ORIGINAL ARTICLE

Validation of Course Interest Survey Tool in MBBS Students of a Private Medical College of Pakistan

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ABSTRACT

Objective: The study was conducted to determine the reliability and validity of Course Interest Survey tool to measure motivation of MBBS students in Pakistan.

Study Design: Quantitative cross-sectional study.

Place and Duration of Study: The study was conducted at Women Medical College Abbottabad, from 17th October 2014 to 30th August 2015.

Materials and Methods: Simple random sampling by lottery method was used to collect data from three hundred students. Each student from all five years of MBBS was assigned a numerical number. The numbers were written on a piece of paper and placed in a box and mixed. A researcher blinded to the procedure randomly selected the required number of students. Course interest survey form was distributed to the randomly selected students at the end of term and data was collected. Ethical approval of the study was received. Reliability was determined by Cronbach's alpha, and validity of the tool was determined by factor analysis on IBM SPSS software version 22.

Results: All the students were females between the ages of eighteen and twenty-four years. The participants had diverse cultural background. The Cronbach's alpha for the CIS scale and its subscales Attention, Relevance, Confidence and Satisfaction were α=0.86, 0.75, 0.75, 0.24 and 0.69 respectively. The overall Kaiser-Meyer-Olkin was 0.88. Factor Analysis with varimax rotation revealed four components explaining 51% of the total variance.

Conclusion: Course interest Survey is a reliable and a valid tool to measure motivation of MBBS students in a private medical college of Pakistan. Results of Women Medical College cannot be generalized to all the medical colleges.

Key Words: *ARCS Model, Course Interest, Medical Students and Motivation, Motivation, Valid Motivational Tool and Medical Students.*

Introduction

Motivation is derived from the Latin root word "motive" which means "to move and is a goal directed activity.[1] Many theories of motivation have been mentioned in the literature focusing on a specific aspect. Amongst these, ARCS Model of Instructional Design provides a synthesis of the different theories and attempts to present a holistic view of motivation.[2] The acronym ARCS stand for Attention, Relevance, Confidence, and Satisfaction. According to this theory attention is the ability to grab interest. It has three types "Perceptual Arousal", "Inquiry arousal" and "Variability". Relevance is the relationship of the content to things that are important to the learners and is achieved by "Goal Orientation", "Motive Matching" and "Familiarity".[2] According to Bandura, highly self-efficacious people believe they have control over their ability to be successful.[3] Confidence is this positive expectation for success. Keller provides three ways to inculcate confidence. "Learning Requirements", "Positive Consequences" and "Personal Responsibility"[2] Satisfaction refers to the contended feelings of learners about their learning experience.[4] There are three strategies to increase satisfaction; "Intrinsic Reinforcement", "Extrinsic Rewards" and "Equity".[2] Motivation based on this theory has been studied in business, psychology, philosophy, music, patients and technology enhanced courses.[5,6,7,8] All of these studies advocate manipulation of motivation through instructional design. Literature searched on the Pub Med, Pub Med Central, Biomed Central and World Wide Web with the search engine Google

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revealed one hundred and twenty articles for a valid motivation measurement tool and medical students. No study was found on a validated motivational tool to determine motivation of medical students in MBBS course. CIS tool, based on this model has provided evidence of reliability, and non-construct based validity of motivation. However, despite evidence of validity of CIS internationally in different contexts, there is no empirical evidence to show that CIS is a reliable and valid tool to measure learner motivation for medical students. The purpose of this study was to determine reliability and validity of Course Interest Survey instrument among MBBS students. This study is significant because a valid CIS tool can be used for diagnosing motivational profiles of medical students and to develop strategies to improve motivation.

Materials and Methods

This study was a part of a quantitative, cross sectional study carried out at Women Medical College Abbottabad from October 2014 to August 2015. Expecting an overall rate of return of seventy percent, a random sample of three hundred students was generated from a list of MBBS students of all five years by simple random sampling. Ethical approval for the study was received. Study participants were female MBBS students aged eighteen to twenty-four years with diverse ethnic and cultural background. The survey forms were distributed to the randomly selected students at the end of their first term examination. Two hundred and twenty completed Course Interest Survey forms (CIS) with no missing data and filled up consent form were included in the study those not meeting these criteria were excluded. Sample size was adequate for Principal Component Analysis for which a general rule is that sample should be 5 times the number of variables.[9] Content relevance, detailed in Keller was taken as evidence of content validity of CIS scale. CIS has thirty-four items divided among the four subscales: Attention (eight items), Relevance (nine items), Confidence (eight items) and Satisfaction (nine items). Five options were given for each item which were scored as "1=not true, 2= slightly true, 3= moderately true, 4= mostly true, 5= very true". The minimum score was 34 and maximum was 170 with a midpoint of 102. The minimum, maximum and midpoints of subscales vary because these do not have equal number of questions. Questions 4, 26, 8, 25, 6, 11, 17, 7 and 31 are stated negatively. These items were reversed in calculations as 5=1, 4=2, 3=3, 2=4, and 1=5. The data was analyzed using IBM SPSS software version 22. Descriptive statistics, Cronbach's alpha for reliability and factor analysis for validity were carried out.

Results

The Mean score of the thirty-four item CIS scale was 119.2±15.8 standard deviation, and mean scores on its subscales were; Attention 25.1±5.8, Relevance 35.60 ±5.07, Confidence 27.7±3.5 and Satisfaction 30.85±5.1 standard deviation. None of the questions were rated at the extreme as not true and very true. Questions 9, 10, 6, 7, 8, 11, 17 and 25 had correlations of 0.2. Questions 6, 7, 17 were also negatively correlated after reversing the coding. The remaining questions had Correlation > 0.2 (Table 1).

Table I: Summary of Items with Low Item to Total Correlations and Squared Multiple Correlation as Proportion of CIS Scale and Subscale

Scale and Subscales	Question number	Corrected item total correlation	Squared multiple correlation	Squared multiple correlation as percentage	Cronbach's
CIS scale Cronbach's alpha=0.863	9	.20	.32	31.5%	.863
	10	.23	.43	42.9%	.862
	6	-.18	.28	28.3%	.873
	7	-.15	.32	31.6%	.869
	8	.23	.35	35.4%	.863
	11	.21	.39	39%	.863
	17	-.01	.22	21.9%	.868
	25	.21	.35	35.1%	.863
Confidence Cronbach's alpha=0.240	3	.37	.38	37.9%	.859
	6 reverse	-.18*	.28	28.3%	.873*
	9	.18*	.086	8.6%	.863
	11reverse	.21*	.39	39%	.863
	17reverse	-.01	.22*	21.9%	.868*
	27	.48	.26	26%	.857
	30	.42	.38	38%	.858
	34	.43	.39	39%	.857
Attention	10reverse	.23*	.43	42.9%	.862
Relevance	8reverse	.24*	.35	35%	.863
	25reverse	.21*	.35	35%	.863
Satisfaction	7reverse	-.146	.32	32%	.869*

Principal Component Analysis generated a correlation matrix, which showed that Questions 4, 6, 7, 8, 9, 11, 17, 25, 26 and 31 had small correlations < 0.3 because of insufficient common variance leading to as many factors as items and were not considered for further analysis (Pett, Lackey & Sullivan, 2003). The suitability of Principal Component Analysis (PCA) for the remaining 24 questions was assessed. Inspection of the correlation matrix showed that the remaining 24 questions had at least one correlation coefficient greater than 0.3. The overall Kaiser-Meyer- Olkin (KMO) measure was 0.88, meeting KMO 'middling' criteria suggesting that sample size is adequate relative to number of items in the CIS scale. The Individual KMO values for Questions 33 and 34 were highest and "meritorious" at 0.84 and 0.88 according to KMO criteria. Individual KMO for Questions 14 and 19 was > 0.7. It was > 0.6 for Questions 3, 10, 15, 18, 21, 32. KMO > 0.5 was found for Questions 1, 2, 5, 12, 22, 23 and 28. For Questions 16, 19, 20, 21and 24 KMO was >0.4. Question 24 had the lowest KMO value of 0.38. KMO value below 0.6 suggests that the sample size is small or inadequate for individual item analysis. Bartlett's test of sphericity was statistically significant ($p < .000$), indicating that the data can be factorizable. PCA revealed five components that had Eigenvalues greater than one and which explained 29.21%,10.18%, 6.31%, 5.75% and 4.39 % of the total variance for components 1, 2, 3, 4 and 5, respectively. First four components contributed 5 to 10% of total variance were retained. Cumulative percent of five components contributes 55% variance. Visual inspection of the scree plot (Fig 1) indicated that four components should be retained.

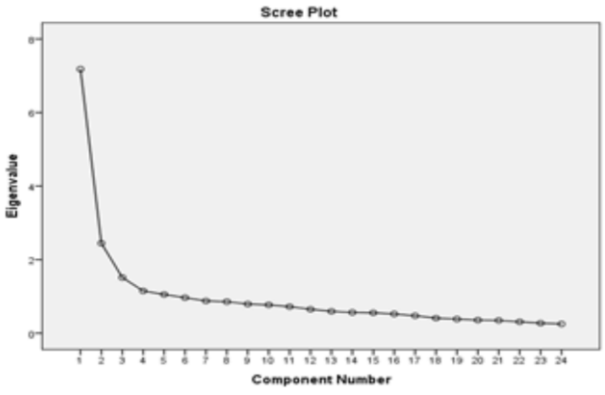

Fig 1: Scree Plot

A Varimax orthogonal rotation revealed four components (Table II). These four components explained 51% of the total variance. Component 1 comprised of Questions 1 to 7 (Table II). Questions 1, 2, 3, 5 and 7 of this component were from the Attention subscale. The loadings of these questions were 0.82, 0.78, 0.64, 0.60 and 0.51 respectively. Loadings of Questions 4 and 6, originally from the Relevance subscale were 0.63 and 0.55 in that order. Component 2 comprised of Questions 8 to 16 (Table II). Questions 8, 9, 10 and 16 were from Satisfaction subscale. Questions 12, 13, 14 were from Relevance subscale. Question 15 was from Attention subscale of CIS scale. Question 11 was from Confidence subscale. The loadings of Questions 8, 9 were excellent at 0.77 and 0.75 respectively. Question 10 had a loading of 0.63 and Question 16 had a loading of 0.30 for the second Component. Loading of Question 11 was 0.50. Remaining questions had loadings of 0.34 (Q16), 0.42 (Q15), 0.46 (Q14), 0.46 (Q13), and 0.47 (Q12). Component 3 consisted of Questions 17 to 21 of the rotated component matrix. Question 17 and 18 had loadings of 0.68 and 0.65 respectively. These questions were from the Satisfaction subscale. Questions 19 and 20 were from Confidence subscale and had loadings of 0.63 and 0.60 in that order. Question 21 from Satisfaction subscale had a loading of 0.37 on this component. Component 4 comprised of 3 items. Questions 22 and 24 were from the Relevance subscale with excellent to very good loadings of 0.79 and 0.61 on this component respectively. Question 24 from Confidence subscale also had a very good loading of 0.65.

Table II: Rotated Component Matrixa and Communalities of CIS Scale

Questions	1	2	3	4	Communalities
1. The instructor uses an interesting variety of teaching techniques	.828	.133	.172	-.008	0.733
2. The instructor does unusual or surprising things that are	.780	.243	.065	-.005	0.672
3.The instructor creates suspense when building up to a point	.643	.152	.047	-.250	0.501
4.The students actively participate in this class	.633	-.176	.357	.212	0.604

5.The instructor knows how to make us feel enthusiastic about subject matter of this course	.600	.308	.060	.193	0.495
6.The instructor makes the subject matter of the course seem important	.551	.177	.094	.376	0.485
7.The students in this class seem curious about the subject matter	.512	.060	.324	.151	0.393
8.I feel that this course gives me a lot of Satisfaction	.142	.769	.150	.055	0.637
9.I enjoy working for this Course	.145	.757	.069	.225	0.650
10.I feel satisfied with what I am getting from this Course	.238	.630	.179	.291	0.570
11.I feel confident that I will do well in this course	.115	.500	-.003	.316	0.363
12.The content of this course relates to my expectations and goals	.107	.471	.300	.464	0.539
13.The personal benefits of this course are clear to me	-.030	.463	.395	.297	0.459
14.In this class I try to achieve high standards of Excellence	.295	.460	.200	.265	0.408
15.My curiosity is often stimulated by the questions asked or the problems given on the	.138	.422	.342	.060	0.318
16.I am pleased with the my work compared to how instructor's evaluations of well I	.352	.397	.338	-.027	0.397
17.I feel that I get enough recognition of my work in this course by means of grades, comments, or other Feedback	.127	.029	.680	.172	0.509
18.The amount of work I have to do is appropriate for this type of course	.040	.193	.654	.023	0.467
19.I get enough feedback to know how well I am Doing	.244	.195	.632	-.145	0.518
20.I find the challenge level in this course to be about right: neither too easy nor too hard	.224	-.001	.606	.290	0.502
21.I feel that the grades or other recognition I receive are fair compared to other Students	.107	.238	.375	.116	0.509
22.To accomplish my goals it is important that I do well in this course	.074	.173	.084	.794	0.674
23.As I am taking this class, I believe that I can succeed if I try hard Enough	-.014	.311	.293	.653	0.0.609
24.The things I am learning in this course will be useful to me	.045	.430	.005	.613	0.562

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalizationa. a. Rotation converged in 7 iterations.

Discussion

CIS scale was found as a very reliable tool to measure motivation of medical students in Women Medical College Pakistan. The Cronbach alpha reliability of CIS scale was 0.86 and of the subscales Attention, Relevance, and Satisfaction was 0.78, 0.70 and 0.69 which was acceptable, but reliability of subscale Confidence was 0.24 which is not acceptable (Table I). Reliability of CIS scale would improve if Questions 6, 7, 17 were to be deleted. It would remain the same if Questions 8, 9, 11, 25 were deleted and it would decrease, if remaining items were to be deleted. Reliability of CIS scale reveals homogeneity of the items of the scale but reliability of Confidence Subscale may have been lowered due to random errors or difficulty in item interpretation. Cronbach's alpha of 0.86 for CIS scale in this study is comparable to the previous study[2] which had a reliability of 0.95 for the CIS scale. Reliability for the subscale Attention was an acceptable 0.75 compared to 0.84, Relevance was acceptable at 0.70 compared to 0.84, Confidence was low at 0.24 in comparison to previous 0.81 and Satisfaction was minimally acceptable 0.69 compared to previous 0.88, respectively. Another study on motivation for an anatomy course had reliabilities of 0.86, 0.82, 0.88, 0.87 and 0.96 for attention, relevance, confidence, satisfaction and the overall scale respectively.[10] Another tool developed on the four constructs also provided evidence of construct validity evidence. CIS has a valid four factor structure to measure

motivation of medical students in a women only medical college in Pakistan. Another study found that males had more interest in medical courses compared to females.[11] Two factors matched very well with Attention and Satisfaction and two with a different combination of items compared to the original model. Random error affects both reliability and validity and may be the reason where no reliable correlations were determined for Confidence Subscale.[12] Reliability analysis identified three items in CIS scale creating ambiguity in analysis which lowered the reliability of the scale (Table I). The key themes of these items can be discussed in light of the attribution theory, self-efficacy, and locus of control. For question 6 "You have to be lucky to get good grades in this course" 39.1% students agreed that it was moderately to very true. Most participants attributed getting good grades to an external uncontrollable factor "luck". Outcomes viewed as uncontrollable promote anxiety and avoidance, whereas those under control lead to increased effort and persistence. However, 28% students did not think that "they have to be lucky to get good grades in class". For question 17 "It is difficult to predict what grade the instructor will give my assignment", 27% students agreed that it was moderately true to predict what grade the instructor will give them. Twenty two percent of the students participating in this study did not agree that they can predict what grade the instructor will give them. This may either be due to the reason that students consider the tasks to be too difficult or attribute it to the examiner which are external factors not within the control of learner.[13] The remaining 78% participants thought that they can predict what grade the instructor will give them. Confidence of students is lowered because they may be attributing their performance to luck, task difficulty and low ability cues which they might have received from their teachers, colleagues or based on their past performances in examinations[14] For question seven, "I have to work too hard to succeed in this course," two-thirds of the students did not think that hard work is required to be successful in a course, and in terms of Attribution Theory, these students are confident that that they can pass the examination without "effort" which is an internal, stable attribute within the control of the learner. Motivational issues can be identified by poorly performing items in CIS scale by Attribution Theory, Self-Efficacy Theory, and Locus of Control[13] for the Confidence category of ARCS model. The Relevance subscale items have their theoretical basis in Hulls, Tolman, Lewin, Maslow's Hierarchy of Needs, Self-determination Theory and Flow Theory.[15] However, a study conducted in Turkey did not identify a relationship between self efficacy and academic performance though self efficacy of males was found to be more than that of females.[16] Attention is a synthesis of several related theories, including Arousal Theory, Curiosity, Boredom and Sensation Seeking.[17] Items in Attention and Relevance subscales were not found to decrease reliability. It means the questions in these two subscales reflect the underlying construct as effect indicators. Items in these two subscales can be used to measure subcomponents of motivation. It is expected that deleting these items would increase the reliability of CIS scale and Confidence subscale. Although Relevance subscale had reliability of 0.70, questions 8 and 25 should be considered for removal if this subscale is to be used as stand-alone scale. Reliability of Satisfaction subscale was 0.69. To improve reliability of the Satisfaction subscale, Keller recommends providing clear learning goals with well-defined assessment criteria promoting a sense of fairness and hence Satisfaction.[2] Constructive feedback on effort and performance besides feedback on result, if provided to the students would increase Satisfaction.[18] Questions six, seven and seventeen, eight and twenty-five are negatively worded items and might have made interpretation of the questions difficult. Since questions six, seven and seventeen poorly correlated with CIS scale and subscale Confidence, convergent validity evidence is lacking, but CIS scale correlated with the remaining items. CIS scale has provided reliable measurement in a different culture and context from the one where it was developed also referred to by Keller. Cultural difference may be the reason for different loadings in the four components found on factor analyses compared to the original theoretical construct of ARCS. The Subscales of CIS had strong correlations with each other as well as with CIS scale, indicating that they are measuring the different dimensions of same construct. Component one can be considered to depict the Attention Subscale, Component two

Satisfaction, Component 3 Confidence and Component 4 can be considered to depict Relevance. CIS scale and its subscales are causal indicators reflecting the underlying construct of motivation and hence defining it rather than being defined by the construct. Four factor structure of CIS scale provided construct validity evidence for our cultural context in female medical students.

In our context motivation may be understood differently. Age, maturity of learner, regional cultural context may be the underlying reasons. Item to total correlations were not high, but that does not matter as the items were not expected to be correlated as homogeneity was not the purpose. Motivation is affected by certain factors which cannot be modified. Gender, age, ethnicity, socioeconomic status, personality, year of medical study, are some such factors. Factors like teacher and peer support,[19] self-efficacy,[20,21] autonomy, competence and relatedness[22] are modifiable in learning environment. Factors such as study skills, safety, security, and physical wellbeing may have been confounders[23] in the study.

Limitations of the Study

The results cannot be generalized as it was conducted at a medical college which admits only females. Self-report measures may have introduced bias due to underreporting, over reporting or failing to respond to a question.

Conclusions

Psychometric properties of the tool suggest it is a reliable and valid motivation measurement tool. However, evidence for its educational impact on medical students is lacking. Psychometric testing on mini version of the scale is warranted. Teachers require training in self-efficacy and feedback for increasing confidence and satisfaction of students. Domain of Motivation should be added when designing courses and assessing students, besides the three domains of Bloom's taxonomy. Further studies should be carried out on utility as construct validity is an “ongoing process” that takes place over a number of studies, in a number of ways.[24]

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