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The USM Mentoring Inventory: A Construct Validity and Reliability Exercise

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ABSTRACT

One of the challenges in mentoring relationships is to understand the real issues faced by the mentees. A mechanism has been established to offer a credible mentoring inventory. The aim of the study was to determine the construct validity and reliability index of the Universiti Sains Malaysia Mentoring Inventory (USM-MT-i) among early phase medical students in a Malaysian public medical school. A cross-sectional study was conducted in June 2017 among 208 early phase of the medical students of School of Medical Sciences, Universiti Sains Malaysia. USM-MT-i is a self-administered inventory and was established based on the information gained from the mentors and mentees. The pre-validated inventory entailed 44 primary items. Exploratory factor analysis (EFA) and Cronbach's alpha reliability analysis were utilised to determine the construct validity and reliability of such inventory. The result revealed three potential constructs with 39 items extracted from the USM-MT-i; academic leadership (19 items), communication skills (12 items) and examination competence (8 items) with factor loading ranges from 0.50–0.77, 0.51–0.80 and 0.65–0.87, respectively. Internal consistency reliability (Cronbach's alpha) for each domain were 0.95, 0.93 and 0.92, respectively. The overall Cronbach's alpha was 0.96. The present study promoted that the three factors with 39 items of the USM-MT-i has a good validity and reliability value to survey for mentoring needs among medical students in their early phase.

Keywords: *Construct validity, Reliability, Mentoring inventory*

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INTRODUCTION

Mentoring relationship provides a guidance session to foster the mentees' professional skills which include academic and non-academic domains (1). Obviously, mentoring service has become a significant exercise in reducing the psychological problems faced by the students (2–7). Even though these problems can be reduced by referring them to professionals such as clinical psychologists and psychiatrics, the preventive measure through an effective mentoring session is most welcomed.

In higher education institutions, mentoring services are activated by interested academic staff at school level voluntarily. They

serve as a mentor to guide mentees in educational, career and social development areas (8, 9) as well. This is consistent with the United Nations Educational, Scientific and Cultural Organisation (UNESCO) which has addressed three main roles of the students' affair section in higher education institutions which promote personal, career and education development as well (8–11). To realise these roles, mentors must be knowledgeable and skilful to help them professionally during the mentoring relationship. A previous study revealed that positive impacts of a helping service (e.g. mentoring sessions) has been admitted by the mentees themselves (12–13). One of the reasons is that, the topics discussed during the mentoring sessions met with mentees needs (14).

In the context of Universiti Sains Malaysia (USM) medical school, the mentoring programme was implemented since its first intake. In 2007, the mentoring programme was reviewed to become peer-mentoring programme, in which senior students were appointed as mentors to a group of students (15–16). In 2011, the peer-mentoring was ceased due to inevitable reasons particularly related to the curriculum change, and thus the faculty-student mentoring programme becomes the main mentoring practice until now. The mentors' responsibilities are to arrange meetings with the mentees at least twice per semester, to discuss any topics related to academic, personal and social matters, and to inform the mentees' examination results. Faculty members who volunteer to become mentors are trained through a training of trainer workshop. The workshop focuses on the foundation and basics of guidance and counselling skills that are appropriate for becoming an effective mentor. The workshop was conducted by a group of professional trainers which include a psychiatrist, psychologist, counsellor and few medical educationists. However, since the inception of faculty-mentoring programme in USM, there is limited evidence to support its needs from mentees' perspective. Consequently, this study was carried out to address the questions on the real needs for mentoring programme in the medical school from the perspective of mentees.

The mounting desires of self-management, social management and academic management to foster personal and professional features (17) among the medical students are good indicators that such students need a professional helper who is able to understand the real issues they face (18–20). For that reason, providing a good service of mentoring sessions are necessary. This can be achieved by understanding the issues which should be entertained. Therefore, an accurate and validated assessment tool is welcomed. Despite the importance of such service (17), we do not have a credibility assessment tool which is able to evaluate the need of mentoring from the students' perspective. Thus, we aimed to assess dimensionality (construct validity) and reliability of the established instrument, which is known as Universiti Sains Malaysia Mentoring Inventory (USM-MT-i). As a result, a null hypothesis was established; the proposed items of the USM-MT-i is one-dimension and the research hypothesis was that the suggested items of the USM-MT-i is multi-dimension.

Scandura and Ragin's 15-items mentoring questionnaire (21), mentoring profile questionnaire and mentorship effectiveness (22) were actively used in the helping profession. Despite the popularity, these instruments have their limitations. Firstly, it was focused on a general target group, not specific to the medical training as proposed by the current study. Secondly, it was only measuring the impacts of the mentoring process rather than the need of mentoring relationships. Thus, it is hoped that these instruments will close the gap.

In the context of the medical training, the scopes of the mentoring sessions are broader including (i) career advancement (23–24), (ii) personal development, and (iii) professional development (3–5, 7, 25–

33). The scopes of services can be attained through effectice mentoring session (32, 34). Apart from that, the service of the elective guidance, residency applications, and social accountability (35–36) services are offered by such programmes. This is aligned with the services provided by the Canadian Medical School (23, 36–38). At the same time, students need to be fostered about ethical accountability, consistency and trustworthiness, service alignment, social talents, ability for development, flexibility and adaptability, cultural proficiency, oral communication, and collaboration spirit (25, 39–41).

Although many medical students experienced numerous challenging issues during the medical training, not all of them are keen to seek help and share their problems with others partly because there is a lack of a well-constructed tool in alerting them. This has led to a situation where students continuously suffering the problems. Thus, a specific mechanism which concern on the need of mentoring sessions for those students must be highlighted. There are few comparable instruments including counselling services questionnaires which are currently available, yet they are limited, and they were developed based on other's inspiration and cultures. Consequently, by using those questionnaires, we are unable to represent the accurate data. Therefore, the justifications for conducting this study, stemmed from the efforts to bridge the gap due to lack of existence of such inventory. For that reason, the present study was formulated to assess its construct validity and reliability the USM-MT-i-

METHODOLOGY

Development of USM USM-MT-i

The development process of USM-MT-i, was started by firstly, compiling the significant data of mentoring service for the target group through literature reviews and focus group discussions with target group and mentors as well. Secondly, the information obtained was clustered based on similarities and differences in a profile of mentoring relationships. Finally, items related to mentoring services were promoted. The evaluation of the content and face validity was completed by five medical educationists who assess the appropriateness of each item. As a response, needed modifications were made grounded based on the feedbacks given. Each item of the USM-MT-i was rated using a five-point rating scale (1 = extremely not needed, 2 = not needed, 3 = less needed, 4 = needed, and 5 = extremely needed) to designate how close the items described the respondent's need.

Assessment of Construct Validity and Reliability

A cross-sectional study was done in June 2017 among the early phase medical students of USM to evaluate the construct validity and reliability of USM-MT-i. Inclusion criteria includes all such group of students. The sample size estimation was founded on sample to variable (N:p) ratio of 3:1 (42). Since there were 44 items in the initial questionnaire, the sample size desired was 132. After adding 10% non-response rate, the desired sample size was 134. The early phase of such students was employed as population of the study through convenient sampling technique. Before responding the questionnaire, respondents were informed about the background of the study (e.g. research objectives). Informed consent was taken from the possible respondents. Data was collected using a self-guided questionnaire. Ethical approval for this study was obtained from the School of Medical Sciences and Human Ethical Committee of USM.

Statistical Analysis

Item level characteristics of each item were evaluated by descriptive statistics to examine floor and ceiling effect of each item. To

determine the construct validity of the items, the exploratory factor analysis (EFA) was conducted. Kaiser-Meyer-Olkin and Bartlett's Test of Sphericity were measured to examine the partial relationship amongst items as a suggestive of sample adequacy. Dimensionality of USM-MT-i was assessed by evaluating number of domains by Eigenvalues and scree plot. Based on the number of domains, item selection for each domain was made based on communalities, correlation and factor loading values. Item with factor loading of <0.5 and communalities of <0.3 were rejected. Cronbach's alpha internal consistency reliability analysis was utilised to measure the reliability of each domain of USM-MT-i. All data entry and statistical analysis process were conducted using IBM SPSS Version 24.0.

RESULTS

A total of 208 of the USM medical students of the early phase participated in the study. There were females (69.7%) and males (30.3%), Malays (72.1%), Year 1 (59.1%) and majority of them were from the matriculation stream prior to entry (47.1%). In terms of origin, 76% came from urban area, 99% stay at university hostel and 56.7% were not scholarship holders (Table 1).

Table 2 showed that the mean score for 44 items range from 2.60 to 4.60 with no floor or ceiling effect. EFA revealed that the initial solution showed Kaiser-Meyer-Olkin value of 0.919 and Bartlett's Test of Sphericity was significant [χ^2 (9275.424) = 990, $P < 0.001$] suggestive of sample adequacy for factor analysis. Eigenvalues and scree plot showed that these items

Table 1: Profile of participants (n = 208)

Variables	Frequency (%)
Gender (n = 208)	
Male	63 (30.3)
Female	145 (69.7)
Ethnic (n = 204)	
Malay	150 (72.1)
Chinese	24(12.5)
Indian	26(11.5)
Others	4 (1.9)
Year of study (n = 208)	
Year 1	123 (59.1)
Year 2	85 (40.9)
Qualification (n = 206)	
High school certificate	5 (2.4)
Matriculation	98 (47.1)
Science foundation programme	68 (32.7)
Others	35 (16.8)
Origin (n = 208)	
Urban	158 (76.0)
Rural	20 (34.0)
Status of accommodation (n = 208)	
Hostel	206 (99.0)
Non-hostel	2 (1.0)
Scholarship (n = 208)	
Yes	90 (43.3)
No	118 (56.7)

consisted of more than one factor. For that reason, we conclude that the items were not uni-dimension. Varimax Schedule Rotated Component Matrix showed that the items shaped three dimensions which predicted 58.95% of variants of dependent variables (53.41% for Factor 1 and 43.16% for Factors 2 and 3). Five items were rejected chronologically due to factor loading of <0.5 constructing 40 items remain in the final investigation with factor loading range from 0.50 to 0.87.

The 39 items can be accumulated under the construct of academic leadership (19 items), communication skills (12 items) and examination competence (8 items). Factor loading for each domain ranges from 0.50 to 0.77 for academic leadership, 0.51 to 0.80 for communication skills and 0.65 to 0.87 for examination competence. Cronbach's alpha internal consistency reliability of the final USM-MT-i was 0.95 for academic leadership, 0.93 for communication skills and 0.92 for examination competence. The overall Cronbach's alpha for the final version of USM-MT-i was 0.96. Table 3 depicted the construct validity and reliability of the final version of USM-MT-i

DISCUSSION

The population profile of the present study consistent with the background of the Malaysian medical students different ethnicity, origin and gender. Thus, these landscapes can be considered as

Table 2: Item level descriptive analysis for USM early phase of medical students' mentoring inventory (n = 208)

Items	n = 208 (%)					Mean	SD
	Extremely not needed	Not needed	Less needed	Needed	Extremely needed		
1	5 (2.4)	20 (9.6)	35 (16.8)	71 (34.1)	77 (37)	3.94	1.07
2	21 (10.1)	52 (25)	69 (33.2)	44 (21.2)	22 (10.6)	2.97	1.14
3	29 (13.9)	38 (18.3)	57 (27.4)	52 (25)	32 (15.4)	3.10	1.27
4	31 (14.9)	49 (23.6)	51 (24.5)	40 (19.2)	37 (17.8)	3.01	1.32
5	27 (13)	47 (22.6)	54 (26)	54 (26)	26 (12.5)	3.02	1.23
6	14 (6.7)	23 (11.1)	52 (25)	71 (34.1)	48 (23.1)	3.56	1.16
7	14 (6.7)	29 (13.9)	41 (19.7)	75 (36.1)	49 (23.6)	3.56	1.19
8	11 (5.3)	17 (8.2)	49 (23.6)	66 (31.7)	65 (31.3)	3.75	1.14
9	19 (9.1)	38 (18.3)	58 (27.9)	56 (26.9)	37 (17.8)	3.26	1.21
10	32 (15.4)	46 (22.1)	56 (26.9)	36 (17.3)	38 (18.3)	3.01	1.32
11	19 (9.1)	36 (17.3)	59 (28.4)	54 (26)	40 (19.2)	3.29	1.22
12	26 (12.5)	37 (17.8)	54 (26)	55 (26.4)	36 (17.3)	3.18	1.27
13	12 (5.8)	18 (8.7)	49 (23.6)	64 (30.8)	65 (31.3)	3.73	1.16
14	12 (5.8)	15 (7.2)	57 (27.4)	72 (34.6)	52 (25)	3.66	1.11
15	11 (5.3)	17 (8.2)	62 (29.8)	67 (32.2)	51 (24.5)	3.63	1.10
16	35 (16.8)	45 (21.6)	69 (33.2)	37 (17.8)	22 (10.6)	2.84	1.21
17	45 (21.6)	56 (26.9)	63 (30.3)	26 (12.5)	18 (8.7)	2.60	1.20
18	37 (17.8)	40 (19.2)	66 (31.7)	41 (19.7)	24 (11.5)	2.88	1.25
19	18 (8.7)	25 (12)	44 (21.2)	52 (25)	69 (33.2)	3.62	1.29

(*Continued on next page*)

Table 2 (*Continued*)

Items	n = 208 (%)					Mean	SD
	Extremely not needed	Not needed	Less needed	Needed	Extremely needed		
20	16 (7.7)	22 (10.6)	61 (29.3)	76 (36.5)	33 (15.9)	3.42	1.11
21	14 (6.7)	24 (11.5)	53 (25.5)	86 (41.3)	31 (14.9)	3.46	1.09
22	19 (9.1)	32 (15.4)	55 (26.4)	66 (31.7)	36 (17.3)	3.33	1.20
23	25 (12)	39 (18.8)	62 (29.8)	50 (24)	32 (15.4)	3.12	1.23
24	19 (9.1)	30 (14.4)	54 (26)	73 (35.1)	32 (15.4)	3.33	1.17
25	19 (9.1)	24 (11.5)	49 (23.6)	61 (29.3)	55 (26.4)	3.52	1.25
26	19 (9.1)	31 (14.9)	57 (27.4)	65 (31.3)	36 (17.3)	3.33	1.19
27	25 (12)	30 (14.4)	74 (35.6)	56 (26.9)	23 (11.1)	3.11	1.15
28	15 (7.2)	30 (14.4)	49 (23.6)	58 (27.9)	56 (26.9)	3.53	1.23
29	16 (7.7)	31 (14.9)	47 (22.6)	56 (26.9)	58 (27.9)	3.52	1.25
30	13 (6.3)	29 (13.9)	29 (13.9)	60 (28.8)	77 (37)	3.76	1.26
31	9 (4.3)	16 (7.7)	31 (14.9)	46 (22.1)	106 (51)	4.08	1.16
32	4 (1.9)	19 (9.1)	32 (15.4)	48 (23.1)	105 (50.5)	4.11	1.09
33	8 (3.8)	12 (5.8)	36 (17.3)	57 (27.4)	95 (45.7)	4.05	1.10
34	2 (1)	5 (2.4)	25 (12)	44 (21.2)	132 (63.5)	4.44	0.87
35	6 (2.9)	9 (4.3)	20 (9.6)	61 (29.3)	111 (53.4)	4.27	1.00
36	6 (2.9)	7 (3.4)	20 (9.6)	48 (23.1)	127 (61.1)	4.36	0.99
37	3 (1.4)	4 (1.9)	11 (5.3)	56 (26.9)	134 (64.4)	4.51	0.80
38	0 (0.0)	5 (2.4)	12 (5.8)	49 (23.6)	142 (68.3)	4.58	0.71
39	0 (0.0)	4 (1.9)	10 (4.8)	51 (24.5)	143 (68.8)	4.60	0.67
40	14 (6.7)	16 (7.7)	63 (30.3)	74 (35.6)	41 (19.7)	3.54	1.10
41	15 (7.2)	22 (10.6)	64 (30.8)	73 (35.1)	34 (16.3)	3.43	1.11
42	22 (10.6)	30 (14.4)	58 (27.9)	62 (29.8)	36 (17.3)	3.29	1.22
43	20 (9.6)	24 (11.5)	61 (29.3)	54 (26)	49 (23.6)	3.42	1.24
44	17 (8.2)	21 (10.1)	53 (25.5)	67 (32.2)	50 (24)	3.54	1.20

representative of the Malaysian medical students' characteristics. Dimensionality is associated with consistency of the items. It can be considered as the number of mutual features required to account for the association among them. In this study, EFA was utilised to determine dimensionality of the inventory.

The EFA revealed that the outcome with 39 items are applicable with the medical students' need of mentoring services (17). Interestingly, the emergence of these; academic leadership, communication skills, and examination competence with all the items loading factor more than 0.5 are aligned with the nature of mentoring service for such group (17). Therefore, all the constructs established were independent of each other which is aligned with the theories of higher education students' challenges. Apart from that, these items are able to measure the real issues faced by such group of students. Consequently, this inventory can be considered as a valid instrument to be applied to evaluate the mentoring service among the early phase of Malaysian medical students.

Table 3: Construct validity and internal consistency reliability for final version of USM early phase of medical students' mentoring inventory (n = 208)

Dimenson	Item	Question	Factor loading	Cronbach's alpha	Overall Cronbach's alpha
Academic leadership	26	I need a guide for conducting a group discussion	0.77		
	21	I need a guide for designing the input of presentation	0.76		0.96
	25	I need a guide for handling oral presentation	0.75		
	20	I need a guide for laying out the material of presentation	0.73		
	13	I need a guide for managing organisation	0.71		
	22	I need a guide for adjusting language of presentation	0.70		
	27	I need a guide for deciding the optimum number of my group mate	0.69		
	23	I need a guide for handling eye contact during presentation	0.68		
	14	I need a guide for promoting vision and mission of organisation	0.67	**0.958**	
	15	I need a guide for controlling sub-ordinate	0.67		
	44	I need a guide for preparing a good assignment	0.63		
	43	I need a guide for searching information skills	0.63		
	24	I need a guide for conducting questionnaire and answer sessions	0.62		
	30	I need a guide for summarising lecture notes	0.61		
	29	I need a guide for drawing mind maps	0.59		
	28	I need a guide for taking lecture notes	0.57		
	31	I need a guide for understanding and remembering lecture notes	0.56		
	41	I need a guide for developing an academic peer support group	0.54		
	16	I need a guide for understanding my lecture's language	0.50		

(*Continued on next page*)

Table 3 (*Continued*)

Dimenson	Item	Question	Factor loading	Cronbach's alpha	Overall Cronbach's alpha
Communication skill	12	I need a guide for cooperating with group work	0.80		
	10	I need a guide for respecting group members	0.79		
	3	I need a guide for managing my time for self-care	0.78		
	9	I need a guide for being a good group follower	0.76		
	4	I need a guide for managing my time for my family	0.76	**0.937**	
	11	I need a guide for accepting and giving ideas in a group work	0.74		
	5	I need a guide for managing my time for social life	0.74		
	6	I need a guide for conducting a group work	0.64		
	7	I need a guide for leading a group work	0.62		
	2	I need a guide for managing my time for co-curriculum	0.58		
	8	I need a guide for being a good group leader	0.56		
	17	I need a guide for understanding my colleagues' language	0.51		
Examination competence	38	I need a specific technique in answering examination format of short essay questions (SEQ)	0.87		
	37	I need a specific technique in answering examination format of scenario-based questions (SBQ)	0.85		
	39	I need a specific technique in answering examination format of objective structured clinical examinations (OSCE)	0.84		
	36	I need a specific technique in answering examination format of single best answer (SBA)	0.84	**0.929**	
	34	I need a specific technique for scoring good marks	0.79		
	35	I need a specific technique in answering examination format of multiple true false (MTF)	0.71		
	33	I need a guide for understanding the topic's learning outcomes	0.70		
	32	I need a guide for managing my time in examination	0.65		

Since the reliability values of the USM-MT-i was high internal consistency (overall Cronbach's alpha of 0.967) which is considered as a good reliability value (43), it has promised a credible instrument in examining the medical students' needs of mentoring service. Four validated dimensions found in the inventory have become extra domains for the current instruments. Emergence of communication, self-leadership and learning skills domains are significant to challenge issues faced by the early phase of medical students in helping them to proceed their medical training journey smoothly. The evidence of previous studies on the importance of helping service and better instruments to measure mentoring needs are consistent with the findings of the present study (12–13, 44). Despite the emergence of the previous results, this study has its limitation. Since the study involved a single medical school in Malaysia, the results might be inappropriate to generalise all the Malaysian medical students. Thus, it is suggested to invite other Malaysian medical schools to conduct such study. By doing this, the results will become more valid and credible.

CONCLUSION

The USM-MT-i promised a good index of validity and reliability. It is a valid and reliable instrument to assess the needs of mentoring services among the early phase of Malaysian medical students.

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