$$NPV = \frac{\text{True negative x 100}}{\text{all negative test}}$$

High Predictive Value does not always indicate that the test has good quality since it might cause from other variable. Predictive Value can have direct variation to disease prevalence. Therefore, if disease prevalence value is high, Positive Predictive Value could be high as well.

Reliability

Reliability defines as the consistency of the measurement. When performing a re-test, which all independent, the reliability of the test has to be reliable. Each test will produce similar results if there is no interruption from other factors (Sandra A. Mcintire & Leslie A. Miller, 2007). Statistic value of reliability is 'Reliability Coefficient' which will be in between 0 to 1 and positive only.

Reliability analysis can be done as following (Sucheera Phattharayuttawat, 2002; Penkae Saengkeaw, 1998; Rattana Siripanich, 1990)

1. Test-Retest Reliability is measured by administering a test twice using the same participants, same test, but at two different points in time. Each retest interval should not take too long or too close. However the standard interval for retest still could not be determined firmly. Generally, it would have around 1-3 weeks. In some test it may take months or years to do retest. There are many factors involved when doing a retest such as the readiness of examinees, the examinees can remember questions and answer from the previous test, test command has changed, etc.

2. Alternate or Parallel Form Reliability can be used the same method as Test-Retest Reliability but using the different test. It could be done all at once but the test cannot be the same. However the two separate tests must be equivalent in mean, variance, difficulty index. This will prevent the examinees to remember their previous answer. However it is difficult to find the tests that are equivalent. Moreover the examinees will have to do many tests which resulted in being weary, giving random answer and would impact reliability.

3. Split-half Reliability is the method that does not require retest. Reliability could be measured at once using only one test. The test will be divided in to two parallel part under the condition that they have be equally difficult and construct in the same way from the same domain. Then after receiving the scores from both part, Spearman-Brown formula will be used to find relation between two parts of the test. It is beneficial since data collection can be done once and examinees will have to do only one test. Therefore, it is easy to control external factor. However, the restrictions could be that the questions has to be adequate and after divide the test into two part, they both have to be equally difficult.

4. Internal Consistency Reliability is the method that does not require retest. It can be calculated as below

- Kuder-Richardson Reliability is to find Internal Consistency Reliability and would be done once. Each questions have to be Dichotomized which the score has to be either 0,1. The famous one is Kuder–Richardson Formula 20 (KR-20) and Kuder–Richardson Formula 21 (KR-21).

- Cronbach's Alpha Reliability is another way to find Internal Consistency Reliability that based on calculating the variance of each question. It is mostly used in essay or multidimensional test in psychology.

2.2 Cognistat

Cognistat, formerly known as the Neurobehavioral Cognitive Status Examination (NCSE), is a cognitive screening test that assesses five cognitive function areas which are language, construction, memory, calculations and reasoning. This tool

can be used to evaluate the working brain by independently evaluating each cognitive function since each brain disease would have different impact to cognitive function. This ability in evaluating cognitive function independently is highly beneficial in the diagnosis. Clinicians can have various use of cognistat such as to evaluate dementia condition, patients after bypass surgery, patients with drug abuse and many other brain diseases as per test manual (Jonathan Mueller et al, 2007). Cognistat will show the score in each brain function instead of overall score which make cognisat different from other cognitive tests and also easier to understand and the diagnosis could be done more thoroughly.

Cognistat consisted of 11 subtests that could evaluate 8 brain functions. Each subtests are Level of consciousness, Orientation, Attention, Language-comprehension, Language-Repetition, Language-Naming, Visual construction, Verbal Memory, Calculation, Verbal Reasoning-Similarities and Verbal Reasoning-Judgment. For Level of consciousness, it is for evaluating consciousness condition whether patients are ready for the test. All subtests, except for Level of consciousness, Orientation and Attention, include screening item and series of metric item that has various difficulties. Passing screening item considers that there is no impairment in that cognitive area and no need to do metric item test. On the other hand, if patient could not pass screening item, metric item will have to be done afterwards. Each subtest will give independent score. The low score indicates the impairment condition in that particular cognitive domain. If screening item could be passed, the scores in that particular part would be the highest (In each subtest, the highest scores are vary as following 12 for orientation, 8 for orientation, 6 for language-comprehension, 12 for language-repetition, 8 for language-naming, 6 for visual construction, 12 for verbal memory, 4 for calculation, 8 for verbal reasoning-similarities and6 for verbal reasoning-judgment). Level of consciousness part will only recorded as alert or impaired. Each subtest score will be recorded in cognitive status profile in 4 levels which are average (gray zone), mildly impaired, moderated impaired and severely impaired respectively. The test normally takes 5-10 minutes for those who have no cognitive impairment condition and 10-30 minutes for cognitive impaired patients.

Cognistat Criteria in Dementia Diagnosis

In cognistat screening test, patients who diagnose dementia must have had obvious memory impairment and impairment in one of the remaining four functions. For instance scores in memory domain is less that 10 and scores in at least one of the remaining 4 lower than average score or gray zone as follow.

1. Language
    - 1.1 Comprehension scores is lower than 5
    - 1.2 Repetition scores is lower than 11
    - 1.3 Naming scores is lower than 7
2. Constructional Ability scores is lower than 4
3. Calculations scores is lower than3
4. Reasoning
    - 4.1 Similarities scores is lower than5
    - 4.2 Judgment scores is lower than4

From the above criteria, it can display in cognitive status profile of dementia patients which show in the cognistat test manual (Jonathan Mueller et al, 2007) as follow.

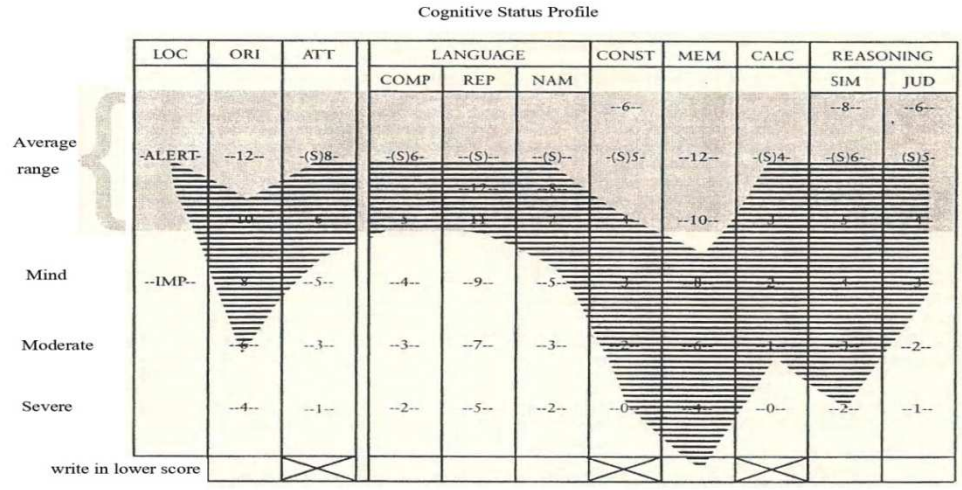

Figure 2.1 Table of score status or cognitive status profile of dementia patients

Psychometric Properties of Cognistat

In other countries, there are many researches regarding the measurement quality of cognistat test. From the research referring the Handbook if Psychiatric Measures, Second Edition by R.J. Kiernan et al found that the study of reliability using Test-Retest Reliability that leave 1 week interval (N=72) in one of the psychiatry hospital has reliability K=0.69 and there is a report that test-retest reliability by Spearman Rank formula with 5-10 days interval (N=28) resulted in Verbal Memory subtest has reliability = 0.52, Visual Construction subtest has reliability = 0.79, Calculation subtest has reliability = 0.81. However reliability analyzed in each subtest cannot use to describe in other subtests since there is a limitation in the rank of scores in different subtest (R.J. Kiernan et al, 2008). For validity, study shows that cognistat that has good sensitivity that can be used to screen patients with Organic Mental Disorder and cognistat has higher sensitivity that MMSE (83% vs. 43%) (C.J. Lamarre, 1994). From many researches by R.J. Kiernan et al indicated that there is a relation between cognistat subtest score, Alzheimer patients' diagnosis and Multi infarct dementia patients by single photon emission computed tomography (SPECT). From R.J. Kiernan research, using cognistat test in patients with organic mental disorder condition and patients without organic mental disorder condition resulted in significantly lower score among patients with organic mental disorder condition when comparing to those without organic mental disorder condition. Moreover, sensitivity is between 72% to 83% and specificity is between 47% to 73%. Study showed that since implementing cognistat among dementia patients and those without psychiatric condition found that cognistat can screen dementia up to 100% and 70% for those without psychiatric condition (R.J. Kiernan et al, 2008).

2.3 Cognitive Function

Cognitive Function refers to the ability of a brain in cognitive process. Normally this includes ability to memorize, learn new things, understand thoughts, speaking, writing and reasoning. In most healthy individuals, the brain is capable of learning new skills, especially in early childhood. It is time when learning skills are developing very fast. Even though the brain is functioning separately according to its area, in fact there is a connection between each brain function. Cognitive function consists of many areas of brain that are connected which can be divided as follow.

Table 2.1 Table of Cognitive function area

Cognitive function	Neural basis
1. Attention/concentration	Reticular activating system (brain stem and thalamic nuclei) and multi modal association areas (prefrontal and parietal) with right bias
2. Memory	Limbic system (hippocampus and diencephalon)
3. Higher-order executive functions	Frontal lobe

Attention and Concentration

Being attentive to something is one of human's ability that is significantly important since it helps human to perform their task effectively. Normally people are triggered by stimulus all around including thoughts and information that keep appearing in the brain and it would be impossible for the brain to respond to all stimulus. Therefore, there are attention and concentration to help human to react or behave specifically although temporary. Besides human can also change their attention to something else and can sometimes react to two things at once. Attention can categorized into 4 parts which are Arousal that refer to condition when that person is fully conscious and aware of their behavior, sustained attention is an ability in paying attention or concentrate to something for a period of time, divided attention is the ability to perform more than one task at once and Selective attention which is the ability to choose the stimulus that they want including stop other stimulus in their thoughts. In some people that have impairment in orientation, concentration, exploration and vigilance will result in attention impairment. Mostly they appear giddy, confused and unaware of date, time and places. Moreover, in some case that has stroke in the right hemisphere will experience domain-specific attention impairment which effect some part of their vision where patients do not pay attention for example can vision only half of the clock.

Memory

Memory plays a highly important role in human cognitive process. In all brain activities must have involve memory. In psychology, memory is the mind process of storing information via the process of encoding, storage and retrieval (Sompop Ruangtrakul, 2009). In neuropsychological considers memory as the changes in neuron form or structure associates with human learning. Thus, memory is resulted from learning and that learning is from encoding the existing memory which we use in learning new things later on (The Psychology Corporation, 1997). From neuropsychological study found that memory consists of more than one subunit as follow.

1. Short-term (working) memory

For new information that has been sent from sensory nerve will be processed in this memory unit before being sent to store in long-term memory for later use. Short-term memory has a function involve in immediate repetition of words, number, melody and spatial information or visuospatial controlled by central executive system in dorsolateral prefrontal lobe. Clinicians simply define short-term memory as an ability to recall the memory in a period of 5-30 minutes. However, sometimes it could be days or weeks (John R Hodges, 2007).

2. Long-term memory

In Neurological term states that long-term memory is processed from systematically associated unit of short-term memory. When the association increase and more frequent, it could turn short-term memory to long-term memory that can be recall and memorize from a short period of time up until the rest of their life. This memory will become an experience for human that used for adapting their life which later called learning (Jesse E. Purdy et al, 2001). Long-term memory can divide into 2 types as follow.

1. Explicit or Declarative memory is a conscious and intentional memory which can be divided into 2 subdivisions: Episodic memory, which is gain from that person's previous experience or specific event in time such as childhood memory, and Semantic memory, which is a general knowledge or factual information that is widely accepted such as the sun rises in the east.

2. Implicit or Procedural memory is resulted from learning unconsciously that usually in form of skills, ability to use things, movement of the body or from classical conditioning such as driving skills, cooking.

Types of memory can be shown in diagram below (John R Hodges, 2007)

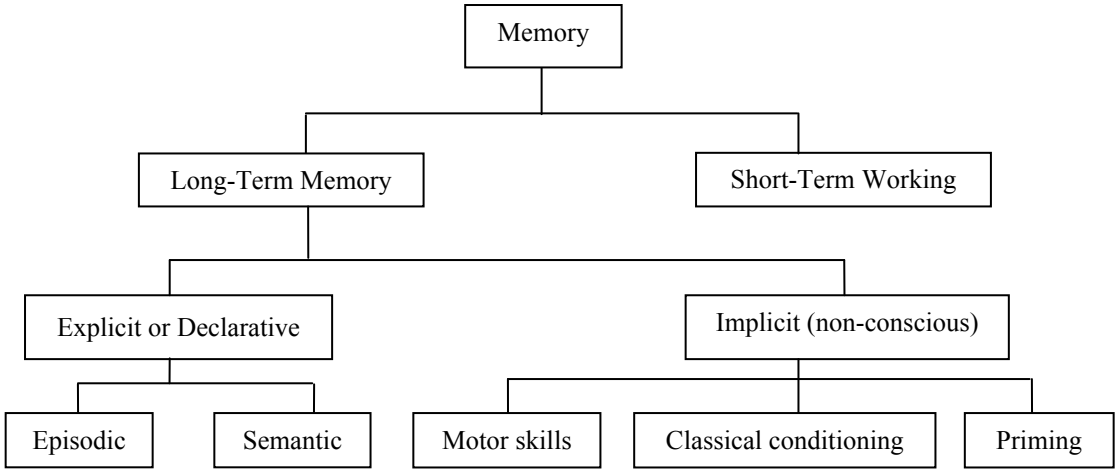

Figure 2.2 Types of memory diagram

Higher-Order Cognitive function (John R Hodges, 2007)

Neocortex is the largest part of brain that distinguish human from other animals. This region of the brain is very importantin term of living, thoughts and behavior. Frontal lobe contains the most part in neocortex and has an influence on human behavioral adaptation such as abstract conceptual ability, mental flexibility, inhibitory control, problem solving, planning, self-monitoring, initiation, sequencing of behavior, decision making, judgments, personality, social behavior, Affect and Motivation. There are many functions in this region of the brain but it is difficult to indicate which region of the brain is function in what area. This region enables a complex association. Generally, it is divided in to 5 major regions as following

1. Motor area (primary motor cortex) is in precentralgyrus involved in the control of the body

2. The supplementary motor area is next to motor area towards the front involved in coordination, planning and control nervous system.

3. The frontal eye field involves in eye movement and has an important role in spatial attention

4. The prefrontal cortex is a very important part since it is a center of all intellectual function involve in planning, reasoning, problem solving, self-monitoring, initiation also including personality, behavior, affect and motivation. Generally, this region of the brain involves in all executive function. Prefrontal cortex can be divided into 3 parts that has different function which are dorsolateral, orbital and mesial.

Cognitive Functions and Cognistat Evaluation

Normally a diverse psychology tests have been used for neuropsychological functions or cognitive functions measurement and evaluation that evaluates major ability of the brain which are Attention, Language, Memory, Spatial and Executive function as per table no. 2.2 (Gary G. Marnat, 2009).

Table 2.2 Cognitive function in 5 major parts

Cognitive domain	**Tests**
Attention	Arithmetic, Digit span, Letter-number Sequencing, Trail Making, Stroop Color, Word Test
Language	Comprehension, Information, Aphasia Screening Test, Boston naming, Controlled Oral Word Association Test
Memory	Digit Symbol, Picture Concepts, Metrix Reasoning, Picture completion, Bender gestalt(recall), Rey-Osterrieth(recall)
Spatial	Block Design, Picture Concept, Matrix Reasoning, Picture Completion, Bender Gestalt, Rey-Osterrieth Complex Figure Test, Judgment of line Orientation
executive functions	Interview/history, Delis-Kaplan Executive Function System, Category Test, Wisconsin Card Sorting Test, Behavioral Assessment of the Dysexecutive Syndrome.

Cognistat is a test that can evaluate the efficiency of cognitive function in 5 domains which are Language, Construction, Memory, Calculation and Reasoning. After comparing to the major ability of the brain above, it is found that cognistat can evaluate cognitive functions or neoropsychological functions inclusively and clearly. Therefore, cognistat is a tool that compresses other tests together and can be used conveniently and quickly (Jonathan Mueller et al, 2007).

2.4 Dementia

Dementia is caused from brain impairment not an abnormali in 'mind' (Robert E. Hales et al, 1987). Mostly found in elderly and more as the age increase. Dementia is found approximately 5% during the age 65 years old or more and will increase to 50% among population aging 85 years and up. There is no treatment available to cure most types of dementia such as Alzheimer's disease and vascular dementia but some can be cure such as hypothyroidism or dementia syndrome of major depression (Manoch Lhortrakul, 1996).

Dementia condition defines as

WHO (1992): Dementia is a chronic or progressive nature syndrome in which there is deterioration in cognitive function or the ability to process thought. It affects memory, thinking, orientation, comprehension, calculation, learning capacity, language, and judgement. Consciousness is not affected. The impairment in cognitive function is commonly accompanied by deterioration in emotional control, social behaviour or learning process.

McHugh and Folstein (1985): Dementia is an abnormality caused from cognitive function detorioration that would decrease intellectual level, losing mental alertness until it leads to a lack of reason and portray inappropriate behavior.

Johnathan Waite (2009): Dementia is abnormality in intelligence, memory and behavior but yet conscious. This syndrome is progressive and can not be cure.

Rawiwan Niwatpan: Dementia is a detorioration in brain tissue or nervous system resulted in reduced ability in pattern of thoughts, judgement and especially memory, cognitive and intelligence. This symptom is gradually onset until it affects an ability to perform everyday activities, work and private life.

Somphob Ruangtrakul (2004): Dementia is a loss of ability in learning and understanding express through loss of memory and there is an impairment in at least one of the following syndrome; aphasia, apraxia, agnosia and executive function.

Jakkrit Sukying (2004): Dementia is a deteriorated cognitive function especially memory and intellectual function. Moreover higher cortical function impairment may be found such as aphasia, apraxia and agnosia which lead to a decline in judgment, reasoning and general behavior.

In conclusion, dementia is a progressive detorioration or declining condition in cognitive or intellectual function and memory from a normal level which may include other symptoms. This deterioration is gradual onset and progressive until it affects everyday activities, work and private life.

Occurrence

Mostly found in elderly while 2-4% of the population more than 65 years of age is found mostly with Alzheimer disease than other types of dementia. The occurrence of Alzheimer disease and stroke is increasing with age. More than 20% of population 85 years old and up are found with brain disease from the above causes.

Causes

There are many causes including Alzheimer, stroke, Parkinson, HIV, physical ailment, brain tumor, accident such as brain concussion and drug abuse such as alcohol and volatile.

Clinical Symptoms (Somphob Ruangtrakul, 2004; Jakkrit Sukying, 2003)

1. Loss of memory is when patients can not perform immediate recall, forgot recent memory or forgot remote memory which reduces the ability in learning new things including previous memory. If symptom worsen, remote memory could be lost.

2. Symptoms that indicate brain pathology

- Aphasia is a loss of the ability to speak causing ambiguous speech or unable to speak at all

- Apraxia is an inability to carry out voluntary body movement despite the fact that muscular power, sensibility and nervous system are still normal.

- Agnosia is a loss of ability to recognise what objects are eventhough sensory function is normal i.e. failing to recognise what he see, hear or touch.

- Executive function impaired is a dysfunction in abstract thinking, deficiency in planning, creativity and behavioral control.

Diagnosis Criteria (American Psychiatric Association, 2000)

A. The development of multiple cognitive deficits manifested by both

1. Memory impairment (impaired ability to learn new information or to recall previously learned information)

2. At least one of the following cognitive disturbances:

(a) Aphasia (language disturbance)

(b) Apraxia (impaired ability to carry out motor activities despite intact motor function)

(c) Agnosia (failure to recognize or identify objects despite intact sensory function)

(d) Disturbance in executive functioning (i.e., planning, organizing, sequencing, abstracting)

B. The cognitive deficits in the above criteria cause significant impairment in social occupational functioning and represent a significant decline from a previous level of functioning.

C. The deficits do not occur exclusively during the course of a delirium.

Progression of disease

Patients could be in critical or stable condition but if the cause of the illness can be cure, they could be in better condition. Patients who are in serious condition would need an all-time caregiver. Most of dementia patients usually had an accident causing premature death. There are 3 stages of dementia symptoms as below

First stage refers to the first 1-3 years when patients are having obvious short-term memory impairment. However they can still perform their normal everyday activities but memory, attention, judgment, emotion and behavior will be declined. Family and friends will be aware of the symptoms but the patients themselves may not.

Second stage refers to 2-10 years when patients would experience sever memory loss. They may not remember what just been done. There will be more problems with memory and everyday activities and may require some help. However patients can still recognize their close ones and mostly be able to take care of themselves.

Third stage refers to 3-12 years when patients have server symptoms, losing almost all memory and completely dependent upon caregivers. There will be no memory, intellectual or any ability. They cannot manage their own bodily function and finally get to the point there they are bedridden. Limbs are stiff and can say repetitive words or may not be able to speak at all. There is a high tendency to death.

CHAPTER III
MATERIALS AND METHODOLOGY

This research aims at studying Psychometric Properties of Cognistat translated to Thai and applied to the normal elderly from Ban Bang Kae Social Welfare Development Center for Older Persons and Dementia patients from Prasat Neurological Institute. The procedures of the study are as follow:

1. Population and Samples
2. Research instruments
3. Data Collection
4. Data Analysis

Population and Samples

Population

The population of this study is divided into 2 groups including the normal elderly from Ban Bang Kae Social Welfare Development Center for Older Persons and Dementia patients from Prasat Neurological Institute in the following basis:

1. Dementia patients group

1.1 Age of 60 years old and over

1.2 Having been clinically diagnosed by Experts that developed Dementia as per DSM-IV criteria. This includes only mild and moderate dementia conditions. Patients with severe dementia will be sorted out.

1.3 Having no other underlying psychiatric illness.

1.4 Have no severe physical disabilities that may obstruct the testing process.

1.5 Willing to participate in the research.

2. Normal elderly

2.1 Age of 60 years old and over

2.2 Have no psychiatric illness history by examining from participants and investigating from personal health profile.

2.3 Have no severe physical disabilities that may obstruct the testing process.

2.4 Willing to participate in the research.

Samples

To find out cronbach's alpha internal consistency reliability of Cognistat which consists of 5 domains, the study will use example groups 10 times so in this research will study in 50 dementia patients and 50 participants of the normal elderly

For collecting data twice to calculate test- retest reliability will study in 30 dementia patients and 30 participants of the normal elderly

Sample size calculation for finding out sensitivity and specificity of Cognistat compared to TMSE [Gold standard] is 95% CI [confidence Interval] of sensitivity and specificity. Referring the previous study, it is found that Cognistat has 83% of sensitivity [n=12 Organic mental disorder], 47% of specificity [n=56 Mood and Psychotic disorder] but there is no study focusing on normal people.

Therefore in this study, it is estimated that 95% CI of sensitivity is 85%± 10% and have to study in 50 dementia patients. As calculated below:

$n = Z_{\alpha/2}^2 p(1-p) / e^2$

when $1-\alpha$ = Confidence interval = 0.95, $Z_{0.025} = 1.96$

p = estimated value of sensitivity = 0.85

e = deviation of sensitivity estimating = 0.10

Therefore the result is that $n = 1.96^2 (0.85)(0.15) / (0.1)^2 = 48.98 = 50$ dementia patients.

If it is estimated that 95% CI of specificity is 85% ± 10%as sensitivity, the study should focus on 50 participants from the normal elderly.

To calculate the Predictive Value, the same group of population is used as well as the same number of sensitivity and specificity sample size that is 50 participants in each group.

Research Instruments

1. Demographic data record is general information regarding to age, gender, education, occupation and marital status.

2. The Neurobehavioral Cognitive Status Examination in Thai- version (Cognistat thai-version) translated by suwit jaroensak, M.D. It is developed to assess a brain's cognitive function. Cognistat shows the evaluation in the profile which independently domains. This screening test consists of 11 subtests that are the level of consciousness, Orientation, Attention, Language-Comprehension, Language-Repetition, Language-Naming, Visual Construction, Verbal Memory, Calculations, Verbal Reasoning-Similarities, Verbal Reasoning-Judgment (R.J. Kiernan et al, 2008) in practical. Score will be shown in profile in every subtest. If score is below the standard zone or gray zone, it means that there is an impaired function in that domain. For using in Dementia patients, score or profile will show as there is impairment in memory and at least one in four domains of brain functions, (Language, Constructions, Calculations and Reasoning) (Jonathan Mueller et al, 2007)

3. Thai Mental State Examination or TMSE was developed by Train the Brain Forum Thailand and developed from MMSE or Mini Mental State Examination created by Folstein. TMSE is a screening test using for screening the dementia condition in patient. This test is convenient and has the high sensitivity, reliability and a good validity. It is adapted for Thai people. This test takes only 10-15 minute for one person. The full score is 30 points and the cut-off point is 23 if it is below, this patient will be considered as a dementia patient. It consists of six subtests as follows ; Orientation (6 points), Registration (3 points), Attention (5 points), Calculation (3 points), Recall (3points), Language (10 points)

4. Two question depression screening test (2Q) is used for screening depression. Subject will answer both question that "Yes" or "No" if answer is "Yes" in one or two, it will be considered a depression. This test consists of 2 items

4.1 During this 2 week until today, have you ever felt depressed, sad or tired?

4.2 During this 2 week until today, have you ever felt bored and not enjoy doing anything?

Data Collection

1. The researcher contacts with the authorized person and asking for permission to use the test in research.

2. The researcher receives the permission from Siriraj Institutional Review Board (SIRB) for authorization in progressing research.

3. Contacts to Ban Bang Kae Social Welfare Development Center for Older Persons and Prasart Neurological Institute to ask for the permission to collect data in both places.

4. Meeting with the elderly and patients to make an understanding and ask for permission to collect data and sign the letter of consent.

5. Collecting data and collecting again for re-test in next 1 month.

6. Analyzing data and concluding the research result.

Data Analysis

The analysis of statistical data is as follow:

1. Descriptive statistics: Percentage of Age, Sex, Education, occupation and Marriage Status.

2. Statistic Analysis for psychometric properties of test:

2.1 validity: calculate Sensitivity and Specificity by comparing Cognistat to TMSE

2.2 validity: calculate Predictive Value of Cognistat and TMSE

2.3 Reliability Analysis: Cognistatis assessed by the test-retest method using Cohen's kappa coefficient statistic and calculate Internal Consistency Reliability using Cronbach's alpha

CHAPTER IV
RESEARCH RESULTS

This research aims at studying the assessment quality of Cognistat in term of sensitivity, specificity, and predictive value by comparing to TMSE. This research also studies the reliability of Cognistat by studying from 100 senile participants classified into the two groups; 50 of the dementia patients from Prasat Neurological Institute and 50 participants from the normal elderly from Ban Bang Khae Social Welfare Development Center for Older Persons. All results are calculated by the statistical methods as the followings;

The results can be classified into 4 parts

Part1 Demographic Data

Part2 Sensitivity and specificity of Cognistat by comparing to TMSE

Part3 The Predictive Value Cognistat and TMSE

Part 4 Reliability of the Cognistat comprises

- Internal Consistency Reliability calculated by Cronbach's alpha
- Intraclass correlation (Cohen's kappa coefficient)

Part 5 The conclusion of validity of Cognistat compared to TMSE and the reliability of Cognistat

Part 1 Demographic Data

Table 4.1 Indicates the frequency and the percentage of the normal group of the elderly and those who suffer from the Dementia classified by sex, age, education and occupation

	Normal Elderly		Dementia Patients	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Sex				
Male	11	22.00	20	40.00
Female	39	78.00	30	60.00
Age(Year)				
60-64	6	12.00	8	16.00
65-69	10	20.00	10	20.00
70-74	14	28.00	9	18.00
75-79	11	22.00	10	20.00
80-84	8	16.00	12	24.00
85 upwards	1	2.00	1	2.00
Education				
Non-educated	4	8.00	3	6.00
Primary	26	52.00	26	52.00
Secondary	6	12.00	5	10.00
High school	6	12.00	9	18.00
Bachelor’s degree	8	16.00	7	14.00
Marital Status				
Single	18	36.00	4	8.00
Married	11	22.00	36	72.00
Divorced	6	12.00	2	4.00
Separated	2	4.00	2	4.00
Widowed	13	26.00	6	12.00

Table 4.1 Indicates the frequency and the percentage of the normal group of the elderly and those who suffer from the Dementia classified by sex, age, education and occupation (cont.)

	Normal Elderly		Dementia Patients	
	Frequency	**Percentage**	**Frequency**	**Percentage**
Occupation				
Government Officer	10	20.00	9	18.00
Self-employed	14	28.00	11	22.00
State Enterprise	2	4.00	3	6.00
Freelancer	8	16.00	7	14.00
Employee	3	6.00	2	4.00
Agriculturist	11	22.00	11	22.00
Etc.	2	4.00	7	14.00

From the table 4.1, considering from the sex classification, it is found that both groups have the female participants joining the study more than the male one. In the group of the Dementia patients, the proportion of female and male participants is slightly different. In the group of the normal elderly, the proportion of female and male participants is 1:2 which is not too different. In term of age, it is found that most of the participants from the group of the normal elderly are around 70-74 years old. For the group of the Dementia patients, the range of age is 80-84 is most of the group. Though, both groups have the various ranges of age, it is found that, considering in term of age, the age range of both groups is somehow similar. It is considered that these two groups of samples do not make the huge difference. In the aspect of education, it is found that both groups acquired the education in the primary school which corresponds with Thailand's population statistics that most of the elderly completed the education in this level. Considering the marital statuses, it is found the normal elderly mostly have the singled status and widowed and married respectively. For the Dementia patients, 72% participants have been married. The other statuses are approximately similar to each other. For the occupation, it is found that both groups work mostly as the self-employment. The other occupations are agriculturalist, government officer respectively. In this term, it is considered that the samples have the similar occupation corresponding with the other factors.

Part 2 Sensitivity and specificity of Cognistat compared to TMSE

Table 4.2 Indicates the result of applying Cognistat and TMSE to the Dementia patients

	Assessment Test	
Result	**Cognistat**	**TMSE**
True positive	46	41
False negative	4	9
Total	n = 50	n = 50

Table 4.2 indicates the results of applying Cognistat and TMSE to 50 Dementia patients. It is found that Cognistat is able to detect 46 of participants who are affected by the brain disorder and have the false negative result with 4 participants. Hence, the sensitivity of Cognistat equals to 92%. For TMSE, it can detect 41of participants who are affected by the brain disorder and have the false negative result with 9 participants. It can be said that the sensitivity of TMSE equals to 82%. Comparing the results, the sensitivity of Cognistat and TMSE is 92% and 82%

Table 4.3 indicates the result of applying Cognistat and TMSE to the normal elderly

	Assessment Test	
Result	**Cognistat**	**TMSE**
True negative	17	35
False positive	33	15
Total	n = 50	n = 50

Table 4.3 shows the evaluation using Cognistat and TMSE in 50 participants from the normal elderly group. It is found that Cognistat have the true negative result on 17 participants and have the false negative result on 33 participants. Hence, the specificity of Cognistat equals to 34%. For TMSE, it has the true negative result on 35 participants and has the false negative result on 15 participants. It can be said that the specificity of TMSE equals to 70%. Comparing the results, the specificity of Cognistat and TMSE is 34% and 70%

Part 3 The Predictive Value of Cognistat

Table 4.4 Indicates the Positive Predictive Value and the Negative Predictive Value of Cognistat

		Gold Standard DSM-IV Diagnosis		
		Condition positive	**Condition** Negative	
Cognistat Test	**Test outcome** Positive	True Positive TP = 46	False Positive FP = 33	Positive Predictive Value PPV = 58 %
	Test outcome Negative	False Negative FN = 4	True Negative TN = 17	Negative Predictive Value NPV = 80 %

Table 4.4 shows the predictive value of Cognistat. It is found that Cognistat has a true positive result on 46 participants comparing to the assessment indicating the total number of Dementia patient as 79. Hence, the positive predictive value of Cognistat equals to 58%. Cognistat has the true negative result on 17 participants from the total number of 21 participants. It can be said that the negative predictive value of Cognistat is 80%.

Table 4.5 Indicates the Positive Predictive Value and the negative Predictive Value of TMSE

		Gold Standard DSM-IV Diagnosis		
		Condition positive	**Condition** Negative	
TMSE Test	**Test outcome** Positive	True Positive TP = 41	False Positive FP = 15	Positive Predictive Value PPV = 73 %
	Test outcome Negative	False Negative FN = 9	True Negative TN = 35	Negative Predictive Value NPV = 79 %

Table 4.5 shows the predictive value of TMSE. It is found that TMSE has the true negative result on 41 participants from the assessment indicating the total number of Dementia patient as 56. Hence, the positive predictive value of TMS equals to 73%. TMSE has the true negative result on 35 participants from the total number of 44 participants. It can be said that the predictive negative value of TMSE equals to 79%.

Part 4 Reliability of Cognistat

Table 4.6 Indicates the result in applying Cognistat in term of test-retest reliability using kappa method in 13 Dementia patients

		The result of the test 2	
		positive	negative
The result of the test 1	positive	11	1
	negative	-	1

Table 4.6 shows the result in applying Cognistat in term of test-retest reliability in the groups of 13 Dementia patients. It is found that the result is both positive for the first test and second test for 11 participants. The first test displays the negative value and does the second test for 1 participant and the first test shows the positive value and the second test shows the negative value for 1 participant. Calculating by kappa coefficient method, it is found that kappa rate is 0.63

Table 4.7 Indicates the result in applying Cognistat in term of test-retest reliability using kappa method in 30 people from the normal elderly

		The result of the test 2	
		negative	positive
The result of the test 1	negative	12	-
	positive	7	11

Table 4.7 shows the result in applying Cognistat in term of test-retest reliability in 30 participants from the normal elderly group. It is found that the result is both positive for the first test and second test for 12 participants. The first test shows the positive value and the second test shows the negative value for 7 participants. Calculating by kappa coefficient method, it is found that kappa rate is 0.55

Table 4.8 Indicates the internal consistency reliability calculated by cronbach's alpha in the normal elderly and the Dementia patients. 50 people from each group

The type of the samples	The samples n	subtest N of items	cronbach's alpha
The normal elderly	50	10	.829
Dementia Patients	50	10	.769

Table 4.8 shows internal consistency reliability calculating by cronbach's alpha in the group of the normal elderly and the Dementia patients, 50 participants from each group. From the subtest 10 domains from the Cognistat, It is found that the cronbach's alpha, when calculating with the group of the normal elderly, is .829 which is considered high. Also, the cronbach's alpha, when calculating with the group of Dementia patients, is .769 which is considered high as well.

Part 5 The conclusion of the validity of Cognistat compared to TMSE and the reliability of Cognistat

Table 4.9 The validity of Cognistat compared to TMSE and the reliability of Cognistat

The Quality of the Tools	Statistical Measurement	Assessment Test	Results
Validity	Sensitivity	Cognistat	92%
		TMSE	82%
	Specificity	Cognistat	34%
		TMSE	70%
	Positive Predictive Value	Cognistat	58%
		TMSE	73%
	Negative Predictive Value	Cognistat	80%
		TMSE	79%
Reliability	The kappa rate in the Dementia patients		0.63
	Thekappa rate in the normal elderly		0.55
	The Cronbach's alpha rate in the normal elderly	Cognistat	0.829
	The Cronbach's alpha rate in the Dementia patients		0.769

From the table 11, it can be concluded that Cognistat has sensitivity rate higher than TMSE (92% VS 82 %) but the specificity less than TMSE (34% VS 70%). The positive predictive value of Cognistat equals to 58% and TMSE equals to 73%. The negative predictive value of Cognistat is 80% while TMSE's is 79%. In term of test-retest reliability), for Cognistat, it is found that in the group of Dementia patients the kappa rate is 0.63 while the normal elderly is 0.55. For the internal consistency reliability of Cognistat, it is found that, in the group of the normal elderly, cronbach's alpha= 0.829 and in the Dementia patients, it is Cronbach's alpha= 0.769. Both are considered as the high rate.

CHAPTER V
DISCUSSIONS, CONCLUSIONS AND RECOMMENDATIONS

This research aims at studying the characteristics of the assessment, Cognistat in term of the validity of the assessment which are the sensitivity, the specificity, and the predictive value by comparing to TMSE and also in term of the reliability using the test-retest reliability and internal consistency reliability method.

The samples can be classified into the two groups; 50 participants from the normal elderly from Ban Bang Khae Social Welfare Development Center for Older Persons and 50 of the dementia patients from Prasat Neurological Institute, Bangkok.

An assessment used in this research is Cognistat which is the initial assessment for the cognitive function. TMSE assessment is the primary screening tool for the Dementia, which, in this research, is used to compare to Cognistat and 2Q screening tool for the depressive disorder. The 2Q screening tool is used to screen the depressive disorder of the participants before taking the two said assessments.

The data collection is acquired by the individual testing which is done by the researcher himself. The data analysis is carried out by using the computer software to calculate the demographic data and the internal consistency reliability. For the sensitivity, specificity, predictive value and test-retest reliability, the statistical measure of kappa coefficient is applied.

Results

The results can be summarized as the followings;

1. Cognistat has sensitivity rate higher than TMSE (92% VS 82 %) but the specificity less than TMSE(34% VS 70%).

2. Cognistat and TMSE has the positive predictive value as 58% and 73%, respectively. The negative predictive value is 80% and 79% respectively.

3. In term of test-retest reliability, for Cognistat, it is found that in the group of Dementia patients the kappa rate is 0.63 while the normal elderly is 0.55.

4. For the internal consistency reliability of Cognistat, it is found that, in the group of the normal elderly, cronbach's alpha= 0.829 and in the Dementia patients, it is Cronbach's alpha= 0.769. Both are considered as the high rate.

Discussion

1. The research shows that the sensitivity of Cognistat is in an excellent level for evaluating the disorder in the elderly's brain who suffers from the dementia in this research. The results is 92% which corresponds with other researches ranging the sensitivity outcome as 72-100% (R.J. Kiernanet al,2008) In the aspect of specificity of Cognistat, the result conveys that the specificity of Cognistat is only 34% which also corresponds to C.J. Lamarre's study. The research team has reported the specificity as 47%. From the two measures, it is revealed that the Cognistat has the excellent sensitivity which is suitable for using as a screening tool for the dementia. However, with this high rate of sensitivity, the normal patient who takes the test could be interpreted as the abnormal in some cases. Hence, Cognistat should not be used the main diagnosis test. The specific test should be applied to ensure the accuracy. Considering the specificity of Cognistat, it is found that the rate is low which corresponds to the high sensitivity. This assessment is appropriate for screening the patient and ruling out. Moreover, this assessment can be used as the follow-up test or as the evaluation of the development of the illness. Though TMSE has less sensitivity rate, it has higher specificity. In case the more accuracy is required, TMSE is still the better choice to initially screen the dementia. However, it depends on the objectives of the work. Each assessment serves the different goal.

2. For the predictive value of Cognistat, it is found that the positive predictive value is 58% that means the opportunity that can detect the disorder from those who suffers from the disorder is 58%. This rate is considered average. Since the assessment has the high sensitivity rate, the person who is detected as the abnormal can be, in fact, normal. However, this said rate can be reliable somehow. It is not too

low. Comparing to the positive predictive value of TMSE which is 73%, it can be seen that TMSE has better positive predictive value but not far better. The negative predictive value of Cognistat is 80% that means it can detect those who are normal as the normal as 80%. This is considered high. This is because the assessment is thorough and difficult. Those who pass the test must have the high ability. Comparing the negative predictive value to TMSE which has 79%, Cognistat is the good assessment tool like TMSE and it is efficient enough to use as a tool for screening those who suffer from the Dementia.

3. For the Reliability of Cognistat, when calculated with the internal consistency reliability, it is found that both groups has the validity rate at the high rate (α = .829, .769) which corresponds with the previous research suggesting the rate at α = .94 (Ashum Gupta, 2009). This means that the assessment has the high reliability. However, considered from test-retest reliability, Cognistat has kappa = 0.63 and 0.55 which is average like the internal consistency reliability. This low rate of retest is perhaps as a result of the fact that the amount of samplings to perform the retest is small. Especially, for the Dementia patients, the retest can be undertaken by 13 participants. Moreover, there is another factor affecting the retest, for instance, the fluctuating condition of Dementia, the period of the retest after the first test is only one month, the learning of the first test, concentration, attention, and collaboration. However, the test-retest reliability rate acquired here is not too low. It is still in an acceptable level and corresponds with C.J. Lamarreet al's research that designed the same kind of research. The reported the kappa rate as kappa = .69 (C.J. Lamarre, 1994) which is somewhat close to this research (kappa = .63 and.55).

Conclusion

Cognistat has the sensitivity rate slightly higher than TMSE (92% VS 82 %) but the specificity rate is obviously less than TMSE (34% VS 70%). Cognistat has the positive predictive value as 58% and the negative predictive value as 80% which is considered as the good and excellent level. The validity is in the good level measuring from the test-retest reliability and internal consistency reliability. It is shown that

Cognistat is an effective assessment tool of the cognitive function suitable for screening the dementia. However, when comparing to TMSE, it is found that TMSE is still the easier and more accurate tool to use than Cognistat. Though, it depends on the objectives of the screening usage.

Research Limitation

1. Using Cognistat could be subject to many factors affecting the results of the assessment. In this research, education and intelligence are one of the factors affecting the score of the test. Most of the samples hold the education in the primary level. Some questions could be hard or beyond their knowledge so that they have lost the scores and finally been evaluated as the abnormal patient in that area of skills.

2. The criteria in the part of the test have not yet been altered to suit Thais. Therefore the cut-off criteria in each domain are one of the factors affecting the results.

3. This research divides samples into two groups. Each group has the different gold standard used in the studying. In other word, in the patient group, the diagnosis test of DSM-IV is applied as the criteria to clarify those who suffer from dementia. The general elderly will be defined by the medical history. This can be one of the factors affecting the research.

4. Generally, this kind of studying will apply the cross sectional study method or use the population from the same group. However, in this research, participants of the research are divided into two groups. The researcher knows the condition of participants. The bias, thus, exists in the test, assessment, and interpretation of score which more or less can affect the research.

5. In test-retest reliability method to find the reliability in the group of those who suffer from the dementia, the retest would be carried out in 30 participants according to the previous goal. Due to the limitations, the retest process cannot be done with 30 participants but 13 of them. The samples to calculate the reliability is in the low rate. This can affect the reliability of the research.

Recommendations

Recommendations for Cognistat

1. Cognistat is the new assessment tool which is just allowed to be translated to use in Thailand and has not yet been supported by Thai research. Therefore this assessment should be used with an additional study to improve the quality of the tool and make it gain the acceptance in practical usage.

2. This assessment should be only undertaken by those who have knowledge in neurology. In the interpretation of score, the result would not be calculated in the decimal base. Experiences and expertise are required for the diagnosis. Thus the assessment should not be used by those who are not in the field.

3. Since Cognistat is the assessment requiring experiences and expertise in undertaking the test, calculating and interpreting the score, those who use this test should consult the manual carefully.

4. The strong point of Cognistat is that it is convenient. There are the questions in the screening parts which helps facilitating the screening process. This is the good screening tool and also the thorough assessment. In other word, the parts are clearly separated into the domain. This helps facilitating the analysis and interpretation. From this advantage, using this assessment would make the working process more efficient.

Recommendations for Further Study

1. In this research, there is the small scale of samples. The result can be affected by this factor. For the further research, the scale of samples should be larger and study on the population that comes from the same sources. There is no need for dividing the samples into two groups This can results in the various calculation of the characteristics.

2. Not only using to evaluate those who suffer from the dementia, but Cognistat should be also studied in term of other neurological disorder such as Delirium. This assessment tends to work well with the patients suffering from other kind of brain disorder.

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