

Correlation of the complementary virtual test of computer-simulated clinical cases with the classic OSCE and with the MIR score.

Correlación de la prueba virtual complementaria de casos clínicos simulados por ordenador con la ECOE clásica y con la puntuación MIR.

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Summary.

Introduction. Starting in 2021, Spanish medical schools were offered a Complementary Virtual Clinical Examination (CVCE) with computer-simulated clinical cases, sponsored by the National Conference of Deans. This study analyzes the correlation between CVCE scores, the local OSCE with simulated patients and mannequins, the clinical rotation score, and the results of the MIR exam. **Methods.** An observational correlation study was conducted, including students evaluated between 2021 and 2025 at the University of Las Palmas de Gran Canaria. Correlations were analyzed using Pearson and Spearman coefficients. **Results.** 652 students were included, with MIR data available for 2022. The correlation between the local OSCE and the CVCE and the MIR was weak ($\text{Rho} = 0.26$; $p < 0.001$ and $\text{Rho} = 0.31$; $p < 0.001$, respectively). The correlation between the Clinical Clinical Practice Assessment (CCP) and the Medical Residency Exam (MIR) was moderate and consistent over the five years ($r = 0.56$; $p < 0.001$). No correlation was found between the clinical rotation score and the CCP, the OSCE, or the MIR. Women performed better in the local OSCE history taking and in the clinical rotation, while men performed better in the CCP and the MIR. **Conclusions:** The CCP correlates more consistently with the MIR than the local OSCE, suggesting greater predictive value. The results suggest that the MIR and the local OSCE assess different domains of clinical competence, highlighting the complementary and exploratory nature of the skills each test evaluates.

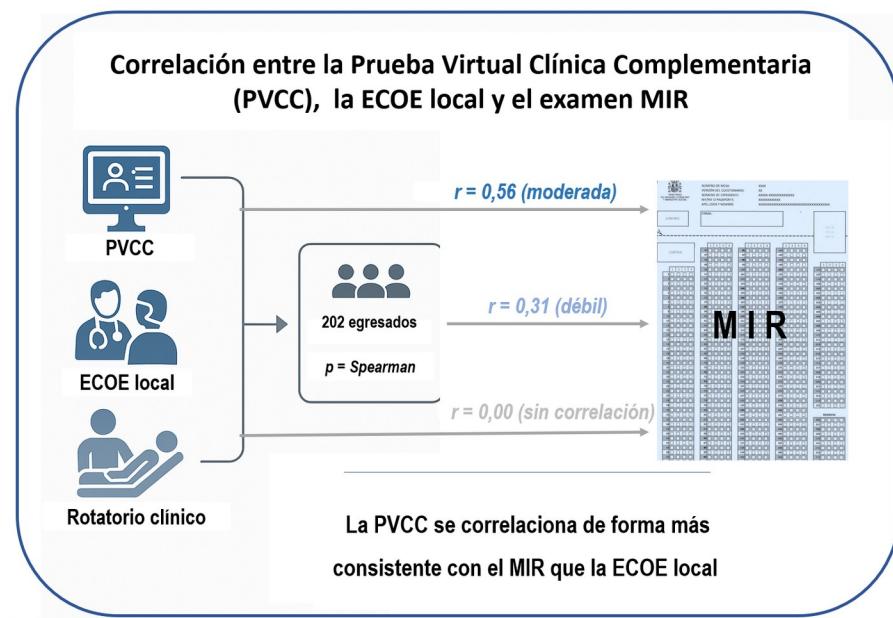
Keywords: OSCE; Objective Structured Clinical Examination; Rotational; Computerized simulated clinical cases; MIR

Resumen.

Introducción. A partir de 2021 se ofreció a las facultades de medicina españolas una Prueba Virtual Clínica Complementaria (PVCC) con casos clínicos simulados por ordenador auspiciada por la Conferencia Nacional de Decanos. Este estudio analiza la correlación entre las puntuaciones de la PVCC, la ECOE local con pacientes simulados y maniquíes, la nota del rotatorio clínico y los resultados en el examen MIR. **Métodos.** Estudio observacional de correlación que incluyó a

estudiantes evaluados entre 2021 y 2025 en la Universidad de Las Palmas de Gran Canaria. Las correlaciones se analizaron mediante coeficientes de Pearson y Spearman. **Resultados.** Se incluyeron 652 alumnos, con datos disponibles del MIR en 202. La correlación entre ECOE local con la PVCC y con el MIR fue débil ($\rho = 0,26$; $p < 0,001$ y $\rho = 0,31$; $p < 0,001$, respectivamente). La correlación PVCC /MIR fue moderada y consistente en los cinco años ($r = 0,56$; $p < 0,001$). No se encontró correlación de la nota de rotatorio con PVCC o ECOE ni con el MIR. Las mujeres destacaron en anamnesis de la ECOE local y en el rotatorio clínico mientras que los varones destacaron en la PVCC y en el MIR. **Conclusiones.** La PVCC se correlaciona de forma más consistente con el MIR que la ECOE local, lo que sugiere un mayor valor predictivo. Los resultados sugieren que el MIR y la ECOE local evalúan dominios distintos de la competencia clínica, poniendo de manifiesto el carácter complementario y exploratorio de las aptitudes que cada prueba valora.

Palabras clave: ECOE; Examen clínico objetivo y estructurado; Rotatorio; Casos clínicos computarizados simulados; MIR



1. Introduction

Clinical competence has traditionally been assessed with real patients, a method that makes it difficult to accurately evaluate all its components. The Objective Structured Clinical Examination (OSCE) is a tool that allows for a comprehensive assessment of students' clinical competencies through simulations with standardized patients. Its structure aims to minimize inter-rater variability and provide a reproducible measurement of clinical performance (1–4). Faculties typically combine various methodologies (standardized patients, mannequins, short-answer questions, or simulators), consolidating the OSCE as an essential part of the final degree assessment process.

The COVID-19 pandemic prompted the development of a computer-simulated clinical case exam as an alternative to the traditional OSCE in several Spanish medical schools (6). This exam consisted of ten 12-minute computerized clinical cases that assessed competencies such as medical history taking, examination, clinical judgment, ethical considerations, interprofessional relationships, and health promotion and prevention (6). It included questions with images, videos,

textual or visual feedback, and multiple-choice or clinical reasoning formats ("Script Concordance").

Since 2021, the ECOE CNDFME committee has offered a Complementary Virtual Clinical Examination (CVCE) of computer-simulated clinical cases to all Spanish medical schools. Although it has limitations in assessing real technical or communication skills, the CVCE, which is administered simultaneously across all schools, has proven to be a useful and standardizable tool, has been positively received by most students, and has contributed to promoting inter-university collaboration (6).

At the University of Las Palmas de Gran Canaria (ULPGC), this PVCC is complemented by a classic OSCE test with actors and mannequins ("local OSCE") which adds another 10 stations, so that the total of the ULPGC OSCE adds up to 20 clinical situations or stations ("PVCC + local OSCE") with a maximum of 2,000 points.

In Spain, access to specialized healthcare training is through the MIR exam (7), a national examination that assesses knowledge, skills, and merits, assigning a ranking that determines the choice of residency position. This system has demonstrated high effectiveness and professional acceptance, and its score is significantly correlated with academic record (8-10). However, the MIR exam has been criticized for prioritizing the assessment of theoretical knowledge, with limited evaluation of other relevant clinical and professional competencies (11-12).

Comparing MIR exam results with those obtained in OSCEs could help determine whether both assessments measure similar or complementary dimensions of medical competence. A study conducted with all graduates from the first four graduating classes of the Medicine degree program at Pompeu Fabra University/Autonomous University of Barcelona showed that scores on a classic OSCE, composed of 20 clinical stations, had a moderate correlation with the overall grade in the medical degree and with the MIR exam (13). However, there are no published data comparing the PCVC with the classic OSCE or analyzing their relationship with MIR exam results.

This study analyzes the correlation between the scores of the PVCC, the local OSCE and the MIR exam, as well as with the clinical rotation grade, providing unprecedented evidence on the correlation between these clinical competence assessment tools in the context of medical training in Spain.

2. Methods

This is an analytical observational study of a correlational (or association) type. The study population consisted of all medical students who took the OSCE exam at the ULPGC between 2021 and 2025.

Description of the OSCE tests

At ULPGC, the OSCE exam is administered during the last month of the sixth year of the degree program and combines the PVCC with a local OSCE. The PVCC is a computer-simulated clinical case exam consisting of 10 cases representing six areas of the rotation (medicine [3 cases], surgery/traumatology [2 cases], primary care [2 cases], pediatrics [1 case], gynecology/obstetrics [1 case], and psychiatry [1 case]) (6). Each case includes three sequential phases:

- initial approach and request for additional tests
- review of results, interpretation and initial treatment
- medium and long term management.

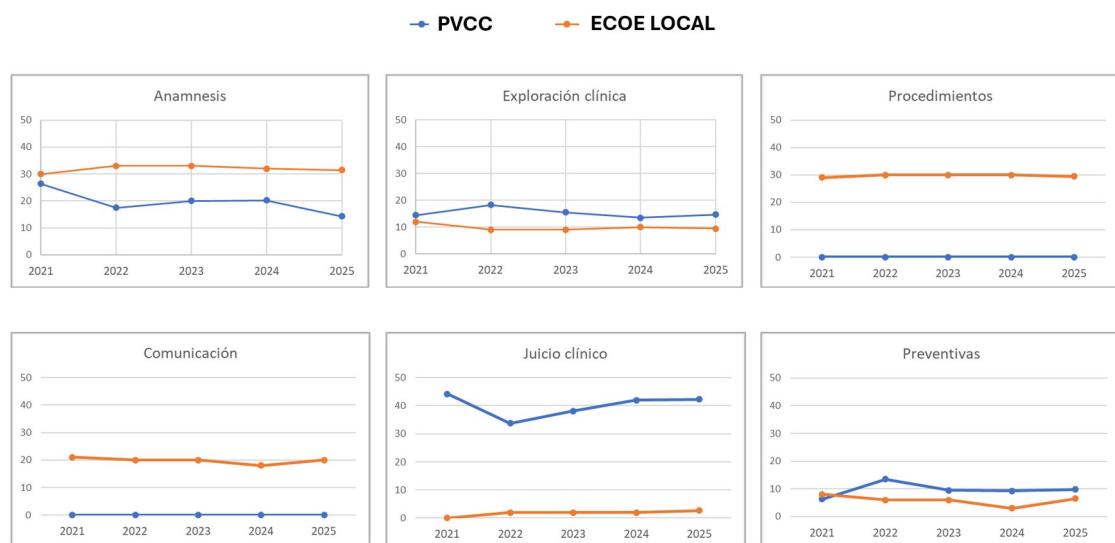


Figure 1. Map of the main competencies expressed as percentages in the Computer-Assisted Virtual Clinical Examination (CVCE) and the OSCE. The weighting of these competencies is the basis for the final score of the ULPGC OSCE. The competency of interprofessional relations, together with ethical/legal aspects, has an average weighting of 1% in the local OSCE and 15% in the CVCE.

The local OSCE is a face-to-face test with 10 stations, with 7 clinical cases evaluated using a simulated patient and 3 stations with a mannequin, a distribution that has remained stable since 2015. Figure 1 shows the competency map of the PVCC and the local OSCE over the years of the study.

Other variables.

The ranking in the MIR (Medical Residency Exam) results was obtained by sending an email to resident physicians in hospitals and primary care centers on the island of Gran Canaria. Specifically, the email requested the ranking achieved in the exam taken the year following the OSCE (Objective Structured Clinical Examination). The email also requested authorization to use personal data for the study. The ranking obtained in the MIR exam was verified by checking with the teaching committees of the corresponding hospitals and primary care centers. Additionally, the grade for the Clinical Rotation course, taken during the sixth year of the degree program, was included. This course comprises 750 hours of clinical practice in various areas (medicine, surgery, primary care, pediatrics, gynecology, and psychiatry). At the University of Las Palmas de Gran Canaria (ULPGC), the rotation is evaluated using two instruments. The first is a form that assesses the acquisition of skills and evaluates attendance, punctuality, behavior, and integration within the clinical unit, which is completed by each clinical supervisor. Furthermore, a practical logbook, where the student records all their activity, is evaluated by an independent examiner using a specific rubric for each rotation area. The overall rotation grade is calculated as the weighted average of the scores for each rotation based on its duration. Table 1 shows a description of the variables collected in the study.

This study was conducted in accordance with ethical principles and international recommendations for research in medical education. It was approved by the Research Ethics Committee of Las Palmas, under code 2025-353-1, and complies with the Declaration of Helsinki and the ICMJE Guidelines. It also analyzes pseudonymized secondary data and, in the case of the MIR (Medical Residency) position, with implicit informed consent obtained through voluntary participation. Authorship met the ICMJE criteria. All authors made substantial contributions to the study design, data analysis and interpretation, drafting or critical revision of the manuscript, and approved the final version.

Table 1. Variables included in the study.

Variable	Definition	Unit / Scale
PVCC Score	Total result obtained in the National Complementary Clinical Virtual Test (10 computer-simulated clinical cases , 6 rotation areas)	0-1,000 points
Local OSCE score	Total result obtained in the ULPGC face-to-face OSCE (10 stations: 7 with simulated patient and 3 with mannequin)	0-1,000 points
Local ECOE components	Percentage obtained in each competency: anamnesis, examination, communication, preventive measures and procedures	0-100%
Clinical Rotation Note	Final grade for clinical placements in medicine, surgery, primary care, pediatrics, gynecology and psychiatry, weighted by rotation time	1-10
MIR position	MIR exam result corresponding to the year of graduation	Order number
Sex	Sex (administrative data) recorded in the academic record	Male / Female

Statistical method

The Kolmogorov-Smirnov normality test was applied to each variable. The association between PVCC and local OSCE scores and MIR ranking was assessed using Pearson's correlation coefficient or Spearman's rho, depending on the data distribution. To control for differences associated with graduation year, MIR exam session, and OSCE test, an adjustment was made using standardized scores (z-scores). Each individual value was transformed according to the formula: $z = \frac{N - \bar{x}}{SD}$, where N represents the original score, \bar{x} the mean, and SD the standard deviation for each cohort (graduation year). Since a numerically lower ranking in the MIR exam corresponds to better performance—in contrast to the OSCE, where a higher score reflects a better result—a sign adjustment was applied by multiplying the MIR score by -1 to maintain the same interpretive direction in the correlation analysis. To correct for the effect of multiple comparisons, a Bonferroni correction was applied, considering p -values $< 0.05/m$ to be significant. Correlations between sexes were compared using the Fisher-Z transformation, applying the z-test for independent differences between correlation coefficients.

A multiple linear regression model was performed to identify factors associated with the MIR z-score. The independent variables t-test or the Mann-Whitney U test was used to compare results by sex, as appropriate. SPSS version 29 (IBM Corp., 2022) was used for data analysis. The comparison by sex was a secondary objective of the study.

3. Results

A total of 652 students were included, 460 women (69.8%) and 192 men (29.1%), with available data from the PVCC, local OSCE, and clinical rotation. Table 2 shows the distribution of students by year in which they took the OSCE and the average scores for the PVCC and the local OSCE. Average scores were higher on the local OSCE compared to the PVCC ($p < 0.001$). Of the 652 graduates, the MIR exam score was received for 202 (44 graduates in 2021, 44 in 2022, 51 in 2023 and 63 in 2024), which represents 38.4% of those who graduated between 2021 and 2024. Compared with the students for whom no MIR number was available, those with MIR data were characterized

by a higher frequency of males (38% vs 30%; $p < 0.01$) and by higher scores in PVCC (674 vs 634; $p < 0.001$) and in the local OSCE (825 vs 815; $p = 0.01$).

The average ranking obtained on the MIR exam was 3.890 (SD 2.420). The distribution of the PVCC and local OSCE scores followed a normal distribution. However, the distribution of the MIR ranking did not pass the normality test.

Table 2. Sample of students included and average scores of the ECOE test.

Year	N	PVCC (media, DE)	local ECOE (media, DE)	PVCC+ECOE Local (average, DE)
2021	131	681.8 (42)	849.3 (49)	1,531.1 (78)
2022	119	634.5 (56)	832.6 (39)	1,467.0 (75)
2023	135	638.6 (56)	814.2 (41)	1,452.8 (75)
2024	141	648.8 (67)	782.0 (39)	1,430.9 (89)
2025	126	628.9 (57)	819.9 (49)	1,448.7 (79)

PVCC: Complementary Virtual Clinical Test of computer-simulated clinical cases; Local OSCE: test of clinical cases with simulated patients and mannequins.

Correlations of the PVCC and ECOE tests with MIR and rotation grade

A moderate correlation was observed between the PCV score and MIR ranking ($\rho = 0.56$; $p < 0.001$), consistent across the different graduation years (Tables 3 and 4). The local OSCE showed a weaker correlation with MIR ranking in the total sample ($\rho = 0.31$). The sum of PCV score and local OSCE showed a correlation with MIR ranking similar to that of PCV score ($\rho = 0.56$; $p < 0.001$). In contrast, the clinical rotation score showed very weak correlations with both OSCE scores and with MIR ranking (Table 3).

Multiple linear regression was performed to identify factors associated with MIR ranking. The model was statistically significant ($F(4,196) = 31.18$; $p < 0.001$) and explained 37.6% of the variability in MIR ranking (adjusted $R^2 = 0.376$). In the multivariate analysis, PVCC ($B = 0.48$; 95% CI 0.37–0.59; $p < 0.001$), sex ($B = 0.35$; 95% CI 0.16–0.53; $p < 0.001$), and local OSCE ($B = 0.19$; 95% CI 0.09–0.29; $p < 0.001$) were positively associated with MIR ranking. The rotary rating did not show a statistically significant association ($B = -0.12$; 95% CI -0.29–0.05; $p = 0.168$).

Gender differences

Women performed better on the local OSCE, particularly in medical history (76 vs. 74; $p = 0.006$) and clinical rotation score (8.76 vs. 8.62; $p = 0.01$) compared to men. Average scores on the PCVC were significantly higher in men (655 vs. 643 points; $p = 0.01$), and the percentage of men was higher in the high-achieving MIR group (25th percentile), 40% vs. 23% ($p = 0.01$). Table 5 shows the adjustment of variables for sex and year of graduation.

Table 3. Correlation (Spearman's rho with Bonferroni correction) between the different scores PVCC, local ECOE, MIR and rotating.

	MIR	PVCC	local ECOE	Local ECOE competencies				
				TO	EC	C	MP	P
PVCC	0.56*	1	0.26*	0.22*	0.13	0.17*	0.02	0.05
local ECOE	0.31*	0.26*	1	0.77*	0.55*	0.65*	0.31*	0.50*
Anamnesis	0.22	0.22*	0.77*	1	0.34*	0.42*	0.20*	0.15
Clinical examination	0.25	0.14	0.55*	0.34*	1	0.39*	0.04	0.07
Communication (actor)	0.29*	0.17*	0.65*	0.42*	0.39*	1	0.15	0.11
Preventive measures	0.03	0.02	0.31*	0.20*	0.04	0.15	1	0.08
Procedures (mannequin)	0.06	0.05	0.50*	0.15	0.07	0.11	0.08	1
Clinical Rotation	0.00	0.14	0.14	0.11	0.09	0.11	0.04	0.08

PVCC: Complementary Virtual Clinical Examination of computer-simulated clinical cases; local OSCE: clinical case examination with simulated patients and mannequins. A, anamnesis; EC, clinical examination; C, communication; MP, preventive measures; P, procedures. The PVCC and the local OSCE were analyzed in 652 students, while the MIR was analyzed in 202 students. *p<0.001.

Table 4. Correlation between ECOE and PVCC and between both and the MIR order position.

	All	2021	2022	2023	2024	2025
ECOE local / PVCC	0.26**	0.43**	0.20*	0.16	0.38**	0.10
Local ECOE / MIR position	0.31**	0.30*	0.29*	0.29*	0.30*	NA
PVCC / MIR position	0.56**	0.51**	0.63**	0.58**	0.56**	NA

PVCC: Complementary Virtual Clinical Examination of computer-simulated clinical cases; Local OSCE: Clinical case examination with simulated patients and mannequins; The PVCC and the local OSCE were analyzed in 652 students, while the MIR was analyzed in 202 students. NA: MIR examination to be taken the following year. **p<0.001; *P<0.05

Table 5. Distribution by sex of the grades obtained.

	Males (n=192)	Women (n=460)	P
PVCC	0.12 (0.97)	-0.05 (1.00)	0.019
local ECOE	-0.09 (1.06)	0.04 (0.96)	0.049
Anamnesis	-0.14 (1.01)	0.06 (0.98)	0.006
Clinical examination	0.05 (0.96)	-0.02 ((1.01)	0.179
Communication (actor)	-0.00 (1.01)	0.03 (0.93)	0.339
Preventive measures	-0.03 (1.23)	0.01 (1.17)	0.332
Procedures (mannequin)	-0.07 (1.00)	0.07 (0.87)	0.033
Clinical Rotation	-0.21 (1.50)	0.02 (1.21)	0.019
MIR Position*	0.32 (0.77)	0.01 (0.82)	0.008

Data are expressed as mean (SD) z-scores (grades adjusted for year of graduation). PVCC: Virtual Clinical Complementary Test of computer-simulated clinical cases; Local OSCE: Clinical case test with simulated patients and mannequins; OSCE scores and competencies were analyzed using an independent samples t-test. The PVCC, the local OSCE, and the clinical rotation were analyzed in 652 students, while the MIR (Medical Residency Exam) was analyzed in 77 males and 125 females. *MIR position analyzed using the Mann-Whitney U test.

4. Discussion

This study is the first publication to jointly analyze the relationship between the PVCC, the classic OSCE with simulated patients and mannequins, and the results of the MIR exam in a large cohort of medical students. The findings show that the PVCC has a moderate and consistent correlation with the MIR result, while the local OSCE shows only a weak correlation, suggesting that both tests assess partially different competencies. In fact, the sum of the PVCC and the local OSCE does not increase the Rho value relative to the MIR.

The observed divergence between the two OSCE modalities likely reflects their design and content. In fact, the correlation between the PCVC and the local OSCE was not consistent across the five years analyzed; it was not significant in two of them, and weak or moderate in the remaining years. The PCVC includes multiple-choice questions with varying weighting for each answer, true/false questions, high-quality medical images (X-rays, ultrasounds, EKGs, skin lesions), and videos (of examinations, procedures, or patients with psychiatric conditions). Therefore, it is a test that places greater emphasis on clinical reasoning, test interpretation, and diagnostic and therapeutic decision-making—competencies that might be considered closer to the cognitive approach characteristic of the MIR exam, although this study does not allow for establishing direct equivalencies between the two assessments. Although the PVCC includes some questions categorized as history taking or physical examination, this competency is assessed differently than in the classic OSCE, as it consists of lists of questions to ask the patient, assessments of examinations to be performed, or videos of examinations where their correctness is evaluated. Depending on the exam session (Figure 1), around 50% of the competencies assessed in the PVCC relate to clinical judgment and preventive measures (6). In contrast, the local OSCE places greater emphasis on competencies such as history taking, clinical communication, and the execution of

practical procedures—dimensions traditionally underrepresented in the MIR exam. At the University of Las Palmas de Gran Canaria (ULPGC), specifically, the competencies assessed in the local OSCE are distributed approximately as follows: 31% for history taking, 30% for procedures, 20% for communication, and 10% for clinical examination. These results are consistent with previous observations indicating that the MIR exam primarily assesses theoretical knowledge, with less emphasis on practical and attitudinal skills.

Scores obtained in the OSCE in early stages of medical training are significantly associated with later performance in clinical rotations and successive clinical assessments, also showing moderate correlations with standardized written exams and national certification tests, which supports its usefulness as an objective measure of clinical competence (14-16).

A recent Spanish study analyzed the correlation between a traditional OSCE, the PVCC, and a multiple-choice test in 108 students (17). The authors concluded that the three tests assess different dimensions. The PVCC measures a construct closer to the test ($\rho = 0.49$, $p < 0.001$), while the correlation between OSCE and PVCC was weak ($\rho = 0.269$; $p < 0.05$) and similar to that found in our study ($\rho = 0.26$; $p < 0.001$). In this study, no correlation was found between the competencies assessed by OSCE and PVCC (17).

The results of this analysis are consistent with those reported by Gutiérrez et al. (13) regarding the moderate correlation between the classic OSCE and the MIR score. However, this study, with a larger sample size, expands the available evidence by including the PVCC and comparing its predictive value with that of the local OSCE, providing a novel framework for understanding how different assessment instruments capture complementary dimensions of medical competence.

Furthermore, our study reveals sex differences: men performed better on the PVCC and the MIR, while women excelled in the anamnesis and clinical rotation evaluation. It should be noted that our study analyzed a total of 652 graduates, 202 of whom had MIR data, although the percentage of men was slightly higher in the MIR sample (38%) than in the PVCC sample (30%). Another study analyzing sex differences on the MIR found women to have a higher percentage of correct answers (18). While interpreting these differences requires caution, it could be speculated that they reflect distinct learning styles and strengths between men and women in the context of medical training.

Another noteworthy aspect of this study is the weak correlation between clinical rotation scores and both the OSCE and the MIR ranking. This could be explained by the fact that rotation evaluation relies heavily on subjective assessments by clinical supervisors, in heterogeneous healthcare settings with more variable grading criteria. Furthermore, the score tends to reflect the student's attitude, attendance, and integration into work teams more than strictly cognitive or clinical reasoning skills. The lack of association with the MIR and OSCE suggests that the rotation provides distinct and complementary information about student performance, focusing on attitudinal and professional aspects, and is therefore less comparable to the technical-cognitive skills assessed in standardized evaluations.

This study has some limitations that must be acknowledged. First, the MIR ranking was only available for slightly more than a third of the cohort, due to the exclusion of graduates who did not take the MIR exam or who, having taken it, obtained their MIR placement outside of Gran Canaria. Second, the raw MIR exam score was not available; only the ranking obtained was used, the calculation of which includes 10% of the academic record. Nevertheless, the consistency of the correlation between MIR ranking and PVCC (Preliminary Clinical Examination) over the four years of comparison should be highlighted. Third, this is a single-center analysis, which limits the

generalizability of the findings to other faculties with different OSCE (Objective Structured Clinical Examination) structures.

A potential limitation of the study could be the disparity in the rating scales between the clinical rotation (1-10) and the OSCE and PVCC tests (1-1,000). However, this effect has been mitigated through the use of dimensionless correlation statistics such as z-scores and the standardization of variables in the multivariate analysis. The use of standardized coefficients allows for a direct comparison of the predictive weight of each test, ensuring that differences in the absolute score ranges do not bias the interpretation of the relative importance of each assessed competency.

Despite these limitations, the results have significant implications for medical education in Spain. First, they show that the MIR (Medical Residency Exam) and the OSCE (Objective Structured Clinical Examination) are not redundant assessments, but rather explore distinct and complementary dimensions of clinical competence. Second, they reinforce the relevance of combining the PVCC (Clinical Clinical Practice Assessment) with the local OSCE in the evaluation of sixth-year medical students. One aspect we must consider is the grading criteria for clinical rotations at the University of Las Palmas de Gran Canaria (ULPGC), as these do not correlate with the OSCE or its components, nor with the PVCC or the MIR.

Our results suggest that integrating OSCE-type tests into the selection processes could contribute to a more comprehensive evaluation of candidates for specialized training, incorporating aspects that the MIR traditionally does not consider.

Future multicenter studies should confirm these findings across different medical schools and explore whether combining OSCE and MIR scores correlates better with professional performance during residency. Furthermore, future studies could incorporate longitudinal indicators, such as academic records or clinical practice evaluations, to explore more comprehensive predictive models of professional performance.

5. Conclusions

- The PVCC correlates more consistently with the MIR than the classic OSCE, indicating that both tests assess different skills.
- While the MIR primarily reflects clinical reasoning and knowledge, the classic OSCE provides information on practical and communicative skills.
- Integrating both approaches could enrich the evaluation and selection of future specialists.

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