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Validity and Reliability of the 'Malay Eating Assessment Tool-10 (M-EAT-10)' among Population with Neurological Disorder in Hospital USM

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Dissertation submitted in partial fulfilment of the requirement for the Bachelor Degree of Health Sciences (Honours) Speech Pathology

June 2018

CERTIFICATE

This is to certify that the dissertation entitled "Validity and Reliability of the 'Malay Eating Assessment Tool-10 (M-EAT-10)' among Population with Neurological Disorder in Hospital USM" is the bona fide record of research word done by Seline Lee Hwei Leng (126586) during the period of September 2017 to June 2018 under my supervision. This dissertation submitted in partial fulfillment for the degree of bachelor of Health Sciences (Speech Pathology). Every research work and collection of data belongs to Universiti Sains Malaysia.

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledged. I also declare that it has not been previously or concurrently submitted as a whole for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use this dissertation for teaching, research or promotional purposes.

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ACKNOWLEDGEMENT

Above everything else, I thank you Lord, God Almighty for everything throughout this journey. I thank God for assuring again and again that I can go on this journey with His strength. Thank you for the wisdom, hope, faith and perseverance that I can finish this journey. I also want to thank God for my parent, Lee Kok Keong and Amy Nga Kor Ding, the listening ear to my everything, none of this could have happened without them. First and foremost, I have to thank my research supervisors Dr. Nik Fariza Husna Nik Hassan, Dr. Wan Amir Nizam Ahmad and Dr. Al Hafiz Ibrahim. Without their assistance and dedicated involvement throughout the process, this research would have never been accomplished. I would like to thank you very much for your support and understanding over these months. I would also like to show gratitude to Encik Izzat Ismail for helping me with the recruitment of participants and Cik Nur Afiqah Abdullah, Speech-Language Pathologists from Hospital USM for teaching me to read and understand VFSS images. Next, thank you Hui Yin for the help too! I will not forget how we carried each other's burden, exchanged words of encouragements and shared information with each other. Thank you, beloved batch mates, (Min, Tian Na, Siew Mee, Thirah, Pinat and Bihah) for listening to all my complaints and provided advices. Every time I was ready to quit, all of you did not let me and I am forever grateful. Last but not least, thank you to all kind and supporting staff and medical doctors in Hospital USM who directly and indirectly helped with this research. This dissertation stands as a testament to everyone's unconditional love and encouragement.

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LIST OF ABBREVIATIONS

CNS	Central Nervous System
CVA	Cerebrovascular Accident
EAT-10	Eating Assessment Tool-10
FEES	Fiberoptic Endoscopic Evaluation of Swallowing
GERD	Gastroesophageal Reflux Diseas
Hospital USM	Hospital Universiti Sains Malaysia
LES	Lower Esophageal Spinchter
MBS	Modified Barium Swallow Study
M-EAT-10	Malay version of Eating Assessment Tool-10
NGT	Nasograstric Tube
ORL	Otorhinolaryngology
SOPD	Surgical Out-Patient Department
TBI	Traumatic Brain Injury
UES	Upper Esophageal Spinchter
USM	Universiti Sains Malaysia
USMKK	Health Campus of Universiti Sains Malaysia
VFSS	Videofluoroscopic Swallowing Study

ABSTRAK

'Eating Assessment Tool-10 (EAT-10)' merupakan suatu borang penilaian oleh Belafsky et al. (2008) yang cepat, mudah untuk dijawab dan telah dibuktikan kesahihannya. Kini, EAT-10 boleh didapati dalam 10 bahasa lain, termasuk versi terbaru iaitu bahasa Melayu yang diterjemahkan dan dibuktikan kesahihan oleh (Farah, 2017.). Tujuan penyelidikan ini adalah untuk menguji kesahan dan kebolehpercayaan penilaian 'Malay Eating Assessment Tool-10 (M-EAT-10)' dalam kalangan populasi gangguan neurologis. Para peserta telah direkrut mengikut kelayakan penyertaan sebelum diberi menjawab borang soal selidik. Lapan peserta, berumur antara 24 hingga 65 tahun, telah mengambil bahagian dalam penyelidikan ini secara sukarela. Peserta juga menjalani ujian objektif Videofluoroscopic Swallowing Study (VFSS) untuk mengesan disfagia mengikut jumlah skor keseluruhan dari M-EAT-10. Dengan merujuk kepada data normatif yang disarankan oleh Belafsky et al (2008), individu dengan jumlah skor tiga dan ke atas mungkin mengalami disfagia. Hasil penyelidikan mendapati bahawa tiada hubungan signifikan antara M-EAT-10 dan VFSS, diuji dengan ujian Fisher's Exact (p value = 0.250). Koefisien Alpha Cronbach M-EAT-10 yang diperolehi ialah 0.895 ($\alpha = 0.895$), menunjukkan nilai ketekalan dalaman yang baik bagi semua item dalam skala M-EAT-10. Secara keseluruhan, disebabkan oleh peserta terhad yang mempengaruhi hasil penyelidikan, penyelidikan selanjutnya dengan saiz peserta yang lebih besar harus dijalankan untuk menguji persamaan antara skor M-EAT-10 dengan VFSS. Walau bagaimanapun, MEAT-10 masih boleh digunakan untuk memberikan gambaran awal dan perihalan simptom pesakit kepada terapis atau doktor di klinik atau hospital di Malaysia.

ABSTRACT

The Eating Assessment Tool-10 (EAT-10) is a validated, quick and easy to self-administer, symptom-specific outcome tool scale developed by Belasfsky et al. (2008). Currently, the EAT-10 is translated and validated into 10 other languages globally, including the most recent version being the Malay language which was translated and validated by (Farah, 2017.). The aim for this research is to test the criterion-related validity and internal consistency reliability of the Malay version of Eating Assessment Tool-10 (M-EAT-10) among population with neurological disorders. Participants were recruited according to the exclusion and inclusion criteria before answering the questionnaire. Eight participants, age ranges from 24 to 65 years old, voluntarily participated in this research. Participants also went through an instrumental assessment of Videofluoroscopic Swallowing Study (VFSS) to validate the presence of dysphagia according to the total scores from the M-EAT-10. By referring to the normative data suggested by Belafsky et al. (2008), individual with total severity scores of three and above may have dysphagia. The findings of the research found that there is no significant association between the M-EAT-10 and VFSS, tested using Fisher's Exact test (p value = 0.250). The Cronbach's alpha coefficient for Malay version of EAT-10 (M-EAT-10) obtained was 0.895 (α= 0.895) which indicated good internal consistency of the items in the M-EAT-10 scale. Overall, due to the limited participants affecting the outcome of the research, future research with a larger participant size should be conducted to determine the association between the M-EAT-10 scores with the VFSS. Nevertheless, MEAT-10 can still be used to give early impression and description of patient's symptoms to the clinicians and attending medical doctors in neurology clinics or hospitals in Malaysia.

Chapter 1: Introduction

1.1 Research Background

Neurological disorders, as defined by World Health Organisation (WHO), are diseases of the central and peripheral nervous system. This includes lesions to the brain, spinal cord, cranial nerves, peripheral nerves, nerve roots, autonomic nervous system, neuromuscular junction, and muscles. Some examples of the disorders include Alzheimer disease, cerebrovascular diseases such as stroke, multiple sclerosis, Parkinson's disease, motor neuron disease, neuroinfections, and traumatic disorders of the nervous system due to head trauma.

According to Takizawa et. al (2016), oropharyngeal dysphagia is a common condition in people with neurological disorders such as after stroke, Parkinson's disease, and Alzheimer's disease. These neurological disorders cause impairment to the sensory and motor functions during the oral and pharyngeal phases of swallowing which result in neurogenic dysphagia. The symptoms of neurogenic dysphagia include insufficient labial closure, initiating swallowing difficulties, nasal regurgitation, managing secretions difficulties, episodes of choking or coughing during swallowing, and food stuck sensation in the throat. When left undetected or untreated, neurogenic dysphagia can lead to dehydration, malnutrition, respiratory complications and disrupted quality of life.

Swallowing is important in our daily life as it is used during eating and drinking of food and water. It is complex but well-coordinated process of transporting food and liquid from oral region to the stomach. There are multiple ways in which this complex function can malfunction. Swallowing impairment or disorder is known as dysphagia where it is derived from Greek. The literal meaning of the word "*dys*" gives meaning to

"difficulty or disordered" while "*phagia*" means "to eat'. The American Speech – Language – Hearing Association (ASHA) defines dysphagia as having impairments at the oral cavity, pharynx, oesophagus, or gastroesophageal junction which causes difficulty or delayed in swallowing.

The 10-Item Eating Assessment Tool (EAT-10) is a self-administered clinical screening tool for dysphagia and has been translated and validated into many languages. However, the tool was first developed and tested with participants of head and neck cancer. Hence, this study was to determine M-EAT-10 as a screening tool to detect dysphagia among population with neurological disorder.

1.2 Background of Dysphagia

1.2.1 Causal Factors

The swallowing complex encompasses voluntary and involuntary movement processes and requires the coordination of multiple muscles and nerves. The swallowing process itself has 3 phases which are oral phase, pharyngeal phase and oesophageal phase (Dodds, Stewart & Logeman, 1990). Dysphagia happens when there are problems or impairments in any of the 3 phases. It is often resulting from neurological disorders of numerous aetiologies secondary to damage to the central nervous system or cranial nerves. Dysphagia may also happen due to problems affecting the head and neck such as cancer of the oral, pharynx, nasopharynx cavity or oesophagus. Weakened immune system can cause swelling or inflammation and weakness of muscle to swallow. Other causes include gastroesophageal reflux disease (GERD), esophagitis, diverticula, decayed or missing teeth and poorly fitting dentures.

1.2.2 Signs and Symptoms

The signs and symptoms associated with dysphagia vary according to individuals (ASHA, n.d.). Some might have odynophagia which is pain during swallowing while some does not. Other signs and symptoms include drooling, sensation of food stuck or unable to swallow completely in the throat or at the chest, regurgitation of food, coughing or choking during swallowing, frequent heartburn and many more. Having trouble to swallow different consistencies and texture of food consistencies are also indications of having dysphagia. While all these signs and symptoms suggest risk of aspiration, the undetected and untreated cases have high risk of developing aspiration pneumonia, endangering the lives of patients.

1.2.3 Complications

The complication of swallowing disorders also might varies across patient. Some of the most common complications are pneumonia, upper respiratory infections or respiratory complications, malnutrition, dehydration disrupted quality of life. It has profound social, emotional and socioeconomic implications towards an individual. Some experienced panic or anxiety during meals and causing them to eat in isolation. The severity of which is linked to anxiety, depression and a compromised quality of life (Nguyen et al., 2005).

1.3 Available Tests and Assessment Tools

Diagnosing of oropharyngeal dysphagia include of several evaluations and assessments such as using clinical evaluation and instrumental evaluation.

1.3.1 Clinical Evaluation

One of the examples is through clinical bedside evaluation. This evaluates the oral motor structure and function of the oral stage. Any impairment allows prediction or suggestion of a differential diagnosis of problems in the swallowing physiology of pharynx, larynx or oesophagus. This evaluation uses a combination of history taking, cranial nerve assessment and swallows observation (Gates, Hartnell & Gramigna, 2006). Other evaluations are the using of available questionnaires in the clinical setting to assess the symptoms of the patients such as MD Anderson Dysphagia Inventory (MDADI) (Chen et al., 2001), SWAL-QOL (McHorney et al., 2000), Sydney Swallow Questionnaire (SSQ) (Dwivedi et al., 2010) and 10-Item Eating Assessment Tool (EAT-10) (Belafsky et al., 2008). One of the most common methods used in the clinical setting is the water-swallow test (Poorjavad & Jalaie, 2014). Patient's swallow reflex is palpated and observed on the tolerance of the quantity of water and different types of food consistencies.

1.3.2. Instrumental Evaluation

Instrumental evaluation is supplement to the clinical evaluation which enables detailed information of the structure and function swallowing complex at the oral, pharyngeal and oesophageal stage. Videofluoroscopic swallowing study (VFSS) and fiberoptic endoscopic evaluation of swallowing (FEES) are some of the most common instrumental tools as an objective test in diagnosing and managing dysphagia. The endoscopy is a live session procedure in which clinicians will insert a very small tube with camera and light at the end of the endoscope to get detailed images of the swallowing process. Meanwhile, the fluoroscopy, which is considered as the gold standard of evaluation (Cook & Kahrilas, 1999), requires patient to swallow a barium-

containing liquid which provides observation of the oral preparatory phase, initiation of the swallowing reflex, transit of bolus during pharyngeal phase and views of a broader range of structures the muscular activity of the oesophagus process. Both instrumental tools are able to provide a view of the bolus and some information on structural movement of the swallowing complex. Others include oesophagoscopy which uses a thin flexible scope to looks at the oesophagus, stomach and the upper intestines. It is then continued by removing a small piece of tissue for biopsy and manometry measure. Information regarding the pressure changes from the muscular contractions of oesophagus can be obtained.

1.4 10-Item Eating Assessment Tool (EAT-10)

The 10-Item Eating Assessment (EAT-10) is a validated, quick and easy to self-administer, symptom-specific outcome tool scale (Belfasky et al., 2008) that is commonly used in clinics worldwide. It has been translated and validated in English (Belfasky et al., 2008), Spanish (Burgos et al., 2012 & Giraldo-Cadavid et al., 2016), Italian (Schindler et al., 2013), Japanese (Wakabayasi & Kayashita, 2014), Chinese (Wang et al., 2015), Arabic (Farahat & Mesallam, 2015), European Portugese (Nogueira et al., 2015), Turkish (Demir et al., 2016) Swedish (Möller , Safa & Östberg, 2016) and Hebrew (Abu-Ghanem et al., 2016).

1.4.1 Procedure of EAT-10

In brief, patients are presented with 10 statements about their swallowing function. They are required to rate themselves on a 5-point scale of severity for each of the statement. The scales reflect from "no problem" to "severe problem". An overall score of more than or equals to 3 is considered as abnormal and predicts of having

dysphagia. The EAT-10 has displayed excellent internal consistency, test-retest reproducibility, and criterion-based validity (Belfasky et al., 2008).

1.4.2 Malay Version of EAT-10 (M-EAT-10)

Recently, EAT-10 has been translated and validated in Malay or Bahasa Melayu (Farah, 2017). The EAT-10 was translated into the Malay language, M-EAT-10, through Modified Forward-Backward Translation technique. Then, the M-EAT-10 was validated through face and criterion-related validation with objective instrument FEES. Lastly, the internal consistency reliability of M-EAT-10 was assessed through obtaining the Cronbach's Alpha value. The study by (Farah, 2017) enables the assessment of dysphagia to be done in Malaysian population, specifically those in the rural areas, as the previous version of questionnaire is not fully understood. The M-EAT-10 is thought to be used in clinical settings at hospitals in Malaysia as there is no other established Malay swallowing assessment tool. The tool can be utilized to document the initial severity of dysphagia and monitor the treatment response (Belfasky et al., 2008).

1.5 Problem Statement

The 10-Item Eating Assessment (EAT-10) was first developed and tested with participants of head and neck cancer (Befalsky, 2008). However, the difference in aetiology will lead to have different symptoms of dysphagia. In this case, this might reduce the efficacy of EAT-10 as a screening tool to detect dysphagia among population with neurological disorder. The translated M-EAT-10 was used as the questionnaire as it will be fully understood by the Malaysia population.

1.6 Objective

1.6.1 General Objectives

To test the criterion-related validity and reliability of M-EAT-10 among population with neurological disorders.

1.6.2 Specific Objectives

i. To determine the association between the Malay version of EAT-10 (M-EAT-10) and Videofluoroscopic Swallowing Study (VFSS).

ii. To assess the internal consistency reliability of the M-EAT-10.

1.7 Hypothesis

There is no association between M-EAT-10 and VFSS.

1.8 Significance of Research

This research enables population with neurogenic dysphagia to seek prompt detection and recognition so that early diagnosis can be done. Besides, ASHA documented that the prevalence of dysphagia among population with neurological disorders are high. Therefore, this will benefit the patients as early intervention and treatment can be given to improve their quality of life. Furthermore, doctors, specialist or clinicians are able to provide better management and services to patients from the early impression benefitted from the screening tool.

1.9 Ethics

The study has been approved from the Secretary of JEP-eM-USM (USM/JEPeM/17100436). The questionnaire and consent form was given and explained on the aims of the research and the nature of involvement of the participants. The participants were also clearly informed of their rights and any risks associated with the participation. Those who agreed to participate and submitted the consent form were regarded as participants of research.

Chapter 2: Literature Review

2.1 Introduction

Logemann (1994) defines swallowing as one of the most complicated tasks performed by the nervous system in which it is accomplished by 26 pairs of muscles, six cranial nerves and many brain regions including cerebral cortex, medulla oblongata and the cranial nerve nuclei.

Swallowing happens when food travels from the mouth through the oesophagus and into the stomach. This should happen without interrupting or irritating the adjacent structures of nasal passages, larynx and the lower respiratory tract.

The swallowing process only starts after food is ingested and the whole process can be divided into four stages. The location of the bolus defines the stages as it travels down the passage. The first stage is the oral preparatory stage in which it is the preparation of bolus to be propelled into pharynx; the second stage is the oral stage whereby the tongue manipulates and pushes the bolus through the anterior faucial pillar into the pharynx; the third stage is the pharyngeal phase in which bolus is moved and pushed by the pharyngeal structures to the upper oesophageal sphincter (UES); and the fourth stage is the oesophageal phase whereby bolus is pushed and moves with oesophageal peristalsis and gravity towards the lower oesophageal sphincter and lastly into the stomach.

At the oral preparatory stage, the initiator of physiological processes is triggered by the nerves from the anticipation and smells form the food or seeing the food.

Oral stage happens once the bolus, food or liquid, is consumed into the mouth. It is sealed off anteriorly by the dorsal tongue and posteriorly by the soft palate to prevent

leakage into the pharynx until ready for swallowing. In this stage, mastication of bolus occurs as oral structure moves to reduce the size of the bolus to prepare for the pharyngeal stage. Besides, the tongue moves to from side to side to manipulate the bolus. The tongue pulls the food from the buccal area and molar region to be placed at the occlusal surface for mastication. When the bolus is prepared to be swallowed, the tongue touches the hard palate to expand posteriorly and pushes the bolus into the oropharynx. Once the bolus touches the anterior faucial pillar, the swallowing reflex is triggered.

At pharyngeal stages, a series of coordinated and almost simultaneous events occurs. When the swallowing reflex is triggered by the bolus, the velum elevates and closes the nasopharynx, the base of tongue will approximates to the pharyngeal wall to push the bolus towards the pharynx, and shortening of pharyngeal wall happens and squeezes the bolus downwards. The pharynx eventually contracts from top to bottom and reduces it volume by shortening vertically; the bolus is further pushed downwards. At the same time, the hyoid and larynx move upwards and outwards while the epiglottis fold downwards to close the laryngeal vestibule. This action helps to protect the airway from any penetration of the bolus. The traction of the epiglottis and hyoid is also known as hyolaryngeal excursion. When this combines with the cricopharyngeus relaxation, contraction of the suprahyoid muscle and the force of gravity generated by the downward movement of the bolus happens, the upper oesophageal sphincter (UES) opens.

Oesophageal stage happens once the bolus passes through the UES. From there onwards, the oesophageal peristalsis and gravity will move the bolus down to the lower oesophageal sphincter (LES) and finally the food reaches the stomach.

At all four stages of swallowing, any deficits that occur at one or more stages may lead to dysphagia. The more area is affected, the more severe it is.

2.2 Neurological Disorders Affecting Swallowing

According to Daniels (2006), oropharyngeal dysphagia can be caused by many disorders of the central nervous system (CNS). The disorders can be categorised into non-degenerative and degenerative. One of the most common types of the former is stroke; while based on the main clinical presentation, the latter can be further subcategorised into dementia, movement disorders, and others. Degenerative disorders are usually progressive and can cause functional swallowing problems such as problems during the preparatory phase, poor bolus control, difficulty initiating the swallow reflex, and decreased hyolaryngeal elevation. Dysphagia caused by problems of the CNS is generally not specific to the type of neurologic disorder (Daniels, 2006). Hence, the diagnosis of dysphagia requires comprehensive history and clinical examination such as using Videofluoroscopic Swallowing Study (VFSS) as the gold standard for characterizing the specific problems.

2.2.1 Stroke

Loo and Gan (2012) reported that stroke is one of the leading causes of death and causes for hospitalisation in Malaysia. Eighty percent of strokes are secondary to ischemia while hemorrhage accounts for the rest of twenty percent. Different locations of stroke will cause different neurologic symptoms. Thus, swallowing problems also varies in the different types of stroke. Some of the symptoms include bolus retention at the oral lateral sulcus, delayed bolus transfer, delayed initiation of swallowing response, decreased hyolaryngeal elevation, and aspiration (Logemann, 1994).

2.2.2 Traumatic Brain Injury

Like in the case of stroke, based on the brain region involved, traumatic brain injury (TBI) can also cause dysphagia. Depending on the severity and site of injury, the brain injury caused by trauma is generally more diffuse as compared to stroke; hence, patients mostly exhibit cognitive impairments (Daniels, 2006).

2.2.3 Brain Tumour

Brain tumours, like stroke and TBI, can cause dysphagia based on the brain region involved. Brain tumours can be differentiated into benign or malignant. The infiltration of the tumour at different brain region can result in neurological dysfunction, affecting deglutition (Daniels, 2006). In this context, dysphagia caused by brain tumour can be progressive as the tumour increases, while undergoing treatments such as surgery or radiation therapy may also affect the swallowing function.

2.2.4 Head and Neck Cancer

One of the more infamous forms of tumour growth is the spreading of tumour along a nerve. It is a common phenomenon in head and neck cancers. One of the most common neoplasms to exhibit this behaviour is the squamous cell carcinomas. Due to the complex and extensive network of nerve fibres within the head and neck, the usual nerves to be affected are trigeminal and facial nerves causing swallowing problems (Bradley, 2015).

2.2.5 Medication Induced

Balzer (2000) states that the swallowing function can be affected by medications that supress the CNS, which decreases a person's awareness and voluntary muscle control. Some of the examples are antiepileptic drugs for seizures such as carbamazepine.

2.2.6 Surgery Induced

Surgery that involves the head and neck region may result in dysphagia due to the manipulation of cranial nerves (Daniels, 2006). Oropharyngeal dysphagia may present postoperative and exhibits symptoms such as reduced laryngeal elevation most prominently (Jennings et al. 1992). In this context, any injury of the fifth, seventh, tenth, and twelfth cranial nerves may also contribute to the dysphagia (Best et al, 2012).

2.3 Validity

Kelley (1927) formulated the concept of validity and defined that a test is valid if it measures what it claims to measure. Hence, it refers to the credibility or believability of the research or an instrument.

One of the four types of validity is statistical conclusion validity, which pertains to the relationship being tested. Next is the internal validity, which means that the instrument or procedure measures what it is supposed to measure. External validity implies that results are generalisable beyond the immediate situation to other persons, settings, and times. Last but not least, construct validity, which refers to how well a constructed concept or idea is being translated or transformed into a functioning and operating reality, the operalisation (Trochim, 2006).

There are many methodological literatures which provide difference in measuring the types of validity. Trochim (2006) classified construct validity into two main categories which are translation validity and criterion-related validity. For this research, the researcher preferred Trochim's (2006) idea in constructing the research; thus, criterion-related validity of construct validity is preferred to use.

2.3.1 Criterion-related validity

Criterion-related validity examines the ability of a tool or instrument to predict a variable that is designated as a criterion. The criterion may be set externally as the 'gold standard'; hence, achieving this level of validity makes results more credible . In criterion-related validity, a prediction is made based on the theory of construct on about how the operationalization will perform (Trochim, 2006).

2.3.1.1 Concurrent Validity

Concurrent validity happens when the criterion exists at the same time as the measure. It refers to the ability of a tool or instrument to predict an event in the present. The results are more powerful if it is able to show discrimination between two groups that are very similar (Drost, 2011).

2.3.1.2 Predictive Validity

Predictive validity happens when the criterion occurs in the future. It refers to the ability of a tool or instrument to measure some event or outcome in the future. A high correlation would provide evidence for predictive validity as it would show that the tool or instrument can correctly predict something that it should theoretically be able to predict (Drost, 2011).

2.3.1.3 Convergent Validity

Convergent validity occurs when measures of constructs that are expected to correlate happens. It is the testing for convergence across different measures or manipulations of the same thing (Cook & Campbell, 1979). Results from the tool or instruments can be correlated with scores on other tests that measure the same ability, where high correlations would be evidence of convergent validity.

2.3.1.4 Discriminant Validity

Discriminant validity occurs when measures of constructs that are expected not to relate does not happen and it becomes possible to discriminate the constructs. It is the testing for divergence between measures and manipulations of related but conceptually different things (Cook & Campbell, 1979). Results from the tool or instruments can be correlated with scores on other tests that measure the opposite ability, where low correlations would be evidence of discriminant validity.

2.4 Reliability

Reliability, defined by Bollen (1989) is the consistency of measurement while Nunnally (1978) defined it as the stability of measurement over a variety of situations in which will obtain similar results. It is the degree to which it gives an accurate score across a range of measurement.

Gabrenya (2003) suggested four types of reliability, namely inter-rater reliability, test-rest reliability, parallel forms reliability and internal consistency reliability.

For this research, the researcher agreed with Gabrenya (2003) idea of using internal consistency reliability to measure the correlations between different items on the same test.

2.4.1 Inter-rater Reliability

It is a measure of agreement across different people. The same tools or test is used to assess the degree of agreement among different raters in their assessment decisions. This is useful because not everyone necessarily interpret answers the same

way. Hence, raters may disagree to certain responses or material demonstrates knowledge of the construct or skill being assessed.

2.4.2 Test-retest Reliability

It is a measure of stability by administering the same test two times over a period of time to the same group of individuals. The results from both times are then correlated to evaluate the test for stability over time.

2.4.3 Parallel Forms Reliability

It is a measure of equivalence by administering different versions of a tool or test to the same group of individuals. Both versions of the tool or test must contain the same items of construct, skill or knowledge base. The results from both versions are then correlated to evaluate the consistency of results across the two versions.

2.4.4 Internal Consistency Reliability

It is a measure of how consistently each item measures the same underlying construct. This method evaluates individual questions in comparison with one another for their ability to produce similar results. The different questions that test the same construct should give consistent results.

2.5 Prevalence of Dysphagia among Population with Neurological Disorder

The American Speech – Language – Hearing Association (ASHA) reports of high prevalence of dysphagia across the neurological populations. It is report that the prevalence for stroke patients is 29% to 64% (ASHA, n.d.) and over one third of patients admitted to stroke rehabilitation units have dysphagia (Falsetti et al., 2009).

Additional studies in other acquired and progressive neurogenic populations reported prevalence of dysphagia ranges from 13% to 57% in dementia patients (Alagiakrishnan, Bhanji & Kurian, 2013), 35% to 82% for individuals with Parkinson's disease (Kalf, de Swart, Bloem & Munneke, 2011) and as high as 90% in individuals diagnosed with Parkinson's disease or amyotrophic lateral sclerosis (Coates & Bakheit, 1997). Other neurogenic populations with dysphagia include individuals with multiple sclerosis which has prevalence of dysphagia ranging from 24% to 34% (Calcagno, Ruoppolo, Grasso, De Vincentiis, & Paolucci, 2002; De Pauw, Dejaeger, D'Hooghe, & Carton, 2002; Roden & Altman, 2013) and 38% to 65% in patients with traumatic brain injury (Terre & Mearin, 2009).

2.6 Awareness of Dysphagia among Population with Neurological Disorder in Malaysia

To date, there are no data regarding the prevalence of dysphagia in neurological disorder among Malaysian population yet. However, according to Abdullah and colleague (2006), the number of neurological disease case is expected to rise to be the second leading cause of morbidity and mortality after heart disease in Malaysia for the next 10 years. This statement can be further supported by Loo and Gan (2012) whom in their study reported that stroke is one of the leading causes of death and causes for hospitalisation in Malaysia. Based on disability-adjusted life years, it is one of the top five diseases which have the greatest burden of disease.

Swallowing problems or dysphagia often manifest itself in population with neurological disorder. In this context, neurologists are often confronted with swallowing disorders in routine practice (Kumar, 2010). In busy neurology clinics or hospitals, there is not enough time to evaluate each patient by using instrumental swallowing evaluation

(Selen et al., 2016) such as Fiberoptic Endoscopic Evaluation of Swallowing (FEES) or Videofluoroscopic Swallowing Study (VFSS). The importance for early identification and management of oropharyngeal dysphagia has to be highlighted. This is to ensure a safe oral intake and reduce of serious dysphagia complications. Furthermore, swallowing impairments can lead to severe health consequences if they are overlooked or inappropriately managed.

Dysphagia is common among neurological disorders. However, it is a symptom and it is important to distinguish between dysphagia symptoms and objective evidence of swallowing impairment (Cheney et al., 2016). Thus, there is a necessity and need for an effective clinical tool to detect dysphagia among neurological disorders. Patient's self-perception of disability caused by swallowing impairment should be documented for monitoring. The M-EAT-10 is quick and easy self-administered tool used for the subjective assessment of dysphagia and it may benefit both individuals with dysphagia and clinicians for a better management.

Chapter 3: Methodology

3.1 Research Design

This research was conducted as a descriptive study which involves population with dysphagia due to neurological disorders. This research consists of criterion-related validity of the Malay version of EAT-10 (M-EAT-10) and internal consistency reliability of the M-EAT-10.

The criterion-related validity of the M-EAT-10 used was Videofluoroscopic Swallowing Study (VFSS) while the internal consistency reliability was carried out using the questionnaire of M-EAT-10.

3.2 Research Location

This research was conducted at the Hospital Universiti Sains Malaysia (Hospital USM), Health Campus of Universiti Sains Malaysia (USMKK), Kubang Kerian, Kelantan.

3.3 Research Participants

The participants for this research were patients from Speech Clinic at Audiology and Speech Pathology Unit, Unit Perubatan Permulihan, Dysphagia and Swallowing Clinic at Otorhinolaryngology (ORL) Clinic, Surgery (SOPD) Clinic and the hospital ward in Hospital USM, Kubang Kerian Kelantan. The participants were selected by age and gender match to the research samples.

3.4 Inclusion and Exclusion Criteria

The inclusion and exclusion criteria for participants were shown in Table 3.6 (a).

Table 3.6 (a) Inclusion and exclusion criteria for participants

Study Group	
Inclusion Criteria	**Exclusion Criteria**
Individuals with dysphagia with complaints of having food stuck sensation at the throat or chest area; having difficulty or need multiple swallowing of food and water; and coughing or choking during eating.	Individuals with poor auditory and language comprehension (Wernicke's Aphasia, Global Aphasia).
Individuals with neurological disorder.	
Individuals able to read and understand the Malay Language.	
Individuals aged over 18 to 80 years old.	

3.5 Sample Size Calculation

The true prevalence of dysphagia across the adult neurological populations is not fully known and is often underestimated (ASHA, n.d.). It varies according to the different neurological disorders, population studied and the diagnostic instruments used. There are no previous studies regarding M-EAT-10, however there is an unpublished study on M-EAT-10 and FEES (Farah, 2017).

According to (Farah, 2017), the sample size calculated by using Raosoft Sample Size Calculator was 30. There were no prevalence of dysphagia in Malaysia; hence the author used prevalence of stroke patient to calculate her sample size. Mourao et al. (2015) stated that the prevalence of stroke among 100 individuals was 50%. With the population of Kelantan on 11th May 2015 of 1,718,200 as stated by Jabatan Penerangan Malaysia (JPM), the risk of having stroke is 34,364. By using the prevalence of 50%, 34,364 in population will have dysphagia. From the data, the sample size calculated is 24 with margin of error 20%, where N (34,364) is the population size, 50% is the response distribution and Z(c/100) is the critical value or the confidence level 95%.

After considering the dropout rate and unreliable data, the sample size for her study was 30 people.

Therefore, the sample size for this research was minimally at 30. With consideration of the dropout rate and unreliable data of 20%, the sample size for this research involved was estimated to be 36 people.

3.6 Sampling Method

The sampling was done with participants from the state of Kelantan. Convenient sampling was used in this research. Participants that follow the inclusion and exclusion criterions were conveniently selected as the research population. The selection procedure started from the preparation of list of neurological disorders patients with dysphagia from admission to the hospital ward, visiting the Speech Clinic at Audiology and Speech Pathology Unit, Unit Perubatan Pemulihan, the Swallowing and Dysphagia Clinic in ORL Clinic and SOPD Clinic, HUSM; followed by choosing the participants for the research; and then overcoming the drop out problem of respondents.

3.7 Research Instruments

3.7.1 Malay Version of Eating Assessment Tool-10 (M-EAT-10)

The M-EAT-10 is a tool that has been translated by (Farah, 2017) and used in this research. The basis of M-EAT-10 is the same as EAT-10 developed by Belafsky et al. (2008). It consists of 10 questions with 4 Likert scales from "0" to "4" which is rated from "no problem to severe problem".

3.7.2 Videofluoroscopic Swallowing Study (VFSS)

The Videofluoroscopic Swallowing Study (VFSS) (Appendix A) is a procedure that permits the visualization of the patterns of the bolus flow in relation to structural movement throughout the upper oesophageal tract in real-time. It facilitates in visual understanding the physiology of the oral phase, pharyngeal phase, upper oesophageal aspects of swallowing (UES opening) and oesophageal phase. The VFSS is able to detect the presence and timing of aspiration. Besides, it can also observe the effects of different volumes and textures of bolus and compensatory strategies on swallowing physiology (Logemann, 1999).

Individuals are asked to drink and eat normally, in which the food or drinks are added with radiopaque contrast (typically barium), while clinicians and doctors observe in real-time visualization of the oral cavity, oropharynx, laryngopharynx and oesophagus. Images of the transport of bolus and the oropharyngeal motility can be seen. The results from the procedure are able to provide recommendations regarding the optimum delivery of nutrition and hydration (i.e. oral versus non-oral feeding, methods of delivery, positioning during meal time, intervention methods) and determine appropriate therapeutic techniques.

Nevertheless, the interpretation of instrumental assessment must be combined with clinical assessment and clinical history before concluding the direction of management.

3.8 Research Procedure

In this research, the first step was to obtain the list of neurological disorders participants with dysphagia. The list was obtained from various places which are

patients and their appointments at the Speech Clinic at Audiology and Speech Pathology Unit, Dysphagia and Swallowing Clinic at ORL Clinic, SOPD Clinic, HUSM; that are admitted to the hospital ward and have dysphagia; and the patients with dysphagia attending rehabilitative therapy in Unit Perubatan Permulihan. The participants were chosen based on the inclusion criteria and exclusion criteria.

Then, the researcher provided a simple explanation about the research, their participation and the risk and benefits of the research. Participants were briefed thoroughly if he or she agrees to take part in the research. Participants have the right to reject to be part of the research if he or she is not comfortable in the procedures of the research. The consent forms and M-EAT-10 questionnaires were distributed to the participants of the research. It is estimated to take about 5 minutes for the completion of the M-EAT-10 questionnaires. Since it is supposed to be a self-administered tool, participants were not assisted.

Next, participants were contacted for the appointment of VFSS diagnostic testing. Participants are needed to come for a diagnostic measurement of dysphagia by using VFSS. The test is estimated to take about 1 hour. After completing the instrumental test, a token of appreciation with small gifts will be handed out to all participants.

Lastly, with all the data collected, the researcher will proceed with data analysis to associate the M-EAT-10 and VFSS among populations with neurological disorders.

For this research, it was conducted in Hospital Universiti Sains Malaysia (Hospital USM), Health Campus of Universiti Sains Malaysia (USMKK), Kubang Kerian, Kelantan from February 2018 to May 2018. The researcher met 30 individuals with dysphagia and 9 individuals with resolved dysphagia. Since M-EAT-10 is a self-administered questionnaire tool, participants are required to be able to read, have good

reading comprehension and are generally aware of their conditions. Many of the patients in the hospital ward have neurologic disorders such as stroke or termed as cerebrovascular accident (CVA) or traumatic brain injury (TBI). Many of them has lesion to the left part of the brain which influences with language comprehension and expression. Due to this, many are unable to participate in answering the questionnaire.

Considering the inclusion and exclusion criteria, only 10 were eligible to participate in this research but none wanted to, due to financial difficulties and fear of risk to radiation exposure. In Hospital USM, undergoing the VFSS procedure requires patient to pay RM200 as the fees. Some of the interested participants eventually decided not to participate as well.

The researcher then searched for the list of patients who had done Videofluoroscopic Swallowing Study (VFSS) and found 11 participants. Of all 11 participants, 8 voluntarily participated in the research. All participants are required to answer the Malay version of EAT-10 (M-EAT-10) questionnaire. All data obtained from participants were collected and statistically analysed by researcher.

3.9 Statistical Analysis

The collected data was analysed by using the IBM-Statistical Package for Social Studies (SPSS) Statistics 24 statistical software. The variables of the research are both independent variables. The first independent variable of the research is the total severity score of the problematic scenarios impacting the participants while the second independent variable is the positive or negative results from the VFSS diagnosis test. The total severity score is accumulated from all the responses from a scale of 0 indicating "no problem" to 4 indicating "severe problem". A total severity score of