

Validation of the postgraduate hospital educational environment measure at a Saudi university medical school

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ABSTRACT

الأهداف: جرى تقييم النسخة الإنكليزية من قياس بيئة المستشفى التعليمية لطلاب الدراسات العليا (PHEEM) لتحديد خصائص القياس النفسي فيها ومصداقيتها واتساقها الداخلي. وقد استخدمت هذه الوسيلة لقياس بيئة التعلم السريري في المستشفى الجامعي لإحدى كليات الطب في المملكة العربية السعودية.

الطريقة: أُجريت هذه الدراسة المقطعية cross-sectional study في كلية الطب بالسعودية خلال الفترة ما بين تاريخ يونيو وأغسطس 2012م، وطبّق PHEEM على طلبة الطب في سنة الامتياز والأطباء المقيمين المتدربين على نحو دوري في مستشفى جامعي بالمملكة العربية السعودية. وقُدّرت تأثيرات مرحلة التدريب (طبيب امتياز أو مقيم) والجنس (ذكر أو أنثى) على أحراز PHEEM. وقد قيست مصداقية التركيب construct validity باستخدام التحليل العاملي الاستكشافي، وقيس الاتساق الداخلي باستخدام كرونباخ α .

النتائج: في هذه الدراسة استجاب 193 من طلبة سنة الامتياز والأطباء المقيمين إلى PHEEM، وكان معدل الاستجابة 100%. وبلغ الاتساق الداخلي لاستبيان يتضمن 40 بنداً 0.936 (كرونباخ α)، ووصل حرز PHEEM الأقصى 160، وكان الحرز المتوسط 89.21 ± 21.6 .

الخلاصة: يُعدّ PHEEM ذا مصداقية وموثوقية عاليتين، ويمكن تطبيقه لقياس البيئة التعليمية لطلبة سنة الامتياز والأطباء المقيمين المتدربين في مقرّ توثيقي مستشفى المركز. وقد كانت بيئة تدريب المستشفى إيجابية، وكان طلبة سنة الامتياز أكثر رضى مقارنة بالأطباء المقيمين، ولم يكن لجنس المتدرّب أي تأثير على تصورات البيئة التعليمية للمستشفى.

Objectives: The English version of the postgraduate hospital educational environment measure (PHEEM) was evaluated to determine its psychometric properties, validity, and internal consistency. The instrument was used to measure the clinical learning environment in the hospital setting of a Saudi university medical school.

Methods: This cross-sectional study was performed in a Saudi medical school between June and August 2012. The postgraduate hospital educational environment measure was administered to interns (house officers) and residents rotating at a Saudi university hospital. Means and mean ranks were calculated. The effects of training stage (intern versus resident) and gender (male versus female) on the PHEEM scores were estimated. Construct validity was measured using exploratory factor analysis, and internal consistency was measured using Cronbach's alpha.

Results: In this study, 193 interns and residents responded to the PHEEM. The response rate was 100%. The internal consistency of the 40-item questionnaire was 0.936 (Cronbach's alpha) with a maximum score of 160. The PHEEM mean score was 89.21 ± 21.6 .

Conclusion: The PHEEM is a valid and highly reliable instrument that can be applied to measure the educational environment among interns and residents in hospital-based clerkships. The hospital training environment was positive, and the interns were more satisfied than the residents. Gender had no influence on the perceptions of the hospital's educational environment.

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The learning environment is considered a 'focal term' in the educational setting.¹ The climate, which is one's perception of the environment, has been described by Genn¹ to be 'the soul and spirit of the medical school environment and curriculum'. Improving this climate along with other parameters such as quality of education and the curriculum are likely to elevate the standards of learning at any given medical organization; and therefore, will ultimately improve the quality of health care provided in the region.¹ The means and ways by which we can improve this environment has been a subject of review in the recent literature. The perceived climate needs to be monitored in order to improve the learning experience, learning outcomes, and performances. For that purpose, a new tool (the Postgraduate Hospital Educational Environment Measure [PHEEM]) was developed and validated by Roff et al in 2005.³ The 40-item questionnaire uses a combination of grounded theory and a multi-Delphi process. It serves as a quality check and has been utilized to determine areas requiring improvements in postgraduate training programs in which interns, trainees, specialists, and consultants were evaluated by this instrument.³⁻⁶ In addition, the PHEEM can be used for comparing different departments as well as comparing different hospitals in the country and region.⁷ Moreover, the PHEEM can document deficiencies in clinical teaching as well as exposing incidents of exploitation and harassment among doctors during their training years.⁵ The PHEEM has previously been evaluated under different settings and diverse geographical distribution.^{5,8} The aim of this study is to validate the PHEEM in a Saudi university hospital.

Methods. All prior related literature to this topic was reviewed through systematic search of the key terms: PHEEM, validation, educational, environment, and Saudi using the PubMed medical research search engine. This cross-sectional study was performed in a Saudi medical school between June and August 2012. The study was approved by the research and ethics committee at the College of Medicine, King Fahd Hospital of the University, University of Dammam, Al-Khobar, Kingdom of Saudi Arabia. This study was carried out in compliance with the Helsinki Declaration.

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Although, the questionnaire was distributed directly by the researchers, it was analyzed anonymously and no personal data were shared. We included interns and residents in the University of Dammam at all hospital departments, including surgery, internal medicine, obstetrics and gynecology, pediatrics, and emergency medicine. Responses with unclear explanations were excluded from the study.

Hospital trainees were instructed to score each item on a 5-point Likert scale from 0-4. Thirty-six items were scored: 0 as strongly disagree to 4 as strongly agree. Four items (7, 8, 11, and 13) were negatively stated and scored from 0 for strongly agree to 4 for strongly disagree. Reliability testing of the PHEEM was performed by measuring its internal consistency with Cronbach's alpha.⁹ Validity testing was performed with factor analysis and correlational studies to measure the strengths of the relationships of the items to each other and to measure how the PHEEM behaved. The effects of training stage and gender were considered in relation to the internal consistency of the PHEEM.

To investigate the internal structure of the PHEEM, we applied principal component analysis with a Varimax rotation.¹⁰ Several criteria were applied to determine how many items should be retained. These criteria included the point of inflexion on the scree plot, eigenvalues¹¹ that were greater than one, and the number of factors that accounted for at least 5% of the variance.

Statistical analysis. Data was entered and analyzed using the Statistical Package for Social Sciences Version 17 (SPSS Inc., Chicago, IL, USA). Comparisons of the mean scores between interns and residents and between males and females for each item, and for the total PHEEM questionnaire were performed using student's t-test. A *p*-value of less than 0.05 was considered to indicate statistical significance.

Results. A total of 193 interns and residents responded to the PHEEM questionnaire that measured their perceptions on 40 items. There was a 100% response rate to the questionnaire. The descriptive statistics and mean item scores are shown in Table 1. Out of a maximum score of 160, the 40-item questionnaire had a mean score of 89.21. Items with scores of ≤ 2 indicated areas of priority. The present results indicated shortage of handbooks for junior doctors, interns and residents being inappropriately beeped, lack of clear clinical protocols, lack of organization among clinical teachers, presence of gender discrimination, lack of quality accommodation for junior doctors on call, culture of blame, lack of adequate catering facilities, and lack of good counseling opportunities for junior doctors who

failed. In addition to these areas, residents perceived lack of clarity on working hours, lack of regular feedback from senior doctors, lack of good feedback on strengths and weaknesses, and lack of access to career advice. Comparisons of means between residents and interns

are shown in Table 2. The interns were generally more satisfied than the residents in almost all of the items. Statistically significant differences between interns and residents were found in individual statements in 7 out of 14 in "role autonomy" subscale, 2 out of 15

Table 1 - Overall and comparison of mean score of 193 interns and residents that responded to the Postgraduate Hospital Educational Environment Measure questionnaire (SpR-specialty resident).

Item	Mean \pm SD			P-values
	Overall mean score	Interns (n=78)	Residents (n=115)	
<i>Perceptions of role autonomy</i>				
1 I have a contract of employment that provides information about hours of work.	2.1 \pm 1.2	2.51 \pm 1	1.89 \pm 1.3	0.0001
4 I had an informative induction program	2.3 \pm 1	2.45 \pm 0.9	2.2 \pm 1.1	0.103
5 I have the appropriate level of responsibility in this post	2.6 \pm 0.9	2.77 \pm 0.8	2.46 \pm 1	0.022
8 I have to perform inappropriate tasks	2.2 \pm 1.1	1.97 \pm 1	2.3 \pm 1.1	0.047
9 There is an informative junior doctors handbook	1.7 \pm 1.2	2.18 \pm 1.1	1.35 \pm 1.2	0.0001
11 I am bleeped inappropriately	1.8 \pm 1	1.69 \pm 0.8	1.79 \pm 1.1	0.494
14 There are clear clinical protocols in this post	2 \pm 1.1	2.41 \pm 0.9	1.79 \pm 1.1	0.0001
17 My hours conform to the new deal	2.2 \pm 0.9	2.51 \pm 0.8	2.05 \pm 1	0.001
18 I have opportunity to provide continuity of care	2.4 \pm 0.9	2.45 \pm 0.8	2.41 \pm 1	0.771
29 I feel part of a team working here	2.5 \pm 1	2.54 \pm 0.8	2.53 \pm 1.1	0.949
30 I have opportunities to acquire the appropriate practical procedures for my grade	2.4 \pm 1	2.5 \pm 0.9	2.36 \pm 1	0.312
32 My workload in this job is fine	2.3 \pm 1	2.52 \pm 0.9	2.09 \pm 1.1	0.005
34 The training in this post makes me feel ready to be a SpR/consultant	2.1 \pm 1.1	2.27 \pm 1	2 \pm 1.1	0.094
40 My clinical teachers promote an atmosphere of mutual respect	2.4 \pm 1	2.48 \pm 0.9	2.37 \pm 1.1	0.476
<i>Perceptions of teaching</i>				
2 My clinical teachers set clear expectations	2.3 \pm 1	2.32 \pm 0.9	2.26 \pm 1	0.693
3 I have protected educational time	2.2 \pm 1	2.32 \pm 0.9	2.03 \pm 1.1	0.057
6 I have good clinical supervision at all time	2.2 \pm 1.1	2.37 \pm 1.1	2.16 \pm 1.1	0.176
10 My clinical teachers have good communication skills	2.4 \pm 1	2.46 \pm 1	2.4 \pm 1	0.677
12 I am able to participate actively in educational events	2.6 \pm 0.9	2.62 \pm 0.9	2.6 \pm 0.9	0.91
15 My clinical teachers are enthusiastic	2.3 \pm 0.9	2.42 \pm 0.8	2.25 \pm 0.9	0.182
21 There is access to an educational program relevant to my needs	2.2 \pm 1.1	2.33 \pm 0.9	2.13 \pm 1.2	0.202
22 I get regular feedback from seniors	2.1 \pm 1.1	2.3 \pm 1	1.97 \pm 1.2	0.04
23 My clinical teachers are more organized	2 \pm 1	2.09 \pm 1.1	1.98 \pm 0.9	0.454
27 I have enough clinical learning opportunities for my needs	2.2 \pm 1	2.33 \pm 0.9	2.05 \pm 1	0.053
28 My clinical teachers have good teaching skills	2.5 \pm 0.9	2.59 \pm 0.8	2.46 \pm 1	0.337
31 My clinical teachers are accessible	2.4 \pm 1	2.38 \pm 1	2.37 \pm 1	0.959
33 Senior staff utilize learning opportunities effectively	2.3 \pm 0.9	2.31 \pm 0.8	2.28 \pm 0.9	0.857
37 My clinical teachers encourage me to be an independent learner	2.6 \pm 0.9	2.47 \pm 0.9	2.69 \pm 0.9	0.104
39 The clinical teacher provides me with good feedback on my strengths and weaknesses	2.1 \pm 1.1	2.29 \pm 1.1	1.92 \pm 1.1	0.024
<i>Perceptions of social support</i>				
7 There is racism in this post	2.3 \pm 1.1	2.23 \pm 1	2.3 \pm 1.2	0.69
13 There is gender discrimination in this post	1.8 \pm 1.2	1.67 \pm 1	1.93 \pm 1.3	0.127
16 I have good collaboration with other doctors in my grade	2.9 \pm 0.8	2.78 \pm 0.8	2.9 \pm 0.9	0.323
19 I have suitable access to careers advice	2.1 \pm 1.1	2.33 \pm 0.9	1.97 \pm 1.2	0.023
20 This hospital has good quality accommodation for junior doctors, especially when on call	2 \pm 1.2	2.34 \pm 1	1.77 \pm 1.2	0.001
24 I feel physically safe in the hospital environment	2.5 \pm 1	2.59 \pm 0.9	2.51 \pm 1	0.577
25 There is no-blame culture in this post	2 \pm 1	2.3 \pm 0.8	1.82 \pm 1.1	0.001
26 There are adequate catering facilities when I am on call	1.5 \pm 1.2	2.03 \pm 1.1	1.2 \pm 1.2	0.0001
35 My clinical teachers have good mentoring skills	2.3 \pm 1	2.39 \pm 0.9	2.29 \pm 1	0.511
36 I get a lot of enjoyment out of my present job	2.2 \pm 1	2.51 \pm 0.7	2 \pm 1.2	0.001
38 There are good counseling opportunities for junior doctors who fail to complete their training satisfactory	2.0 \pm 0.9	2.36 \pm 0.9	1.81 \pm 0.9	0.0001

in “perception of teaching” subscale, and 6 out of 11 in “social support” subscale. Significant differences between the intern and resident perceptions were found in the overall mean score of role autonomy and social support subscales not in perception of teaching. Gender differences were generally not significant ($p=0.35$). The internal consistency of the 40-item PHEEM questionnaire was high (Cronbach’s alpha: 0.936). All items correlated strongly with each other, and the questionnaire behaved as a uni-dimensional tool. The reliability of the intern responses was 0.934, and the reliability of the resident responses was 0.936. The reliability of the female responses (Cronbach’s alpha: 0.948) was higher compared to the male responses (Cronbach’s alpha: 0.924). The exploratory factor analysis, followed by Varimax rotation of the data, identified 9 factors with eigenvalues greater than one (Table 3). The first factor had an eigenvalue of 13.1 and accounted for 32.8% of the variance in the data. The next 8 factors had eigenvalues <2.5 (Figure 1) Together, these 9 factors accounted for 61.6% of the variance. These factors included questions 7, 13, 16, 20, and 24 from the social support section, questions 1, 8, and 11 from the role autonomy section, and item 37 from the teaching quality section. Even though the PHEEM consists of 3 subscales, our results suggest one factor and a one-dimensional scale.

Discussion. According to the criteria proposed by the PHEEM, the overall score of 89.21 corresponds to the “more positive than negative environment”, “but with room for improvement”.³ The PHEEM has been used to evaluate hospital training environments at several centers.^{5,8} It is a highly reliable tool that highlights the strengths and weaknesses of postgraduate hospital training environments. In our study, the Cronbach’s alpha value were comparable with previous studies.^{8,12,13} Factorial analysis of the PHEEM questionnaire used in this study was also reported by another group in the UK.⁴ Boor et al⁴ reported that resident training differs from internship training because residents have more responsibility and received less guidance. Residents have higher levels of stress as they are assessed by the national commission for their health specialty at the end of each year. Both interns and residents are paid and received training in the same hospital environment, but the additional pressure on residents may account for their lower levels of satisfaction compared with that of interns. Absence of a significant gender impact on PHEEM scores was also found in other studies.^{3,8} The factor analysis showed that the items were strongly related to each other and to the entire

Table 2 - Postgraduate Hospital Educational Environment Measure perceptions among 193 residents and interns.

Perceptions	Mean \pm SD		P-values
	Interns	Residents	
Perceptions of role autonomy	33.1 \pm 6.7	29.6 \pm 8.1	0.002
Perceptions of teaching	35.5 \pm 9.3	33.5 \pm 9.8	0.167
Perceptions of social support	25.4 \pm 4.4	22.5 \pm 6.5	0.001

Table 3 - Factor analysis components.

Component	Eigenvalues	Variance %	Cumulative %	Item no	Item-total correlation
1	13.1	32.8	32.8	11	0.003
2	2.4	6.1	38.9	7	-0.109
3	1.7	4.3	43.2	8	0.019
4	1.5	3.8	47.0	1	0.45
5	1.3	3.4	50.4	13	-0.045
6	1.2	3.1	53.5	16	0.43
7	1.1	2.9	56.4	20	0.469
8	1.07	2.7	59.1	24	0.449
9	1.006	2.5	61.6	37	0.453

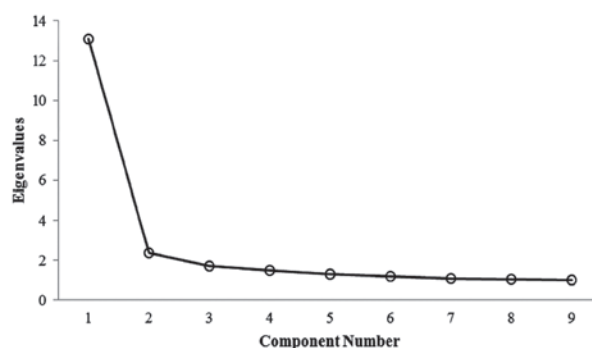


Figure 1 - Validity of the Postgraduate Hospital Educational Environment Measure (PHEEM). Scree plot of the factorial analysis and eigenvalues.

PHEEM questionnaire, which was also found in other studies.¹⁴ The highest scores were for teachers, and the lowest scores were for catering, housing, feedback, information, and guidance. A low social support score was found in other studies of large hospitals more often than studies of small hospitals.^{4,13,14} The results of this questionnaire can be used to improve the hospital training environment. Priority areas include the need to prepare guidelines for interns and residents to help them cope with the hospital environment and to inform them of their duties and rights; establish well-defined job descriptions for interns, residents, and paramedical staff that make exploitation less possible; establish and circulate clinical protocols for all cases; train clinical instructors for bedside and other modes of clinical

teaching; observe clinical instructors and ensure that they adhere to teaching schedules; improve catering and accommodation facilities, including lounges, and prayer areas; appoint career counselors; and ensure that clinical instructors provide feedback to trainees in a positive and constructive manner.

Study limitations. Despite the small sample size, we had an excellent response rate to our questionnaire.

In conclusion, PHEEM is a valid and reliable instrument that can be used to monitor the educational environment and quality of hospital training in Saudi medical schools. Further studies are needed to validate our results with a larger sample that includes different regions of the Kingdom.

References

- Genn JM. AMEE Medical Education Guide No. 23 (Part 1): Curriculum, environment, climate, quality and change in medical education—a unifying perspective. *Med Teach* 2001; 23: 337-344.
- Ruesseler M, Obertacke U. Teaching in daily clinical practice: how to teach in a clinical setting. *European Journal of Trauma and Emergency Surgery* 2011; 37: 313-216.
- Roff S, McAleer S, Skinner A. Development and validation of an instrument to measure the postgraduate clinical learning and teaching educational environment for hospital-based junior doctors in the UK. *Med Teach* 2005; 27: 326-331.
- Boor K, Scheele F, van der Vleuten CP, Scherpbier AJ, Teunissen PW, Sijtsma K. Psychometric properties of an instrument to measure the clinical learning environment. *Med Educ* 2007; 41: 92-99.
- Clapham M, Wall D, Batchelor A. Educational environment in intensive care medicine—use of Postgraduate Hospital Educational Environment Measure (PHEEM). *Med Teach* 2007; 29: e184-e191.
- Malling B, Mortensen LS, Scherpbier AJ, Ringsted C. Educational climate seems unrelated to leadership skills of clinical consultants responsible of postgraduate medical education in clinical departments. *BMC Med Educ* 2010; 10: 62.
- Vieira JE. The postgraduate hospital educational environment measure (PHEEM) questionnaire identifies quality of instruction as a key factor predicting academic achievement. *Clinics (São Paulo)* 2008; 63: 741-746.
- Aspegren K, Bastholt L, Bested KM, Bonnesen T, Ejlersen E, Fog I, et al. Validation of the PHEEM instrument in a Danish hospital setting. *Med Teach* 2007; 29: 498-500.
- Cronbach LJ. Coefficient alpha and the internal structure of tests. *Psychometrika* 1951; 16: 297-334.
- Comrey AL, Lee HB, editors. *A First Course in Factor Analysis*. 2nd ed. Hillsdale (NJ): Lawrence Erlbaum Associates; 1992.
- Kline R, editor. *Principles and Practice of Structural Equation Modeling*. 2nd ed. New York (NY): The Guilford Press; 2005.
- van Hell EA, Kuks JB, Cohen-Schotanus J. Time spent on clerkship activities by students in relation to their perceptions of learning environment quality. *Med Educ* 2009; 43: 674-679.
- Wall D, Clapham M, Riquelme A, Vieira J, Cartmill R, Aspegren K, et al. Is PHEEM a multi-dimensional instrument? An international perspective. *Med Teach* 2009; 31: e521-e527.
- Schonrock-Adema J, Heijne-Penninga M, van Hell E, Cohen-Schotanus J. Necessary steps in factor analysis: enhancing validation studies of educational instruments. The PHEEM applied to clerks as an example. *Med Teach* 2009; 31: e226-e232.

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