

# Research Paper: Educational Effect of Telegram-Based Virtual Training on Orthopedic Residents' Knowledge in the Field of Spine Surgery



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## ABSTRACT

**Background:** The widespread use of social networks among students seems to provide an appropriate opportunity to track the effects of the media on their educational capabilities.

**Objectives:** We aimed to investigate the effect of virtual education (via Telegram messaging service during six months) on the knowledge of orthopedic residents of Mashhad University of Medical Sciences in the field of spine surgery.

**Methods:** This quasi-experiment study was conducted on 25 orthopedic residents with an Mean±SD age of 31.4±4.1 years. During a 6-month training course, 85 educational spinal cases were presented in the form of riddles, video questions, or case presentations and were discussed among orthopedic residents. Before and after the intervention, a reliable and valid exam comprising 70 multiple choice questions about different topics of spinal surgery was taken to evaluate the level of students' knowledge. We used the annual residency promotion exam to compare the correlation coefficients obtained by Fischer exact test, paired t test, and independent t test for statistical analysis.

**Results:** The Mean±SD score of the assistants' knowledge in the pretest and post-test exams were 42.8±6 and 45.2±9.2 (out of a total score of 70). Despite the obvious increase, the values were not statistically significant (P=0.09, t=-1.7). The intervention was associated with an increase in the level of knowledge in 17 residents (68%) while in 8 (32%), this 6-month virtual training course has had no significant effect. In this regard, age, marital status, housing, activity level, or level of residency (from the first to fourth year) had no significant relationship with knowledge improvement.

**Conclusion:** virtual spinal education for six months using the social network of Telegram could improve the level of knowledge in most orthopedic residents, although the observed difference was not statistically significant.

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## 1. Introduction

In recent years, significant efforts have been made to develop and extend virtual training. Virtual education refers to a strategy of training between physically-separated instructors and learners while the former can describe, display, or exam some capabilities in this virtual environment. In this way, the students who for whatever reason cannot attend the classes can take the course without obligatory face-to-face training [1]. Nowadays, based on the experience, we must accept that e-learning has become a necessity. This method eliminates many of the limitations existed in traditional physical teaching and virtual reality facilitates data transfer [2, 3].

Currently, education is under the most motivational changes throughout the world. Virtual education as a source of teaching and learning has been used for educational purposes at all educational levels. Literature shows that academic virtual training is a successful and efficient system if it is appropriately designed and implemented [4, 5]. Acceptance of faculty members and their positive attitude toward the change in educational approach are the key factors in the successful implementation of e-learning and its future continuation.

Many universities have already launched virtual education and even many universities and higher educational institutions have established virtual schools along with their usual academic training [6-8]. Virtual training at the universities of medical sciences in Iran is still in its infancy and early stages [9]. This study aims to evaluate the effect of virtual training (using Telegram messaging service) on orthopedic residents' knowledge of Mashhad University of Medical Sciences in different topics of spine surgery during a 6-month course.

## 2. Methods

We carried out a quasi-experiment study on all orthopedic residents (25 cases) of Mashhad University of Medical Sciences over 6 months. First, Farzad Omidi Kashani (senior author) created a specific group in the Telegram application and then added all orthopedic residents working at this university (as the recipients). Then, he added Dr M. Najaf Najafi (as the statistical expert of the project, the second author), and Dr S. Zahra Yahoueiian (as a raw data collector, the first author) to the educational group.

A pre-test was designed to assess the baseline knowledge of orthopedic residents. The test comprised 70 multiple choice questions about common topics of spine

surgery. These topics included spinal imaging (radiography, computed tomography, and magnetic resonance imaging), surgical techniques, trauma (cervical and thoracolumbar), deformity (scoliosis and kyphosis), degenerative disk diseases, spondylolisthesis, infection, and tumor. We tried to design the questions with a difficulty index of 20% to 80% and a discrimination index of more than 50%. The reliability and validity of the questionnaire were also assessed and confirmed. We used split-half and Cronbach  $\alpha$  to measure the reliability of the test. Also, for assessing the test validity, it was reviewed by two of our expert colleagues. We also used the annual residency promotion exam to compare the correlation coefficients.

The pretest was held in a similar condition for all orthopedic residents. Then, during the 6-month course, the senior author Farzad Omidi Kashani presented 85 different cases about different spine disorders in the form of riddles, image quizzes, or clinical cases in the Telegram group and discussed them with the participants.

At the end of each case, the correct answers and take-home messages were also presented. As the course ended, the same test (post-test) was re-taken in the same place and within the timeline that the pretest had already been taken. According to the number of the comments submitted by the assistants during this 6-month virtual training course, we categorized their activity level into low-active and active. In the end, we compared the results of the two tests with each other and statistically analyzed the success rate of this virtual learning method.

## Statistical analysis

The obtained data were analyzed in SPSS V. 21. We used the Fisher exact test, paired t test, and independent t test for statistical analysis. The analysis was performed at a significant level of 0.05.

## 3. Results

We studied 25 male orthopedic residents with an average age of  $31.4 \pm 4.1$  years (ranged: 25-42 years). Table 1 presents the demographic characteristics of the participants.

The Mean  $\pm$  SD of the assistants in the pre-test and posttest exams were  $42.8 \pm 6$  and  $45.2 \pm 9.2$  (out of a total score of 70). Despite an obvious increase in the level of knowledge of the assistants, the values were not statistically significant ( $P=0.09$ ,  $t=-1.7$ ). The results of this study indicated that the intervention resulted in an increase in the level of knowledge in 17 residents (68%) while in 8 (32%), this 6-month virtual training course has had no significant effect.

**Table 1.** Demographic characteristics of the orthopedic residents in our study

Index	Definitions	No. (%)
Marital Status:	Single	10 (40)
	Married	15 (60)
	No child	9 (36)
	Single child	4 (16)
	Two children	2 (8)
Housing	Owned	18 (72)
	Rented	7 (28)
Level of residency	First year	8 (32)
	Second year	8 (32)
	Third year	4 (16)
	Fourth year	5 (20)

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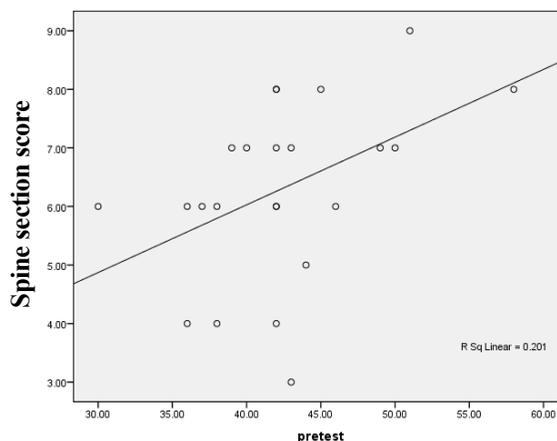
There was no correlation between the total score of annual residency promotion test and pretest or posttest scores ( $P=0.8$ ,  $r=0.05$  for pretest and  $P=0.1$ ,  $r=0.3$  for posttest, respectively). But based on [Figure 1](#), there is a significant positive correlation between the pretest (and not posttest) score and the spine questions score (spine section only) of the annual residency promotion test ( $P=0.03$ ,  $r=0.6$  for pretest and  $P=0.2$ ,  $r=0.2$  for post-test).

There were no significant relationships between knowledge improvement and variables of age, marital status, housing, activity level, or level of residency (from the first to the fourth year). There was also no significant relationship between the level of activity and academic year of residency ( $P=0.09$ ) ([Table 2](#)). Those participants who were placed in the active group had a higher score

in posttest examination ( $P=0.04$ ) but this relationship did not exist with pretest scores ( $P=0.09$ ).

#### 4. Discussion

We carried out a quasi-experiment study on 25 orthopedic residents. We arranged a 6-month virtual educational course on the Telegram application. The course presented 85 common challenging spinal surgery cases and discussed these topics roughly as a 24/7 service without any time or place restriction. The average score of the participants' knowledge in the posttest was higher than the pretest, but the increase was not significant statistically. The results of the study showed that this educational intervention led to an increase in the level of knowledge in 68% of the orthopedic residents. Those participants who



**Figure 1.** The Pearson correlation coefficient ( $r$ ) and  $P$  value ( $P$ ) between scores of pre-test and spine section of the annual residency promotion test

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were more active during this course had a higher level of knowledge at the end (post-test score).

Today, the use of social media is steadily increasing not only among general populations but also among academic subjects [10, 11]. If appropriately and ethically managed, these virtual spaces can promote the level of knowledge of patients and health providers [12-14]. Studies have shown that due to the lack of adequate personal skills and incompetency of the relevant applications, the prevalence of using social media among physicians is lower than ordinary people [15].

Sterling et al., in a systematic review of 29 studies, attempted to find out the efficacy of social media on education (13 studies), recruitment (6 studies), and professionalism (10 studies) of the medical residents [16]. Although the students' interest in social media seems to be huge and rising, the quality of these studies was not desirable and their efficacies were inconclusive. They finally recommended that further investigation is necessary to develop a best practice approach for both medical trainers and trainees. Unfortunately, there are no reliable statistics on the most common social media used in Iran but it seems that Telegram and Instagram are the most prevalent ones [17]. The particular advantages of Telegram that make it suitable, especially for Iranian people, include the ease of use, high speed, high security, and privacy, ability to share multiple and heavy (up to 1024 megabits) audio or video files, and free of charge with no annoying ads [18].

There are only a few studies throughout the world investigating the role of Telegram in promoting medical health or education. One of these studies is Khademolhosseini et al. who conducted a quasi-experimental study to examine the efficacy of Telegram-based education on the Pap smear test [19]. They studied 106 participants in the intervention (48 cases) and control (47 cases) groups in which the pretest was taken from both groups. How-

ever, the educational content based on the health belief model was regularly sent only to the intervention group (by Telegram service in one month). Three months later, the questionnaires were completed again and the number of patients from each group who performed Pap smear during this period was compared. They finally found that Telegram-based education has been significantly effective on the level of knowledge and behavior of the recipients.

Recently, Sarbaz et al. reported the result of their cross-sectional study about social media's usage and skills of 480 medical and paramedical students of Mashhad University of Medical Sciences [17]. They found that Telegram and Instagram were the most prevalent media among them, while Snapchat and Flickr were the least social network used for learning purposes in this university. They finally recommended that one of the most effective ways to access educational goals in medical sciences is to familiarize the students with useful social media such as LinkedIn and ResearchGate.

Another study that confirms the positive effect of Telegram in medical students pertains to Zia Ziabari et al. [20]. In this quasi-experimental study, the researchers evaluated the level of knowledge after a 3-month educational course about basic life support conducted via Telegram. The recipients were the interns who passed the emergency medicine training course. The results showed that continuous education through Telegram could significantly improve the level of knowledge in medical interns.

Although most researchers approve the benefits of using applications like Telegram in the improvement of the recipients' awareness, these applications are not problem-free. The most important limitations include technical knowledge, professionalism, and risks of data protection [21]. In this regard, patient privacy should be preserved in all situations, physician-physician or physician-patient

**Table 2.** Relationship between the academic year and level of activity in the virtual training group

Variables	Activity Level		
	No. (%)		
	Low active	Active	
Academic year	First	7 (87.5)	1 (12.5)
	Second	4 (50)	4 (50)
	Third	4 (100)	0 (0)
	Fourth	1 (20)	4 (80)

relationship should be within the boundaries of ethics, and the posted contents must be accurate and appropriate [22].

Our study had several strengths and weaknesses. To our knowledge, such a Telegram-based study on spinal surgery education for six months has not been conducted in any academic orthopedic training groups before. However, discrepancy between the residents' educational levels as well as its centrality (versus multi-centric assessments) are the notable weaknesses of this study. It is suggested that in future studies, the impact of Telegram (or other internet-based education methods) on continuous medical education of the postgraduate professionals be also evaluated. In this regard, it would be very useful to hold workshops on the appropriate use of these educational methods in virtual environments for the empowerment of the professionals and students.

## 5. Conclusion

Continuous spinal education for six months using the social network of Telegram could improve the level of knowledge in most orthopedic residents, although the observed difference was not statistically significant.

## Ethical Considerations

### Compliance with ethical guidelines

This study was approved by the Ethics Committee of our institute (Code: IR.MUMS.FM.REC.1395.307).

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### Authors' contributions

All authors contributed in preparing this article.

### Conflict of interest

The authors declared no conflict of interest.

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