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The Impact of Team-Based Learning on Nervous System Examination Knowledge of Nursing Students

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ABSTRACT

Introduction: Team-based learning is one of the active learning approaches in which independent learning is combined with small group discussion in the class. This study aimed to determine the impact of team-based learning in nervous system examination knowledge of nursing students.

Methods: This quasi-experimental study was conducted on 3rd grade nursing students, including 5th semester (intervention group) and 6th semester (control group). The traditional lecture method and the team-based learning method were used for educating the examination of the nervous system for intervention and control groups, respectively. The data were collected by a test covering 40-questions (multiple choice, matching, gap-filling and descriptive questions) before and after intervention in both groups. Individual Readiness Assurance Test (RAT) and Group Readiness Assurance Test (GRAT) used to collect data in the intervention group. In the end, the collected data were analyzed by SPSS ver. 13 using descriptive and inferential statistical tests.

Results: In team-based learning group, mean and standard deviation was 13.39 (4.52) before the intervention, which had been increased to 31.07 (3.20) after the intervention and this increase was statistically significant. Also, there was a statistically significant difference between the scores of RAT and GRAT in team-based learning group.

Conclusion: Using team-based learning approach resulted in much better improvement and stability in the nervous system examination knowledge of nursing students compared to traditional lecture method; therefore, this method could be efficiently used as an effective educational approach in nursing education.

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Introduction

The aim of nursing assessments is to collect objective and subjective data to determine the health status of the patients to achieve a professional clinical judgment. The nursing assessments are the determinants of the nursing interventions which have direct and indirect influence on the health status of the patients.¹This process increases the ability of the nurses in monitoring and determining the changes in the patients' condition and allows nurses to use their theoretical knowledge in different clinical

situations.^{2,3} Developing health assessment skills can help the nurses to make more accurate diagnosis.⁴ Many nursing faculties in the U.S believe that health assessment training is an important and essential part of nursing students' education⁵ and according to professional nursing performance standards, it is critical.³ Therefore, choosing the right method to achieve successful learning is crucial for the students.⁶

The lecture is the most common educational method in medical groups.⁷ But, this method is not suitable for all

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educational purposes.⁸ Limiting the capabilities of the students in participating and answering the questions,⁹ loss of concentration of the students over time,¹⁰ reduction of absorption, stability and remembering the subjects,¹¹⁻¹³ inactive role of students,¹⁴ and boring lecture¹⁵ are the some reasons which have made lecture among the least effective teaching methods.¹⁶ The search for some solutions for these deficits resulted in development of new methods for active learning¹² that different approaches are proposed in their application.¹⁷

Team-based learning (TBL) is an active learning approach which has been designed in order to help the students achieve the goals of a training course and the manner of working in a team.¹⁸ This accelerates the change in the teaching method and can be considered as a replacement for the traditional lecture method.¹⁹ In this new approach, students are first given the educational information and then, they are divided into smaller groups in classes, each group is given a problem-based learning (PBL) scenario to stimulate the discussion among the students. This help students to exchange the information about the topic and use previously given information to solve the problem through practical way.^{20,21} According to the approach developed by Hunt et al., the primary goal of a team-based learning is to build student self-confidence by giving them a chance to practice using the concepts that they have learned during the previous courses. This approach results in spending the majority of the class time on team working by using the practical assignments.²⁰

Team-based learning in nursing results in decreasing tension and study time and increasing preparation time for the class among nursing students, which make it possible to allocate more time for discussion about complicated nursing topics.¹⁹ Other advantages of this method includes increasing class dynamics,²² students

involvement in class discussions,¹⁸ increasing differential diagnosis skills in students and clinical experiences, decreasing the economic costs,²¹ enhancing self-learning,²³ and stimulating higher levels of knowledge based on performance.²⁴ Moreover, team-based learning improves student performances in some healthcare educational courses.²⁵ Therefore, this approach is recognized as an effective educational method due to its high applicability.²²

Different studies have shown that using this new method could lead to improving students learning and increases students' scores.^{18,22} Pileggi and O'Neill's showed that the performance of the students has been improved following team-based learning method. In this study, the mean score of the final exam in the team based education course had also been increased as compared with the traditional lecture based courses.²² Vasan et al.,²³ and Letassy et al.,²⁶ in the different studies showed the same results. It has also been found through investigation of the students' attitude toward this method that all students were satisfied with team-based learning and they had positive feedback about it.^{18,19,25}

There are, however, conflicting data on whether TBL improves knowledge outcomes compared to other educational techniques. Haidet et al.,²⁷ did not find a significant difference in knowledge outcomes between TBL and lectures. But, some found improved examination scores in the TBL group while using the historical controls has made its interpretation difficult.²⁸ Others found improvement in some aspects.²⁹

Based on the aforementioned literature review, learning is basically a social activity, and considering the significance of health assessment in developing of clinical skills and professional capabilities of nursing students and according to the promising results of team-based learning, our aim in this study was to determine the

effectiveness of using this active educational method on nervous system examination knowledge in nursing students of Urmia nursing and midwifery faculty.

Materials and methods

This is a quasi-experimental study conducted with the aim of determining the impact of team-based learning in nervous system examination knowledge in nursing students at the Bachelor of Science in Nursing (BSN) course from Urmia nursing and midwifery faculty, a big urban city in the northwest of Iran in 2013.

All nursing students at 5th and 6th semester were invited to participate in this study and were selected through a census. Fifth semester students (n=32) were assigned as the intervention group and sixth semester students (n=30) were considered as the control group. Researchers obtained ethics approval from the ethics committee of the Uremia Medical University and nursing students filled out the informed consent form. Based on the principles mentioned in previous researches^{20,22} and obeying 3S proposed by Michelson (same problem, specific case and simultaneously report), an adjusted TBL design was used in the intervention group and the traditional lecture method was used for the control group to provide educational content. To collect data a 40-question test in the format of multiple choice, matching, gap-filling, and descriptive questions with several modifications in writing questions as scenarios. The maximum score was 40 for pre-test and post-test sections. Students had 20 minutes to answer all 40 questions. In this test, the demographic characterizations of the students including age, sex, score in health status assessment course which were passed in the 2nd semester and grade point average (GPA) was also collected. The content validity method was used to determine the validity of the test. Thus, the data gathering instrument was prepared by using literature review and referring to

related books and articles. Then its content was given to 10 faculty members at Urmia University of Medical Sciences for critical review. For investigating the reliability pilot study (10 nursing students in 7th semester) was conducted and the Cronbach alpha was 0.88.

Before starting the study, a pre-test was taken from all nursing students to determine their knowledge in the nervous system examination. After the pretest, at the "First Phase", the educational materials in the form of booklets and educational slides as a module about nervous system examination skills were given to all students. The students in the intervention group were given one week to study these materials. At the Second Phase, intervention was performed as an 8-hour workshop with TBL group. As soon as starting the workshop, the students answered individual Readiness Assurance Test (RAT) to assess their perception of the learned knowledge and concepts in the first Phase. RAT consisted of 40 questions in various formats from the educational module. Giving correct answers to these questions required using topics that the students should have learned in the first phase. Immediately, after finishing the RAT and collecting the papers, the students were randomly assigned to 6 groups of 5 or 6 numbers and the same test was taken from the teams in a different format. This step called Group Readiness Assurance test (GRAT), each team should come to an agreement by all team members to choose one answer to each question. After answering by all groups and collecting the GRAT papers, each group discussed and justified its own answers with other groups. The teacher, as a facilitator, discussed about all questions and answers with the students and clarified any concepts that the students might have problems with, as shown in Figure 1.

The students in the control group received the educational content through traditional lecture method. Finally, five weeks after

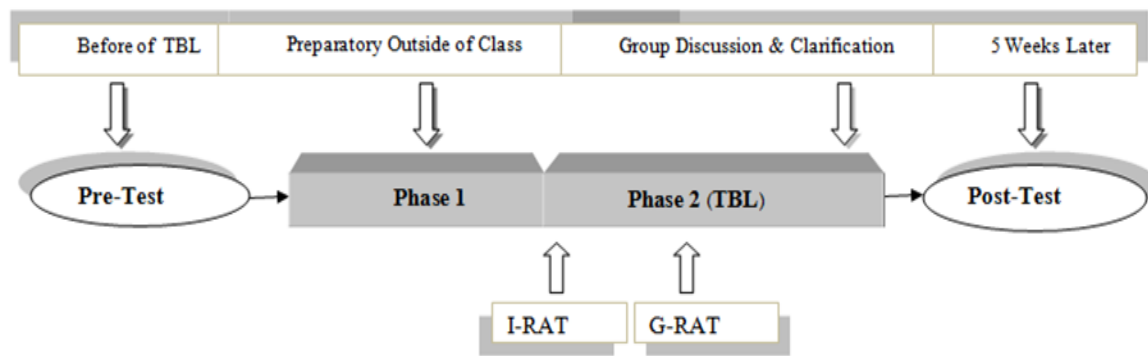


Figure 1. The conduction pattern of the research in intervention group

performing the research, a post-test was taken individually and with the changes in writing of questions from the intervention and control groups. Post-tests consisted of the same scenarios as the pre-test, but the order of scenarios and questions randomly scrambled. Data we reanalyzed by SPSS software ver. 13 using descriptive and inferential statistical tests (Chi square, paired-sample t-test and Independent t-test).

Results

In this study, 40% and 50% of the subjects in control group and intervention group were male, respectively. Chi square test showed no significant differences between two groups regarding sex distribution. Moreover, independent t-test result indicated that there was no significant difference statistically between two groups in terms of variables such as age, the mean score of health status assessment and GPA (Table 1).

Based on paired t-test result, there was no significant difference in the post-test mean score of health status assessment knowledge among the students in the control group ($P=0.14$). But, after performing team-based learning, the mean score of health status assessment knowledge among the students in the intervention group significantly increased compared with pre-test score ($P<0.001$) (Table 2).

The results showed that the mean score of nursing students on nervous system examination knowledge in team-based learning was greater than control group, and this increase was statistically significant ($P<0.001$).

The independent t-test showed no statistically significant difference in the scores of nervous system examination knowledge between the two groups at pre-test mean score, but there was a significant difference at post-test scores between two groups ($P<0.001$) (Table 3).

Other findings showed that in the intervention group the mean and standard deviation of the scores in nursing students in individual Readiness Assurance Test (RAT) was 25.05 (3.36), while it increased to 31.68 (1.33) in Group Readiness Assurance Test (GRAT). Paired t-test showed a statistically significant difference between the mean scores in the RAT and GRAT in the intervention group ($P<0.001$).

Discussion

The present study results showed that using the team-based learning in comparing with traditional lecture-based learning led to significant improvement in knowledge of nursing students as the primary outcome of the study. Arisen a significant difference between two groups in the post-test that was held 5 weeks following TBL performance, showed a significant improvement in students learning with the TBL method in

Table 1. Demographical specification comparison in control and study groups

Variable	Control group	Intervention group	Statistical indicators
Age [‡] (years)	22.50 (1.38)	23.22 (3.69)	P=0.32 [€]
Mean score in lesson health status assessment [‡]	15.76 (2.00)	15.99 (1.44)	P=0.61 [€]
GPA [‡]	14.97 (1.12)	15.40 (1.02)	P=0.11 [€]
Sex [*]			
Female	18 (60)	16 (50)	P=0.42 ^{€€} , df=1 ^{€€}
Male	12 (40)	16 (50)	

[‡] Mean (SD), ^{*}N (%), [€]Independent t-test result, ^{€€}Chi square test result

Table 2. Comparison of score mean in nervous system examination knowledge before and after performing intervention in control and study groups

Group	N	Pre-test Mean (SD)	Post-test Mean (SD)	Difference Mean (SD)	Statistics (t)	Paired t-test result
Intervention group	32	13.39 (4.52)	31.07 (3.20)	17.68 (5.31)	-27.03	<0.001
Control group	30	15.15 (5.12)	17.22 (3.69)	2.7 (2.19)	-1.49	0.145

Table 3. Comparison of score mean in nervous system examination knowledge before and after performing intervention between control and study groups

Nervous system examination knowledge	Intervention group Mean (SD)	Control group Mean (SD)	Statistics (t)	Independent t-test result
Pre-test	13.39 (4.52)	15.15 (5.12)	-1.44	0.154
Post-test	31.07 (3.20)	17.22 (3.69)	4.56	<0.001
Average difference after- before	17.67 (3.69)	2.7 (2.19)	4.61	<0.001

comparison with the traditional lecture method. Consistent with the results of this study, the majority of the previous studies which have dealt with the comparison of the knowledge scores of students using TBL and lecture based methods, show that the scores in the team-based learning course are higher.^{23,26}

The obtained improvement in students' performance in this project is consistent with the results achieved by Koles et al.,³⁰ and Wiener et al.,³¹ in which the students showed greater dominance on the contents in the TBL group compared with other traditional approaches and non-TBL methods. Increased the examination scores with TBL was found in other studies which had compared it with other approaches such as self-studying.^{22,23} The results of another crossover study with the aim of comparing active learning through TBL with inactive learning by self-studying

showed that the post-test mean scores in the intervention group was significantly higher than control group.³² This finding is supported through numerous other studies in which the score improvement has been reported by TBL.^{22,28}

Based on the results of the previous researches, there are few contradictory data about the further improvement of learning outcomes with TBL compared with the other educational techniques which are contrary to our findings. Haidet et al., compared the TBL-like active learning method with inactive lecture method and there was no significant difference was found in scores between the two groups.²⁷ The reason for this can be attributed to the difference in the way TBL was performed or the heterogeneity of participants (as mentioned in Tan's et al., study).³² What is more apparent in the previous studies about disadvantages of the TBL related to

its effectiveness to various topics presented in the research, using TBL led to improve some of the topics, not all of them.^{25,29}

In this study, the post-test score in TBL compared with pre-test had been surprisingly increased; such that the mean score in the class had reached from 13 to 31 point from total 40 point. This difference is more important to know that the post-test was taken 5 weeks after performing TBL while students were unaware of the post-test and most likely resulted in their lack of study; therefore, it could be concluded that this high mean score in class and remembering the contents by students can be a net effect of TBL method. The results of a study with the aim of evaluating effectiveness and efficiency of TBL showed that the students in the pre-test was in the least knowledge level (the mean score of 36.9%) but this reached to 63.4% in GRAT which had been considered as a post-test that showed a significant improvement in the students' performance with TBL.²² However, considering GRAT as a post-test cannot be a proper criteria to be compared with pretest in this study, because it is clear that the Group Readiness Assurance test score which is obtained from individuals in the group will be higher compared to the individual scores. In general, reason for increasing TBL scores can be related to factors such as reinforcing and utilizing the concepts, increasing students' involvement in class discussions, and creating meaningful learning.^{18,32,33}

Although, we didn't intend to assess retaining the contents with TBL but performing post-test 5 weeks after conducting the research in the intervention group retained the contents much more than control group. From this viewpoint, our study finding is consistent with other studies that show that the knowledge can be retained better following TBL.³⁴ On the other hand, the student in the control group hadn't been able to achieve significant improvement in retaining the contents

which shows that the presented topics through lecture are forgotten faster.³⁵

Our findings in this research showed that the mean score of the students in the intervention group in GRAT was significantly higher than RAT. Our result was similar to these^{25,32} In the Pileggi *et al.*, and O'Neal *et al.*, studies, the mean of missed questions (unanswered) in RAT and GRAT was 8.29 and 2.98 respectively, which this had led to a higher score of GRAT compared with an individual RAT score.²² In the Persky *et al.*, study, the score of RAT and GRAT was 86% and 97%, respectively.³⁶

In the present study, there was no significant correlation between students' total GPA and the amount of progress in scores by TBL. This means that the weak and strong students were benefited to the same amount from the TBL education. This finding is inconsistent with other study results that indicate TBL has more effect on weaker students.^{32,34,37}

The strength of the current study is the delayed post-test that had measured retaining the contents in mind addition to the effect of TBL on knowledge improvement. Also not using true or false questions on the taken tests, is another advantage of this study. Because this type of question has inherent limitations.³⁸

Adjusting the performance of TBL is the main limitation in this study. Full performance of TBL consists of three major phases (preparation before the class, individual and Group Readiness Assurance tests and finally using the obtained knowledge from first and second phases in clinical problems)³² that it had been focused on the first two phases in this study. The main reason for expressing this limitation is that the lack of full performance of TBL may lead to negative results regarding the efficiency of this approach.³⁹ Although, this hadn't happened in this study, it was possible that if fully performed, more positive results could be achieved and caused no change in the main aspects and

the nature of the findings; a point that other researchers have also mentioned.³² Moreover, this is TBL features that in some parts because of its flexibility allows teachers to choose one or more phases depend on the concept and the course's demand. Also, several other studies have been used adjusted TBL design because of their research conditions.^{25,32} Small sample size of research groups was another limitation in this study. So, it is recommended that experimental studies to be conducted with a higher sample size to support the positive results about the efficiency of the TBL.

Conclusion

Using TBL method compared to the traditional lecture approach resulted in more improvement and stability in the knowledge of nursing students in the nervous system examination skills. Therefore, using TBL can result in higher preparation of nursing students for the class and allocating more time for class discussions about complicated nursing topics. Thus, according to the findings of the current study, it might be concluded that using TBL in nursing education could be used to promote the learning quality of nursing students.

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Ethical issues

There was no ethical issue.

Conflict of interest

The authors declare no conflict of interest in this study.

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