Validation of the French translation of the Dutch Residency Educational Climate Test

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Abstract

BackgroundThe learning environment is one of the most influential factors in training of medical residents. The Dutch Residency Educational Climate Test (DRECT) is one of the strongest instruments for measuring the learning environment. However, it has not been translated in French. The objective of this study is the psychometric validation of the DRECT French version. MethodsAfter translation of the DRECT questionnaire into French, residents of five Moroccan hospitals were invited to complete the questionnaire between July and September 2018. Internal consistency, temporal stability and confirmatory factor analysis were used to analyze psychometric properties of the translated version. ResultsDuring the study period, 211 residents completed the questionnaire. The French version had a good internal consistency (Cronbach alpha score = 0.95) and a good temporal stability (correlation score between two measurements = 0.89). Confirmatory factor analysis showed an adequate model fit with the following indicators: SRMR = 0.058 / RMSEA = 0.07 / CFI = 0.88 / TLI = 0.87. ConclusionThis study enabled the psychometric validation of DRECT French translation. It could be used to evaluate the residency learning environment in francophone countries.

Background

Postgraduate medical education takes place in most countries in the form of residency training. The objective of this training is to produce competent medical specialists capable of meeting population and country needs. The quality of resident training is therefore a major issue for decision-makers and educational leaders in medical schools and university hospitals.

Among influential elements in residency postgraduate medical training systems quality, the concept of environment, or climate, of training takes an becomes increasingly important in pedagogic research[1]. It is a concept that includes the many facets of resident training. It reflects how individuals approach learning in clinical departments and incorporates their common perceptions on topics such as atmosphere, supervision, and learning. Learning environments are constructed through the interactions of learners with other health care workers and are influenced by organizational arrangements[1]. The measurement of learning climates can serve as a general indicator of the quality of a department's education because of the versatility of its construction[2].

There are several instruments for evaluating the learning environment in the context of residency [3–8]. Boor et al. noted that the two most used instruments for measuring learning environments (PHEEM, DREEM) lack a clearly described theoretical basis, and their underlying factor structure is contested [2, 9–11]. Such a controversial subscale structure precludes any possibility of having a good assessment of the postgraduate environment[2].

To overcome the constraints, Boor and.al developed a new psychometric test based on qualitative research findings [12]. A final version called the Dutch Residency Educational Climate Test (DRECT) with 50 items was created. Then, Silkens et al.[13] showed that the learning climate could be assessed using

35 questions grouped into nine subscales. This new version of the DRECT was administered to 1537 residents in the Netherlands for validation. It showed a good internal consistency and a good fit of the factorial model.

Several studies have used the DRECT to assess the learning environment and its impact on resident training[14–18]. It was used successfully in quality improvement programs for residency systems [19]. It was also strongly correlated with the performance of teaching staff in clinical departments [20, 21] [20, 21] and with the occurrence of burn-out among residents [22]. However, most of these studies have been done in the Netherlands and the psychometric properties of DRECT have not been validated in other contexts, especially non-English ones. It is for these reasons that we undertook this study of psychometric validation of the French translation of DRECT.

Methods

Translation:

The original questionnaire [13] was translated into French by two bilingual doctors in French and English. Then the French version was translated to English by a professional translator. The translated questionnaires were evaluated and an initial version of the instrument was prepared.

Pre-test:

The initial version was submitted to 10 residents[23]. For each question, residents were asked if the question was clear and understood, and proposed changes to improve the questionnaire. All remarks were noted and evaluated, then incorporated where needed to the final version of the questionnaire in French.

Distribution of the questionnaire:

In addition to the French version of the DRECT, the final questionnaire included demographic and professional questions. An electronic questionnaire was created using the Google Form platform (*https://www.google.com/forms/about/)* and was submitted to Moroccan residents between July 1 and September 30, 2018. In the absence of residents' email databases in medical schools, it was not possible to directly target residents in a consistent manner. To overcome this difficulty, referent doctors were designated in each university hospital and they were responsible for distributing the form to residents. The first page of the form included all information about the study and its objective. Participation in the study was voluntary and data was collected anonymously. Informed consent was unnecessary according to national regulations. The Ethics committee approval was deemed unnecessary by the "Ethics committee for biomedical research" of the Mohamed 5 University in Rabat, Morocco, according to national regulation.

Statistical methods:

Quantitative variables are expressed as mean and standard deviations, or medians and quartiles as appropriate. For DRECT answers, normality of data distribution was assessed by the asymmetry test and the Kurtosis test. Absolute asymmetry values less than 3 and Kurtosis values less than 10 are considered acceptable for confirmatory factor analysis[24]. Quantitative variables are expressed in number and percentage.

For the DRECT scores, the means and standard deviations of each of the nine subscales were analysed. Missing data were tested using the little's test of missing completely at random, and then the missing values were replaced using the expectation-maximization (EM) technique.

Fidelity analysis:

Internal consistency

Internal consistency was assessed by Cronbach Alpha test [25]. A result greater than 0.7 was considered satisfactory[26]. The internal consistency was measured for the entire DRECT questionnaire and for each of the nine subscales.

Test—Retest:

We invited 15 residents to respond to the questionnaire a second time to assess the stability of responses over time. A minimum of two weeks was necessary between the first and second measurements. Test-retest intraclass correlation coefficient greater than 0.6 was considered satisfactory[23].

Evaluation of the construct validity:

Confirmatory factor analysis was used to evaluate the validity of the construct [23, 27, 28]. The fit of the model was evaluated by the following indices[27]: SRMR (*Standardized root mean square residual)*,, RMSEA (*root mean square error approximation)*,, CFI (*Comparative Fit Index)* and TLI (*Tucker- Lewis Index)*.. Threshold values for these indices were predetermined according to Brown's recommendations [27, 28] (SRMR 0.08 for a good fit and 0.12 for an acceptable fit, RMSEA <0.06 for a good fit and <0.10 for an acceptable fit CFI and TLI > 0.95 for a good fit and > 0.90 for an acceptable fit).

IBM SPSS statistics 21 application was used for descriptive statistics, analysis of internal consistency and test-retest reliability. The SPSS Amos Application Version 21 was used for confirmatory factor analysis.

Results

During the study period, out of 695 residents contacted, 211 responded to the questionnaire (response rate of 30.35%) The characteristics of the participants are presented in Table 1. The mean age 29.11 years (standard deviation 2.65). There were 97 men (46%) and 114 women (54%). First-year (25.6%), third-year (24.6%) and fourth-year (23.7%) residents were the most represented in the study. Finally, there were more residents in medical specialty (54.5%) than surgical specialty (32.2%) or medical-surgical (13.3%).

DRECT Scores:

Of the 211 responses received, there was a form that contained two missing responses from the same resident, which is less than 0.01% missing data. The mean score of the DRECT score was 3.21 (standard deviation 0.77). Table 2 shows the results of the 9 subscales of the DRECT.

Fidelity Analysis:

Table 3 shows the Cronbach alpha test results for the DRECT score and for each of the 9 subscales. All subscales showed a score greater than 0.7.

Of the fifteen residents contacted, thirteen answered the questionnaire twice. The correlation coefficient obtained was 0.89, indicating a good correlation between the two measurements.

Confirmatory factor analysis:

Table 4 shows the results of confirmatory factor analysis. Based on Brown's recommendations, two indicators had satisfactory results (SRMR and RMSEA) and two indicators had a result slightly below the recommended threshold (CFI and TLI).

Discussion

Despite the importance of the learning environment concept, its use in the French-speaking countries is limited, probably due to the lack of a validated French version. We have therefore tried to address this issue through the validation of the French version of the Dutch Residential Educational Climate Test (DRECT). After translation of the DRECT into French, we were able to obtain 211 responses to the questionnaire. Statistical analysis showed that this translated version had good internal consistency, good temporal reliability and good construct validity.

The reliability of a psychological test concerns the accuracy of the instrument no matter what it measures[30]. A reliable test always measures the psychological construct in the same way. Recent research has highlighted the use of two types of indices: internal consistency indices and temporal stability indices. When the test is measured on a continuous scale (like a Likert-style scale), the Cronbach

alpha analysis is recommended[23]. The value of the alpha coefficient can vary between 0 and 1. The higher the scores, the more the instrument is judged to have a high level of internal consistency. On the other hand, a score too high (more than 0.95 for example) would indicate the presence of a redundancy in the elements which infers that some of them measure a an overly narrow aspect of the concerned dimension. Values between 0.70 and 0.85 are therefore generally preferred [23, 31]. We compared the results of internal consistency in this study with the study of Pacifico et al.[16], Boor et al.[2, 16] and Silkens et al.[13] (Table 3). As for the other studies, the scores obtained varied between 0.7 and 0.91, indicating a good internal consistency of the French version. Temporal stability indices were evaluated by asking subjects to fill the instrument twice. We asked 15 residents to complete the questionnaire twice, but only 13 responded. The correlation coefficient was 0.89, indicating good temporal stability. Temporal stability has not been evaluated in previous DRECT creation or validation research.

Confirmatory factor analysis (CFA) is the recommended method for validating the factorial structure of a questionnaire [23, 27, 28]. When developing a new instrument in the social sciences, the factor structure is determined by the exploratory factor analysis, then the created instrument is validated by the confirmatory factor analysis. In the case of validation of a translation of an instrument, the confirmatory factor analysis is used directly, taking as a model the proposed structure of the original instrument. Although the CFA is strongly recommended, it is noteworthy that it is not systematically used for the validation of an instrument. Thus, Pinnock et al. used only internal consistency to validate the adaptation of DRECT in the Australian context[14]. Similarly, Caron et al.[32] only used internal consistency (Cronbach) to validate the French translation of PHEEM (*Postgraduate Hospital Educational Environment Measure)*..

Although researchers agree that the larger the sample size, the better for the CFA, there is no universal agreement on sufficient size. A sample of over 200 is considered acceptable for most models[24, 28]27]. Other authors have proposed a minimal number of cases for each question (5 per question) [33, 34]. The sample in our study was 211, which meets the requirements of the aforementioned rules.

There are several indices of goodness of fit, and most of them can be interpreted as describing the lack of fit of the model to the data[28]. Each type of adjustment index provides different information about the fit of the model (or the non-fit), so that researchers generally indicate several indices of fit when evaluating the fit of the model. There are many guidelines for an “acceptable” model fit[24, 35]. For this study, we used the threshold values recommended by Brown. It is important to note that these are not rigid guidelines, and Brown comments that his use of *"close to"* for threshold values is intentional. We found that the SRMR and RMSEA values were adequate. The CFI and the TLI were close to the 0.90 threshold. Silkens et al.[13] reported better fit results with SRMR and RMSEA of 0.04 (good result), CFI and TLI at 0.92 and 0.91 respectively, which is considered acceptable. Boor et al.[2] obtained a CFI of 0.89 (near acceptable threshold) and a RMSEA of 0.04 (good) and considered this result as indicating a good fit of the model (Table 4). We found only one study that attempted to validate the DRECT instrument in a non-european context[2, 16]. The authors did not obtain a good fit of the model proposed by Silkens et al.[13]. They proposed an alternative model with 28 questions that gave better model fit results. Given our results,

and compared to the results obtained by Boor and Silkens, we can consider that we obtained an adequate model fit. This study therefore validated the French version of the DRECT instrument, thus allowing its use in French-speaking countries. One of the challenges of medical research is the reproducibility of the scientific results obtained. In this case, reproducibility of the results obtained by the original authors suggests the robustness of the DRECT instrument and its adaptability to other international residency programs.

One of the limitations of this work was the small size of our sample compared to previous studies. In the development of the first version of the DRECT instrument by Boor et al., 1276 residents participated in the validation study[2]. In the development of the modified version by Silkens et al., 2306 residents participated in the work[2, 13]. Finally, 843 residents participated in the validation work of DRECT in the Philippines[16]. These authors were able to reach this important number because investigators had access to all residents contact information in their countries. In Morocco, faculties of medicine do not have an email database for residents in training. This could explain the low number of participation compared to other studies. Nevertheless, it should be noted that this is relative since the size of our sample is sufficient to carry out a confirmatory factor analysis.

Conclusion

This study enabled the psychometric validation of the French translation of the Dutch Residency Educational Climate Test. We have shown that this French version has a good internal consistency, good temporal reliability and an acceptable validity of the construct. This validation would make it possible to use the DRECT for the evaluation of the perception of the training environment by residents in French-speaking countries.

Abbreviations

DRECT: Dutch Residency Educational Climate Test.

PHEEM: Postgraduate Hospital Educational Environment Measure

DREEM: Dundee Ready Educational Environment Measure

SRMR: Standardized root mean square residual

RMSEA: root mean square error approximation

CFI: Comparative Fit Index

TLI: Tucker- Lewis Index

CFA: Confirmatory factor analysis

Declarations

Ethics approval and consent to participate:

The Ethics committee was deemed unnecessary by the “Ethics committee for biomedical research” of the Mohamed 5 University in Rabat, Morocco, according to national regulation (Law 28–13).

Participation in the study was voluntary and data was collected anonymously. Informed consent was unnecessary according to national regulations (Law 28–13).

Consent for publication:

Not applicable

Availability of data and materials:

The datasets are available upon a reasonable request.

Competing interests:

The authors declare that they have no competing interests

Funding:

None.

Authors’ contributions:

All authors contribute significantly to the design and implementation of the study. MAM initiated and designed the study, facilitated the data collection, performed the statistical analysis and wrote the first draft and succeeding drafts. YM helped in the study design, collected data and wrote the first draft of the article. AS facilitated the statistical analysis and interpretation, critically revised the first and succeeding drafts for important intellectual content. AB1, AB2, LA, and RM, critically commented on the drafts and contributed to the improvement of the final draft. All authors read and approved the final draft.

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References

1. Boor K-B. The Clinical Learning Climate. 2009.
2. Boor K, Van Der Vleuten C, Teunissen P, Scherpbier A, Scheele F. Development and analysis of D-RECT, an instrument measuring residents' learning climate. Med Teach. 2011;33:820–7.
3. Soemantri D, Herrera C, Riquelme A. Measuring the educational environment in health professions studies: a systematic review. Med Teach. 2010;32:947–52.
4. Nagraj S, Wall D, Jones E. The development and validation of the mini-surgical theatre educational environment measure. Med Teach. 2007;29:e192–7.
5. Kanashiro J, McAleer S, Roff S. Assessing the educational environment in the operating room-a measure of resident perception at one Canadian institution. Surgery. 2006;139:150–8.
6. Holt MC, Roff S. Development and validation of the Anaesthetic Theatre Educational Environment Measure (ATEEM). Med Teach. 2004;26:553–8.
7. Roth LM, Severson RK, Probst JC, Monsur JC, Markova T, Kushner SA, et al. Exploring physician and staff perceptions of the learning environment in ambulatory residency clinics. Fam Med. 2006;38:177–84.
8. Keitz SA, Holland GJ, Melander EH, Bosworth HB, Pincus SH, VA Learners' Perceptions Working Group. The Veterans Affairs Learners' Perceptions Survey: the foundation for educational quality improvement. Acad Med. 2003;78:910–7.
9. Roff S, McAleer S, Harden RM, Al-Qahtani M, Ahmed AU, Deza H, et al. Development and validation of the Dundee Ready Education Environment Measure (DREEM). Med Teach. 1997;19:295–9.
10. Schönrock-Adema J, Heijne-Penninga M, Van Hell EA, 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:e226–32.
11. Boor K, Scheele F, van der Vleuten CPM, Scherpbier AJJA, Teunissen PW, Sijtsma K. Psychometric properties of an instrument to measure the clinical learning environment. Med Educ. 2007;41:92–9.
12. Boor K, Van Der Vleuten C, Teunissen P, Scherpbier A, Scheele F. Development and analysis of D-RECT, an instrument measuring residents' learning climate. Med Teach. 2011;33:820–7.
13. Silkens MEWM, Smirnova A, Stalmeijer RE, Arah OA, Scherpbier AJJA, Van Der Vleuten CPM, et al. Revisiting the D-RECT tool: Validation of an instrument measuring residents' learning climate perceptions. Med Teach. 2016;38:476–81.
14. Pinnock R, Welch P, Taylor-Evans H, Quirk F. Using the DRECT to assess the intern learning environment in Australia. Med Teach. 2013;35:699.
15. Bennett D, Dornan T, Bergin C, Horgan M. Postgraduate training in Ireland: expectations and experiences. Ir J Med Sci. 2014;183:611–20.

16. Pacifico JL, van der Vleuten CPM, Muijtjens AMM, Sana EA, Heeneman S. Cross-validation of a learning climate instrument in a non-western postgraduate clinical environment. BMC Med Educ. 2018;18:22.
17. Iblher P, Zupanic M, Ostermann T. The Questionnaire D-RECT German: Adaptation and test theoretical properties of an instrument for evaluation of the learning climate in medical specialist training. GMS Z Med Ausbild. 2015;32:Doc55.
18. Alshomrani AT, AlHadi AN. Learning environment of the Saudi psychiatry board training program. Saudi Med J. 2017;38:629–35.
19. Silkens MEWM, Arah OA, Scherpbier AJJA, Heineman MJ, Lombarts KMJMH. Focus on Quality: Investigating Residents' Learning Climate Perceptions. PLoS One. 2016;11:e0147108.
20. Lombarts KMJMH, Heineman MJ, Scherpbier AJJA, Arah OA. Effect of the learning climate of residency programs on faculty's teaching performance as evaluated by residents. PLoS One. 2014;9:e86512.
21. Silkens MEWM, Chahine S, Lombarts KMJMH, Arah OA. From good to excellent: Improving clinical departments' learning climate in residency training. Med Teach. 2018;40:237–43.
22. van Vendeloo SN, Godderis L, Brand PLP, Verheyen KCPM, Rowell SA, Hoekstra H. Resident burnout: evaluating the role of the learning environment. BMC Med Educ. 2018;18:54.
23. Vallerand RJ. Vers une méthodologie de validation trans-culturelle de questionnaires psychologiques: Implications pour la recherche en langue française. Canadian Psychology/Psychologie canadienne. 1989;30:662–80.
24. Kline T. Psychological Testing: A Practical Approach to Design and Evaluation. 2455 Teller Road, Thousand Oaks California 91320 United States: SAGE Publications, Inc.; 2005.
25. Tavakol M, Dennick R. Making sense of Cronbach's alpha. J Int Assoc Med Sci Educ. 2011;2:53–5.
26. Bland JM, Altman DG. Cronbach's alpha. BMJ. 1997;314:572.
27. Brown TA. Confirmatory Factor Analysis for Applied Research, Second Edition. Guilford Publications; 2015.
28. Harrington D. Confirmatory Factor Analysis. 2008.
29. Arah OA, Hoekstra JBL, Bos AP, Lombarts KMJMH. New tools for systematic evaluation of teaching qualities of medical faculty: results of an ongoing multi-center survey. PLoS One. 2011;6:e25983.
30. Nunnally (Jr. J. Introduction to Psychological Measurement. 1970.
31. McIver J, Carmines E. Unidimensional Scaling. 1981.
32. Caron F, Pina A, Mahone M, Costa J-P, Sansregret A, Durand M. Évaluer l'environnement éducatif post-gradué: traduction et validation d'un questionnaire. Pédagogie Médicale. 2014;15:91–8.
33. Bentler PM, Chou C-P. Practical Issues in Structural Modeling. Sociol Methods Res. 1987;16:78–117.
34. Ding L, Velicer WF, Harlow LL. Effects of estimation methods, number of indicators per factor, and improper solutions on structural equation modeling fit indices. Struct Equ Modeling. 1995;2:119–43.

35. Raykov T, Tomer A, Nesselroade JR. Reporting structural equation modeling results in Psychology and Aging: Some proposed guidelines. Psychol Aging. 1991;6:499–503.

Tables

Table 1: Demographic characteristics of the population

riables	Results
ean age (Years, Standard Deviation)	29.11 (2.65)
nder	
Ien	97 (46.0%)
Vomen	114 (54.0%
y	
es	85 (40.3%)
abat	94 (44.5%)
arrakech	8 (3.8%)
asablanca	13 (6.2%)
ujda	11 (5.2%)
ar of residency	
	54 (25.6%)
	34 (16.1%)
	52 (24.6%)
	50 (23.7%)
	21 (10.0%)
pe of speciality	
edical	115 (54.5%)
rgical	68 (32.2%)
edico-Surgical	28 (13.3%)

Table 2: Results of the DRECT sub-scales.

ıbscale	Mean score	Standard deviation
ducational atmosphere	3.16	0.92
eamwork	3.07	0.99
ole of specialty tutor	3.21	1.02
oaching and assessment	3.00	1.05
ormal education	3.10	1.04
esident peer collaboration	3.54	0.90
ork is adapted to residents' competence	3.19	0.90
ccessibility of supervisors	3.79	0.95
atient sign-out	3.04	1.14

Table 3: Cronbach alpha test for the subscales of the DRECT score in this study and in the literature.

	Cronbach score			
	This study	Pacifico et al.	Silkens et al.	Boor et al.
ational atmosphere	0.82	0.85	0.83	0.77
ıwork	0.79	0.93	0.79	0.69
of specialty tutor	0.91	0.96	0.86	0.78
hing and assessment	0.91	0.92	0.82	0.80
ıal education	0.89	0.88	0.79	0.75
lent peer collaboration	0.81	0.92	0.84	0.76
: is adapted to residents' competence	0.70	0.88	0.71	0.66
ssibility of supervisors	0.82	0.93	0.71	0.64
nt sign-out	0.88	0.91	0.78	0.75

Table 4: Indicators of construct validity of confirmatory factor analysis of our study and other literature studies.

e	This study	Silkens et al.[13]	Boor et al.[2]	Pacifico et al.[16]
R	0.058	0.04	0.05	
EA	0.07	0.04	0.05	0.108
	0.88	0.92	0.86	0.84
	0.87	0.91	0.85	0.82