

**The Utility of the Multiple Mini-Interview in Selecting
Medical Students: The Philippine Experience**

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Peter S. Aznar, MD, FPSP

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ABSTRACT

The National Medical Admission Test (NMAT) supplemented by general weighted average and traditional interview scores serve as staple admission tools in screening medical school applicants in the Philippines. The direction of the admissions is purely cognitive.

This paper reported the first utilization of Multiple Mini Interview (MMI) as applied in selecting medical students in Southwestern University School of Medicine, Cebu City Philippines. The study measured the validity, reliability, acceptability, feasibility and educational impact of MMI. A universal sample of 253 candidates was included.

Results showed that the main source of error in construct validity stemmed from the interviewer's subjectivity with a variance of 0.15 (9%) while content validity yielded a negligible difference of 0.02 (1%) in the cross-over adjustment. This means that scenarios presented actually measured the non-cognitive attributes of candidates. As to reliability, there was a higher proportion of candidate variance (28%) reflecting on the difference between candidate's ability across interviewers and to the scenarios encountered. Therefore, different non-cognitive attributes were extracted from the candidates as they proceed to the next MMI station. There was no correlation ($r = 0.26$) between the MMI and NMAT scores of candidates when MMI was identified individually according to scenarios. An exploration of raw correlations of four different stations of MMI were summed and showed strong correlations between MMI and NMAT ($r=0.81$) and moderately strong correlations between MMI and GPA ($r=0.70$). The Faculty has great confidence that MMI was feasibly measuring non-cognitive attributes that the institution desired and that educational impact can then be identified.

The medical school faculty needs to buy-in the idea of MMI that the combined measures are of value in identifying future success of students. Longitudinal predictive validity studies are required to determine to what extent the MMI, NMAT scores and GPA both singly and in combination predict both performance and licensure examination success in the future.

Keywords: Multiple Mini Interview, Southwestern University School of Medicine, National Medical Admission Test, Philippines, Acceptability, Reliability

LIST OF ABBREVIATIONS

MMI	Multiple Mini Interview
SWUSM	Southwestern University School of Medicine
CMO	CHED Memorandum Order
SQA	Standard Quality Assessments
GWA	General Weighted Average
LOR	Letter of References
NMAT	National Medical Admission Test
GPA	Grade Point Average
iMMI	Internet-based Multiple Mini Interview
OSCE	Objective Subjective Comprehensive Examination
CPST	Clinical Problem Solving Test
SD	Standard Deviation

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INTRODUCTION

The goal of each medical institution is to select the best candidates for the medical program. The selection process can be challenging depending on the objectives of the admitting institution since there are too many applicants but there are only limited seats available; this situation is true in the Philippine context. Foreign nationals come to the country to study medicine because of the cost and shortage of slots from their country of origin. The Philippine government requires that at least 80% of the available seats in a medical school be reserved for its citizens and the remaining are available for international students (CMO 10, s2006, Commission on Higher Education). Since these international applicants come from different educational backgrounds that have varying standards, there is a need to assess them through a process that allows the accepting institution to identify candidates who are likely to be successful in the program.

Some countries require undergraduate preparation while others do not. In the Philippine context, medical education is primarily patterned on the United States (US) model where a Bachelor's of Science or Arts degree is required before acceptance into a four-year program leading to a Doctor of Medicine degree. While undergraduate pre-medical course is a necessity, not all preparatory schools have comparable standards. A student who graduated with the highest honours from a non-accredited institution may be equally prepared to a student who graduated from a school that has been deemed accredited by an external accrediting body. Selecting the right medical student can be laborious, yet it is an essential part of the medical education process.

Van Zanten et al. (2012) conducted a comparative study of the impact of accreditation on student outcomes. The authors categorized medical institutions across the Philippines and Mexico that did and did not have qualification standards from a national and/or international accrediting body. The study revealed that graduates from an accredited institution scored higher in the USMLE (United States Medical Licensure Examination) and had fewer failed attempts in all three steps of the examination. Furthermore, the findings support the importance of accreditation, linking it to positive student outcomes.

A study conducted by Leinster (2013) discussed the validity of a medical student selection process. In his study, he concluded that "A" Levels in any standard assessments (like UKCAT, SQA, etc.) were the best predictor of medical student success. However, the "A" Level students in the medical programme only comprised 65% of the total population. He suggested that there is a need to reassess the 35% who applied and who were not "A" level students and that standard admission assessment tools should be employed to select the right medical students.

Historically, the General Weighted Average (GWA) is one of the most important criteria used when admitting medical school applicants. The GWA is commonly supplemented with the percentage obtained from the traditional panel or individual unstructured interview and Letters of Reference (LOR); thus, the applicant is measured predominantly on his/her cognitive abilities (Lemay et al, 2007). Entry criteria for medical school include the Medical College Admission Test (MCAT) for North America and the Graduate Australian Medical School Admission Test (GAMSAT), required in Australia and Biomedical Admissions Test (BMAT) or the United Kingdom Clinical Aptitude Test (UKCAT)

for the United Kingdom (Eva et al., 2004). Superior performance on these assessments is generally required for admission, meaning above average performance (Roberts et al., 2008). In the Philippines, the National Medical Admission Test (NMAT) percentile score, Grade Point Average (GPA) and traditional unstructured interviews serve as admission tools for screening medical school applicants. These tools, in combination, are weighted towards cognitive ability. The issue as to whether this is appropriate stems from a debate concerning the qualities of a good doctor and whether other abilities, not currently assessed as part of the selection process, are important for high-quality patient care.

Ferguson, James and Madeley (2002) conducted a review of the factors associated with successful medical practice in the future. The authors found that attitude, motivation, communication, confidence, and ethics were all important predictors of future success. In fact, good communication skills and attitude are highly essential in the actual practice of patient care. Additionally, they argued that these measures are non-cognitive in nature and, when taken into account, can have a positive impact on student outcomes. Similarly, Eva et al. (2004) showed that the non-cognitive abilities of medical students were positively associated with licensure examination performance and pass/fail status. The authors further reasoned that these non-cognitive abilities can predict outcomes during pre-clerkship, internship and successful practice in the future.

Based on the prevailing literature, and experiences at the Southwestern University School of Medicine (SWUSM), both cognitive and non-cognitive abilities are needed to be successful in medical school. Furthermore, as the

Philippine government shifts to a Western Education system, medical schools, including the SWUSM, will need to develop and validate new tools to select the right medical students.

The SWUSM was the first institution to adopt the Multiple Mini Interview (MMI) in the Philippines. The MMI was instituted in 2015, and is part of the medical student selection process. This decision, supported by the work of Eva et al. (2004), was based on the fact that current academic markers, traditional interviews and scores from high-stakes examinations failed to capture the performance of the non-cognitive domains of its applicants.

LITERATURE REVIEW

The properties of the MMI, including acceptability, feasibility, reliability and validity are presented in this section. The relevant literature was gathered from electronic journals, printed materials, internet articles and websites. A pilot study was conducted prior to the actual data gathering to assess the properties of MMI scores; a focus group discussion with the raters was conducted as a qualitative supplement.

The Nature of Multiple Mini Interview

The Multiple Mini Interview was developed to measure other “non-cognitive” attributes that are important for medical school success and future practice. The MMI is a multi-station interview with one interviewer rating candidates’ performance at each station based on their responses of the scenarios presented to them. The MMI was developed at the Michael G. DeGroot School of Medicine at McMaster University in Hamilton, Ontario, Canada, and has been validated at the University of Calgary, in Australia, and in the United Kingdom. As compared to traditional interview methods, the MMI readily measured professionalism, interpersonal and communication skills, and systems-based knowledge applicants and students.

The generalizability and validity of the MMI scores were evaluated in various contexts and with different student populations. Validity and reliability studies of MMI also include graduate-entry medical school, residency and even in allied health programs like Doctor of Pharmacy and Physical Therapy. And to add to its pool, there is a current development of internet-based MMI in Australia.

The MMI was not meant to displace measures of academic achievement. Rather, it supplements academic achievement by including important attributes needed for the care of patients and families. The original authors of the MMI believed that there was predictive validity limitation of traditional interviews and that achievement measures, while important, did not tap all the relevant domains of medical school education and practice in the future.

Acceptability

Several studies across different geographical locations measured the acceptability of MMI in an admission process. Acceptability was operationally defined as the degree of satisfaction or suitability of a procedure; MMI, in a specific process in the context of application in a medical program.

Campagna-Vaillancourt, et al. (2014) evaluated the acceptability of MMI in selecting applicants for medical residency program. The process was specific for Otolaryngology-Head and Neck at McGill University. Members of the selection committee were asked to comment on the 7 stations used in the process. These stakeholders rated the scenarios of each station using a 7-point Likert scale. Based on a content analysis, 80% of the applicants agreed that MMI helped them present their strengths and 85% of the raters agreed that it allowed them to evaluate a range of applicant capabilities. The interclass coefficient revealed that >70% of the assessors and raters agreed that MMI was a “fair process”, concluding that it was an acceptable evaluation tool for residents.

While MMI has been used extensively in the US and UK, the Kingdom of Saudi Arabia attempted the process in their own context. Batwa, Baig and Aidarous (2014) presented initial results regarding the acceptability of MMI in the KSA during the 2014 International Conference on Residency Education. The results of this study revealed that >71% of the faculty agreed that it measured their set non-cognitive qualities; the authors indicated that the majority of faculty and students (94%) deemed the MMI to be acceptable.

The studies of Batwa, Baig and Aidarous (2014) were supported by the findings of Kelly et al. (2014) who showed that the MMI was a good addition to the assessment tools used for selection, particularly with regard to stakeholder acceptability. The researchers further elucidated that differences in performances, especially among international candidates, were effectively measured by the MMI. This complies with the metrics of good assessment practice and principles in medicine as a whole observing a procedural justice for all applicants.

Kangwon National University in Korea also studied the acceptability of MMI in selecting medical students. Roh, et al. (2009) recruited 84 applicants to undergo the MMI which consisted of 3, 8-minute stations that were evaluated using 9 checklist items and 3 global items. The 3 domains chosen were motivation to become a doctor, communication, and interpersonal skills, and ethical decision-making. Two (2) interviewers chosen from the faculty of the University were available in each room. In the post-study interview, students verbalized satisfaction on the quality of the MMI. Interviewers also responded positively, thereby achieving a high acceptability from both students and faculty.

In another study, Hofmeister, Lockyer, and Crutcher (2008) investigated the acceptability of the MMI as a measure of professionalism potential. International Medical Graduates (IMG) applicants who applied for family of medicine residency training were evaluated using MMI at two different medical schools within the same province in Canada. The high response rates from applicants and interviewers (97.2% and 93.9% respectively) indicated that members of both subgroups were willing to share their opinions about their MMI experience. In the study, the interviewers' responses suggested they were amenable to using the MMI in the residency application process as it allowed them to measure the desirable behaviour they wish for their residents. Program directors, practitioners, and residents from both university communities had first-hand experience in identifying the presence or absence of qualities, and evaluating behaviours associated with professionalism potential in the heterogeneous group of IMG physicians who participated. Interviewers indicated a high level of satisfaction with their training and the material provided to them for their station. Interviewers agreed that the MMI was a fair assessment of family medicine professionalism potential. The authors concluded that residency programs from two institutions can work together to define the personal qualities important to their programs, construct scenarios to measure each, and conduct the interviews in ways that were acceptable to both applicants and interviewers. Furthermore, the interviewers liked the MMI because the time for actual interviewing was less than for panel interviews, the interview day was shorter, and there were no post-interview reports to write. In addition, the findings were seen to be free from gender and cultural biases, which supported the earlier work of Brownell et al, (2007).

Kelly et al. (2014) published a study on the fairness and acceptability of MMI in an internationally diverse student population in Ireland. The study utilized a mixed-method approach to gather evidence to support both the validity of MMI scores and its acceptability. The study included 109 students (45% of class) where 41.3% (n=45) were Non-EU and 35.8% (n=39) did not have English as first language. Demographic profile as to age, gender and socioeconomic class did not have an impact on their MMI scores. Significantly lower MMI scores were noted from non-European Union (EU) students and those for whom English was not a first language than their EU and English speaking counterparts (difference in mean 11.9% and 12.2% respectively, $P < 0.001$). The study revealed that MMI scores were positively skewed and directly associated with English language proficiency (IELTS) ($r = 0.5$, $P < 0.01$). The correlations emerged between First Year results and IELTS ($r = 0.44$; $p = 0.006$; $n = 38$) and EU school exit exam ($r = 0.52$; $p < 0.001$; $n = 56$). The MMI also provided a predicted EU student Objective Subjective Comprehensive Examination (OSCE) performance ($r = 0.27$; $p = 0.03$; $n = 64$). In the analysis of focus group data, two overarching themes emerged: authenticity and cultural awareness. Further, the MMI was considered by the interviewers and faculty to be a highly authentic assessment that offered a deeper understanding of the applicant than traditional tools previously used by the institution; MMI also provided a predictive validity towards relevance to clinical practice. However, the cultural specificity of some stations and English language proficiency were seen to disadvantage international students. The study concluded that understanding the mediating and moderating influences for differences in performance of international candidates was essential to ensure that MMI

complies with the metrics of good assessment practice, and is free from bias. Moreover, the researchers concluded the high level of general acceptability with cultural specificity of MMI in the context of this application.

Kumar et al. (2009) published a study on the participants' experiences following involvement to an MMI process. His study revealed the qualitative inputs of participants and also interviewer's understandings of MMI as used in a graduate-entry medical school admissions. The qualitative data from six interviewer focus groups and 442 candidate and 75 interviewer surveys were analysed using framework analysis and also a series of thematic analysis where multiple researchers captured the content-relatedness of the scenarios. It was the thematic framework which was used as a dataset. The themes captured included participants' perspectives on having a face-to-face interview, the ability of multiple assessment chances, homogeneous, scenarios-based questions, attributes measured by MMI and other attributes which should be assessed. The authors revealed further that the participants' and interviewers' experiences improve the credibility of MMI in the context of graduate-entry medical school. Their deeper understandings also promoted the high level acceptability of the process in terms of measurement purposes.

In the Philippines, Indian and Nepali based partnered schools were using the MMI as part of the admission process for psychology degree students. The use of MMI as an admission tool was not yet common in the educational system, and has yet to be explored in terms of feasibility and cultural acceptability. Furthermore, the addition of MMI in the admission process of any medical school has yet to be validated in the Philippine context. However, international companies (e.g. Astroff Corporation), based in Singapore, had

been using MMI as a method of assessing applicants for jobs or positions which require employees to have high level decision-making and judgment capabilities (Astroff Consultants, 2014).

The recent development of MMI was the exploration of internet-based presentation. The report of Tiller, et al. (2013) on Internet-based Multiple Mini Interview (iMMI) provided information on the acceptability of the internet-based concept. According to his study, the iMMI was acceptable to participants, producing comparable results to the in-person MMI, with a saving of resources. However, only few institutions reported this type of MMI administration and information was limited to acceptability and feasibility alone, and thus it warrants further investigation in the context comparable to medical school admission.

Kelly et al. (2014) stated that MMI has proved a welcome addition to assessment methods in medical school. The mixed-method approach dealt on the fairness, predictive validity and acceptability of MMI. They found that MMI demonstrated good job relatedness and acceptability, particularly amongst candidates. Moreover, the authors elaborated that understanding the mediating and moderating influences of differences in performance of international candidates was essential to ensure that the MMI complies with the metrics of both distributive and procedural justice for all applicants, irrespective of nationality and cultural background.

Another study on MMI conducted by Jesper, Hesselbjerg, Isaksen et al. (2013) suggested that both applicants and panellists generally accepted the interview as a tool for selection. The applicants felt comfortable that the interview started with questions addressing their own written application and

fully accepting the challenge of answering the questions spontaneously and honestly according to the situation presented. They felt that the overall interview duration was appropriate, although some requested more time to address specific issues where the situation applies as well. They stated that it would be more acceptable if they had been given an opportunity to make a supplementary comment at the end of the interview. However, the assessors stated that these additional comments were unnecessary since they could not be part of the rating at all. The assessors found that the structured interviews guided through MMI were much more effective than the previously used non-structured interviews. However, the interviewers expressed concern that increased structure may result in the loss of important, unexpected details and, in some situations, might reduce the applicants' opportunity to form their own independent impression. The benefits of the structure, nonetheless, clearly outweighed the disadvantages. The authors concluded that a combination of a structured application form and a structured interview had a high acceptability among applicants and assessors alike.

Feasibility

The succeeding studies presented the viability and practicability of MMI. It also determined the challenges on the application of MMI in medical school admission setting.

Since its inception, the feasibility of the MMI was dependent on cost. Rosenfeld, et al. (2008) compared the cost between MMI and traditional interviews, both relying heavily on human resources. The team recalled the 5-year data of MMI utilization at McMaster University School of Medicine and

compared these data to the prior five years (2000 to 2004) where Objective OSCE was used. The researchers reported that the MMI was cost-effective compared to standard panel-based interview, considering the generation of interview material, human resource, infrastructure requirements and other miscellaneous expenses.

A recent paper of Finlayson and Townson (2011) documented the feasibility of MMI for resident selection in the physical and rehabilitation programs. The MMI process, similar to what was applied in McMaster University, was replicated. The team found that the process was feasible as to time and cost efficiency. The researchers noted, however, that administering MMI required more preparation. Compared to traditional panel-based interviews, they found out that additional rooms were required to carry out MMI; at least 7 rooms were required in their instance. Likewise, the development of scenarios and training of the raters demanded more resources in terms of preparation. However, these cost disadvantages were offset by the decreased time need to evaluate each individual. Absolute costs may, however, vary and were dependent on institutional requirements and the structure of the MMI desired (e.g., number of interviews).

Brownell et al. (2007) replicated the original study of Eva et al. (2004), this time by using MMI as an admission process at the University of Calgary with the objectives of comparing the time requirements for the MMI with the traditional interview process. His team interviewed applicants in one weekend and found that fewer interviewers, and less time per interviewer, were required compared to the original traditional interview format. This led Brownell and his team to recommend MMI since then at the University of Calgary.

Kelly et al. (2014) published a paper on the use of MMI in the Irish setting. The study began in September 2012 with the objectives of determining its applicability while measuring competencies such as communication skills, teamwork, and ethical reasoning. The cost per student was estimated at 145 Euros. The author pointed out that the MMI helped the faculty in creating an assessment blueprint and consumed 80% less person-hours during the actual interview process. The authors concluded that the use of MMI in Irish medical school setting was feasible in terms of cost and time efficiency.

The feasibility of the MMI was not only investigated in medical schools alone. Fricky et al. (2004) conducted a series of 8, 10-minute stations in the Department of Physical Therapy in the University of Manitoba with the following formats: discussion, interaction with an actor, collaboration, and writing as an admission process. The study included trained interviewers ranging from clinicians, physical therapy faculty, student physical therapists and non-physical therapists. The non-cognitive characteristics measured in the study included critical thinking, ethical/moral decision making, self-evaluation, communication, cultural sensitivity, and empathy. The MMI score of the applicants was used in conjunction to the academic grades of the applicant to determine over-all ranking for selection purposes. The authors concluded that MMI was reasonable and a valid means of assessing the non-cognitive attributes of individuals in the Physical Therapy program.

According to Eva et al. (2004), the authors mentioned that even the most reliable and most valid of admissions exercises will not be useful if they do not prove to be feasible and cost-effective. In fact, the issue of cost-effectiveness was highest among the primary reasons that have been launched against the

use of personal and unstructured interviews. In their study conducted using unstructured interviews for McMaster's medical program, approximately 400 applicants were interviewed annually, each of whom requires an hour of interview time (30 minutes for the interview and 30 minutes for scoring and a break). There are 4 members on each interview team, requiring each personal interview per applicant; the entire interview program therefore requires 1600 person-hours in total. Of these, 550 are typically faculty hours for which the cost can be translated to estimated \$27,500 per annum. The use of other non-cognitive tools, particularly the simulated tutorial, increases total interviewer time to about 1800 hours against unstructured interview and the faculty cost to about \$32,000. However, a 10-station MMI (with 10 minutes per station) could be run for only 2 person hours per candidate which also included a 20-minute break for all examiners after the fifth station. Assuming the same ratios of faculty versus community personnel, this would require 275 faculty hours at a cost of \$13,750 per annum. However, these values could potentially be reduced even further if it is determined that 10 minutes per station was not fully required or if fewer stations were used.

One anticipated strength of MMI was that fewer resources might be required. Even if it turns out that the MMI required the same investment or slightly more, these resources might at least be better spent on a tool that can prove itself more capable of selecting the highest quality of candidates. The *Medical Education Journal* expressed that health sciences programs do, after all, have an ethical obligation to do everything in their power to make appropriate and accurate admissions decisions because these decisions will have a large impact on the quality of health care received by individual patients,

families and by the society as a whole ('Decisions in Medical Admission', 2004: 21).

Eva et al. (2012) presented another study on the feasibility of MMI to be more cost-effective against standard interview formats. Utilizing a retrospective design, the team reviewed the costs accumulated by 25 interviewers who interviewed 447 candidates from 2004 to 2007. These data were compared to the accumulated cost incurred during panel interviews conducted from 2000 to 2003 in the same number of candidate aggregate. The authors found out that MMI allowed them to save at least 37% of the actual cost incurred from the previous years where standard interview formats were utilized. It also revealed that it only took the interview to last for a week in contrast to the panel interview which lasted for at least three weeks. The authors concluded that the efficiency of MMI as to cost and time improved its feasibility integrity.

Reliability

Contemporary studies have shown that traditional medical school admissions interviews using panellist have strong face validity but have low reliability and construct validity. In general, this method does not provide a standardized, defensible and fair process for all applicants. The succeeding studies below presented the stable and consistent results of MMI when applied in different admission settings across geographical locations.

In 2006, Lemay et al. (2007) conducted a study where applicants to the University of Calgary Medical School (UCMS) were interviewed using MMI. The interview process consisted of 9, 8-minute stations and applicants were presented with scenarios. The applicants were asked to discuss their views

based on the scenario presented to them. This was followed by a single 8-minute station that allowed the applicant to discuss why he or she should be admitted to UCMS. Sociodemographic and station assessment data provided by each applicant were used to determine whether MMI provides a reliable assessment of the non-cognitive attributes and effectively discriminates between those accepted and those placed on the waitlist. The reliability of each station using Cronbach's alpha ranged from 0.97–0.98. Reliability across stations were not investigated. Interestingly, the MMI scores was able to discriminate a high degree of difference from those accepted and those on waitlist; more so to those who were not accepted.

Roberts et al. (2009) determined the factors that were important in ensuring that interviewers were able to make reliable and valid decisions about the non-cognitive characteristics of the applicant for the graduate-entry medical program. Four hundred and eighty-five candidates, 155 interviewers and 21 questions, taken from a pre-prepared bank, defined the test. The reliability for an 8-question MMI was 0.7; to achieve 0.8 would require 14 questions or stations. The study concluded that MMI was a moderately reliable method of assessment. Furthermore, the team found out that the interviewer's subjectivity poses the largest source of error and that training was needed and could reduce error.

Recent research on MMI reliability was not limited to medical schools. Tavarez and Mausz (2015) estimated the reliability of scores for the assessment of non-cognitive attributes using MMI in the paramedic context. Entry to practice level paramedic candidates completed a 10-station MMI to assess non-clinical attributes on day 1 and a 10-station Simulation-Based

Assessment (SBA) of clinical skills on day 2; both were assessed using different global rating scales. The primary outcomes of the research included MMI inter-station reliability and Pearson's correlation between non-clinical attributes and clinically focused skills. The inter-station reliability for the MMI reached 0.77 while Pearson's correlations between the overall MMI score and mean SBA global rating scores reached $r=0.31$ ($r=0.48$) and ranged by dimension from $r=-0.11$ (-0.17) (procedural skills) to $r=0.54$ ($r=0.83$) (communication). Based on these findings, there is some evidence to support the reliability of MMI scores and validity of each station.

Dowel et al. (2012) introduced the MMI at Dundee Medical School and traced the experience over three (3) years. A 10-station MMI was administered from 2009 to 2012 with faculty recruited as raters, simulated patients, and students. Reliability using Cronbach's alpha was 0.69. Multi-faceted Rasch Modelling (MFRM) was used to control for assessor leniency or stringency and "fair scores" which produced an average result of 0.906 in the selection outcome. This means that the categorical situations in each station was able to measure the candidate's traits or abilities based on the difficulty of the situation itself. The authors concluded that the use of MMI in Dundee Medical School yielded scores with sound psychometric properties.

The use of MMI also extends beyond undergraduate medical education. Hofmeister, Lockyer and Crutcher (2009) utilized MMI as a selection tool for post graduate medical education, specifically for international medical graduates (IMG). A group of 71 IMGs participated in the 12-station MMI. The intention of the authors was to evaluate the applicant's ability to address the objectives of the situation, interpersonal skills, and suitability for a residency in

family medicine, and overall performance. The reliability, as indicated by G-coefficient associated with average stations scores was 0.70 with one interviewer per station only. There were no statistically significant differences in total MMI scores or mean station sum scores based on session, track, applicant age, gender, years since medical school completion, or language of medical school. The authors concluded that MMI provides for a reliable assessment of professionalism in IMG doctors applying for Canadian family medicine residencies. Furthermore, the clinically situated MMI reliably assessed facets of competence different than those assessed by the OSCE.

Fraga et al. (2013) conducted a study on the reliability of a 5-station MMI model for residency program recruitment in the US. The study included 237 applicants and employed 17 faculty interviewers. The assessment included 5, 10-min MMI stations with five different interviewers blinded to the candidate's records and one traditional 20-minute interview with the program director. Candidates were rated on two items: interpersonal and communication skills, and overall performance. The generalizability of the scores was high (>0.9). Furthermore, the authors concluded that even using only five stations, reasonably reliable scores could be generated.

Following the success of MMI in the UK and Canada, the Kingdom of Saudi Arabia also attempted the use of MMI after King Abdulaziz University requested international recognition by the Liaison Committee of Medical Education (LCME) for Canadian education accreditation. El Says et al. (2013) recruited interviewers and used a standardized scoring form to rate candidates. They then compared the results by demographic variables and with OSCE performance. The estimated reliabilities were 0.6 and 0.7 in two stations. The

authors concluded that MMI provided data that could improve of the process of selecting medical school aspirants.

Validity

Validity was defined in this study as the level or extent to which MMI, as a process, measures what it was supposed to measure; and as such, its outcomes were comparable to the degree of evidence that support the actual interpretation of its scores yielding the extraction of non-cognitive attributes of candidates. Different researchers who studied MMI across geographical locations combined different measures of validity. The following studies was intensely focused on MMI constructs and convergence whether one scenario can measure the non-cognitive attributes desired by the medical school. With respect to selection, predictive validity determined how well scores on a selection measure predicts some future outcome, such as work performance or examination scores.

Reiter et al. (2007) expressed that the application of MMI, in different contexts, was used as a process rather than a test which screens non-cognitive abilities. Noted precisely, MMI was not intended to test an individual's characteristics but to lay-out which desired quality for these qualities were not typically measured by other tools. The reliability of MMI does not argue that non-cognitive characteristics of an individual are superior to his/her cognitive lay-out. Rather, the cognitive performance of the individual must be correlated with marked professionalism of being a future medical practitioner.

Lemay et al. (2007) in their research at UCMS noted that there were low correlations between station scores; a factor analysis suggested that each

station assessed different attributes. Validity was supported by the fact that there were significant differences in scores between those who were accepted and those on the waitlist. The authors concluded that MMI was valid in assessing different non-cognitive attributes.

Tavarez and Mausz (2015) provided evidence to support the validity of the MMI in assessing non-cognitive attributes in the paramedic context. It was notable that the inter-station reliability of 0.77 had synchronously demonstrated evidence of convergence and construct validities as each scenario explicitly measure non-clinical attributes in paramedic contexts.

The experiences of each institution were varied ranging from moderately satisfactory (Roberts et al., 2008) to highly acceptable in different aspects (Eva et al., 2009, Hofmeister, Lockyer and Crutcher, 2009). However, there were other issues associated with the use of MMI related to validity. Kumar, et al. (2009) gathered qualitative data of 442 candidates and 75 interviewer surveys and analysed them using framework analysis method capturing “what was said” themes which emerged from the data. Several key themes were identified, including participants’ perspectives on having a one-to-one interview; multiple assessment opportunities; a standardized, scenario-based interview; a mini-interview, and on the attributes currently measured by the MMI, and other attributes that should be assessed. The analysis of the themes provided great support on the construct validity and credibility of the MMI process although low level of predictive validity was noted when similar data was processed for graduate-entry medicine requirements.

Following several successful attempts of MMIs use, O’Brien, et al. (2011) compared the MMI and structured interview scores in a UK setting.

Researchers developed MMI stations/situations and tested in volunteer candidates to both MBBS 4 and MBBS 5 courses. Scores were compared between formats and the study revealed that MBBS 4 applicants performed just as well on the MMI as they did on the traditional interview. Nevertheless, MBBS 5 applicants performed better otherwise, although MBBS 4 and 5 applicants performed equally well in MMI. However, this study failed to build relationship on performance (UK Clinical Aptitude Test and Medical School Admissions Test) as to age and sex. The reliability using Cronbach's alpha and inter-class correlation of MMI for MBBS 4 and MBBS 5 were 0.69 and 0.73, respectively, stating that MMI was, valid and feasible to both applicants and interviewers. However, this study failed to build relationship on performance (UK Clinical Aptitude Test and Medical School Admissions Test) as to age and sex.

The University of Toronto pilot tested MMI for admission to Pharmacy degree program and identified time-process validity of MMI administration on the notion that 10 minutes was too long for each applicant to present their responses. Cameron and MacKeigan (2011) utilized a nominal group process to identify 8 non-academic attributes of pharmacists. The researchers found that the validity of 6-minute interview was "just right" and 8-minute interview was "a bit long". The authors concluded that 6 minutes was enough for each stations and that despite the time, the scenarios with the responses of candidates still provided a valid measure of non-cognitive attributes.

In a study by Roberts et al. (2008) concerning the selection of specialty training, there was a modest raw score correlation ($r = 0.26$, $n = 1382$) between the situational judgment test (SJT) and the MMI scores of candidates. The authors determined that the MMI showed correlations of problem-solving and

analytical skills (0.19), professional & ethical skills (0.18) and clinical performance and knowledge (0.24) suggesting the strongest relationship between the MMI scenarios and the SJT was in the area focused on clinical knowledge. Moreover, the authors concluded that the constructs used in each MMI stations did not only measured knowledge but non-cognitive attributes as well; imposing a strong validity of the scenarios.

Summary

In summary, MMI was a feasible alternative to traditional interviews and can be applied for selection decisions in medicine and other health professions. With cost-effectiveness as a major feasibility asset, several studies have shown that even with an increased utilization of physical resources in the MMI, this is easily outweighed by the savings generated by time efficiency and fewer faculty hours, especially when the faculty was involved in the MMI preparations. The applicants who experienced MMI enjoyed the experience as evidenced by their positive responses of the involvement. They felt that it allowed them to present their strengths and was a “fair process” leading to widespread acceptability between interviewees and interviewers.

Used in different geographical settings and contexts, the MMI yielded reliable scores when used to assess the non-cognitive attributes of candidates entering undergraduate, postgraduate and allied health programs. Several studies have supported the reliability of MMI can be increased by adding more stations and rater training. However, no study has currently addressed the maximum number of stations that continuously provided cost-efficiency compared to panel or unstructured interviews.

While unstructured traditional interviews suffer a low predictive validity, several studies support MMI having a good predictive validity in relation to success in medical school, performance in postgraduate medical training, national high stakes examinations, and future medical practice. The success in MMI was not limited to the medical academic sector only but has also been documented in other allied health programs, and in the corporate sector as well.

RESEARCH METHODOLOGY

Design

This study utilized a non-experimental descriptive-correlational design with qualitative supplementation through focus group discussion. The descriptive-correlational part of the study was designed to determine whether MMI has a good predictive validity when applied in the context of SWUSM medical school admission process. The research design was appropriate since there was no manipulation applied to the participants and that the prior component/s of the medical school applicant was never adjusted to prevent any confounding bias. The study also utilized focus group discussion to supplement the acceptability measures of MMI process. The relationship between variables; MMI, NMAT score, and GPA were also estimated.

Study Locale and Sampling Technique

Southwestern University School of Medicine (SWUSM), located at Villa Aznar, Urgello Street, Cebu City, Philippines, was the setting of the study. SWUSM started to open its doors to aspiring doctors in academic year 1951 and was granted full Government Recognition in 1954 (GR Number 001). By then, SWUSM was the first medical school outside the capital city, Manila, Philippines. Southwestern University continues to expand and adjust to the changing world of rapid progress in medicine and science and technology. It serves the present needs and demands of the region and contributes its share to the educational, cultural, moral and economic development of the nation and the international community.

A total of 253 first year and transferee applicants for the Doctor of Medicine degree composed the research respondents. At least 11 faculty members composed the interviewers of the study where qualitative data on acceptability was obtained through focus group discussion.

Research Questions

This study was designed to answer the following queries: (1) could interviewers/raters make reliable and valid decisions about the non-cognitive characteristics of candidates with the purpose of selecting them for medical school admission, (2) were there evidences of relationships between Verbal and Biology NMAT score and grade point average (GPA) and MMI performance, and (3) was MMI acceptable and feasible in the SWUSM context?

Research Procedures

Applicants who sought admission for the Doctor of Medicine degree for first year level and/or transferees for the academic year 2015 to 2016 were automatically enrolled as participant in the study. Preliminary admission requirements, as set by the University, were met by the applicants through submission of Application for Admission Form, birth certificate, pre-medical degree diploma or application for graduation of the pre-medical degree, academic records, Good Moral Certificate from the last school attended, and NMAT certificate. The NMAT is a prerequisite examination required for all applicants who wish to enter to any medical school in the Philippines. The test consists of two parts; Part I includes Verbal, Inductive Reasoning, Quantitative

and Perceptual Acuity Skills while Part II encompasses the field of Basic Sciences such as, Biology, Physics, Social Sciences and Chemistry.

Only applicants who have successfully completed the pre-admission requirements and had satisfied the institutional NMAT cut-off score (raw score of 850 from the sum of both Verbal and Biology areas) were shortlisted by the Admissions Committee of SWUSM to undergo the MMI process. The Admissions Committee was composed of four (4) faculty members adept in the different disciplines of medicine. The applicant who was shortlisted by the Admission Committee, notified through letter and mobile messages; and had confirmed attendance automatically became a respondent of this research.

A total of 253 candidates were enrolled in this study after accomplishing the preliminary institutional admission requirements. To quantitatively score the candidates with respect to admission, relative values were assigned to; NMAT (20 points), MMI (60 points) and GPA (20 points). This was necessary to rank the candidates. However, the interviewers were blinded on this scoring system to prevent any bias.

The rate the candidates' responses according to the desired non-cognitive attributes of SWUSM, the Admissions Committee recruited 11 faculty members, across different medical disciplines or specialties, to be interviewers/raters. Five (45%) were male doctors and 6 (55%) were female doctors. Most interviewers did not have a prior MMI experience; however, briefing and mini-training was conducted prior to actual administration of the procedures.

Table 1 provides a listing of the values assigned to each score for each variable.

Table 1. Corresponding Values of NMAT, MMI, and GPA Scores as obtained by each candidate

VARIABLE	SCORE	POINT EQUIVALENT	TOTAL POINT EQUIVALENT
NMAT Score	1 – 283	2	2 – lowest point
	284 – 566	4	
	567 – 849	8	20 – highest point
	850 – 1132	12	
	1133 – 1415	16	
	1416 – 1700	20	
MMI Score	1 – 40	15	15 – lowest point
	41 – 80	25	60 – highest point
	81 – 120	30	
	121 – 160	45	
	161 – 180	60	
GPA Score	1 .0	20	5 – lowest point
	1.1 – 1.3	18	
	1.4 – 1.6	16	
	1.7 – 1.9	14	
	2.0 – 2.2	12	20 – highest point
	2.3 – 2.5	10	
	2.6 – 2.8	8	
	2.9 – 3.0	6	

Research Instrument

The MMI instrument was composed of four (4) stations. Each candidate was given 5 minutes to read a scenario after the bell was sounded. Another 8 minutes was allotted for the candidate to provide his/her response or answer to the scenario task while the interviewer rated his/her response based on the scale of 1 to 5; where 1 was the lowest and 5 as the highest. The candidate's response was rated according to: (a) physical reception and (b) reasoning; each component was assigned 20 points with a total of 40 with the exemption of Station 4 which had a total of 60 points. Physical Reception was further rated according to (1) appearance, (2) voice, (3) speech, and (4) self-confidence. Reasoning was rated according to (1) strength of arguments, (2) ability to present ideas, (3) ethical reasoning, and (4) applicant's suitability for medical profession. An additional marking key with a value of up to 20 points was added to Station 4 which focused on Work-Related Decision Making. The responses

of the candidates for this additional section were rated based on (1) professionalism, (2) team-player, (3) confidentiality, and (4) reflection and humility (see attached Appendix C MMI Instrument and Score Sheet).

Research Pilot Study

The researcher conducted a pilot study to determine how many scenarios to the minimum, were required to achieve a comparable result from the studies conducted in the Canada, UK, US and Ireland. The pilot study also determined how many raters were required based on the number of scenarios/situations and the flow of the MMI process.

The pilot study begun in February 2015 and was completed in March 2015. A total of 20 applicants submitted pre-admission requirements during this period and were recruited by the researcher as pilot participants. Four (4) interviewers were recruited broadly from Admissions Committee of the Faculty of Medicine. The pilot test was conducted at the 3rd floor of Southwestern University School of Medicine. Stations/Scenarios 1 to 4, provided in Appendix C, were used, with 1 interviewer assigned to each station. Separate areas/room assignments were used for each station. Posted to each door was a card with the “Instructions to Applicants”; the participant was given a one-time 2 minutes to read the card. In addition, as this was not intended to be a memory task, the same information was included on a card inside the interview room so that the participant could refer back to it if he/she desired to do so. Each station lasted 13 minutes (5 minutes for preparation and 8 minutes for presentation) and was followed by a 2-minute interval during which the raters completed evaluation forms and participants prepared for the subsequent station. The

evaluation forms required interviewers to rate each of the participants using a 5-point scale on: (1) physical perception, (2) reception. An additional marking key was also included in station/scenario 4.

Table 2 shows the variance components and G-coefficient which summarized the reliability of the MMI scores. The overall test generalizability (the reliability of the average of all 4 ratings) was estimated to be 0.63. Table 2 also reported the results of a D-study performed to determine the optimal combination of stations and interviewers, assuming that 4 observations can be collected. In general, it appeared that at least 2 stations with 1 interviewer per station had a greater impact on the reliability of the test than increasing the number of stations while decreasing the number of interviewers and having a single station with multiple interviewers/raters.

Furthermore, it was revealed in the pilot study that a minimum of 2 stations with separate interviewers or raters were required for the actual study to achieve a generalizable validity and reliability based on the assumption that only 4 situations were available. With the above coefficients, the researcher continued the study with four (4) MMI stations/scenarios and 1 rater per station/scenario.

Table 2. Summary of effects, estimated variance components, the G-coefficient and results of D-study indicating expected reliability for combinations of 4 observations

N=20

EFFECT	Degree of Freedom	ESTIMATED VARIANCE
Applicant	19	30.197
Station	3	0.000
Interviewer within station	4	17.898
Applicant * station	57	14.221
Applicant * interviewer within station	76	14.274

G – coefficient

$O^2(\text{applicant}) / (O^2(\text{applicant}) + (O^2(\text{applicant} * \text{station}) / 1) + (O^2(\text{applicant} * \text{interviewer w/in station}) / 4)) = 0.63$

D-study

$O^2(\text{applicant}) / (O^2(\text{applicant}) + (O^2(\text{applicant} * \text{station}) / n(\text{station})) + (O^2(\text{applicant} * \text{interviewer w/in station}) / n(\text{interviewer w/in station})))$

	<u>n(station)</u>	<u>n(interviewer w/in station)</u>	<u>G</u>
1 station, 4 interviewers	1	4	0.62
4 stations, 1 interviewer	4	1	0.63

Ethical Considerations

Candidates who confirmed attendance for the interview were provided a transmittal letter (Appendix B) and Nondisclosure Agreement (Appendix C) to signify their voluntariness and willingness as respondents. No injury, harm or maltreatment were done to respondents as they were also provided the free will to withdraw from the procedure/study as appropriate. However, the respondent’s consent of involvement does not waive the Admissions Committee to apply the institution’s standards in accepting medical students.

Respondent’s data from this MMI procedure was archived until 2020 (until the licensure examination of the respondents, whichever comes last). The purpose was to recheck information and validates MMI’s longitudinal predictability.

The interviewers recruited in this study included full-time and part-time faculty of SWUSM which their involvement commenced in April 2015 and concluded on June 2015. The interviewers were informed of their responsibilities and duties as participants of the study as their provision of rating played an important role of the determination of the psychometric measures of MMI. These participants did not receive special remuneration for MMI purpose as such has been included in their per hour basis as employee of SWUSM and as appointed by the Admissions Committee. Furthermore, the interviewers were informed to obtain respondent consent and observe the freedom of respondents to withdraw at any time in the process. There was no direct communication between the interviewer and the candidates. The candidates were assigned to the interviewer in a random, first-come-first-serve basis.

Confidentiality was strictly observed in the process.

RESULTS AND INTERPRETATION OF DATA

Results

Following the pilot study of 20 participants, the study proceeded with 4 MMI stations and 1 interviewer/rater assigned per station. This section presented the results of the study based on the research questions. The results were divided into three parts: (a) profile of the participants (Tables 3 to 7), (b) variables studied (Table 8), (c) validity measure (Table 9), and acceptability and feasibility (Table 10). As mentioned previously, 253 medical school applicants participated in the study.

Table 3 below presented the profile of the candidates as to gender and undergraduate degree finished or currently taking as a pre-medical course.

Table 3. **Profile of Candidates**

N = 253

VARIABLES	Frequency	%
Gender		
<i>Male</i>	87	34.4
<i>Female</i>	166	65.6
Pre-Medical Course		
<i>Nursing</i>	112	44.2
<i>Medical Technology</i>	51	20.1
<i>Biology</i>	73	28.8
<i>Bio-technology</i>	1	0.4
<i>Pharmacy</i>	6	2.5
<i>Physical Therapy</i>	2	0.9
<i>Psychology</i>	3	1.1
<i>Radiologic Technology</i>	1	0.4
<i>Nutrition and Dietetics</i>	1	0.4
<i>Physiology</i>	1	0.4
<i>Anatomy</i>	1	0.4
<i>Biochemistry</i>	1	0.4
Country of Origin		
<i>Philippines</i>	223	80%
<i>Foreign</i>	30	20%

The candidates were composed of 34.4% males and 65.6% females. Age ranged from 21 to 35 years, with mean age of 24.5 (SD= ±3.5). Candidates came from across the Philippines, with at least 20% from foreign countries like Nigeria, USA, Thailand, and some other countries in the Middle East. Most of

the candidates had Nursing (44.2%) as their pre-medical degree, followed by Biology (28.8%) and Medical Technology (20.1%).

Table 4 below presented the NMAT raw scores of candidates obtained in the combined Verbal and Biology components.

Table 4. National Medical Admission Test (NMAT) Scores of Candidates as to Verbal and Biology Components*

N = 253

VARIABLE	Frequency	%	POINT EQUIVALENT**
NMAT Score			
1 – 283	0	0.0	2
284 – 566	2	0.8	4
567 – 849	37	14.6	8
850 – 1132	148	58.6	12
1133 – 1415	66	26.0	16
1416 – 1700	0	0.0	20

**minimum summed components score of 850 and maximum summed components score of 1700*

***used as reference for successful acceptance to SWUSM in addition to other admission components; minimum Point Equivalent is 2; maximum Point Equivalent is 20*

As to NMAT score, only Verbal and Biology scores were considered since Southwestern University School of Medicine (SWUSM) merely require a minimum summed score of 850, with a maximum summed score of 1700, on these two NMAT components despite that 40 percentile requirement was necessary for the Philippine government, this sole condition was institutional in nature and does not follow any government regulations. Approximately, 59% of candidates obtained a summed score between 850 to 1132, 25% obtained a summed score between 1133 to 1415, while 14.6% had a score below the least requirement of both Verbal and Biology component scores. The mean score of candidates was 991 (SD = 424) although the data was positively skewed. Over 84% (58.6% + 26%) of candidates were above the set SWUSM cut-off score of both Verbal and Biology components of the NMAT. However, these 39 candidates who scored lower than required summed score of both Verbal and

Biology were still admitted on the basis of NMAT due to the fact that their total percentile was above 40% (as required by Philippine government).

Table 5 below presented the attenuated MMI scores of candidates attained in each station. With the exemption of Station 4, each candidate could achieve a maximum of 40 points from Stations 1 to 3, and 60 points in the last station. The scores below were provided by the 11 interviewers/raters who were recruited by the Admissions Committee of SWUSM. Most interviewers did not have a prior MMI experience; however, briefing and mini-training was conducted prior to actual administration of the procedures.

Table 5. Individual Multiple Mini Interview Scores of Candidates in each station*

N = 253

SD = (± 5.0)

VARIABLE	Frequency	%	POINT EQUIVALENT**
MMI Score Station 1			
1 – 10	0	0.0	3
11 – 20	22	8.7	6
21 – 30	68	26.9	9
31 – 40	163	64.4	12
MMI Score Station 2			
1 – 10	0	0.0	3
11 – 20	22	8.7	6
21 – 30	75	29.6	9
31 – 40	156	61.7	12
MMI Score Station 3			
1 – 10	0	0.0	3
11 – 20	22	8.7	6
21 – 30	99	39.1	9
31 – 40	132	52.2	12
MMI Score Station 4A			
1 – 10	0	0.0	3
11 – 20	22	8.7	6
21 – 30	46	18.2	9
31 – 40	185	73.1	12
MMI Score Station 4B			
1 – 5	0	0.0	3
6 – 10	1	0.4	6
11 – 15	28	11.1	9
16 – 20	224	88.5	12

*minimum summed components score of all Stations is 1; maximum summed components score of each Stations (1, 2, 3, and 4A) is 40; maximum summed component score of Station 4B is 20.

**used as reference for successful acceptance to SWUSM in addition to other admission components; minimum summed Point Equivalent is 15; maximum summed Point Equivalent is 60

Each station had varied situation components as decided upon by the researcher. Station 1 detailed a scenario about family medicine, Station 2 presented a scenario on occupational medicine, and Station 3 was based on obstetrics. The content of station 4 was based on surgical medicine with the addition of ethics and critical decision making.

The scores of each candidate were calculated and an equivalent point was provided based on the range achieved with the interval of 3 points per range achieving a lowest point of 3 and a highest point of 12 in every stations and a summed score of 60 (see Table 1 for the equivalent values). It was interesting to note that at least 85% of the candidates scored at the mean range of 21 to 40; achieving an equivalent point between 9 to 12 points. Consistently, no candidate obtained a score on 1 to 10 range or 3-point equivalent in all stations. These scores may likewise reveal an association to the Verbal component score of the candidates as achieved from NMAT; however, this Verbal component alone and how it relates to MMI scores of candidates was not undertaken in the study.

Table 6 summarized the scores of candidates in all four (4) stations. The maximum score a candidate could achieve in all four (4) stations was 180, with 1 as the lowest.

Table 6. **Summed Multiple Mini Interview Scores of Candidates in all Four (4) Stations***

N = 253

SD = (± 1.1)

VARIABLE	Frequency	%	POINT EQUIVALENT**
MMI Score Station 1 to 4			
1 – 40	0	0.0	15
41 – 80	19	7.5	25
81 – 120	79	31.2	30
121 – 160	153	60.5	45
161 – 180	2	0.8	60

**minimum summed components score of all Stations is 1; maximum summed components score of all Stations 180*

***used as reference for successful acceptance to SWUSM in addition to other admission components; minimum summed Point Equivalent is 15; maximum summed Point Equivalent is 60*

The data was positively skewed with 60.5% of candidates having an MMI score between 121 and 160 (mean= 140.5, SD = 9.75), while 31.2% had a score between 81 to 120 (mean = 100.5, SD = 9.75). These scores had an equivalent point of 45 and 30, respectively. However, there were at least 7.5% (n=19) candidates who scored between 41 to 80 with an equivalent point of 25; one notch away from the lowest point. At least 91.7% (31.2% + 60.5%) of candidates were beyond the mean or average MMI score of 80.

Table 7 below presented the GPA of candidates obtained during their pre-medical or undergraduate course or degree. Despite the varied preparatory course of these candidates, the researcher used the standard SWU grade equivalents as institutionally utilized. This was necessary to standardize the grades achieved by each candidate since there were candidate grades which were presented in letters and need to be converted into the numerical form for analysis.

Table 7. Grade Point Average of Candidates who applied for admission in SWUSM*

N = 253

SD = (± 0.15)

VARIABLE	GRADE EQUIVALENT	QUALITY	Frequency	%	POINT EQUIVALENT**
GPA					
1.0 – 1.3	100% - 97%	EXCELLENT	4	1.60	20
1.4 – 1.9	96 – 91%	VERY GOOD	56	22.1	15
2.0 – 2.5	90 – 85%	GOOD	149	59.0	10
2.6 – 3.0	84 – 75%	FAIR	44	17.3	5

*SWU grade equivalent was used for uniform reference where 1 is the highest and 5 as the lowest.

**used as reference for successful acceptance to SWUSM in addition to other admission components; minimum Point Equivalent is 5; maximum Point Equivalent is 20

The GPA data of candidates were negatively skewed with 59% having an average between 2.0 to 2.5. However, in reference to SWU official grade equivalence, these GPAs were considered “good” in quality. At least 17.3% (n=44) of the candidates had a GPA between 2.6 to 3.0 which was interpreted as fair in the grade equivalence. In reference to GPA as an academic marker, this means that 23.70% (n=60) of candidates who sought medical school admission were rated as above average, 59% (n=149) were average, and 17.30% (n=44) were fairly average. However, because SWUSM was, since then, on open-admission, it was already expected that a heterogeneous and diverse group of student applicants would apply.

Table 8 below presented the results from a person times the rater nested in station design. The variance components of MMI scores were crossed against the effect achieved from the candidates, MMI situation in four stations, interviewers/raters, interviewer assigned in an MMI situation, candidate answering or responding to the MMI situation, and the candidate being rated by the interviewer.

Table 8. Variance components of MMI score for partially crossed data from Southwestern University School of Medicine for medical school admission

(N = 253, Candidates) (N = 11, Raters/Interviewers) SD = (± 0.86)

COMPONENT AND THEIR EFFECT	EXPLANATION OF INTERACTIONS	VARIANCE COMPONENT ESTIMATE	PROPORTION OF VARIANCE FROM EACH FACTOR
Candidate	The consistent difference between candidate's ability across interviewers and MMI stations	0.47	28%
MMI Situation	The consistent differences in MMI station difficulty across candidates and interviewers	0.02	1%
Interviewer/Rater	The consistent differences in interviewer stringency across candidates and interviewers	0.15	9%
Interviewer with MMI Situation	The varying question-specific stringency of interviewers between MMI questions across candidates	0.06	3%
Candidate with MMI Situation	The varying MMI question-specific difficulty between candidates across interviewers	0.30	18%
Candidate with Interviewer/Rater	The varying views that interviewers have of candidates because of their differing perspectives	0.67	40%

The greatest proportion of variance (40%) could be attributed to the component "candidate as rated by the interviewer." This component effect reflected the varying views that interviewers had of candidates because of their differing perspectives based on their specialty as presented by the MMI situation. On the other hand, 28% of the variance could be attributed to the candidate. This effect represented the consistent difference between candidate's ability across interviewers and MMI stations as reflected in their heterogeneous profile. However, the least amount of variance was associated

with “MMI situations” comprising of 1%. This means that the stations were equally difficult.

MMI Validity

Table 9 below presented the Pearson correlations between the candidates’ MMI scores, NMAT score, and GPA.

Table 9. Correlation between Candidates’ MMI scores, NMAT score, and GPA

N = 253

VARIABLE	<i>r</i>	INTERPRETATION
MMI (individually scored)*		
<i>NMAT Score</i>	0.26	No relationship
<i>GPA</i>	0.35	No relationship
MMI (summed score)*		
<i>NMAT Score</i>	0.81	Strong relationship
<i>GPA</i>	0.70	Moderately Strong relationship

* as presented in Table 5

** individually as presented in Table 6

There was no correlation ($r = 0.26$) between the MMI and NMAT score of candidates when MMI was identified individually according to station related to their success in medical school. Likewise, the GPA of the candidates was not highly related to MMI per station. The researcher assumed that MMI was the predictor variable and the correlation was because of the difference in reliability between the NMAT score ($r = 0.4$) and the GPA ($r = 0.5$) as cited from the study of Barbosa et al. (2009). The same results were also noted that there was no relationship between MMI and the candidates’ GPA ($r=0.35$) in the determination of their medical school success. An exploration of raw correlations when the scores of four different stations of MMI were summed or cumulated showed strong correlations between MMI and NMAT ($r=0.81$) and moderately strong correlations were noted between MMI and the candidates’ GPA (0.70). This suggested that MMI was measuring the same cognitive

constructs as reflected from the GPA and NMAT of candidates. This in turn mean that the non-cognitive attributes measured by MMI cannot be singled-out but rather should be treated cumulatively thus the non-cognitive domain cannot be attributed to the situation/scenario itself but to the whole MMI instrument.

Feasibility and Educational Impact of MMI

Proceeding the full conduct of MMI to the medical school applicants for academic year 2015 to 2016 which concluded in June 2015, the researcher conducted a focus-group discussion with the interviewers/raters. The discussion centred on practicability and usefulness of MMI as a process, the applicability of the process in SWUSM's context, the expediency of MMI in screening applicants, and its appropriateness in determining the non-cognitive attributes. Further, the researcher also asked the interviewers on the educational impact MMI has provided in the current setting. The responses of the interviewers/raters supplemented the quantitative results of the study and were summarized in Table 10.

Table 10. Emerging themes on the feasibility of MMI in the context of Southwestern University School of Medicine based from the interviewers/raters

N = 11

THEMES	Frequency	INTERPRETATION
Discriminate intellectually the cream-of-the-crop students	9	Identifies students who are really above average in terms of academics and non-academics
Quality students selected through a stringent process	11	The process is reliably and cannot be pre-empted
Mental algorithm of student responses	7	Student responses are not homogeneous
Degree of professionalism identified	11	Non-cognitive attribute which is highly essential in determining future success in the medical practice
Successfully passing the licensure examinations	8	Determinant of pre-practice success
Situation bias	9	The interviewers'/raters' specialty in the field of medicine may produce a situational bias as to the response of the candidate.
Rightness of reasoning and confidence	11	Critical thinking and decision making is measured
Time allocation	7	The degree of time may have a bearing in the ability of the candidate to answer the situation

DISCUSSION

In this study, we report the results of the first utilization of MMI in selecting medical school applicants in the Philippines. For the first time, a combination of an observed MMI, NMAT Verbal and Biology scores, and candidate GPA were used. While focused in measuring the non-cognitive attributes of the candidates, the MMI is considered observational, not experimental, in the study. The NMAT scores and GPA are focused principally on the cognitive domains of each candidate and the study attempts to provide relationship between these domains and the non-cognitive attributes of medical school aspirants obtained from their MMI scores.

MMI Reliability

The finding that a significant proportion of variance is related to the desired behaviours of candidates set by the interviewer's perception resounds with Dore et al. (2010), which included a smaller sample size (less than 300). The greatest source of variance is related to the views that interviewers have for particular candidates; because of their particular perspective or pre-conception, which accounted for nearly half of all the variance. This indicates that a candidate's score can be influenced by the rater. In particular, the specialty training of the interviewers has greatly affected the rating they give to the candidate. An example to which is when Scenario 4 (Appendix D) is presented to the candidate and by-chance, a surgeon interviewer is assigned to the scenario. The interviewer has set a personal response algorithm on what he or she thinks is an appropriate response. However, the interviewer's subjectivity is on the response itself and not on the candidate.

In the study, there was a higher proportion of candidate variance reflecting on the difference between candidate's ability across interviewers and to the MMI situations or scenarios encountered. Therefore, based from the candidate's response on every situation and as they began to adapt to the situation itself, different non-cognitive attributes can be extracted. However, it is not surprising that the varying MMI-specific difficulty between candidates across interviewers only accounted less than fourth of the variance. This means that candidates profile (pre-medical course) including NMAT Verbal and Biology Score and GPA may play a relationship on this matter; that a nursing graduate may find the situations easy than a biology graduate who never had any hospital or similar situation exposure. This holds true to Scenarios 3 and 4 (Appendix D). The nursing graduate applicants have higher tendency to be able to respond based on a hospital context while a biology and/or biotechnology graduate applicant may respond on the generic point-of-view.

The issue as to interviewer or rater stringency or leniency cannot be attributed as a negative reliability of MMI in this study. The variance might reflect the greater certainty among interviewers in determining the trainability of the candidate to become a doctor as opposed to determining the aptitude of a candidate for undertaking a medical degree. Equally, it might reflect the lack of independence between the different MMI scenarios as each station is testing different construct of medical situation. Noticeably, the four MMI stations (Appendix D) are independent of each other; however, the same measures and rating of physical perception and reasoning are used. This, however, address the connotation that interviewers have their personal algorithm of responses. Moreover, this results are not surprisingly different from the study of Robert et

al. (2008) for which the authors addressed the issue by interviewer training and tightening definitions in the marking criteria has traditionally to address interviewer subjectivity, particularly in situations where the interviewer pool is practicing in different specialties. However, neither strategy alone or in combination has resolved the persistent challenges of interviewer variability (Hofmeister et al., 2009). Thus, there is a need for original evidence-based approaches which can be undertaken in a separate study.

The reliability of MMI to measure non-cognitive attributes desired by SWUSM can be readily examined on the variance scores. Increasing the number of MMI situations or scenarios is another way in which reliability can be increased, particularly as a comprehensive question bank is developed in the future. Therefore, to increase reliability of MMI in the SWUSM context is to increase the number of stations and assigning 1 interviewer or rater per station since the ability of the candidates to adopt on the situation is evident on their confidence to respond on the situation itself.

Interviewers may have used different algorithm in judging candidate performance when these candidates are exposed to the different scenarios. The interviewer or rater may score the candidate in a process that has similarities to clinical reasoning, the notion of making some instant and intuitive decisions based on pattern recognition and analytical decisions. By investigating the perceptual and processing capacities of the interviewers or raters, and the algorithm they operate by, and then aligning the scoring system, one may be able demonstrate improved discrimination between candidates in future iterations of the MMI. However, this was not undertaken in the research and such will require further investigation.

Although interviewer stringency or leniency accounted for 9% of the variance in the study, it is generally thought that this is a relatively stable characteristic of interviewers, and is not impacted upon by training (Roberts et al., 2004). However, consideration could be given to adjusting candidates' scores by using a measurement model which accounts for the stringency/leniency of whichever interviewer the candidate saw.

Construct Validity

With respect to construct validity of the MMI in the medical school setting, our results indicate that interviewers can make moderately reliable and valid decisions about the non-cognitive characteristics of candidates in selecting them for admission. From the responses of the candidates on the situation they are presented, interviewers/raters are able to identify the extent of physical perception and reasoning of candidates; these are the two non-cognitive parameters identified by SWUSM as essential in medical school success. The data suggests that, similar to other MMI investigations (Roberts et al., 2008, Eva et al., 2009), the main source of error is interviewer subjectivity (as opposed to context specificity); which is often a major source error in performance assessments, as documented in OSCE (Guiton et al., 2004). In fact, variance estimate of the MMI situation or scenario is very minimal and is acceptable against interviewer/rater differences in stringency across candidates and interviewers.

Our results also indicate a relationship between the MMI, NMAT Verbal and Biology scores, and GPA when MMI scores are treated cumulatively.

Meaning, the responses of the candidates on each stations has a cognitive bearing; that prior knowledge is necessary for them to respond appropriately.

Content Validity

Content validity is supported because the MMI items were specifically developed for the purpose of screening applicants for admission to medical school. The situations are centred on four (4) major areas of medical practice: surgery and ethics, family medicine, reproductive health or obstetrics, and occupational medicine. One advantage of situational questions is that all candidates respond to the same hypothetical situation rather than describe experiences unique to them from their past. Another advantage is that situational questions allow candidates who have had no direct job experience relevant to a particular question to provide a hypothetical response. This means that not all applicants had prior job exposure in a situation where patient care was required. Expected relationships of the MMI with independent external variables, such as the NMAT scores and GPA provide some evidence to support the validity of its use in medical school admissions. There is also a pragmatic interest in the relationship, as it has been claimed that MMI would be a more cost-efficient method (Rosenfeld et. al, 2008); however, a cost/benefit analysis was not undertaken in the study. The finding of a strong correlation between the MMI and NMAT Verbal and Biology scores suggests that the two are testing different aspects and should be retained on the argument of divergent validity. It can also be hypothesized that the MMI ratings are highly influenced by the reasoning abilities of the candidate and the raters are

capturing an algorithm on this. However, sufficient data is necessary to formally conclude this.

MMI Feasibility and Educational Impact

The researcher circulated a survey questionnaire and a focus-group discussion among interviewers/raters to determine the feasibility and educational impact of MMI. Although no formal standard setting procedure was used, the researcher modelled an open discussion format and gathered the qualitative inputs of the 11 interviewers/raters. The themes which emerged during the discussion ranged from the ability of the MMI process to screen the cream-of-the-crop students to professionalism and process stringency. However, there are also issues which arise including thereof; situation bias, time allocation and rightness of the candidate's response.

In the study, the interviewers/raters see the administration of MMI as feasible in the context of SWUSM. Despite the heterogeneous nature of student applicants; with the inclusion of foreign nationals; the MMI has successfully weed-out candidates who are not likely to thrive in the program. It also enables the raters to identify students who can be likely used as student mentors to other students who may be noted a little weak. Furthermore, the raters' experience with MMI has significantly changed their views on the admission process of SWUSM and they unanimously agreed to the acceptability of the new admission process. The greatest educational impact they described was that candidates' non-cognitive attributes can now be more developed and developing such will entail positive outcomes in the licensure examination and medical practice in the future.

Research Limitations

Time is a limitation in the study because the researcher administered the MMI in one cohort approach only during the months of April to June 2015. Despite the lack of MMI resources in the current setting, the researcher sought faculty and interviewer/rating training through whatever is available from journals, websites and video presentations. Unlike the study conducted in Dundee University with thousands of samples, the researcher had only 253 samples of freshmen and transferees to comprise the findings. The study was not repeated to other year levels as well.

CONCLUSION

Our results suggest that the MMI is a reliable method of assessment for medical school admission in the context of SWUSM. For the MMI, the largest source of identifiable measurement error is related to aspects of interviewer subjectivity, suggesting further training of interviewers/raters would be beneficial. Further, the study added to the construct validity of MMI by showing a positive correlation with situationally oriented questions. In order to justify long term sustainable use of the MMI in medical admission setting in the Philippine context, theoretical work is required to understand how written and performance based tests of non-cognitive attributes can be combined, in a way that achieves acceptable construct validity, generalizability and reasonably precise decision making processes. The medical school faculty needs to buy-in the purpose and to the whole idea of MMI that the combined measure is of value in measuring future success of students. Without faculty commitment and cooperation, there will be difficulty of the MMI process to be assimilated in the admission process.

Longitudinal predictive validity studies are required to determine to what extent the MMI, NMAT scores and GPA both singly and in combination predict both performance in medical school, licensure examinations, and success in the future practice.

RECOMMENDATIONS

The study recommends the continuous training and orientation of interviewers/raters to the development of MMI in the Philippine context. To exhaust all resources available, aside from the faculty, the researcher is recommending the use of some more senior medical students to be included in the pool of raters. Cost-analysis and divergent validity of MMI should be studied further. MMI stations should be increased from 4 to 8 stations to strengthen reliability as scenario and a situation pool may be developed in the future. Moreover, it is also recommended that MMI be institutionalised once local validation is completed; thereby producing a standardised admissions process throughout the whole university.

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**APPENDIX A
TRANSMITTAL LETTER
LETTER OF TRAINING FOR SWUSM FACULTY MEMBERS**

March 23, 2015

To: ALL FACULTY MEMBERS
All Departments

Dear Colleagues;

I hope this letter finds all of you well!

The Admissions Committee has started to accept applications for the academic year 2015-2016. There will be great changes for this year's admission process for us to be able to screen the candidates in all domains of learning. Henceforth, there is a need for us to measure both the cognitive and non-cognitive aspects of these candidates. The Multiple Mini Interview will be employed as a process in selecting rightful candidates to be admitted in our prestigious institution.

The Multiple Mini Interview (MMI) is a process where true-to-life scenarios and/or situations will be presented to the candidates. The candidates will be required to provide their response in a time frame. The purpose of the MMI is to identify the non-cognitive attributes as several researches have concluded that these attributes are essential to the success of medical students in the learning stage, licensure examinations and future practice (Eva et al., 2004, Roberts et al., 2008, Hofmeister et al., 2012). However, previous requirements as stipulated in the handbook will still be applied.

And since this is new to us and as Southwestern University is the first to apply this method in the country, a training will be afforded to all faculty. The date of the training is set on March 27, 2015 at 08:00AM to 05:00PM, AVR2 MHAM Building. Moreover, the undersign will attempt to measure the outcomes of the process through psychometric validation, reliability testing, feasibility, acceptability, and its educational impact.

Your attendance is highly appreciated. Please do not hesitate to come to my Office should you have questions related on the matter.

More power!



PETER S AZNAR, MD FPSP
Dean, School of Medicine
Principal Investigator

APPENDIX B
LETTER TO CANDIDATES/RESPONDENTS

Dear Candidate,

Welcome to Southwestern University School of Medicine (SWUSM)!

After successful submission of all pre-interview required documents, you are now in the interview process. For this academic year, 2015-2016, SWUSM requires all medical school applicants to undergo the Multiple Mini Interview.

The institution believes that the success of the students in medical school and in practice does not only stem from purely academics. Thus, SWUSM employs Multiple Mini Interview to measure your non-cognitive attributes by obtaining your response/s as real life situation/scenario is presented. Your responses will be rated according to: (a) physical reception and (b) reasoning. **Physical Reception** is categorized according to (1) appearance, (2) voice, (3) speech, and (4) self-confidence. While **Reasoning** is further categorized to (1) strength of arguments, (2) ability to present ideas, (3) ethical reasoning, and (4) suitability for medical profession. And since this is new to SWUSM, it is our intention to measure the validity, reliability, feasibility, and acceptability of this procedure.

With your consent, your data will be taken as specimen for research purposes only and will be archived until 2020 (until you the results of your licensure examination). Attached on the next page is the Non-Disclosure Agreement. Rest assured that ethical considerations as to confidentiality, conflict of interest, and non-maleficence will be observed. No injury, harm or maltreatment is expected as you are also free to withdraw from the procedure should you deem appropriate. However, your consent of involvement does not waive the Admissions Committee to apply the institution's standards in accepting medical students.

Please feel free to ask questions if you have any.



PETER S AZNAR, MD, FPSP
Dean, School of Medicine
Principal Investigator

Signature above Printed Name
Date Signed: _____
Respondent

APPENDIX C NONDISCLOSURE AGREEMENT

This Nondisclosure Agreement (“the Agreement”) is entered into by and between the Admissions Committee of Southwestern University School of Medicine and _____ (*candidate’s/respondent’s name*) _____ for the purpose of preventing the unauthorized disclosure of Confidential Information as defined below. The parties agree to enter into a confidential relationship with respect to the disclosure of certain confidential information (“Confidential Information”).

1. **Definition of Confidential Information.** For the purpose of this Agreement, “Confidential Information” shall include all information or material from the proceedings of the Multiple Mini Interview (MMI) that will be conducted with the receiving party.
2. **Exclusions from Confidential Information.** Receiving Party’s obligations under this Agreement do not extend to information that is: (a) publicly known at the time of disclosure or subsequently becomes publicly known through no fault of the “Receiving Party”; (b) discovered or created by the Receiving Party before disclosure by Disclosing Party; (c) learned by the Receiving Party through legitimate means other than from the Disclosing Party or Disclosing Party’s representatives; or (d) is disclosed by Receiving Party with Disclosing Party’s prior written consent.
3. **Obligations of Receiving Party.** Receiving Party shall hold and maintain the Confidential Information in strictest confidence for the sole and exclusive benefit of the Disclosing Party. Receiving Party shall carefully restrict access to Confidential Information to employees, contractors, and third parties as is reasonably required and shall require those persons to sign nondisclosure restrictions at least as protective those in this Agreement. Receiving party shall not, without prior written approval of Disclosing Party, use for Receiving Party’s own benefit, publish, copy, or otherwise disclose to others or permit the use by others for their benefit or to the detriment of Disclosing Party any Confidential Information. Receiving Party shall return to Disclosing Party any and all records, notes, and other written, printed or tangible materials in its possession pertaining to Confidential Information immediately if Disclosing Party requests it in writing.
4. **Time Periods.** The nondisclosure provisions of this Agreement shall survive the termination of this Agreement and Receiving Party’s duty to hold Confidential Information in confidence shall remain in effect until the Confidential Information no longer qualifies as a trade secret or until Disclosing Party sends Receiving Party written notice releasing Receiving Party from this Agreement, whichever occurs first.
5. **Relationships.** Nothing contained in this Agreement shall be deemed to constitute either party a partner, joint venture or employee of the other party for any purpose.
6. **Severability.** If a court finds any provision of this Agreement invalid or unenforceable, the remainder of this Agreement shall be interpreted so as best to effect the intent of the parties.

7. **Integration.** This agreement expresses the complete understanding of the parties with respect to the subject matter and supersedes all prior proposals, agreements, representations, and understandings. This Agreement may not be amended except in a writing signed by both parties.
8. **Waiver.** The failure to exercise any right provided in this Agreement shall not be a waiver of prior or subsequent rights.

Disclosing Party



PETER S AZNAR, MD, FPSP
Dean, School of Medicine
Principal Investigator
Dated: _____

Receiving Party

By: _____
Candidate/Respondent
Dated: _____

APPENDIX D
MULTIPLE MINI INTERVIEW (MMI) SCORE SHEET

Applicant's Name : _____
 Interviewer/Rater's Name : _____
 Potential Conflict of Interest? [Y] [N] If "YES," Why? _____

SCENARIO/STATION 1

Instruction to the Rater:

Please rate the applicant's performance on this station relative to the pool of all applicants you are rating. You may adjust your scores as necessary before turning them in. Encircle the number corresponding to the rating that best describes the characteristics of the applicant. You may ask the applicant to qualify his/her answer should vagueness warrant clarifications. Additionally, a comment space is provided below.

Physical Reception

APPEARANCE	VOICE	SPEECH	SELF-CONFIDENCE
(1) Creates bad impression	(1) Very unpleasant	(1) Cannot be understood	(1) Very low confidence (overly timid, self-conscious)
(2) Creates unfavorable impression	(2) Unpleasant	(2) Slightly understandable	(2) Low confidence (timid, self-conscious, easily influenced)
(3) Creates acceptable impression	(3) Somewhat pleasant	(3) Understandable	(3) Moderate confidence (somewhat assertive, self-assured, opinionated)
(4) Creates favorable impression	(4) Pleasant	(4) Distinct	(4) High confidence (assertive, self-assured, opinionated)
(5) Creates very good impression	(5) Very pleasant	(5) Very distinct	(5) Very high confidence

Reasoning

STRENGTHS OF ARGUMENTS DISPLAYED	ABILITY TO PRESENT IDEAS	ETHICAL REASONING	APPLICANT'S SUITABILITY FOR MEDICAL PROFESSION (PROFESSIONALISM)
(1) Unable to defend arguments	(1) Illogical and incoherent all the time	(1) Unethical	(1) Not suitable at all
(2) Able to defend arguments sometimes	(2) Illogical and incoherent most the time	(2) Sometimes ethical	(2) Sometimes suitable
(3) Able to defend arguments adequately	(3) Logical and coherent some of the time	(3) Usually ethical points of view	(3) Mostly suitable
(4) Able to defend arguments well	(4) Logical and coherent most of the time	(4) Ethical most of the time	(4) Suitable
(5) Able to defend arguments very well	(5) Logical and coherent all of the time	(5) Always ethical	(5) Very suitable

Scenario/Situation

Dr Reyes recommends homeopathic medicines to his patients. There is no scientific evidence or widely accepted theory to suggest that homeopathic medicines work, and Dr Reyes doesn't believe them to. He recommends homeopathic medicine to people with mild and non-specific symptoms such as fatigue, headaches, and muscle aches, because he believes that it will do no harm, but will give them reassurance.

Consider the ethical problems that Dr Reyes' behaviour might pose. Discuss these issues with the interviewer.

Interviewer/Rater's Comments:

MULTIPLE MINI INTERVIEW (MMI) SCORE SHEET

Applicant's Name : _____
 Interviewer/Rater's Name : _____
 Potential Conflict of Interest? [Y] [N] If "YES," Why?

SCENARIO/STATION 2

Instruction to the Rater:

Please rate the applicant's performance on this station relative to the pool of all applicants you are rating. You may adjust your scores as necessary before turning them in. Encircle the number corresponding to the rating that best describes the characteristics of the applicant. You may ask the applicant to qualify his/her answer should vagueness warrant clarifications. Additionally, a comment space is provided below.

Physical Reception

APPEARANCE	VOICE	SPEECH	SELF-CONFIDENCE
(1) Creates bad impression	(1) Very unpleasant	(1) Cannot be understood	(1) Very low confidence (overly timid, self-conscious)
(2) Creates unfavourable impression	(2) Unpleasant	(2) Slightly understandable	(2) Low confidence (timid, self-conscious, easily influenced)
(3) Creates acceptable impression	(3) Somewhat pleasant	(3) Understandable	(3) Moderate confidence (somewhat assertive, self-assured, opinionated)
(4) Creates favourable impression	(4) Pleasant	(4) Distinct	(4) High confidence (assertive, self-assured, opinionated)
(5) Creates very good impression	(5) Very pleasant	(5) Very distinct	(5) Very high confidence

Reasoning

STRENGTHS OF ARGUMENTS DISPLAYED	ABILITY TO PRESENT IDEAS	ETHICAL REASONING	APPLICANT'S SUITABILITY FOR MEDICAL PROFESSION (PROFESSIONALISM)
(1) Unable to defend arguments	(1) Illogical and incoherent all the time	(1) Unethical	(1) Not suitable at all
(2) Able to defend arguments sometimes	(2) Illogical and incoherent most the time	(2) Sometimes ethical	(2) Sometimes suitable
(3) Able to defend arguments adequately	(3) Logical and coherent some of the time	(3) Usually ethical points of view	(3) Mostly suitable
(4) Able to defend arguments well	(4) Logical and coherent most of the time	(4) Ethical most of the time	(4) Suitable
(5) Able to defend arguments very well	(5) Logical and coherent all of the time	(5) Always ethical	(5) Very suitable

Scenario/Situation

Your company needs both you and co-worker (Jessie, a colleague from another branch of the company) to attend a critical business meeting in Leyte Philippines. You have just arrived to drive Jessie to her place.

Jessie is in the room.

Interviewer/Rater's Comments:

MULTIPLE MINI INTERVIEW (MMI) SCORE SHEET

Applicant's Name : _____
 Interviewer/Rater's Name : _____
 Potential Conflict of Interest? [Y] [N] If "YES," Why? _____

SCENARIO/STATION 3

Instruction to the Rater:

Please rate the applicant's performance on this station relative to the pool of all applicants you are rating. You may adjust your scores as necessary before turning them in. Encircle the number corresponding to the rating that best describes the characteristics of the applicant. You may ask the applicant to qualify his/her answer should vagueness warrant clarifications. Additionally, a comment space is provided below.

Physical Reception

APPEARANCE	VOICE	SPEECH	SELF-CONFIDENCE
(1) Creates bad impression	(1) Very unpleasant	(1) Cannot be understood	(1) Very low confidence (overly timid, self-conscious)
(2) Creates unfavourable impression	(2) Unpleasant	(2) Slightly understandable	(2) Low confidence (timid, self-conscious, easily influenced)
(3) Creates acceptable impression	(3) Somewhat pleasant	(3) Understandable	(3) Moderate confidence (somewhat assertive, self-assured, opinionated)
(4) Creates favourable impression	(4) Pleasant	(4) Distinct	(4) High confidence (assertive, self-assured, opinionated)
(5) Creates very good impression	(5) Very pleasant	(5) Very distinct	(5) Very high confidence

Reasoning

STRENGTHS OF ARGUMENTS DISPLAYED	ABILITY TO PRESENT IDEAS	ETHICAL REASONING	APPLICANT'S SUITABILITY FOR MEDICAL PROFESSION (PROFESSIONALISM)
(1) Unable to defend arguments	(1) Illogical and incoherent all the time	(1) Unethical	(1) Not suitable at all
(2) Able to defend arguments sometimes	(2) Illogical and incoherent most the time	(2) Sometimes ethical	(2) Sometimes suitable
(3) Able to defend arguments adequately	(3) Logical and coherent some of the time	(3) Usually ethical points of view	(3) Mostly suitable
(4) Able to defend arguments well	(4) Logical and coherent most of the time	(4) Ethical most of the time	(4) Suitable
(5) Able to defend arguments very well	(5) Logical and coherent all of the time	(5) Always ethical	(5) Very suitable

Scenario/Situation

You are a family doctor on a small town. One of your patients, 17-year-old male, makes an appointment to see you. You have been whose family doctor for the past 10 years. He is obviously upset when you go in to see him. He tells you that he has just found out that his 16-year-old girlfriend is pregnant. He says that neither he nor his girlfriend knows what to do and that he feels he cannot speak to his parents about this situation. He asks you not to speak to his parents about this.

What would you say?

Interviewer/Rater's Comments:

MULTIPLE MINI INTERVIEW (MMI) SCORE SHEET

Applicant's Name : _____
 Interviewer/Rater's Name : _____
 Potential Conflict of Interest? [Y] [N] If "YES," Why?

SCENARIO/STATION 4

Instruction to the Rater:

*Please rate the applicant's performance on this station relative to the pool of all applicants you are rating. You may adjust your scores as necessary before turning them in. **This scenario/situation has an Additional Marking Key.** Encircle the number corresponding to the rating that best describes the characteristics of the applicant. You may ask the applicant to qualify his/her answer should vagueness warrant clarifications. Additionally, a comment space is provided below.*

Physical Reception

APPEARANCE	VOICE	SPEECH	SELF-CONFIDENCE
(1) Creates bad impression	(1) Very unpleasant	(1) Cannot be understood	(1) Very low confidence (overly timid, self-conscious)
(2) Creates unfavourable impression	(2) Unpleasant	(2) Slightly understandable	(2) Low confidence (timid, self-conscious, easily influenced)
(3) Creates acceptable impression	(3) Somewhat pleasant	(3) Understandable	(3) Moderate confidence (somewhat assertive, self-assured, opinionated)
(4) Creates favourable impression	(4) Pleasant	(4) Distinct	(4) High confidence (assertive, self-assured, opinionated)
(5) Creates very good impression	(5) Very pleasant	(5) Very distinct	(5) Very high confidence

Reasoning

STRENGTHS OF ARGUMENTS DISPLAYED	ABILITY TO PRESENT IDEAS	ETHICAL REASONING	APPLICANT'S SUITABILITY FOR MEDICAL PROFESSION (PROFESSIONALISM)
(1) Unable to defend arguments	(1) Illogical and incoherent all the time	(1) Unethical	(1) Not suitable at all
(2) Able to defend arguments sometimes	(2) Illogical and incoherent most the time	(2) Sometimes ethical	(2) Sometimes suitable
(3) Able to defend arguments adequately	(3) Logical and coherent some of the time	(3) Usually ethical points of view	(3) Mostly suitable
(4) Able to defend arguments well	(4) Logical and coherent most of the time	(4) Ethical most of the time	(4) Suitable
(5) Able to defend arguments very well	(5) Logical and coherent all of the time	(5) Always ethical	(5) Very suitable

Additional Marking Key

PROFESSIONALISM	TEAM-PLAYER	CONFIDENTIALITY	REFLECTION AND HUMILITY
(1) Discuss the situation with the family himself/herself	(1) Does not identify it as a team-problem	(1) Discuss the problem with the public (social media post)	(1) Fails to reflect on the situation and blames other team members
(2) Agrees with (the team) not communicating with the family	(2) Bad team player (blaming other team members)	(2) Discuss the problem with other hospital staff	(2) Fails to reflect on the situation
(3) Fair	(3) Fair team player	(3) Sometimes able to maintain confidentiality	(3) Reflects on the situation but does not identify learning needs
(4) Good professionalism	(4) Good team player (identifies it as a team problem)	(4) Most of the time able to maintain confidentiality	(4) Reflects on the situation and identify learning needs
(5) Very good professionalism, lets the professor or senior registrar communicate to the family	(5) Very good team player (identifies it as a team problem and professor as a team leader)	(5) Does not discuss with anyone outside the team	(5) Reflects and learns from the situation, owning up to the professor

Scenario/Situation

Sometime ago, there was a breaking news of a professor being sacked/fired because of a death of a patient after a pair of scissors was left inside the peritoneum by a senior consultant during laparotomy, while a resident and nurse were assessing.

- 1. Who do you think was responsible?**
- 2. Should it be communicated to other team members and hospital staff?**
- 3. What would be your response, had you been assisting the senior consultant and left the scissors inside?**
- 4. Having learned from this situation, what would you do in the future?**
- 5. In your opinion, who should talk to the patient's family? Why?**

Interviewer/Rater's Comments:

APPENDIX E

FOCUS GROUP DISCUSSION INTERVIEW GUIDE

Introduction:

1. Please state your NAME, DESIGNATION, and course handled in Medicine Level 1.
2. Please state the number of years of service teaching Doctor of Medicine courses. If you have taught multiple times in different locations, please specify, including the courses handled.
3. Please state whether you have read the letter addressed to you as signed by Dr Peter S Aznar.
4. Please state any disclosure or conflict of interest related to this study (multiple mini interview).

Pre-Interview:

Interviewer:

1. I am Dr Peter S Aznar. I am gathering qualitative data related to study on multiple mini interview as applied during the 2015-2016 admissions. This interview is voluntary and you may withdraw anytime if you feel that your rights as an informant and/or any personal ethical principles are tampered. Also, this interview is recorded verbatim and will be transcribed in the official manuscript which will be submitted to Keele University. The official language is English. However, you may respond on the language you desire should you need a point of emphasis. This interview will take approximately 15 to 20 minutes. General themes related to feasibility, validity, reliability, and cultural acceptance are the main concerns of the interview.

Informant:

1. Affirmation of pre-statement.

Actual Interview:

1. Statement: *Multiple Mini Interview (MMI) has been widely used in the US, UK and Australia as the primary process of admitting students in the medical school. Accordingly, Eva and colleagues in 2004 first tested this approach and found that they were able to measure the non-cognitive attributes of medical school applicants; for which according to them is very important in determining the over-all success of the medical professional in the future.*

Question: *What are your views about the feasibility of measuring the non-cognitive attributes of a medical school applicant through MMI? What do you think is the impact of these attributes when applied in our setting?*

2. Statement: *Since the commencement of MMI in McMaster University School of Medicine, it has been widely used across the UK and Australia in both undergraduate medicine and residency programs. Roberts and colleagues in 2008 found that MMI is superior against any one-time aptitude test like MCAT, UKCAT.*

Question: *How do you see the validity of MMI against NMAT? What do you think are the benefits you obtain from MMI which cannot be readily available from NMAT?*

3. Statement: *Several authors about MMI boasted that students who were channelled using MMI as a process during admission and large scale return demonstration, like OSCE, scored superiorly and in-deed successfully passed licensure examinations. One author from Saudi Arabia (Batwa, 2013) mentioned that they were able to discriminate gender wise relationship between MMI and the ability of the student to perform in the undergraduate medicine. Tiller (2008) also acknowledged the reliability of MMI even in the residency program; that residents who were admitted in the program through an MMI process performed better both in the written and oral examinations.*

Question: *Translating the above studies in your setting of students, did you first-handed notice the difference of performance between the Level 1 students under your supervision and the previous students of your, who are now Level II, on the same subject matter of supervision? What are these differences? Do you think these differences will play relevance in future endeavours like OSCE, licensure examinations and even in the actual practice?*

4. Statement: *MMI in Philippines is still on its early stage despite some institutions wanting to be at par to Western medical education in terms of student selection and admission. There are few schools who already use MMI like Ateneo de Zamboanga School of Medicine as well as the University of the Philippines in Palo Leyte but there are no current available data.*

Question: *Do you think there are barriers related to the implementation of MMI? Please enumerate. What cultural differences can you think that will help enable and prevent the implementation of MMI in the Philippines; in SWU?*

5. Statement: *The interviewers or raters are important key elements in the administration of MMI. A study in Korea established that the more raters or interviewers available per station or circuit, the better or effective the results are in screening medical school applicants. Another study by Hofmeister (2012) also described the critical role of interviewers and/or raters in the implementation of MMI.*

Question: *Can you describe your experience as a rater/interviewer? What areas did you find difficulty; is it the process itself, the applicant,*

the scoring method, the time element, etc.? What actions can you recommend to better the implementation?

Closing:

Interviewer:

Thank you for your responses.

CURRICULUM VITAE

PETER S. AZNAR

Doctor of Medicine

Fellow, Philippine Society of Pathologist

Candidate, Master's in Health Professions Education



PROFESSIONAL QUALIFICATIONS

- 2016 Candidate, Master's in Health Professions Education
Keele University, United Kingdom
- 2001 Residency Training in Anatomic and Clinical Pathology
University of the Philippines – Philippine General Hospital
(UP-PGH)
Metro Manila, Philippines
- 1988 Doctor of Medicine
Southwestern University – Matias H Aznar Memorial College of
Medicine (SWU-MHAMCM)
Cebu City, Philippines
- 1984 Bachelor of Science in Medical Technology
Southwestern University

AWARDS AND CITATIONS

- 2016 James J Meany Service Award
Awarded by:
Philippine Accrediting Association of Schools, Colleges and
Universities
- 2007 Fellow Physician
Awarded by:
Philippine Society of Pathologists
- 2002 Diplomate Physician
Awarded by:
Philippine Society of Pathologists
- 1988 18th Placer, Board of Medical Technology
Awarded by:
Philippine Regulations Commission
- 1984 Magna Cum Laude
Awarded by:
College of Medical Technology
Southwestern University
- 1982 Army Cadet of the Philippines
- 1980 Class Valedictorian
Awarded by:
High School Department
Southwestern University

WORK EXPERIENCES

2015 - present	President Regenerative Health Systems, Philippines
2007 - present	Dean Southwestern University Matias H Aznar Memorial College of Medicine (MHAMCM)
2007 - present	President TotalMed Solutions Philippines, Inc.
2006 - 2007	President Southwestern University
2004 – 2006	Vice-President for Academic Affairs Southwestern University
2003 - present	President Prime Care Cebu SM City Cebu, North Reclamation Area
2002 – 2004	Dean College of Medical Technology Southwestern University
1998 – 2001	Medical Officer III University of the Philippines – Philippine General Hospital

PERSONAL BACKGROUND

Wife	Tinna Palacios – Aznar
Daughter	Kimberly Anne T. Aznar