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Development of Clinical Reasoning and History-Taking Remediation Training

Giray KOLCU[1]
[1]Süleyman Demirel University, Faculty of Medicine, Departments of Family Medicine & Medical Education and Informatics, Isparta, Türkiye

Sebahat ULUSAN[2]
2Süleyman Demirel University, Faculty of Medicine, Department of Histology and Embryology, Isparta, Türkiye

Mukadder İnci BAŞER KOLCU[3]
[3]Süleyman Demirel University, Faculty of Medicine, Department Medical Education and Informatics, Isparta, Türkiye

ABSTRACT

Objective: Clinical reasoning and history skills are essential for health care professionals. The design of "remediation" training to compensate for "learning gaps", which may occur for various reasons in educational programs, is recommended. This study aimed to develop remediation training within the scope of a model for clinical reasoning and history-taking skills.

Methods: This study was designed as program development research. In this study, the researchers followed Kern's six-step training approach. The objectives were determined in accordance with the general requirements. The application was developed via a flipped classroom. Pre- and posttests were performed for assessment. For satisfaction, the participants were asked to rate the training on 5 points.

Results: A total of 46 students volunteered to participate in this study (n = 46). The pretest mean score was 73.47±15.23, and the posttest mean score was 88.69±9.79. The pre- and posttest results were significantly different ($P < .05$). The mean preself-efficacy score was 5.87 ±1.71, and the mean score was 7.89 ±1.16. Pre- and postself-efficacy scores were statistically significant ($P < .05$). The mean satisfaction score of the participants was calculated as 4.57±0.58.

Conclusion: In this study, remediation training was developed for medical education programs. In accordance with the literature, remediation training has been shown to contribute similarly to learning. Educational programs should be enriched with more comprehensive studies to be developed in line with these findings.

Keywords: Medical education, Remediation training, Clinical reasoning skill, Taking history skill

INTRODUCTION

Clinical reasoning and history-taking skills are essential for healthcare professionals to understand and analyze patient problems.[1,2] These skills go beyond theoretical knowledge and require nontechnical cognitive and social abilities.[3] In numerous international studies, concepts such as clinical reasoning, skill development, mentoring, supervision, and assessment in healthcare education have contributed to our understanding of the significance of both technical and nontechnical skills in clinical practice.[4–7] These concepts highlight the need for effective educational strategies aimed at enhancing these skills. Lluch et al. conducted a 3-year study on peer mentoring as a tool for developing soft skills in clinical practice. The study involved 276 students and revealed that nontechnical skill acquisition improved over three years of clinical training. This highlights the importance of incorporating mentoring programs to enhance student skills.[4] Gregersen et al. explored students' perspectives on practical nursing skills. This study emphasizes the need to review the approach and content of practical nursing skill learning in undergraduate programs to better prepare students for clinical practice.[5] Tseng discussed learning theories and principles in surgical education and technical learning. The article highlighted the importance of deliberate practice in cementing surgical skills and the need to target not only technical skills but also nontechnical and cognitive skills in surgical coaching frameworks.[6] Johnson and Smith discussed how respiratory clinical guidelines can inform ward-based nurses of their clinical skills and knowledge of evidence-based care. This article identified the common core knowledge and technical and nontechnical skills required for the optimal care of adult patients.[7]

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Corresponding author:
Giray KOLCU
E-mail: giraykolcu@sdu.edu.tr

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Remediation training is a promising intervention for resolving the problem of noncompletion in higher education.[8] The authors discussed the importance of remediation in medical education and its impact on failing learners, remediators, and health and educational systems.[9] They also argued that accurately diagnosing underperformance and identifying its causes is crucial for effective remediation.[10] This approach supports the learning-to-learn approach and contributes to closing learning gaps. The authors suggest that remediation can provide valuable insights into the generalizability of interventions and allow for more rigorous study designs to determine cause–effect relationships.[10] During the challenging conditions of the pandemic, endeavors were undertaken to generate solutions that catered to students' needs. Recognizing the urgency of providing remediation education while students continue their clinical education, a two-day rapid training program was developed.

This study aims to develop a program within the scope of a model in the context of remediation training.

METHODS

This study was designed as program development research [11]. This study received approval from the Ethical Committee/Board of Süleyman Demirel University (No: 53/12 Date: 10.11.2021). This study was conducted in accordance with the principles outlined in the Declaration of Helsinki. The invitation to participate in the study was extended to all 297 4th-year students (in the first year of the clinical phase) through a mobile platform, and 46 volunteer students participated (n = 46). Response rate %15.48 calculated. Written informed consent was obtained from all the participants.

The Faculty of Medicine at Süleyman Demirel University is a prominent institution in Turkey that focuses on education and research in the field of health. With strong academic staff in the medical field and modern educational infrastructure, the faculty stands out as a leading establishment dedicated to training the future generation of medical professionals. The faculty not only provides comprehensive medical education but also develops various programs and projects to contribute to clinical practice, research, and public health services. Through high-quality education and research in the healthcare sector at both the national and international levels, the Süleyman Demirel University Faculty of Medicine has made valuable contributions to healthcare. In the pregraduate education programme at Süleyman Demirel University, Faculty of Medicine, training was implemented in 2018 to enhance these skills. However, owing to the COVID-19 pandemic, these training sessions were transitioned to an online format, with lectures replacing small group training sessions. In the 2021-2022 academic year, the Süleyman Demirel University Department of Medical Education and Informatics conducted a needs analysis study to identify the educational needs of clinical students after the pandemic. In the needs analysis study, the students were asked whether they required remedial training for the education they received during the pandemic period. For those who answered "yes" to this dichotomous question, a follow-up question was posed regarding the specific subjects in which they needed support. The responses indicated that students primarily required training in anamnesis, clinical reasoning, and causation. In response, the Department of Medical Education developed a focused training plan that covered all three topics. Feedback on the training was obtained from the student representative, and the implementation phase was initiated. The feedback received indicated a strong demand for "clinical reasoning and history skill training" among these students.

In this study, the researchers followed Kern's six-step approach to program development.[12,13] Kern's six-step approach refers to a model used in the development of medical education programs[14]. This model offers a structured framework that encompasses the various stages of planning, designing, and implementing medical education initiatives. It has been frequently used in numerous academic studies[15,16]. Kern's six-step approach consists of the following stages: identification of general needs, targeted need assessment, identification of learning objectives, educational strategies and implementation, and evaluation of participants and the program.[13]

Step 1: Identification of general needs: In the 2021-2022 academic year, the Department of Medical Education and Informatics conducted a needs analysis for compensatory education after the pandemic through all faculty members and students.

Step 2: Targeted need assessment: The feedback, taken from clinical-phase students, underlines the requirement for nontechnical skills, especially clinical reasoning and history-taking skills.

Step 3: Identify the learning objectives: The aim of the program was as follows: “Students will gather knowledge about the importance of taking history and the use of the Calgary–Cambridge guide to interview efficiently with patients and algorithms of clinical reasoning.”[17,18]

“Students will be able to interview patients comprehensively and efficiently to collect key clinical findings needed to reason about diagnostic hypotheses” and “students will gain self-efficacy in history taking and clinical reasoning skills.”

Steps 4--5: Educational strategies and implementation: In the process of designing and implementing the educational strategy. First, a need analysis was conducted. After the needs were

determined via a mobile communication application (WhatsApp), a brief introduction of the program was shared with the 4th-year students. The students were asked to take part in this program if they had some difficulties while taking a history or critical thinking process or if they felt uncomfortable.

To determine the educational strategy, the flipped classroom approach in the LMS (Moodle) of our medical school, defined as an active learning method, was preferred. The learning sources include books about "propaedeutic education for clinical education," some published manuscripts about patient–physician interviews, history taking and the scripts of some clinical scenarios and videos of appropriate and inappropriate samples of patient–physician interviews" before two weeks of educational activity.

The students were divided into small groups according to the order of registration, including five students (only one had six students).

A brief lecture was given by the first educator (also a researcher in the study), which included the importance and steps of the medical interview. Two videos were shown. After the video was presented, which included both appropriate and inappropriate samples of patient–physician interviews, the educator created a discussion environment for brainstorming.

The students also indicated on a flipchart the key aspects that enhanced the medical interviews. In the third session, a second educator (also a researcher in the study) gave a lecture about the clinical reasoning and scripts of different cases and the thinking pathway of senior physicians. After this session, a simulated patient acted on two clinical scenarios: cerebrovascular ischemia and ectopic pregnancy. The small groups included five students (only one group had six students) who were interviewed with a peer-simulated patient, and the students attempted to make a diagnosis. Educators monitored the process and provided feedback to each student.

Step 6: Evaluation of both the participants and the program: To assess the learning process for both clinical reasoning and history-taking skills, pre-and posttests were applied. The evaluation process was furthered in three ways: cognitive and self-efficacy measurement and feedback analysis. A 10-question exam consisting of equivalent questions was created for the assessment tools used in the program to determine cognitive changes. For both instruments, there were ten multiple-choice questions, and each question was given a score of more than 10 points. Three questions were created to determine changes in self-efficacy levels. To assess self-efficacy, three questions with a global rating scale (1-10) were created to manage patient–physician interview skills and clinical reasoning skills. The mean of the three question scores was recorded as the self-efficacy level of the participants.

After the instruments were developed, for the equality of the pre/posttests and the validations of the instruments, expert opinions were received. The experts were academic staff working at the same institution, and all were specialized physicians. One of them was an expert in the academic development of cognitive or psychometric measurement tools. They were asked to voluntarily participate in the project.

Pretests and preself-efficacy tests were conducted before the training. After training, posttest and postself-efficacy tests were conducted.

The students' feedback was also noted and analyzed for overall satisfaction with the program.

The first two steps of the Kirkpatrick model were evaluated during training.[19] In the first step, participant satisfaction was evaluated. In the second step, the realization of learning was evaluated.

Statistical Analysis

The SPSS software program SPSS (V24) was used for the study. In this study, data analysis was performed with the significance level set at $P < .05$. Descriptive statistical analysis was performed to determine the means and standard deviations of the values. The distribution of the data was assessed via the Shapiro–Wilk test, and the impact of the educational intervention was evaluated via the paired sample t test.

RESULTS

In this study, we aimed to reach all 4th year students in the School of Medicine who need to receive remediation training for history taking and clinical reasoning training. Therefore, no sample was included in this study. All the students who responded to the announcement and wanted to participate in the training were included in the study. A total of 46 students volunteered to participate in the study (n = 46); 35 participants (76%) were female, and 11 (24%) were male. The mean age was 21.98±1.32 years (min: 20 years, max: 26 years). Students from the four internship programs participated in this study (Table 1).

Table 1. Students participating in the study according to the internship program

	The Internship Program	n	%
Internal internships	Pediatrics	16	34.78
	Internal Medicine	6	13.04
Surgical internships	Gynecology and Obstetrics (Gyn/Ob)	14	30.43
	General Surgery	10	21.74
	Total	46	100%

In this study, we compared the pre- and posttest scores of the 46 participants. The mean pretest score was 73.47, with a standard deviation of 15.23, whereas the mean posttest score increased to 88.69, with a standard deviation of 9.79. A paired-sample t test revealed that this difference was statistically significant (t (45) = 5.93, $P < .001$). Furthermore, the effect size, as measured by Cohen's d, was 1.19, indicating a large effect size. These findings suggest that the intervention or educational program led to a significant and substantial improvement in participants' test performance (Table 2).

Table 2. Pre-test and post test scores of overall groups

Variable	N	Mean+SD	Min	Max	CL for Mean***		t-value	p-value*	Cohen's d
					Lower 95%	Upper 95%			
Pretest	46	73.47 ±15.23	30	100	10.10	20.33	5.93	$P < .001$**	1,19
Post test	46	88.69 ± 9.79	70	100					

**P < .05 is significant level*
***paired sample t test*
**** 95% Confidence Interval of the Difference*

Alsowe examined the pre- and postintervention self-efficacy scores of 46 participants. The mean preintervention self-efficacy score was 5.87 (SD = 1.71), with scores ranging from 1 to 9.33. After the intervention, the mean self-efficacy score increased to 7.89 (SD = 1.16), with scores between 5.67 and 10. A paired sample t test revealed a statistically significant increase in self-efficacy scores from pre- to postintervention (t(45) = 11.60, $P < .001$). The 95% confidence intervals for the mean difference were 1.16 and 2.36. The effect size, measured via Cohen's d, was calculated to be 1.40, indicating a large effect size. Given that our study's effect size of 1.40 exceeds both sets of thresholds, it can be interpreted as representing a substantial and meaningful improvement in self-efficacy following the intervention (Table 3).

Table 3. The pre-self-efficacy and post self efficacy scores of overall groups

Variable	N	Mean+SD	Min	Max	CL for Mean***		t-value	p-value*	Cohen's d
					Lower 95%	Upper 95%			
Pre self- efficacy	46	5.87 ±1.71	1	9.33	1.16	2.36	11.60	$P < .001$**	1,40
Post self efficacy	46	7.89 ±1.16	5.67	10					

**P < .05 is significant level*
***paired sample t test*
**** 95% Confidence Interval of the Difference*

Participant satisfaction was assessed via the Kirkpatrick model. The mean satisfaction of the participants was calculated as 4.57±0.58 (min: 3, max: 5).

DISCUSSION

Clinical reasoning is a critical skill for healthcare professionals, as it involves the ability to analyze patient data, make accurate diagnoses, and develop appropriate treatment plans.[20] Clinical reasoning involves analyzing patient data, generating hypotheses, and evaluating the likelihood of each diagnosis on the basis of available evidence.[20] This requires a combination of knowledge, experience, critical thinking, and problem-solving abilities. It also involves considering the patient's individual characteristics, such as medical history, risk factors, and preferences, to make informed decisions. Healthcare professionals use various strategies and tools to enhance their clinical reasoning skills. These may include utilizing clinical guidelines and protocols, seeking input from colleagues or specialists, conducting further diagnostic tests or imaging studies, and continuously updating knowledge through ongoing education and professional development.

A comprehensive and accurate patient history is a fundamental skill in clinical practice, as it serves as the foundation for clinical reasoning and diagnostic decision-making.[21] The process of history taking provides valuable information that can reveal a clinician's ability to initiate diagnostic reasoning, which is an essential component of clinical reasoning.[21] Training in history taking is crucial for medical students, as it involves skills in communication, clinical reasoning, and summarization.[22] These nontechnical skills are essential for high-level cognition and require effective training methods and optimal timing.[22] Integrating history-taking training early in medical education can help students develop these skills and enhance their clinical reasoning abilities.[22]

To develop "Clinical Reasoning and History Taking Skills" remediation, a combination training program was designed to

increase students' proficiency in effective history-taking and clinical reasoning. The program included a brief lecture on medical interview skills, an educational video of patient–physician interviews, a brief lecture on clinical reasoning, and peer-simulated patient action to emphasize Kern's six-step approach. This study aimed to assess the effects of this training on medical students' clinical skills at various stages of their education.

The literature emphasizes the need for rigorously designed assessments to identify specific deficits in clinical reasoning and history-taking skills.[23] It also highlights the multidimensional nature of clinical reasoning and the challenges in fostering the acquisition of these skills among medical learners.[24] In addition, the importance of using established standards as the basic framework for medical education accreditation is underscored.[25]

Furthermore, the literature discusses the need to remediate knowledge deficits before developing clinical reasoning skills.[26] It also provides resources for faculty development to assist with diagnosing and remediating learners' clinical reasoning difficulties.[27] Moreover, it outlines the causes of errors in clinical reasoning and offers strategies to address them.[28] Additionally, it provides a detailed overview of clinical reasoning difficulties, including cues for clinical supervision and targeted remediation strategies.[29]

The development of a taxonomy for clinical teachers further enhances the understanding of clinical reasoning difficulties and provides a useful tool for remediation.[29] The literature also reviews the detection and remediation of clinical reasoning difficulties, offering practical steps for accurately diagnosing and resolving these problems.[29] Moreover, the enhancement of clinical research capabilities for medical undergraduates through innovative simulation-based clinical research curriculum development has been discussed.[30] Although methods to improve clinical reasoning have been proposed, limited evidence is available to guide remediation practices.[31] This scoping review emphasizes the need for remediation programs for regulated healthcare professionals and provides insights into the literature on this topic.[32] Additionally, one study reported the use of a mobile application to help clinical teachers verify and describe clinical reasoning difficulties.[33] Educators expressed modest confidence in remediating deficiencies in clinical skills among medical students.[34] Preclerkship predictors of clerkship variance have been identified, and efforts have been made to tailor the remediation of clinical skills and reasoning for medical students before they enter the clerkship period.[35] Furthermore, targeted needs assessments were conducted to evaluate the efficacy of clinical leadership curricula for pediatric residents.[36]

The gathered data indicate that "clinical reasoning and history-taking skills training effectively enhanced students' clinical reasoning abilities". The participants reported being better equipped to assess patients and manage the history-taking process more strategically following training. Furthermore, the posttraining self-assessment results reflected an increase in students' self-confidence. Our study revealed that there was a statistically significant difference for both skills in accordance with the literature.[4,9,21]

In the program evaluation of the training, satisfaction was achieved in the first step, and learning took place in the second step. The "Clinical Reasoning and History Taking Skills" training has emerged as an effective remediation program for developing skills critical to clinical practice among students. This training program should be regarded as a significant step toward enhancing students' ability to engage in effective patient communication, history taking, and clinical reasoning, all of which are vital aspects of their medical practice.

This study presents the outcomes of enhanced remediation training focusing on "clinical reasoning and taking history skills." However, this study has certain limitations and constraints that should be acknowledged. These limitations underscore certain crucial aspects of the outcomes and general applicability of the study. The data collection process was executed within a restricted timeframe. This implies that a more extended data collection period could have facilitated greater diversity and depth of data. Owing to the brevity of the data collection period, certain subgroups might not have been adequately represented, which could influence the generalizability of the results. The methods and instruments employed in this study exhibit constraints. For example, the survey form employed for data collection might not comprehensively reflect the participants' emotional states and could omit certain essential details. Furthermore, the statistical analysis methods employed in this study are based on specific assumptions, potentially introducing a constraint concerning the alignment of these assumptions with the real-world context. This study was confined to a specific geographical region or sample group. This limitation implies that the applicability of the outcomes to other geographic regions or different sample groups may be limited. Notably, the results may diverge in distinct cultural and demographic contexts. The funding and resources allocated to this study were subject to certain limitations. A larger budget or additional resources could have facilitated a more comprehensive data collection process or the utilization of more sophisticated analytical methods. Despite these limitations, the outcomes of this study continue to serve as a foundation for valuable scholarly insights and contribute to future research endeavors. Nonetheless, being cognizant of

these limitations and constraints is pivotal for interpreting the study's results and enhancing their generalizability.

The COVID-19 pandemic has substantially impacted medical education, prompting a swift transition to online teaching methods for medical students.[37] As we navigate through this transitional phase, it is crucial to ensure that these recent shifts in medical education are thoughtfully integrated with the eventual reintroduction of face-to-face teaching.[37] Within this transitional period, various gaps have emerged in educational programs. Identifying these gaps through needs assessments and feedback mechanisms is imperative. We believe that when these identifications lead to the design of targeted small-scale educational interventions, students' foundational competencies can be enriched.

This study evaluated participant satisfaction and learning outcomes; however, the long-term effects of acquired skills were not examined. To assess the sustainability of educational interventions, it is essential to monitor participants' skill levels at multiple time point postintervention. Research indicates that early childhood social-emotional development lays the foundation for mental health and well-being. Specifically, social-emotional competencies, such as self-regulation, motivation, and interpersonal skills, play a significant role in academic and career success. Investigating how demographic factors, educational background, and initial skill levels affect the long-term effectiveness of educational programs is crucial. Studies have suggested that individual characteristics can significantly influence the outcomes of such interventions. The implementation of longitudinal studies with control groups can provide more definitive insights into the lasting impact of educational programs. These studies can help determine whether the observed benefits are sustained over time and are truly attributable to the intervention. In addition to cognitive skills, future research should assess the long-term effects of educational programs on social and emotional development. The early acquisition of social-emotional skills has been linked to improved life satisfaction, mental health, and physical well-being. For example, research has demonstrated that social-emotional learning programs can enhance students' academic performance and overall wellbeing. These recommendations aim to deepen our understanding of the sustained impacts of educational interventions and inform the development of programs that promote holistic development across a lifespan.

CONCLUSION

The evaluation of the effectiveness of two-day rapid training on clinical reasoning and history-taking skills is a crucial step in addressing the educational needs of clinical-phase students at Süleyman Demirel University, Faculty of Medicine. By employing various assessment methods, valuable insights into the impact of training can be gained, which in turn will guide the refinement of the curriculum and ensure that students are equipped with essential skills to provide high-quality patient care.

Ethics Committee Approval: This study received approval from the Ethical Committee/Board of Süleyman Demirel University (No: 53/12 Date: 10.11.2021).

Informed Consent: Written informed consent was obtained from all participants.

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