Psychometric properties of a questionnaire on medical students' satisfaction with a community health program

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Article Info

ABSTRACT

Changes in the learning modes during the recent COVID-19 pandemic has provided a need to construct a feedback questionnaire to measure medical students' satisfaction with community-based health programs. A total of 551 forms which has a 5-point Likert scale were submitted by the medical students upon concluding the public health program in 2018-2021 (which includes face-to-face and virtual learning). Reliability coefficients were estimated for each factor (domain) with values >0.70. Exploratory factor analysis (EFA) was used to assess the validity of the instrument, using principal components analysis with varimax rotation. EFA identified two factors; the first included 6 items (67.031%) of the total variance, the second explained 4 items (10.114%) and together explained 77.15%. root mean squared error of approximation (RMSEA): 0.074; normed fit index (NFI): 0.975; comparative fit index (CFI): 0.981; incremental fit index (IFI): 0.981; goodness of fit index (GFI): 0.956; Tucker Lewis index (TLI): 0.972. The overall students' satisfaction had a Cronbach's alpha test of 0.945 with a 95% confidence interval (0.938-0.952), and a reliability using Guttman Split-Half for overall was 0.894. Students' satisfaction questionnaire with the public health program has a good reliability and validity in contrasting educational situations and it is worthwhile to include as part of the quality improvement.

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1. INTRODUCTION

The recent COVID-19 pandemic has resulted in a global rapid and unforeseen changes in the modes of learning at health educational institutions where the teaching approaches have shifted back and forth from face-to-face to virtual learning strategies [1]–[4]. Students' satisfaction and expectations with their learning experiences are key indicators for quality improvement and the evaluation of any educational endeavor in higher educational institutions [5]. A need exists for a tool that could be employed to ensure the successful achievement of the learning goals in such diverse situations (face-to-face, virtual or hybrid), particularly in field-based community health activities [6], [7].

The College of Medicine and Medical Sciences (CMMS) at the Arabian Gulf University (AGU), Kingdom of Bahrain has compulsory community health activities as part of its medical curriculum [1]. Public health program is a fundamental component of these community-based activities [8]. Students' feedback data

has been continuously collected before the COVID-19 pandemic (face-to-face) as well as during the virtual transformation phase [1]. Thus, an opportunity has risen to develop and assess a valid and reliable instrument [9]–[13] that can be applied to measure students' satisfaction with public health activities in these contrasting learning environments.

This study aimed to examine the psychometric properties of a feedback questionnaire that was developed by CMMS-AGU seeking students' satisfaction towards the public health program. This community health field activity was conducted as real visits until the start of the COVID-19 pandemic where the activity has been transformed into virtual format. Accordingly, the public health program was changed from face-to-face into online [1]. It is hoped that this scientific effort will provide higher health educational institutions with a trustworthy tool that could be applied in diverse learning scenarios to measure students' satisfaction and expectations from community-based health programs.

2. METHOD
2.1. Study population
An online self-administered questionnaire (instrument) seeking feedback upon completing a community-based program in the period 2018-2021 (which includes face-to-face and virtual learning) was developed and assessed. The total collated data yielded a sample of 551 forms. The students' feedback questionnaire, comprising of 10 items. Researchers ensured that the instrument text was clear and reflect the students' satisfaction. Public health expert's opinion from within CMMS was sought about the items in the feedback forms as an indicator of face and content validity. Those questions were categorized into two domains, communicable diseases/food safety control and consumer products safety. The response options of the questionnaire items adopted a 5-point Likert scale.

2.2. Validity and reliability
Construct validity was evaluated using a maximum likelihood exploratory factor analysis and confirmatory factor analysis. For the verification of the reliability of the instrument, the internal consistency of the items is usually examined using Cronbach's alpha and split-half coefficients.

2.3. Statistical analysis
The mean and standard deviation were calculated for the continuous variables. Cronbach's Alpha and Guttman Split-Half coefficients were used to assess the internal consistency for the 10 items for the 551 participants. Reliability coefficients were estimated for each factor (domain) with values >0.70 (acceptable reliability). In addition, Pearson's correlation coefficient was used. The validity of the instrument was assessed by exploratory factor analysis (EFA), using principal components analysis with varimax rotation for factors that have eigen values above 1 [14]–[16].

Confirmatory factor analysis (CFA) using structural equation modeling was employed to investigate construct validity. Several fit indices were selected to find out which CFA model best represents the current data set: Chi-square/degree of freedom (CMIN/DF), comparative fit index (CFI), Tucker Lewis index (TLI), Normed Fit Index (NFI), incremental fit index (IFI), goodness of fit index (GFI) and the root mean squared error of approximation (RMSEA). The acceptable thresholds for the goodness of fit indices were based on the table published in [17]. A p-value <0.05 was considered as statistically significant. The research and ethics committee of the CMMS at AGU (approval number: E43-PI-1-22, dated 27.1.2022).

3. RESULT
3.1. Reliability
3.1.1. Internal consistency
The Cronbach's alpha of overall student feedback was 0.945 with a 95% confidence interval (0.938-0.952). The alpha coefficient for the first and second domains were 0.931 and 0.926 respectively. The results related to the reliability using Guttman Split-Half showed that the reliability for overall was 0.894, and for the two domains were 0.916 and 0.850 respectively [18], [19].

3.2. Validity
3.2.1. EFA
Table 1 presents the correlation matrix between the items, Bartlett's sphericity and kaiser-meyer-olkin (KMO) tests were used. The correlation matrix between the 10 items was acceptable (p-value <0.01). The KMO was 0.926. The EFA using principal components method for the 10 items of the student's is presented in Table 2. Two factors with eigenvalue greater than 1 were found. The numeric values of the two

Eigen values 6.703 and 1.011 for the first and second factor respectively as presented in Figure 1. The component plot in rotated space as shown in Figure 2 showed the two factors, the first factor accounted for 67.031% of the total variance, and it included 6 items (items 5 to 10) with factor loadings >0.40. The second factor accounted for 10.114% of the variance, and it included 4 items (items 1 to 4). The combined factors explained 77.15% of the variance of medical student's satisfaction with the public health program.

Table 1. Correlation matrix between the items of the medical student's feedback about public health program

Items	Item1	Item2	Item3	Item4	Item5	Item6	Item7	Item8	Item9	Item10
Item1	1	0.80[a]	0.78[a]	0.73[a]	0.57[a]	0.55[a]	0.55[a]	0.59[a]	0.59[a]	0.59[a]
Item2		1	0.77[a]	0.75[a]	0.56[a]	0.54[a]	0.54[a]	0.58[a]	0.61[a]	0.58[a]
Item3			1	0.79[a]	0.54[a]	0.59[a]	0.55[a]	0.58[a]	0.60[a]	0.61[a]
Item4				1	0.53[a]	0.53[a]	0.57[a]	0.59[a]	0.60[a]	0.64[a]
Item5					1	0.72[a]	0.81[a]	0.66[a]	0.62[a]	0.63[a]
Item6						1	0.73[a]	0.54[a]	0.59[a]	0.60[a]
Item7							1	0.65[a]	0.64[a]	0.65[a]
Item8								1	0.77[a]	0.74[a]
Item9									1	0.77[a]
Item10										1

Note: [a] Indicates correlation statistically significant p<0.01

Table 2. EFA results for the 10 items of the instrument (n=551)

| Item #	Item description	Factor 1	Factor 2
	Factor loading		
1	Consumer products safety regulations & registration program		0.833
2	Examine the safety and quality of products, monitor compliance to standards		0.848
3	Control & supervise product consignments imported through ports		0.844
4	Field inspection programs on premises related to consumer products		0.820
5	Notification of diseases in Bahrain	0.848	
6	WHO surveillance guidelines	0.761	
7	Control of communicable diseases	0.854	
8	Food safety Rules and regulations	0.733	
9	Inspection of food premises	0.718	
10	Prevention and control of food borne diseases	0.716	
Eigen value		6.703	1.011
Variance explained (%)		67.031	10.114
Total variance explained (%)		77.15	
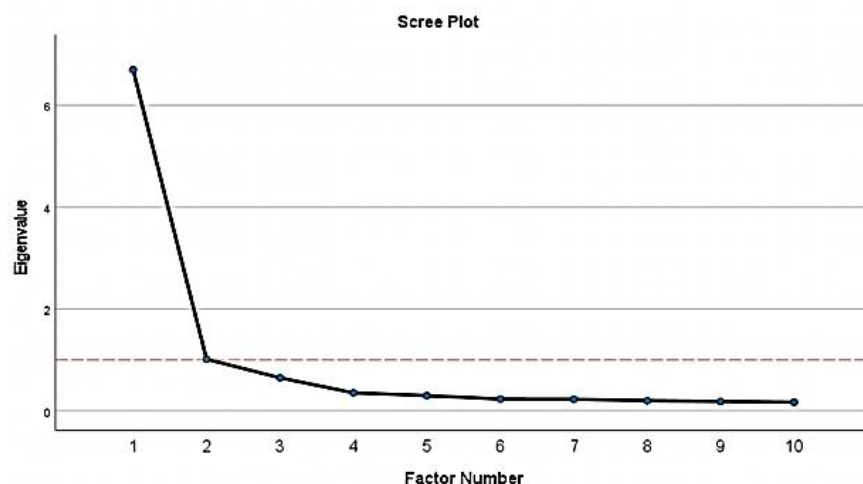
Figure 1. Scree plot of EFA. The numeric values of the first two eigen values, with associated % variance explained in parentheses factor 1=6.703 (67.03%), factor 2=1.011 (10.114%)

3.2.2. CFA

CFA was used to investigate construct validity of 10 items (instrument) according to the fit indices. The results showed that the two factor (domain) structure of the 10 items (instrument) produced an acceptable fit index ($\chi2$ =123.334, DF=31, CMIN =3.979) which was less than 5, (CFI)=0.981; (NFI)=0.975;

(IFI)=0.981; (GFI)=0.956; (TLI)=0.972 supported acceptable fit of the model. Further evidence of the model fit comes from the RMSEA=0.074, which was less than 0.08 (<8 considered good fit) show in Figure 3.
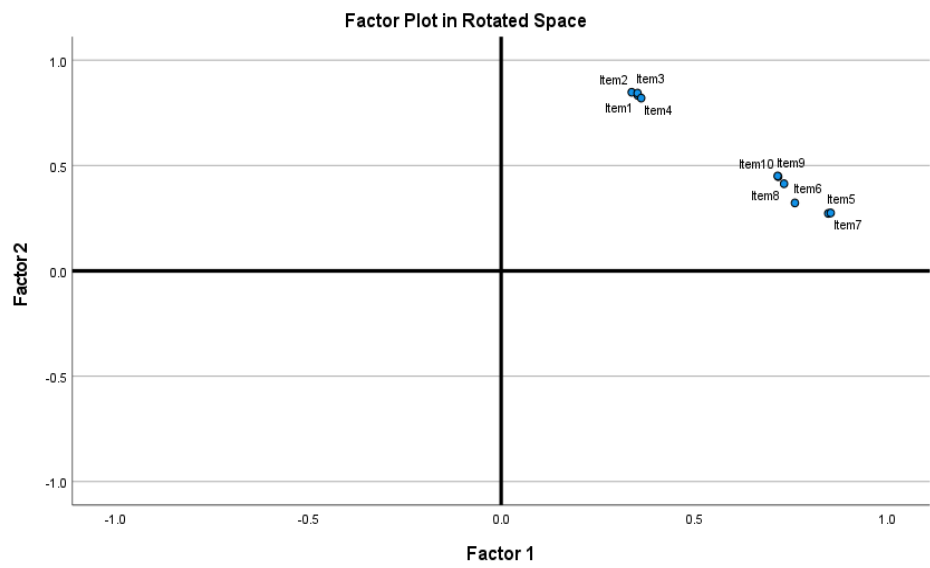

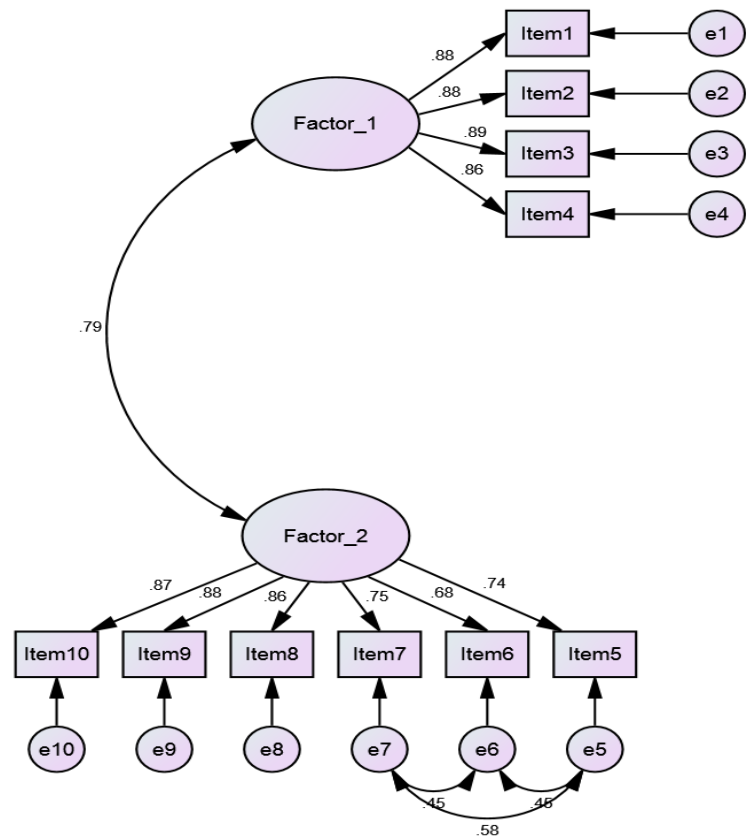Figure 2. Component plot in rotated space with remaining 10 item indicating two factors

Figure 3. Confirmatory factor model for the two factors

4. DISCUSSION

The recent transformation of the learning modes due to the COVID-19 pandemic have attracted global attention since it has resulted in changes that are unlikely to revert to the pre COVID-19 era [20], [21]. This new reality necessitates the construction and maintenance of assessment techniques to ensure the continued effectiveness of the academic educational programs or activities [22], [23]. Published studies from academic programs such as engineering and hospitality have developed instruments that can effectively measure learners' satisfaction with field programs in diverse learning situations where programs may have been transformed from real to virtual visits and vice versa [24]–[27]. However, lack of such tools in the medical field, particularly in community health programs remains a challenge for health academic institutions as they thrive to ensure the continuity of educational packages.

Our study has assessed the psychometric properties of an instrument for measuring medical students' satisfaction towards a public health program among medical students at AGU, Kingdom of Bahrain. The validity and reliability of this instrument are good which makes it suitable for measuring the satisfaction of medical students with public health programs, even in situations of two or more diverse learning scenarios (face-to-face, virtual or hybrid).

Moreover, the results related to the CFA provided an acceptable fit to a two-factor model in the medical student's sample, the chi-square test of model fit ($\chi2=123.334$, $p>0.05$). In addition, the EFA showed the presence of two factors with an eigen value greater than 1, explaining 77.15% of the variance of medical student's satisfaction about public health program. The Cronbach's alpha coefficient revealed that the reliability of the total items and two factors of field visits activity was 0.945, 0.931, and 0.926, respectively. Further, the internal consistency of the overall and two factors using the Guttman Split-Half were 0.894, 0.916 and 0.850 respectively, suggesting that the instrument has a good reliability [17].

It is widely acknowledged that students' educational achievements are closely linked to their method of learning [28], [29]. Senior students at graduate educational levels, just like those in junior levels of schooling are dazzled with their scores at the end of the program courses. It is not surprising then to find out that students corelate in their minds their academic educational achievements with their exam marks which in turn nessicitates that educational institutes should develop credible instruments to mesure academic performance. Further, this has major implications for institutional accreditation [30]. Within this context, we feel that this paper provides a useful instrument to ensure that learning environment changes from face-to-face to virtual and vice versa does not negatively affect students' satisfaction with community-based health programs.

5. CONCLUSION

Despite its application in contrasting educational situations (face-to-face and virtual), the feedback students' satisfaction questionnaire with the public health program has an acceptable reliability and validity. It would be worthwhile to consider including this research tool within the improvement packages in health sciences. This validated questionnaire would have positive implications in medical schools since it could be implemented in different educational situations to measure students' satisfaction with community-based health programs.

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