Journal of
Modern Rehabilitation

October 2024, Volume 18, Number 4

Research Article

Teamwork Skills, Satisfaction, and Knowledge Level in Rehabilitation Students through Team Observed Structured Clinical Examination

Marzieh Amiri[1], Neda Orakifar[2], Fatemeh Taheri[1], Nasrin Khajeali[3], Nahid Pirayeh[2], Mojtaba Tavakoli[1], Masoume Hosseini Bidokhti[4], Maryam Saadat[2], Amin Behdarvandan[2], Majid Soltani[4], Arash Bayat[1,5], Parisa Heidari[1*]

1. Department of Audiology, School of Rehabilitation Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
2. Department of Physical Therapy, School of Rehabilitation Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
3. Educational Development Center (EDC), Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
4. Department of Speech Therapy, School of Rehabilitation Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.
5. Hearing Research Center, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

Use your device to scan and read the article online

Citation Amiri M, Orakifar N, Taheri F, Khajeali N, Pirayeh N, Tavakoli M, et al. Teamwork Skills, Satisfaction, and Knowledge Level in Rehabilitation Students through Team Observed Structured Clinical Examination. Journal of Modern Rehabilitation. 2024; 18(4):471-479. http://dx.doi.org/10.18502/jmr.v18i4.16916

http://dx.doi.org/10.18502/jmr.v18i4.16916

Article info:
Received: 25 Nov 2023
Accepted: 10 Mar 2024
Available Online: 01 Oct 2024

Keywords:
Teamwork; Team observed structured clinical examination; Rehabilitation; Student

ABSTRACT

Introduction: Team-observed structured clinical examination (TOSCE) is a powerful approach to formative assessment resources, regarded as an essential element of students' performance in a team format. Considering the importance of teamwork in rehabilitation, this study implements an intervention focused on enhancing teamwork skills within diverse groups of rehabilitation students, employing TOSCE as a tool for assessment and improvement.

Materials and Methods: A total of 49 fourth-year undergraduate students specializing in audiology, physical therapy, and speech therapy constituted three groups in our study. Students in each major were randomly divided into four groups. The students were asked to complete the teamwork (19-item scale of Lencioni) and satisfaction (researcher-made scale) questionnaires after TOSCE. A knowledge assessment questionnaire was also conducted at pre- and post-TOSCE time points.

Results: There was no significant difference between the average score of the teamwork ($F=1.508$, $P>0.05$) and satisfaction ($F=3.508$, $P>0.05$) levels across different majors. All participants had high scores on both teamwork and satisfaction scales. By comparing the pre-test and post-test knowledge assessment, in all groups, there was a statistically significant difference between the pre-and post-test results ($P<0.05$). The students obtained a higher score after the implementation of the TOSCE.

Conclusion: The TOSCE method provides a valuable and viable educational opportunity for rehabilitation students to receive feedback on their clinical performance, enhance their knowledge, and, most importantly, lead to a positive feeling of teamwork among students.

*** Corresponding Author:**
Parisa Heidari, Assistant Professor.
Address: *Department of Audiology, School of Rehabilitation Sciences, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.*
Tel: *+98 (61) 33743101*
E-mail: *hdr.parisa@gmail.com*

Introduction

An objective of medical student evaluation is promoting the learning process and improvement of educational program quality [1]. In recent years, structured clinical assessments have been utilized widely to evaluate the clinical competence of medical student's performance in practice settings [1, 2]. One of the standardized clinical assessment methods used in various fields of medicine is the objective structured clinical examination (OSCE) method, developed in 1975 by Harden and Gleeson [3]. During the OSCE examination, students move between different stations to evaluate their clinical skills. The validity and reliability of this method have been confirmed in several studies and has been used for years in rehabilitation fields to evaluate students' performance [4, 5].

During the last decades, team objective structured clinical examination (TOSCE) has been developed as a variation of OSCE. TOSCE was developed addressing the importance and necessity of teamwork and interdisciplinary cooperation. The scenario is designed and implemented by teams of four to five students, each with a role in the team. The examiners monitor students' performance and, subsequently, provide feedback on their communication and clinical and professional skills [4, 6, 7]. Some studies have used a similar test but under the name of group objective structured examination (GOSCE) [8].

The purpose of designing TOSCE was to make students aware of their strengths and weaknesses and to measure their attitudes the them as a team [6]. It also provides an exciting start to the course, which would weld the participants into supportive social groups. Therefore, exploring interpersonal relationships is quite a significant role of TOSCE. For instance, addressing a variety of clinical problems in small groups can help the future members of each profession better understand each other's perspectives [7].

Some high-ranking students think that teamwork may cause them to perform more than their assignments, however, TOSCE can help empower students to learn how to work together. It also helps beginners become experienced, and think about themselves and what they do. As a formative evaluation tool, it can promote learning and problem-solving abilities in students [4, 5].

The importance of teamwork in rehabilitation is well understood and is demonstrated by focusing on teamwork in rehabilitation guidelines [9-11]. Published reviews exploring teamwork in rehabilitation have demonstrated that communication is an important aspect of teamwork [12-15]. Nijhuis et al. argued that communication can simplify collaboration at all levels of health care, making it crucial in the consideration or evaluation of team practices [16]. However, studies have shown that TOSCE improves team communication skills [17].

This study improves teamwork skills using the TOSCE in different educational groups of the Rehabilitation School. Additionally, the knowledge and satisfaction levels of students using the TOSCE method have been evaluated.

Materials and Methods

Study design

This cross-sectional comparative study was conducted from October 17, 2021, to October 18, 2022. For assessing teamwork skills, a 19-item Lencioni team assessment questionnaire was used [18]. In this questionnaire, a score between 19 and 31 shows low teamwork, a score between 32 and, 64 indicates moderate teamwork, and a score above 64 means high teamwork. In addition to this pre-existing questionnaire, two questionnaires are also developed for evaluating the knowledge and satisfaction level of students using the TOSCE method. For assessing pre- and post-level knowledge assessment, a 10-item questionnaire was developed in each major (Appendix 1 to 3). Based on the Kirkpatrick model, we assessed the application of knowledge in these questionnaires [19]. Students were asked to complete the questionnaire before and after the TOSCE test. Furthermore, a 10-item self-reported questionnaire was developed using a 5-point Likert scale (5 = very good, 4 = good, 3 = moderate, 2 = poor, 1 = very poor) to assess satisfaction.

The developed questionnaires were distributed among ten experts in rehabilitation sciences (three audiologists, three speech therapists, and four physical therapists) to validate their content. The content validity Ratio (CVR) is calculated based on the Lawshe equation (Equation 1):

1. $CVR = [(ne-(N/2)]/ (N/2)$

in which, "ne" indicates the number of panelists indicating an item, and "N" indicates the total number of panelists. The acceptable value for the CVR for 10 experts according to Lawshe is ≥0.62. The calculated CVR values for the questionnaire items were ≥0.8.

We also calculated the content validity index (CVI) according to the experts' opinions regarding simplicity, relevance, and clarity based on a 4-point Likert scale (4 = very important, 3 = relevant, 2 = not important, and 1 = not relevant). The acceptable value for the CVI index was ≥0.79. The results reported that all questions had item CVI values above 0.79. The calculated content validity ratio values for the questionnaire items were ≥0.8. According to the results, the questionnaires had acceptable content validity.

Study participants

The study population consisted of 49 final-year rehabilitation students specializing in audiology, physical therapy, and speech therapy constituted the three groups in our study. Students in each major were randomly divided into four groups. Criteria for student entry were passing all theory courses of the rehabilitation curriculum (audiology, physical therapy, or speech therapy) that made them eligible to take the TOSCE and the willingness to participate in the study.

Study procedure

The participants in each major were divided into four groups, and their practical skills and knowledge were assessed before and after undergoing the TOSCE by the knowledge assessment questionnaire. The TOSCE involved various stations, each requiring participants to demonstrate their competence in specific aspects of their field. Following the completion of the TOSCE, the students were invited to respond to satisfaction and teamwork questionnaires.

Statistical analysis

Mean±standard deviation (SD) were measured for presenting descriptive data. After measuring the normality of the data using the Kolmogorov-Smirnov test, the one-way analysis of variance and the Tukey post hoc test were used to compare teamwork, knowledge, and satisfaction scores across different study groups. The SPSS software, version 17.0 (IBM Corporation, New York, USA) was used for all statistical analyses, and the significance level for all tests was set at 0.05.

Results

A total of 49 fourth-year undergraduate students participated in this study (Table 1).

Table 2 demonstrates the average satisfaction levels for each item on the questionnaire across all three investigated groups. Accordingly, on average, students gave high scores in response to the satisfaction questionnaire. Furthermore, no notable differences were observed among the three groups regarding satisfaction levels.

Table 3 shows the average teamwork levels within all three examined groups. Since a score above 64 indicates high teamwork, students, on average, reported high levels of teamwork.

Figure 1 shows the frequency of teamwork questionnaire grades across three different groups of students. Our results indicated that the scores of none of the students were in the low score category of the teamwork questionnaire.

Figure 2 shows the scores of the satisfaction questionnaire of this method based on the Likert scale. Most students reported their satisfaction with this method in a completely agreeable way, and none of the students reported a completely disagreeing score.

The results of the one-way analysis of variance test indicated no significant difference between the average score of the teamwork level between the studied groups ($F=1.508$, $P>0.05$). Meanwhile, the results of the one-way analysis of variance test showed no significant difference between the average score of the satisfaction level across different study groups ($F=3.508$, $P>0.05$).

Table 1. Demographic characteristics of the study population (n=49)

Major of Students	Gender	Age (y), Mean±SD
Physical therapy	M=16, F=5	23.07±2.96
Audiology	M=3, F=12	23.46±1.88
Speech therapy	M=8, F=5	22.41±0.99

SD: Standard deviation; M: Male; F: Female.

Table 2. Mean satisfaction score of different study groups

No.	Questions	Mean Score			P
		Audiology	Occupational Therapy	Speech	
1	Announcing that the TOSCE was appropriate.	3.50	4.4	3.72	1.46
2	The method of conducting the test at each station was clearly defined.	3.16	4.26	4.06	0.72
3	The duration of the test at each station was appropriate.	3.16	4.37	4.31	1.02
4	The physical environment for conducting the TOSCE test was suitable.	3.32	3.89	4.22	0.66
5	The methods of presenting the TOSCE test were innovative.	3.5	3.8	4.41	0.06
6	The tool for conducting the TOSCE test was suitable.	4.43	4.33	3.84	0.16
7	The response letter at each station was well-designed.	3.13	3.73	3.53	0.72
8	The presentation of the TOSCE has motivated me to learn.	3.26	4.4	3.84	1.02
9	The TOSCE method was helpful in my decision-making in the field of clinical work.	4.11	4.26	4.25	0.07
10	Conducting the TOSCE test can help meet the clinical training needs of students.	3.06	4.46	3.91	0.72
	Total	3.46	4.19	4.00	0.86

TOSCE: Team observed structured clinical examination.

JMR

By comparing the pre-test and post-test results of the knowledge level in all three investigated groups, we found a statistically significant difference between the pre-and post-test conditions ($P<0.05$). This indicates that following the implementation of TOSCE, there was a clear enhancement in the students' knowledge levels (Table 4).

Discussion

The analysis of the teamwork skills of the students showed that most of them had high levels of teamwork abilities [9]. TOSCE allowed rehabilitation students to work better with their peers. Biran [8] indicated that GOSCE's primary role is to use its teamwork structure to explore interpersonal relationships. General practitioners

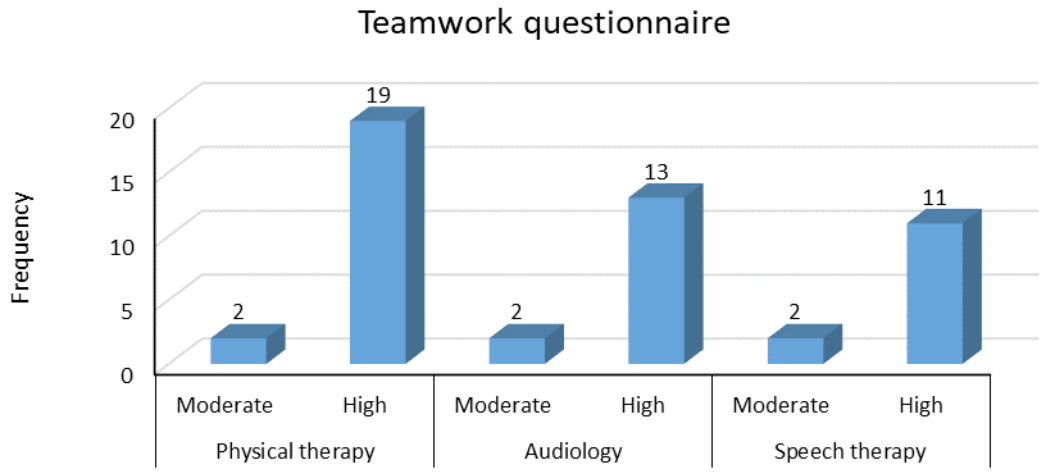

Figure 1. Frequency of teamwork questionnaire grades across students in three majors

JMR

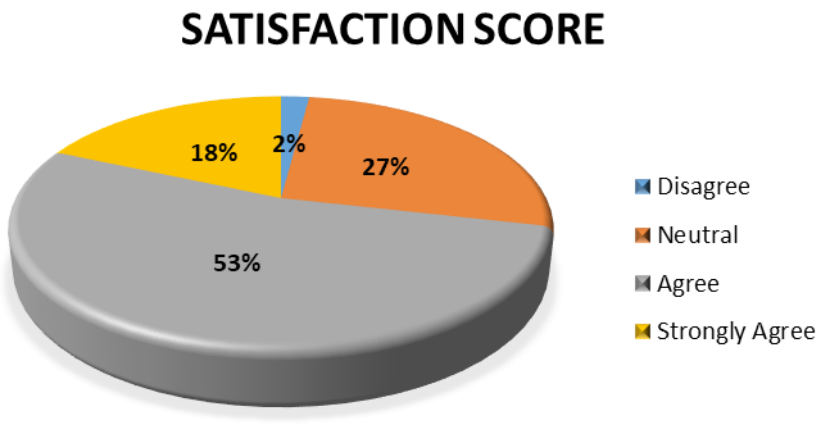

Figure 2. Distribution of satisfaction questionnaire scales

JMR

who participated in the study rated GOSCE highly as a method of self-assessment and a satisfying social event. Biran [8] reported that GOSCE is a resource to learn more about interpersonal and interprofessional communications. The author also concluded that addressing a range of clinical problems in small, mixed small groups, may help the future members of each profession better understand each other's perspectives.

Jain et al. [17] utilized a formative group assessment tool, team objective structured bedside assessment. In this method, students were directly observed performing tasks and were evaluated based on their performance in each group. Jain et al. results showed that team objective structured bedside assessment reinforced students' team communication skills and empowered their confidence [17]. Medical educators attempt to empower clinical, communication, and reasoning (critical thinking) skills in their training programs [20]. However, teaching these skills, especially higher-order cognitive skills is challenging [21]. Many programs have been designed for direct observation and assessment of clinical skills. However, there is little data on their use as a formative assessment [22].

Table 3. Teamwork level of study groups

Major of Students	Teamwork Score	
	Mean±SD	Min-Max
Physical therapy	75.90±8.99	64-94
Audiology	71.40±8.47	54-89
Speech therapy	77.23±11.46	61-94

SD: Standard deviation; Min: Minimum; Max: Maximum.

JMR

Table 4. Comparison of the knowledge level of study groups across different time points

Major of Students	Before TOSCE		After TOSCE		P
	Mean±SD	Min-Max	Mean±SD	Min-Max	
Physical therapy	6.83±0.42	6.25-7.50	8.80±0.50	8.04-9.66	<0.001
Audiology	7.00±0.00	7.00-7.00	8.73±1.16	7.00-10.00	<0.001
Speech therapy	6.76±1.20	6.00-8.50	8.42±1.11	7.50-10.00	<0.001

JMR

Abbreviations: TOSCE: Team observed structured clinical examination; SD: Standard deviation; Min: Minimum; Max: Maximum.

TOSCE depends on the student's ability to gather helpful information not only from their performance, but also through evaluating, watching, and discussing others' performance. In another study in 2017 on medical students, they agreed or strongly agreed that the TOSCE taught them something new, made them more comfortable in giving and receiving feedback, and showed better group clinical communication by working in groups [23]. Student's satisfaction with this training course was average. This result has been confirmed in some studies evaluating TOSCE's impact on students' satisfaction. The relatively high satisfaction is correlated to the aspect that it can provide opportunities for each student to observe and reflect on their performance and to receive feedback from classmates and tutors. Suleiman et al. [5] reported that most clinical tutors were satisfied with the organization, timing, and implementation of the formative TOSCE. The reasons were included as the learning opportunity provided, which most tutors noticed. Another reason reported was greater resource efficiency, according to a clinical tutor. In contrast, findings on OSCE showed that physiotherapy students had an undesirable satisfaction level regarding the overall structure of the OSCE, and OSCE was considered stressful [24].

Our findings demonstrated that after the implementation of the TOSCE, the students obtained a higher score on the knowledge assessment scale. By comparing the pre-test and post-test results in all three studied groups, there was a statistically significant difference between the pre-and post-test results. The purpose of formative assessments is to monitor the learning process during education and provide feedback to students and teachers. Jain et al. [17] also reported a statistically significant improvement in the post-test grades of all the students who participated in a team-objective structured bedside assessment program. Specifically, students appreciated the informative, advisory, and motivational aspects of the feedback. The feedback played a vital role in helping them understand their competence level, with a special emphasis on addressing their individual learning needs.

Providing feedback is a crucial aspect of formative assessment [25]. The literature has identified important aspects of effective feedback in medical education [26]. Giving feedback to students leads to strengthening successful learning and identifying learning errors and correcting them. TOSCE, as an assessment instrument for formative assessment, also helps teachers to improve their education. If the given feedback is taken as a group, it can improve the teamwork ability among students and increase the motivation and learning level of learners [27]. In a similar study, Brian reported that a group OSCE is a beneficial method for formative and self-assessment of medical students [8]. In a study conducted at Sharjah University of the United Arab Emirates on medical students in the first, second, and third years in the practical unit of semiology. The results showed that many learners and teachers preferred TOSCE to individual feedback. They considered this experience valuable because it helped students identify gaps and share their knowledge and skills with group members, which is in agreement with the present study [5].

In the current study, students received feedback after the implementation of TOSCE, and the results showed that TOSCE increased the motivation and learning level of the learners. On the other hand, clinical work is an essential part of medical education, and to get the most out of the clinical experience, it is necessary to provide regular feedback on trainee performance. Unfortunately, it is challenging to do this critical thing in clinical learning environments, and clinical trainers often neglect this important responsibility. Experts acknowledge the importance and necessity of effective feedback in education. Medical professors believe they provide effective feedback to students, but students complain about the lack of feedback in clinical education [28]. By using TOSCE, the medical students mentioned that TOSCE is a framework for problem-based short courses [11]. Therefore, the use of TOSCE in clinical environments can help provide effective feedback for students.

Conclusion

The formative TOSCE is a valuable and viable educational opportunity for rehabilitation students to receive feedback on their clinical performance, enhance their clinical knowledge, and encourage teamwork in the students. Considering the high student satisfaction of this method, it can be applied more often in clinical education.

Ethical Considerations

Compliance with ethical guidelines

This study was approved by the Ethics Committee of the Ahvaz Jundishapur University of Medical Sciences (Code: IR.AJUMS.REC.1401.479), which was followed with the ethical standards and regulations of the Declaration of Helsinki. All participants signed a consent form before participating in the study.

Funding

This research was supported by the Research Deputy of Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran (No: EDC.0140).

Authors' contributions

Conceptualization and Supervision: Marzieh Amiri and Nasrin Khaje Ali; Methodology: Marzieh Amiri and Arash Bayat; Investigation, Writing – original draft, and Writing – review & editing: Parisa Heidari, Marzieh Amiri, and Neda Orakifar; Data collection: All authors; Data analysis: Nahid Pirayeh, Masoomeh Hosseini Bidokhti, and Fatemeh Taheri.

Conflict of interest

The authors declared no conflict of interest.

References

[1] Harden RM, Stevenson M, Downie WW, Wilson G. Assessment of clinical competence using objective structured examination. BMJ. 1975; 1(5955):447-51. [DOI:10.1136/bmj.1.5955.447]

[2] Amiri M, Nickbakht M. The objective structured clinical examination: A study on satisfaction of students, faculty members, and tutors. Life Science Journal. 2012; 9(4):4909-11. [Link]

[3] Harden RM, Gleeson FA. Assessment of clinical competence using an objective structured clinical examination (OSCE). Medical Education. 1979; 13(1):41-54. [PMID]

[4] Amini M, Moghadami M, Kojuri J, Abbasi H, Abadi AA, Molaee NA, et al. Using TOSCE (team objective structured clinical examination) in the second national medical sciences olympiad in Iran. Journal of Research in Medical Sciences. 2012; 17(10):975-8. [PMID] [PMCID]

[5] Sulaiman ND, Shorbagi SI, Abdalla NY, Daghistani MT, Mahmoud IE, Al-Moslih AM. Group OSCE (GOSCE) as a formative clinical assessment tool for pre-clerkship medical students at the University of Sharjah. Journal of Taibah University Medical Sciences. 2018; 13(5):409-14. [DOI:10.1016/j.jtumed.2018.06.003]

[6] Singleton A, Smith F, Harris T, Ross-Harper R, Hilton S. An evaluation of the team objective structured clinical examination (TOSCE). Medical Education. 1999; 33(1):34-41. [DOI:10.1046/j.1365-2923.1999.00264.x]

[7] Symonds I, Cullen L, Fraser D. Evaluation of a formative interprofessional team objective structured clinical examination (ITOSCE): A method of shared learning in maternity education. Medical Teacher. 2003; 25(1):38-41. [DOI:10.1080/0142159021000061404]

[8] Biran L. Self-assessment and learning through GOSCE (group objective structured clinical examination). Medical Education. 1991; 25(6):475-9. [DOI:10.1111/j.1365-2923.1991.tb00100.x]

[9] Lindsay P, Bayley M, Hellings C, Hill M, Woodbury E, Phillips S. Canadian best practice recommendations for stroke care (updated 2008). Canadian Medical Association Journal. 2008; 179(12):S1-25. [DOI:10.1503/cmaj.081148.R2]

[10] Alberts MJ, Latchaw RE, Selman WR, Shephard T, Hadley MN, Brass LM, et al. Recommendations for comprehensive stroke centers: A consensus statement from the Brain Attack Coalition. Stroke. 2005; 36(7):1597-616. [DOI:10.1161/01.STR.0000170622.07210.b4]

[11] Paediatric Stroke Working Group. Stroke in childhood: Clinical guidelines for diagnosis, management, and rehabilitation. London: Royal College of Physicians; 2004. [Link]

[12] Körner M, Bütof S, Müller C, Zimmermann L, Becker S, Bengel J. Interprofessional teamwork and team interventions in chronic care: A systematic review. Journal of Interprofessional Care. 2016; 30(1):15-28. [DOI:10.3109/13561820.2015.1051616]

[13] Barnard R, Jones J, Cruice M. Communication between therapists and nurses working in inpatient interprofessional teams: Systematic review and meta-ethnography. Disability and Rehabilitation. 2020;42(10):1339-49. [DOI:10.1080/09638288.2018.1526335]

[14] Franz S, Muser J, Thielhorn U, Wallesch CW, Behrens J. Inter-professional communication and interaction in the neurological rehabilitation team: A literature review. Disability and Rehabilitation. 2020; 42(11):1607-15. [DOI:10.1080/09638288.2018.1528634]

[15] Paxino J, Denniston C, Woodward-Kron R, Molloy E. Communication in interprofessional rehabilitation teams: A scoping review. Disability and Rehabilitation. 2022; 44(13):3253-69. [DOI:10.1080/09638288.2020.1836271]

[16] Nijhuis BJ, Reinders-Messelink HA, de Blécourt AC, Olijve W, Groothoff JW, Nakken H, et al. A review of salient elements defining team collaboration in paediatric rehabilitation. Clinical Rehabilitation. 2007; 21(3):195-211. [DOI:10.1177/0269215506070674]

[17] Jain S, Kumar S, Tankhiwale N. Team based objective formative assessment method for postgraduate students: Evaluation of students' clinical performance and perceptions. The Journal of Medical Research. 2016; 2(2):47-52. [DOI:10.31254/jmr.2016.2209]

[18] Ghanbari S, Beheshtirad R. [The effect of organizational silence on reduction of teamwork and organizational performance based on balanced scorecard (BSC)(case study of Kermanshah Razi University staff) (Persian)]. Journal of Applied Sociology. 2017; 27(4):47-60. [DOI:10.22108/jas.2017.21160]

[19] Kirkpatrick D, Kirkpatrick J. Evaluating training programs: The four levels. Oakland: Berrett-Koehler Publishers; 2006. [Link]

[20] Elstein AS, Schwarz A. Clinical problem solving and diagnostic decision making: Selective review of the cognitive literature. BMJ. 2002; 324(7339):729-32. [DOI:10.1136/bmj.324.7339.729]

[21] Spencer J. Learning and teaching in the clinical environment. BMJ. 2003; 326(7389):591-4. [DOI:10.1136/bmj.326.7389.591]

[22] Kogan JR, Holmboe ES, Hauer KE. Tools for direct observation and assessment of clinical skills of medical trainees: A systematic review. JAMA. 2009; 302(12):1316-26. [DOI:10.1001/jama.2009.1365]

[23] Ludwig AB, Raff AC, Lin J, Schoenbaum E. Group observed structured encounter (GOSCE) for third-year medical students improves self-assessment of clinical communication. Medical Teacher. 2017; 39(9):931-5. [DOI:10.1080/0142159X.2017.1332361]

[24] Abbaszadeh-Amirdehi M, Talebi G, Gholamnia-Shirvani Z, Ghaemi-Amiri M, Taghipour M, Javanshir K, et al. Assessment through objective structured clinical examination: how to promote the satisfaction of physiotherapy students. Journal of Modern Rehabilitation. 2022; 17(1):21-6. [DOI:10.18502/jmr.v17i1.11293]

[25] Rushton A. Formative assessment: a key to deep learning? Medical Teacher. 2005; 27(6):509-13. [DOI:10.1080/01421590500129159]

[26] Cantillon P, Sargeant J. Giving feedback in clinical settings. BMJ. 2008; 337:a1961. [DOI:10.1136/bmj.a1961]

[27] Jönsson A. Definitions of formative assessment need to make a distinction between a psychometric understanding of assessment and "evaluative judgment". Frontiers in Education; 2020; 5(2):1-4. [DOI:10.3389/feduc.2020.00002]

[28] Burgess A, van Diggele C, Roberts C, Mellis C. Feedback in the clinical setting. BMC Medical Education. 2020; 20(2):1-5. [DOI:10.1186/s12909-020-02280-5]

Appendix 1. Pre- and post-knowledge assessment for audiology students

Stations	Questions
Otoscopy	1. Name the four important landmarks of the observed tympanic membrane image. 2. The observed tympanic membrane image related to the eardrum of which ear.
Hearing aid	1. Mention the necessity of using hearing aids in the presented case with the reason. 2. Fit the existing hearing aid for the provided case.
Estuation tube function	1. Explain how to perform the Valsalva maneuver. 2. Based on what results of the Valsalva maneuver it is determined that the Eustachian tube has a dysfunction.
Differential diagnosis	1. Name four important clinical signs of sensory hearing loss. 2. Which test plays an important role in the differential diagnosis of sensory hearing loss
Clinical masking	1. Name two important methods of performing clinical masking. 2. Mention the necessity of performing clinical masking in the presented case with the reason.

JMR

Appendix 2. Pre- and post-knowledge assessment for speech therapy students

Stations	Questions
Voice disorders	1. What treatment method do you use to improve a patient's condition for the presented case? 2. Mention the dimensions of the method implementation.
Developmental language disorder	1. Name a task to evaluate the receptive vocabulary size of the verb category. 2. Conduct the modeling approach to increase mean length of utterance (MLU)= 2 in the noun and verb structure.
Dyslexia and dysgraphia	1. What are your investigations and therapeutic measures for the presented case? 2. Does it need to be referred to other specialists?
Stuttering	1. Give counsel to parents for a child with a normal non-fluency (minimum 3 items). 2. How do you teach the concept of the Loyola Clinical Centers (LCC) to a client?
Aphasia	1. Perform a task to assess the patient's visual-spatial perception. 2. Perform a task to assess the patient's executive function.

JMR

Appendix 3. Pre- and post-knowledge assessment for audiology students

Stations	Questions
Cardio-pulmonary station	1. As a physiotherapist, what is your diagnosis and treatment priority for the presented case? 2. What are the indications and contraindications in physiotherapy in this case?
Physical therapy in neurology	1. How do you evaluate the muscle tone of the lower extremities? 2. If this patient has impaired balance in standing, what tests do you use to evaluate? How would you design an exercise to improve this patient's balance?
Manual muscle testing station	1. Which muscle weakness is likely for the presented case? 2. How to evaluate the weakness of this muscle?
Exercise therapy station	1. To differentiate the origin of pain from lumbar radiculopathy, in what direction should be checked the active movement first? 2. What parameters should be considered while doing this movement by the patient?
Electrotherapy station	1. What is the chosen electrotherapy modality to reduce pain for the presented case? 2. If we want to use electrotherapy to increase strength and prevent muscle fatigue during treatment, what kind of current and parameters do you use?

JMR