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Este artículo fue aprobado para publicación en el v70n3 de la Revista de la Facultad de Medicina teniendo en cuenta los conceptos de los pares evaluadores y los cambios realizados por los autores según estos conceptos. Por lo tanto, se publica la versión preliminar del artículo para su consulta y citación provisional, pero debe aclararse que esta puede diferir del documento final, ya que no ha completado las etapas finales del proceso editorial (corrección de estilo, traducción y diagramación) y solo los títulos, datos de autores, palabras clave y resúmenes corresponden a la versión final del artículo.

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**Level of satisfaction and correlation between the performance and self-evaluation of physical therapy students in the objective structured clinical examination (OSCE) when using physical agents**

**Nivel de satisfacción y correlación entre el desempeño y la autoevaluación de los estudiantes de fisioterapia en el examen clínico objetivo estructurado (ECOE) al utilizar agentes físicos**

**Running title:**

Self-evaluation and performance in OSCE

**Título corto:**

Autoevaluación y desempeño en la ECOE

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## Abstract

**Introduction:** Objective structured clinical examination (OSCE) is a validated instrument that allows measuring clinical skills in health sciences students; thus, it is important to know the students' level of satisfaction with this strategy, as well as the correlation between performance and self-evaluation.

**Objective:** To assess the level of satisfaction and the correlation between the performance and self-evaluation of Chilean physiotherapy students in an OSCE developed to assess their clinical skills when using physical agents.

**Materials and methods:** Cross-sectional study conducted in 114 physical therapy students who participated in an OSCE consisting of seven stations. Performance checklists were used at each station (passing score: 70% of the maximum score per station) and students were administered 2 perception surveys for self-evaluation purposes and for determining their level of satisfaction. The Spearman Rho test was performed to determine the correlation between station scores and the students' self-evaluation (significance level $p < 0.05$).

**Results:** Median scores higher than the passing score were observed in 5 stations (S1=66, IQR: 52-70; S2=55, IQR: 45-60; S3=60, IQR: 50-69; S4=65, IQR: 55-73; S7=40, IQR: 33-45), except for the strength-

ening and parameter interpretation stations (S5=54, IQR:46-65; S6=10, IQR: 9-13). A positive significant correlation was found between the OSCE scores and the students' self-evaluation in five stations (S3: p =0.042; S4: p <0.0001; S5: p =0.000; S6: p =0.000; S7: p <0.0001). The students' level of satisfaction with the OSCE was high, with 89.18% of them stating they agreed with how it was organized.

**Conclusion:** The OSCE allowed the evaluation of the participants' clinical skills when using physical agents. Also, their performance in the OSCE was consistent with their self-evaluation, which proves the usefulness of the instrument. The students' high level of satisfaction with this methodology supports its use, since they acknowledge both its contribution and the importance of using similar tools to improve their training.

## Resumen

**Introducción.** La evaluación clínica objetiva estructurada (ECOE) es un instrumento validado que permite medir las habilidades clínicas de los estudiantes de ciencias de la salud, por lo que es importante conocer su

nivel de satisfacción con esta estrategia, así como la correlación entre desempeño y autoevaluación.

**Objetivo.** Evaluar el nivel de satisfacción y la correlación entre el desempeño y la autoevaluación de estudiantes chilenos de fisioterapia en una ECOE diseñada para evaluar sus habilidades clínicas a la hora de usar agentes físicos.

**Materiales y m**étodo**s.** Estudio transversal realizado en 114 estudiantes de fisioterapia que participaron en una ECOE de siete estaciones. Se utilizaron listas de verificación de desempeño en las estaciones (nota aprobatoria: 70% de la nota máxima por estación) y 2 encuestas de percepción para la autoevaluación y determinar el nivel de satisfacción. Se realizó la prueba de Rho de Spearman para determinar la correlación entre los puntajes por estación y la autoevaluación (nivel de significancia $p<0.05$).

**Resultados.** Se observaron medianas de puntajes superiores al aprobatorio en 5 estaciones (E1=66, RIC:52-70; E2 = 55, RIC:45-60; E3= 60, RIC:50-69; E4=65, RIC:55-73; E7=40, RIC:33-45), pero no en las estaciones de fortalecimiento e interpretación de parámetros (E5=54, RIC:46-65; E6=10, RIC:9-13). Se observó una correlación positiva y significativa entre los puntajes de la ECOE y la autoevaluación en cinco estaciones (E3: $p=0.042$; E4: $p<0.0001$; E5: $p=0.000$; E6: $p=0.000$; E7: $p<0.0001$). El nivel de satisfacción con la ECOE fue alto, con un 89.18% de aprobación respecto a cómo fue organizada.

**Conclusión.** La ECOE permitió evaluar las habilidades clínicas de los participantes al usar agentes físicos, siendo sus puntajes consistentes con la autoevaluación, lo que demuestra la utilidad del instrumento. El alto nivel de satisfacción con esta metodología da soporte a su uso, ya que los

estudiantes reconocen su aporte y la importancia de usar herramientas similares para mejorar su formación.

## INTRODUCTION

The training of health professionals involves teaching and evaluation methods that facilitate the assessment of their knowledge, skills, and attitudes, all of which are collectively referred to as professional skills to solve problems that inherent to their profession in a specific context (1-5).

Education in physical therapy is aimed at the development and acquisition of learning outcomes (LO), defined as the knowledge, comprehension, and actions that students must demonstrate at the end of a learning period, and which require teaching methods focused on the students' learning needs regarding their professional practice (6-8).

The LO integrate knowledge, skills, and attitudes that students develop, and they must be able to demonstrate their level of compliance with certain conditions and evaluation criteria defined by the academic program (9-16).

Physical agents  are defined in physical therapy as therapeutic resources

used commonly in rehabilitation processes. They are often used to relieve pain, reduce edema, manage muscle tone alterations, foster tissue repair and strength augmentation, or to increase the effectiveness of other interventions aimed at solving mobility problems and promoting functional restoration. These resources include electromagnetic, acoustic, and mechanical energies, all of which generate biophysical changes in cells and tissues and, ultimately, physiological and clinical effects (17-19). The use of physical agents is a physical therapy requirement that undergraduate students must meet in their education, and it is a key component of physical therapy programs (20,21).

Clinicians are required to properly use these resources to avoid adverse effects in patients. This implies training and an appropriate assessment of these professional skills, (22-23) which creates the need to develop teaching and evaluation strategies that permit the assessment of physical therapy students' skills and reasoning capacity when selecting and using physical agents (20-23).

The Objective Structured Clinical Examination (OSCE) is a recognized instrument to assess clinical skills, and it is regarded as a valid methodology for the education of health professionals. The OSCE incorporates various evaluation strategies implemented along a circuit of stations that simulate clinical scenarios (24-27). Therefore, the OSCE is recognized as a multipurpose, versatile evaluation tool used to assess different health professionals in a clinical context, guaranteeing uniformity in the criteria applied to evaluate an array of clinical skills. It is also a good instrument to provide feedback, foster reflection, and improve skills (28-32). The OSCE is an efficient tool to provide feedback to students and facilitate the

improvement of their skills, allowing students to reflect and assess the quality of their performance and identify improvement avenues. The assessment of one's own skills may enhance one's performance in the future professional practice (33-34).

There is a two-fold challenge that must be addressed: having a well-designed instrument to assess clinical skills and provide students with feedback on their performance, and making sure that the observed performance is aligned with the performance as perceived by the students. The observed performance in a test such as the OSCE must have a positive correlation with the performance perceived by students, for it will facilitate the identification of strengths and aspects to improve as well as the betterment of self-reflection about their skill acquisition. This will result in the enhancement of the teaching-learning process through effective feedback (35-40). Another relevant aspect of the OSCE is the students' level of satisfaction with the test as it provides feedback and allows them to improve their skills during their professional training (29,39).

Thus, the aim of this study was to assess the level of satisfaction and the correlation between the performance and self-evaluation of Chilean physiotherapy students in an OSCE developed to assess their clinical skills when using physical agents.

## MATERIALS AND METHODS

*Type of study*

A non-experimental, descriptive, cross-sectional study was employed.

*Ethical considerations*

Compliance with the ethical principles for conducted biomedical research involving human subjects established by the Declaration of Helsinki (41) was verified by the Bioethics Committee at the Rehabilitation Sciences Faculty (RSF) of Universidad Andrés Bello (Certificate A161, approved on June 3, 2019). All participants signed an informed consent form to enroll in the study.

*Participants*

The study included 114 students enrolled in the Physical Agents course regularly taught during the seventh semester of the Physical Therapy program at Andrés Bello University in Santiago, Chile. The inclusion criteria were being enrolled in the physical agents course and providing written consent to use the information about their performance, self-evaluation, and satisfaction with the test. Students who did not fully complete the OSCE, who could not take the test, or those who did not fully complete the surveys were excluded. 114 students performed the OSCE and 111 students answered the self-evaluation and satisfaction surveys.

The OSCE station checklists were numbered and kept by the lead researcher in order to maintain students' anonymity.

*Instruments*

*OSCE*

The OSCE included seven stations designed to assess the LO of the physical agents course: 1. analyze the physical and physiological effects of using non-ionizing physical agents; 2. assess different non-ionizing phys-

ical agents modalities, aligned with the therapeutic objective, in different professional contexts to address deficiencies and functional limitations caused by various health conditions; and 3. evaluate deficits and functional limitations related to health conditions, as well as the relevance and context for the use of non-ionizing physical agents. Five stations included standardized patient modality, one had a mailbox, and one was equipped with a dummy (phantom). At each station, students were evaluated with a checklist that included various criteria grouped into three domains: attitudes, knowledge, and skills. (TABLE 1).

**TABLE 1. OSCE stations and clinical skills evaluated.**

| STA-TION | STATION NAME | LEARNING OUTCOME* | STATION MODALITY | STATION DE-SCRIPTION | TOTAL SCORE |
|---|---|---|---|---|---|
| S1 | Connective tissue flexi-bility | LO 1 LO 2 LO 3 | Standard-ized patient | Apply ultrasound with the thera-peutic purpose of making connec-tive tissue more flexible | 0 - 74 |
| S2 | Muscle re-laxation | LO 1 LO 2 LO 3 | Standard-ized patient | Check contraindi-cations for short-wave diathermy application be-fore muscle re-laxation | 0 - 64 |
| S3 | Analgesia | LO 1 LO 2 LO 3 | Standard-ized patient | Demonstrate Biphasic Pulsed Current (TENS**) appli-cation with the therapeutic pur-pose of attaining analgesia | 0 - 80 |
| S4 | Drainage | LO 1 LO 2 LO 3 | Standard-ized patient | Demonstrate Biphasic Pulsed Current (NMES***) appli-cation for edema drainage, acti-vating muscle pumps | 0 - 80 |

| S5 | Muscle strengthening | LO 1 LO 2 LO 3 | Standardized patient | Perform electric muscle strengthening to increase trophism | 0 - 80 |
|---|---|---|---|---|---|
| S6 | Parameter interpretation | LO 1 LO 2 LO 3 | Mailbox | Develop the intervention-energy model | 0 - 18 |
| S7 | Equipment installation | LO 1 LO 2 | Dummy (phantom) | Install electrotherapy equipment safely | 0 - 53 |

*Learning outcomes of the Physical Agents course, **Transcutaneous Electrical Nerve Stimulation, ***Neuromuscular Electrical Stimulation
Source: Own creation based on the data obtained in the study

S1, S2, S3, S4, S5, and S7 were evaluated with checklists by observers, while S6 was evaluated with an answer sheet in a mailbox. A rest station was set up between S4 and S5. The time allotted per station was eight minutes, for a total test time of 64 minutes. In terms of LO achievement, 70% of the maximum score at each station was required to pass.

*Self-evaluation with regard to the OSCE and satisfaction survey*

Immediately after the test, students performed a self-evaluation regarding the OSCE, and were asked to provide information about their level of satisfaction with it by answering two surveys (Tables 3 and 5). The survey for the self-evaluation purposes was a Likert-type scale with five levels of qualitative assessment for each question: 1=very poor, 2=poor, 3=fair, 4=good, and 5=very good regarding each OSCE station. Similarly, their level of satisfaction was assessed with a Likert-type scale that included five levels to assess the OSCE: 1=strongly disagree, 2=disagree, 3=neither agree nor disagree, 4=agree and 5=strongly agree (40, 42).

*Statistical analysis*

The statistical analysis was performed with STATA, version 16.0. The scores obtained at each station were analyzed using the Shapiro-Wilk normality test to determine their distribution, statistical procedures, and descriptive statistics to be used (43). Scores were described using medians and interquartile ranges (IQR=P25-P75).

The results of the self-evaluation and the level of satisfaction surveys were analyzed using frequency distributions.

The Spearman's Rho test was performed to analyze the correlation between the OSCE scores and the students' self-evaluation per station (significance level of $p < 0.05$).

## RESULTS

The scores of the OSCE show a non-normal distribution at S1, S2, S3, S4, S6, and S7 (Table 2). The median values per station show scores that exceed the passing level, except for S5 and S6. The S1, S2, and S4 scores of the twenty-fifth percentile ($p_{25}$) were equal or greater than the passing score, so more than 75% of the cohort passed those stations (S1=77.19%; S2=83.33%; S4=79.82%).

**Table 2. OSCE scores per station**

| STA-TION | STATION NAME | P-VALUE | MEDIAN | $(P_{25}$ - $P_{75})$ | MIN-IMAL SCORE | MAX-IMUM SCORE | TOTAL SCORE |
|---|---|---|---|---|---|---|---|
| S1 | Connective tissue flexi-bility | 0.000* | 66 | (52-70) | 10 | 74 | 0 - 74 |
| S2 | Muscle re-laxation | 0.000* | 55 | (45-60) | 21 | 64 | 0 - 64 |
| S3 | Analgesia | 0.011* | 60 | (50-69) | 21 | 80 | 0 - 80 |
| S4 | Drainage | 0.006* | 65 | (55-73) | 35 | 80 | 0 - 80 |
| S5 | Muscle strengthen-ing | 0.010 | 54 | (46-65) | 12 | 80 | 0 - 80 |
| S6 | Parameter interpreta-tion | 0.037* | 10 | (9-13) | 1 | 18 | 0 - 18 |
| S7 | Electro-therapy installation | 0.000* | 40 | (33-45) | 0 | 53 | 0 - 53 |

Source: Own creation based on the data obtained in the study

Normality analysis performed with the Shapiro-Wilk test. *p-value < 0.05

Although the twenty-fifth percentile ($p_{25}$) at stations S3 and S7 performed below the passing score, the median revealed a good performance by more than 50% of the group (S3=62.28%; S7=69.30%). The lowest performance stations were S5 and S6, where the scores of $p_{25}$ and $p_{50}$ were below the passing score, which is consistent with a passing rate below

50% at both stations (S5=48,25%; S6=34.2%). The highest passing rate was attained at the muscle relaxation station, while the least satisfactory result was attained at the parameter interpretation station. The OSCE total passing rate was 88.4%, which includes various levels of performance at the different stations.

The self-evaluation results show a high perceived performance (after adding the "good" and "very good" criteria) at S1, S2, S3, and S4 (S1=62.15%, S2=64.85%, S3=62.16%, and S4=57.66%), while S6 and S7 show low perceived performance (S6=44.13%; S7=43.25%). Finally, S5 was the worst perceived performance by students (S5= 20.73%) (Table 3).

**TABLE 3. Self-evaluation with regard to the OSCE per station**

| STATION | VERY POOR | POOR | FAIR | GOOD | VERY GOOD |
| | n (%) | n (%) | n (%) | n (%) | n (%) |
| --- | --- | --- | --- | --- | --- |
| S1 | 3 (2.70) | 13 (11.71) | 26 (23.42) | 44 (39.63) | 25 (22.52) |
| S2 | 9 (8.10) | 11 (10.00) | 19 (17.11) | 40 (36.03) | 32 (28.82) |
| S3 | 1 (0.90) | 11 (9.91) | 30 (27.03) | 48 (43.24) | 21 (18.92) |
| S4 | 3 (2.70) | 14 (12.61) | 30 (27.03) | 34 (30.63) | 30 (27.03) |
| S5 | 8 (7.21) | 40 (36.04) | 40 (36.04) | 17 (15.32) | 6 (5.41) |
| S6 | 1 (0.90) | 17 (15.31) | 44 (39.63) | 33 (29.72) | 16 (14.41) |
| S7 | 10 (9.01) | 13 (11.71) | 40 (36.04) | 31 (27.93) | 17 (15.32) |

Source: Own creation based on the data obtained in the study

Subsequently, a correlation analysis was performed between the observed performance (OSCE scores) and the perceived performance (self-evaluation with regard to the OSCE with physical agents) using the Spearman's Rho test (Table 4). Statistically significant positive correlation values are observed at S3, S4, S5, S6, and S7. Only at S1 and S2 a non-significant correlation was observed.

**TABLE 4. OSCE scores and the self-evaluation**

| | S1 SE** | S2 SE** | S3 SE** | S4 SE** | S5 SE** | S6 SE** | S7 SE** |
|---|---|---|---|---|---|---|---|
| S1 score | 0.11<br>111<br>0.268 | | | | | | |
| S2 score | | 0.15<br>111<br>0.121 | | | | | |
| S3 score | | | 0.19<br>111<br>0.042* | | | | |
| S4 score | | | | 0.56<br>111<br>0.000* | | | |
| S5 score | | | | | 0.36<br>111<br>0.000* | | |
| S6 score | | | | | | 0.36<br>111<br>0.000* | |
| S7 score | | | | | | | 0.47<br>111<br>0.000* |

Spearman's Rho. *p-value <0.05

**Self-evaluation

Source: Own creation based on the data obtained in the study

The data regarding the level of satisfaction with the OSCE (Table 5) show high percentages when the "agree" and "strongly agree" criteria are grouped in all questions: Q1:89.18%; Q2:82.6%; Q3:92.67%; Q4:90.74%; Q5:98.17% (Table 5).

**TABLE 5. Level of satisfaction with the OSCE**

| QUESTIONS | STRONGLY DISAGREE n (%) | DIS-AGREE n (%) | NEITHER AGREE NOR DISAGREE n (%) | AGREE n (%) | STRONG-LY AGREE n (%) |
|---|---|---|---|---|---|
| Q1. The general OSCE organization is adequate. | 1 (0.90) | 8 (7.20) | 3 (2.70) | 46 (41.44) | 53 (47.74) |
| Q2. The stations were adequate for my knowledge. | 0 (0.00) | 4 (3.60) | 15 (13.51) | 51 (45.94) | 41 (36.94) |
| Q3. The OSCE has been useful for my training as a Physical Therapist. | 0 (0.00) | 4 (3.60) | 4 (3.60) | 31 (27.93) | 72 (64.86) |
| Q4. Taking similar tests improves my training. | 0 (0.00) | 4 (3.60) | 6 (5.41) | 32 (28.83) | 68 (61.26) |
| Q5. It is relevant to take tests that evaluate my clinical skills. | 0 (0.00) | 0 (0.00) | 2 (1.80) | 26 (23.42) | 83 (74.77) |

Source: Own creation based on the data obtained in the study

## DISCUSSION

The training of health professionals is not only aimed at developing knowledge, but also at acquiring skills and abilities that will allow them to solve clinical problems (44-46). Physical therapists stress the importance of intervention skills, a process of intentional interaction with patients that requires the use of various procedures and techniques that include physical agents to generate changes in health conditions (47). The dosage and

use of physical agents require prior reasoning to assess their relevance and therapeutic benefits to treat a condition. Common problems observed in clinical practice are the technical application with pre-established parameters and installation, especially of electrotherapy resources (8,48. This is why it is important to implement teaching strategies that involve reasoning models and intervention skills with physical agents in the training of physical therapy students (22). The OSCE is a multidimensional tool designed to assess the students' performance in specific clinical settings, testing their knowledge, reasoning ability, skills, attitudes, and interpersonal communication. This instrument has already been tested and validated for the training of other health professionals. Students are major stakeholders in this process, so knowing their self-evaluation and levels of satisfaction are essential to develop feedback processes (28-31,34,37,49).

The aim of this study was to correlate the self-evaluation and clinical skills performance of physical therapy students and assess their levels of satisfaction with the OSCE when using physical agents.

These results obtained here are positive in light of the high number of passing scores observed. The analysis of the stations reveals a passing rate greater than 75% at S1, S2, S3, and S4, which means that the learning outcomes were reached. On the other hand, S3 shows that $p_{50}$ and $p_{25}$ surpassed the passing score, although the passing rate at this scenario did not reach 80% (69.30%); therefore, the students' performance is set at the average level. S5 and S6 had lower passing rates (48.25% and 34.21%); slightly over 50% of students were below the passing score, which constitutes a low performance.

The results of the self-evaluation with regard to the OSCE at different stations were satisfactory after the "good" and "very good" qualitative criteria were grouped for stations S1, S2, S3, and S4 (S1=62.15%; S2=64.85%; S3=62.16%; S4=57.66%). On the other hand, the results of the self-evaluation at S5, S6, and S7 were lower after adding the same two qualitative criteria (S5=20.73%; S6=44.13%; S7=43.25%). Thus, the OSCE results are favorable and illustrate that the LO were attained by the students. These results allow students to analyze their own performance at each station and assess their clinical skills in terms of high or low performance, which facilitates their reflection on their ability to apply what they have learned (20,27,26,39).

In general, a positive and significant correlation between the scores obtained in the OSCE and the students' self-evaluation stands out at most stations (S3-S7). In stations where students had lower scores in the OSCE (S5 and S6), a significant correlation with the self-evaluation was observed. It should be noted that the results present a significant correlation at both the high-performance and low-performance stations, which explains the high level of agreement between the students' performance as observed by the evaluators and the students' perception regarding their own performance. In turn, this correlation permits the execution of improvements to the training process, the implementation of self-reflection practices, and the generation of effective feedback for students and instructors (24,29,35).

The students' level of satisfaction with the OSCE was positive for all questions. Students value the organization (89.18%) as well as the usefulness of the test for their training process (92.79%). In general, 82.88% of the

cohort rated the instrumented using the positive qualitative criteria and declared that this methodology effectively improves their skills (24,34).

To improve the learning outcomes and the achievement of clinical skills, it is recommended to increase the number of stations so as to reinforce those skills where lower performance was observed and to implement en-hancement to the training process (50-52).

*Limitations*

A limitation may have been the number of stations and the time required to perform the tasks of each station, which could be adjusted to improve the observed performances (53,54). It must be noted that this type of assessment requires a large amount of resources, equipment, trained hu-man resources, and support personnel.

Another limitation was that there was not enough training with dummies and standardized patients. As the OSCE was a first-time approach to this assessment mode, students would ideally have had more experience with these tasks to improve their confidence and safety levels in the execution of every task.

## CONCLUSION

The OSCE is a great assessment instrument that enables the evaluation of clinical skills and reasoning ability. It is essential to incorporate it as an end evaluation to assess the achievement of LO.

The passing scores rates and the good correlation between the results obtained by the students in the OSCE scores and their self-evaluation

stand out, which proves the usefulness of the instrument to assess the development of clinical skills. Also, this positive correlation means that the tool allows students to identify their strengths and the aspects they need to work on to improve, as well as provides them with an opportunity to reflect on their skills acquisition process.

The students' high level of satisfaction with this methodology supports its use, since they acknowledge both its contribution and the importance of using similar tools to improve their training.

Future studies may include the assessment of the OSCE by instructors and standardized patients as part of the students' feedback process.

**Conflict of interests**

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**REFERENCES**

1. Barzansky B. Educational Programs in US Medical Schools, 2002-2003. JAMA. 2003;290(9):1190. DOI: 10.1001/jama.290.9.1190.

2. Pinilla-Roa A. Evaluación de Competencias Profesionales en Salud. Revista Facultad de Medicina. 2013;61.53-70.

3. Gómez-Clavelina F, Hernández-Torres I, Grijalva M. Professional. Clinic Competence of the Family Medicine Specialist. Atención Familiar. Vol.

21. Núm. 4. pág101-102 (octubre - diciembre 2014. DOI: 10.1016/S1405-8871(16)30028-1.

4. Trivino X. Objective Structured Clinical Examination for a pediatric internship assessment in two schools of medicine. Rev. Med. Chile [online]. 2002, vol.130, n.7, pp.817-824. ISSN 0034-9887. DOI: 10.4067/S0034-98872002000700016.

5. Epstein RM, Hundert EM. Professional Competence. JAMA. 2002 Jan 9;287(2):226-35. DOI: 10.1001/jama.287.2.226.

6. Broberg C, Aars M, Beckmann K, Emaus N, Lehto P, Lähteenmäki M et al. A Conceptual Framework for Curriculum Design in Physiotherapy Education – an International Perspective. Advances in Physiotherapy. 2003;5(4):161-168. DOI: 10.1080/14038190310017598

7. Mori B, Carnahan H, Herold J. Use of Simulation Learning Experiences in Physical Therapy Entry-to-Practice Curricula: A Systematic Review. *Physiother Can*. 2015;67(2):194-202. doi:10.3138/ptc.2014-40E

8. Macauley, Kelly. (2016). Simulation in Physical Therapy Education and Practice: Opportunities and Evidence-Based Instruction to Achieve Meaning Learning Outcomes. Journal of Physical Therapy Education. 2016. 30:3. DOI: 10.1097/00001416-201630010-00002.

9. Leite, Ângela & Soares, Diana & Sousa, Hélder & Vidal, Diogo & Dinis, Maria & Dias, Diana. For a Healthy (and) Higher Education: Evidences from Learning Outcomes in Health Sciences. Education Sciences. 2020.10;168. DOI:10.3390/educsci10060168.

10. Varnava marouchou, Despina. Can Students' Concept of Learning Influence Their Learning Outcomes? Higher Learning Research Communications. 2012. 2;18. DOI: 10.18870/hlrc.v2i2.23.

11. Adams S. An introduction to learning outcomes: A consideration of the nature, function and position of learning outcomes in the creation of the European Higher Education Area', in E. Froment (ed.), EUA Bologna Handbook: Making Bologna Work, Volume 4 (Berlin: RAABE). 2002. p 2-22.

12. Watson P. The Role and Integration of Learning Outcomes into the Educational Process. Active Learning in Higher Education. 2002;3(3):205-219. DOI: 10.1177/1469787402003003002.

13. Gallavara G. Learning Outcomes: Common Framework. Different Approaches to Evaluation Learning Outcomes in the Nordic Countries; European Association for Quality Assurance in Higher Education. Gunn Gallavara, Teemu Suominen. 2008.

14. Tremblay K. Assessment of Higher Education learning outcomes (AHELO): Feasibility Study. Feasibil. Study Rep. 2013. (1). p 66–86. 15.

15. Kennedy D. Writing and Using Learning Outcomes: A Practical Guide. 2007.

16. Rogers GD, Thistlethwaite JE, Anderson ES, et al. International consensus statement on the assessment of interprofessional learning outcomes. Med Teach. 2017;39(4):347-359. DOI:10.1080/014215 9X.2017.1270441

17. American Physical Therapy Association. Guide to physical therapy practice. Fairfax (VA): American Physical Therapy Association; 2001.

18. Allen RJ. Physical agents used in the management of chronic pain by physical therapists. Phys Med Rehabil Clin N Am. 2006 May;17(2):315-45. DOI: 10.1016/j.pmr.2005.12.007.

19. Springer S, Laufer Y, Elboim-Gabyzon M. Clinical decision making for using electro-physical agents by physiotherapists, an Israeli survey.

Journal of Health Policy Research (2015) 4:14. DOI 10.1186/s13584-015-0015-x.

20. Robertson V, Spurritt D. Electrophysical agents: Implications of their availability and use in undergraduate clinical placements. Physiotherapy 1998 (84): 335–344

21. Pérez-Machado, J.L. & Rodríguez-Fuentes, Gustavo. Autopercepción de competencia en el manejo de los agentes electrofísicos en alumnos españoles de fisioterapia de último año. Fisioterapia. 2012:34. 146–153. DOI: 10.1016/j.ft.2012.01.005.

22. Watson T. The role of electrotherapy in contemporary physiotherapy practice. Man Ther. 2000 Aug;5(3):132-41. DOI: 10.1054/math.2000.0363

23. Watson T. Current concepts in electrotherapy. Haemophilia. 2002 May;8(3):413-8. DOI: 10.1046/j.1365-2516.2002.00613.x.

24. Epstein RM. Assessment in medical education. N Engl J Med 2007; 356 (4): 387-96.

25. Harden R, Gleeson F. Assessment of Clinical Competence Using an Objective Structured Clinical Examination. Medical Education 1979; 13: 41-54.

26. Khan KZ, Ramachandran S, Gaunt K, Pushkar P. The Objective Structured Clinical Examination (OSCE): AMEE Guide No. 81. Part I: an historical and theoretical perspective. Med Teach 2013; 35 (9): e1437-46. DOI:10.3109/0142159X.2013.818634.

27. Lockyer J, Carraccio C, Chan MK, Hart D, et al. Core principles of assessment in competency-based medical education. Med Teach. 2017 Jun;39(6):609-616. DOI: 10.1080/0142159X.2017.1315082.

28. Villegas N. Assessment of breastfeeding clinical skills among nursing students using the Objective Structured Clinical Examination (OSCE).

Inv Ed Med. 2016;5(20):244-252. DOI: 10.1016/j.riem.2016.04.001.

29. Urteaga EM, Attridge RL, Tovar JM, Witte AP. Evaluation of Clinical and Communication Skills of Pharmacy Students and Pharmacists with an Objective Structured Clinical Examination. Am J Pharm Educ. 2015 Oct 25;79(8):122. DOI: 10.5688/ajpe798122.

30. Barry M, Bradshaw C, Noonan M. Improving the content and face validity of OSCE assessment marking criteria on an undergraduate midwifery programme: a quality initiative. Nurse Educ Pract. 2013 Sep;13(5):477-80. DOI: 10.1016/j.nepr.2012.11.006.

31. Manogue M, Kelly M, Masaryk SB, et al. Evolving methods of assessment. Eur J Dent Educ 2002: 6(Suppl.): 53–66.

32. Ericson D, Christersson C, Manogue M, Rohlin M. Clinical guide- lines and self-assessment in dental education. Eur J Dent Educ 1997: 1: 123–128.

33. Rodríguez-Espinosa H, Restrepo-Betancur L, Luna-Cabrera C. Percepción del estudiantado sobre la evaluación del aprendizaje en la educación superior. Revista Electrónica Educare, vol. 20, núm. 3, septiembre-diciembre, 2016, pp. 1-17 Universidad Nacional Heredia, Costa Rica.

34. Larsen T, Jeppe-Jensen D. The introduction and perception of an OSCE with an element of self- and peer-assessment. Eur J Dent Educ. 2008 Feb;12(1):2-7. DOI: 10.1111/j.1600-0579.2007.00449.x.

35. Schoonheim-Klein ME, Habets LL, Aartman IH, van der Vleuten CP. Implementing an Objective Structured Clinical Examination (OSCE) in dental education: effects on students' learning strategies. Eur J Dent Educ. 2006 Nov;10(4):226-35. DOI: 10.1111/j.1600-0579.2006.00421.x

36. Pierre RB, Wierenga A, Barton M, Branday JM, Christie CD. Student evaluation of an OSCE in paediatrics at the University of the West Indies, Jamaica. BMC Med Educ. 2004;4:22. DOI:10.1186/1472-6920-4-6

37. Brand HS, Schoonheim-Klein M. Is the OSCE more stressful? Examination anxiety and its consequences in different assessment methods in dental education. Eur J Dent Educ. 2009;13:147–153. doi:10.1111/j.1600-0579.2008.00554.

38. Khan A, Ayub M, Shah Z. An audit of the medical students' perceptions regarding objective structured clinical examination. Educ Res Int. 2016: Article ID 4806398:4. DOI:10.1155/2016/4806398.

39. Alemán S, Marín C, Soriano V, González A, Flores D, Ramírez P, Cascales P. Cómo perciben los estudiantes del primer curso clínico del Grado en Medicina la prueba de Evaluación Clínica Objetivada Estructurada (ECOE). Educ Med. Educ Med. 2019;20(S2):144-147. DOI: 10.1016/j.edumed.2018.02.005.

40. Brown, Celia & Green, Kathryn. (2013). OSCE Feedback: A Randomized Trial of Effectiveness, Cost-Effectiveness and Student Satisfaction. Creative Education. 04. 9-14 DOI: 10.4236/ce.2013.46A002.

41. WMA declaration of Helsinki – ethical principles for medical research involving human subjects [Internet]. Wma.net. [citado el 23 de febrero de 2021]. Disponible en: http://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/.

42. Vagias WM. Likert-type scale response anchors. Clemson International Institute for Tourism & Research Development, Department of Parks, Recreation and Tourism Management. Clemson University. 2016

43. Yap B, Sim C. Comparisons of various types of normality tests. Journal of Statistical Computation and Simulation. 2011;81(12):2141-2155. DOI: 10.1080/00949655.2010.520163. 10.1080/00949655.2010.520163.

44. Howe A, Anderson J. Involving patients in medical education. BMJ 2003; 327:323–8. DOI: 10.1136/bmj.327.7410.326

45. Fields SA, Usatine R, Steiner E. Teaching medical students in the ambulatory setting. Strategies for success. JAMA 2000; 283;2362–4. DOI: 10.1001/jama.283.18.2362

46. American Physical Therapy Association. Guide to Physical Therapist Practice. Second Edition. Physical Therapy 2001: 8:1;9-744.

47. Robertson VJ, Spurritt D. Electrophysical Agents: Implications of their availability and use in Undergraduate clinical Placements. Physiotherapy. Volume 84, Issue 7, July 1998, Pages 335-344. DOI: 10.1016/S0031-9406(05)63462-1.

48. Pérez Machado JL, Rodríguez Fuentes G. Autopercepción de competencia en el manejo de los agentes electrofísicos en alumnos españoles de fisioterapia de último año. Fisioterapia. 2012;34(4):146-153. DOI:10.1016/j.ft.2012.01.005

49. Valencia Castro J, Tapia Vallejo S, Olivares Olivares S. La simulación clínica como estrategia para el desarrollo del pensamiento crítico en estudiantes de medicina. Investigación educ. médica. 2019; 8(29): 13-22. DOI: 10.1016/j.riem.2016.08.003.

50. Zayyan M. Objective Structured Clinical Examination: The Assessment of Choice. Oman Medical Journal (2011) Vol. 26, No. 4: 219-222. Review Article. DOI 10. 5001/omj.2011.55.

51. de la Barra-Ortiz HA, Gómez-Miranda LA, de la Fuente-Astroza JI. Objective structured clinical examination (OSCE) to assess physical therapy stu-

dents' clinical skills when using physical agents. Rev. Fac. Med. [Internet]. 2021Feb.8 [cited 2021Jul.28];69(3):e83545. Available from: https://revistas.unal.edu.co/index.php/revfacmed/article/view/83545

52. Figueroa-Arce N, Figueroa-González P, Gómez-Miranda L, Gútierrez-Arias R, Contreras-Pizarro V. Implementation of Objective structured clinical examination (OSCE) as a tool to evaluate the development of clinical reasoning in physical therapy students and level of satisfaction with its use. Rev. Fac. Med. [Internet]. 2021Apr.19 [cited 2021Jul.28];70(2):e90746. Available from: https://revistas.unal.edu.co/index.php/revfacmed/article/view/90746

53. Parks R, Warren P, Boyd K, Cameron H, Cumming A, Lloyd-Jones G. "The Objective Structured Clinical Examination and student collusion: Marks do not tell the whole truth". Journal of Medical Ethics (2016). 32 (12): 734–738. DOI:10.1136/jme.2005.015446. PMC 2563344. PMID 17145916.

54. Kamran Z. Khan, Kathryn Gaunt, Sankaranarayanan Ramachandran & Piyush Pushkar (2013) The Objective Structured Clinical Examination (OSCE): AMEE Guide No. 81. Part II: Organisation & Administration, Medical Teacher, 35:9, e1447-e1463, DOI:10.3109/0142159X.2013.818635.