

Original article**The Effect of the Jigsaw Technique on the Knowledge and Skills of Nursing Students**Nasibe Yağmur Ziyai¹, Yurdanur Dikmen²**Abstract**

Background: The Jigsaw technique is a modern method that enables the creation of a positive learning environment. In this study, we aim to determine the impact of Jigsaw technique on students' knowledge level regarding arterial blood pressure and their arterial blood pressure performance skill level. **Material and Methods:** A quasi-experimental design study was conducted with 60 first year nursing students at Sakarya University. Students in the control group received traditional learning method while the intervention group had Jigsaw technique activities. Data was collected through "Arterial Blood Pressure Knowledge Test" and "Arterial Blood Pressure Skill Performance Test". Cronbach Alpha, Mann Whitney U Test, and Independent T-Test, were used for the data analysis. **Results and Discussion:** Arterial blood pressure knowledge level test score ranking average of the students in the intervention group were (42.38) significantly higher than those of control group (18.62) ($p < .05$). Besides, the average test score for arterial blood pressure skill performance test in the intervention group (78.00 ± 6.72) was found significantly higher than that of the control group, which was 58.00 ± 15.11 ($p < .05$). **Conclusion:** According to the data obtained, it is concluded that the jigsaw technique was more effective than the traditional method for increasing knowledge level and skill performance.

Keywords: Active Learning; Health Education; Psychomotor Performance; Jigsaw Learning.

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Introduction

Advanced cognitive and psychomotor skill enables the students to acquire competencies at senior level in health education. However, there is an increase in the number of students and the number of personnel is insufficient in universities that provide traditional education in our country. Therefore, challenges arose in achieving the educational goals of Generation Z.¹⁻³ Innovative teaching methods and strategies should be used, especially in nursing and health education programs, in line with students' needs⁴. Research has shown that compared to traditional learning methods, active structuring approaches facilitate learning and skill development in nursing educations^{5,6}.

The Jigsaw technique is a modern method that enables

the creation of a positive learning environment dominated by individual accountability.⁷ Previous research on the usage of the Jigsaw technique in health education has shown that this method enhances the self-confidence, communication skills and academic success of students^{1,8-10}. It is crucial to impart knowledge regarding the measurement of vital signs in nursing education. Teaching vital signs is one of the important applications of cognitive and psychomotor skills in nursing education¹¹. Another point is that the jigsaw technique was mostly applied to second, third and fourth year nursing students. In the literature, jigsaw technique is not preferred in first class nursing students. Therefore, a simple subject, arterial blood pressure, was chosen when performing the jigsaw technique⁹⁻¹¹. The use of different

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educational techniques can contribute substantially to nursing education by enabling first-year students to effectively measure arterial blood pressure.

Aim of the study:

With a special focus on the study course of arterial blood pressure, this study aimed to investigate the effects of the Jigsaw IV technique on the students' academic knowledge and skill performance level.

Research Hypotheses:

H₁: A difference exists between the academic knowledge test scores of students who learn the measurement of arterial blood pressure through the Jigsaw technique and those who learn it through traditional learning method.

H₂: A difference exists between the psychomotor skill performance scores of students who learn the measurement of arterial blood pressure through the Jigsaw technique and those who learn it through traditional learning method.

Material and Method

Study Design:

This study was planned as a randomized controlled study and use a quasi-experimental design with a pre-test and post-test control group. The study population comprised 167 first-year students who began their academic year 2017 at the Nursing Department of a Health Sciences Faculty in a state university located in northwest Turkey. Some previous study, the Jigsaw technique failed to yield effective results in larger samples. Therefore, the power analysis method was not used to determine the sample size and its statistical power. Thus, In this study, 60 volunteer students who met the following criteria were included in the study. The inclusion criteria for this study:

- ✓ To be enrolled in Fundamentals of Nursing for the first time,

The students were assigned to intervention and control groups by simple randomization method. Thus, intervention group (n = 30) and control group (n = 30) were formed. At baseline, both the groups underwent the Arterial Blood Pressure Knowledge Test (ABPKT) as the pre-test application. Kolmogorov-Smirnov test was applied to the intervention and control group after the pre-test and it was concluded that the groups were similar (p>.05).

Measurement / Instruments

Arterial Blood Pressure Knowledge Test (ABPKT): In this study, a 20-item and five-choice multiple-choice

test was prepared to determine the knowledge about arterial blood pressure. The questions of this test were presented to four academics to evaluate the content validity. Then, it was applied to 142 nursing second year students from the same faculty. Test Analysis Program (TAP) was used to evaluate the reliability and difficulty level of the test. The internal consistency coefficient of the test is 0.75.

Arterial Blood Pressure Skill Performance Test (ABPSPT): This test was prepared by the researcher in line with the literature in order to evaluate the skill performance of students regarding arterial blood pressure measurement. Arterial Blood Pressure Skill Performance Test consisted of 28 practice steps covering skill steps.

Data Collection/Procedure

Prior to study commencement, the course instructor gave brief theoretical information about arterial blood pressure to all students in both groups.

1. Intervention Group: The implementation of the intervention group is mentioned below.

- ✓ Step 1: An arterial blood pressure test was used for pre-test data collection in the intervention group. A general introduction was provided. An educational video showing the practice of arterial blood pressure measurement was played. The main groups were separated according to pre-test result.
- ✓ Step 2 : The main groups were provided the study subjects (Arterial blood pressure corotkoff stages, Factors determining and affecting blood pressure, Blood pressure evaluation steps, Errors in blood pressure measurement, Blood pressure abnormalities) Students gathered according to each subject and formed expert groups. The expert groups worked in the classroom to study the same subjects. A quiz was conducted by the expert groups for determining their understanding of the subject after course completion.
- ✓ Step 3: According to the quiz results, the subjects that they did not understand were discussed with the students in the expert group. The students in the expert group were asked to come together with their main groups. Each student shared their knowledge by explaining their expertise to each other
- ✓ Step 4: Students made arterial blood pressure measurement in a laboratory environment using a blood pressure measurement simulator. The

AKBSPT were applied as the final test for the students in the intervention group

2. *Control Group*: The implementation of the control group is mentioned below.

- ✓ Step 1: Under the guidance of a responsible trainer, the theoretical infrastructure of the implementation was discussed for 2 hours.
- ✓ Step 2: Control lists containing the arterial blood pressure skill steps were distributed, and the blood pressure measurement steps were demonstrated in the skills laboratory. During the application, the students were required to follow the skill steps from the checklists. While demonstrating skill application, the point to be noted for the arterial blood pressure issue was emphasized again.
- ✓ Step 3: The students prepared the necessary equipment themselves and implemented the arterial blood pressure application using the blood pressure measurement simulator. The students' performances during the application were monitored by the researcher, and during the application process, the student's missing or incorrect performance was corrected and information was given about the subject.
- ✓ Step 4: Students performed the application from the beginning to the end as per the Arterial Blood Pressure Skill Performance Test steps. The Arterial Blood Pressure Skill Performance Test was conducted by a different teaching staff who was blinded to the identity of the intervention and control groups for reliable tests results.

Data Analyses

The data obtained in the study were entered into the computer and evaluated by the researcher using the SPSS 20.0 package program. We used the Kolmogorov-Smirnov to assess the normal distribution of the pre-test and post-test scores of the ABPKT and those of the skill performance test. To investigate the difference between the groups, the independent T-Test was used for normally distributed variables, while the Mann Whitney U-Test was used for the variables with a non-normal distribution.

Declaration for Ethical consideration: Prior to study commencement, ethical approval dated 11.18.2016 with reference number E.15912 was obtained from the Ethical Board for Non-Pharmacological Interventional Studies of Sakarya University's Medicine Faculty. An official permission

dated 11.04.2016 with reference number 11977 was also obtained from the Office of the Dean of Sakarya University's Faculty of Health Sciences. Data were collected anonymously and confidentiality of the students' information was secured.

Results

Results of the ABPKT

The significance of the pre-test academic achievement scores of the groups was examined by performing an independent t-test ($p > .05$). Thus, both groups were normally distributed according to AKBKT. The breakdown of the post-test scores of the subjects regarding their knowledge of arterial blood pressure showed that the mean test score rank of the experimental group was 42.38 and that of the control group was 18.62 ($z = -5.13$; $p < 0.01$). Thus, the experimental group had significantly higher post-test knowledge scores compared to the control group.

Results of ABPSPT

The average score for arterial blood pressure skill performance test was 78.00 ± 6.72 for the experimental group and 58.00 ± 15.11 for the control group; this difference was statistically significant ($t = 6.62$; $p < 0.01$).

Discussion

In conclusion, compared to traditional methods, the Jigsaw technique is more effective in enhancing the students' knowledge on arterial blood pressure and skill performance. The present results are similar to those reported by an earlier trial that investigated the effectiveness of the Jigsaw technique in nursing education programs^{8, 12-14}. Renganathan reported that students ($n = 189$) who learnt under the Jigsaw technique demonstrated significantly higher knowledge scores than those taught using a traditional learning method⁹. The Jigsaw technique exerts several positive effects, such as the placement of students at the core of the learning process, positive interaction among groups, self-confidence enhancement, motivation and sense of responsibility toward learning¹⁵. Thus, the present results that show positive effects of the Jigsaw technique on the nursing students' performance on arterial blood pressure support previous findings¹³. Moreover in this study, it was seen that jigsaw technique can improve students' skills by using this technique in laboratory training. The widespread positive feedback for the Jigsaw technique is attributed to the fact that, student could openly express their opinions, actively

participate in the teaching and learning process, and feel more at ease than in a traditional classroom environment¹⁶. By contrast, Moral and Camps stated in their study that the learning process of nursing students (n=157) in the Jigsaw technique is longer than in traditional methods. For this reason, students reported that they were not satisfied with the jigsaw technique¹⁷. Although this study reveals that the jigsaw method is effective in health education, it is very important to evaluate it in online cooperative education methods. Gupta et al. emphasized the analysis of the effectiveness of innovative education methods during the pandemic period¹⁸. Due to the COVID 19 pandemic, students have experienced time management and compliance issues in online learning. Cooperative learning methods can be easily used in online education when coordinated with the lesson schedule.^{19,20}

Conclusion

The results of this study suggest that the Jigsaw technique is more effective than traditional learning methods in enhancing students' knowledge and skill performance for arterial blood pressure measurement. Therefore, we recommend that the Jigsaw technique, a type of cooperative learning method, should be used in programs integrated into nursing education, for imparting theoretical knowledge and psychomotor skill training, particularly in clinical and laboratory work. However, these study findings are limited to the present population, and future research should aim to confirm these results on other study populations receiving nursing education.

Recommendations for Future Research

Prospective research studies should be conducted to investigate the effects of the Jigsaw technique on the students' critical thinking and problem-solving skills in health education. However, the Jigsaw technique can be more effective if the students are provided detailed information regarding the method and the related steps in the preparation phase. Students should be given a presentation and provided documents (guiding material) showing the steps of the Jigsaw technique, and the preliminary phase prior to application should be planned with due care. In addition, the educators should also be trained in active teaching and learning strategies via in-service training programs. In addition, due to the Coronavirus disease 2019 (COVID-19) pandemic that has occurred in recent months, it is recommended to research the jigsaw technique online.

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References

1. Kritpracha C, Sae-Sia W, Nukaew O, Jittanoon P, Chunan S, and Ophat. The Development of Cooperative Learning Using Jigsaw Activities for Learning Achievement and Self-directed Learning Behaviors of Master Nursing Students Kaosaiyaporn. *International Journal of Information and Education Technology*. 2018;**8** (12). 913-917. <https://doi.org/10.18178/ijiet.2018.8.12.1162>
2. Salyers V. Teaching psychomotor skills to beginning nursing students using a web enhanced approach: A quasi experimental study. *Int J Nurs Educ Scholarsh*. 2007;**4**(1): 23-29. <https://doi.org/10.2202/1548-923X.1373>
3. Gerdprasert S, Pruksacheva T, Panijpan B, Ruenwongsa P. Development of web based learning medium on mechanism of labour for nursing students. *Nurse Educ Today*. 2010;**30**(5):464-9. <https://doi.org/10.1016/j.nedt.2009.10.007>
4. Mosalanejad, L., Sani, M. S., Hosseini, Y., Abdollahifrad, S. Implementation of serial workshop by students educational need: Trend to accountability in medical education. *Bangladesh Journal of Medical Science*. 2018; **17**(4):631-637. <https://doi.org/10.3329/bjms.v17i4.38328>
5. Dikmen Y, Ak B, Yıldırım Usta Y, Ünver V, Akın Korhan E, Cerit B, Yönder Ertem M. Effect of peer teaching used in nursing education on the performance and competence of students in practical skills training. *Online J. Educ. Sci*. 2017;**16**(1-3): 14-20. <https://doi.org/10.1080/09751122.2017.1311583>
6. Lee K, Kim S, Yang YL. Preliminary study of outcome-based clinical practicum for undergraduate nursing students. *Japan Journal of Nursing Science*. 2019; **16** (2):145-154. <https://doi.org/10.1111/jjns.12222>
7. Akçöltekin A, Doğan S. The Effects of Jigsaw Technique on the Environmental Behaviors of 9th Grade Students. *Iğdır University Journal of the Institute of Social Sciences*. 2019;**17** (1).273-320
8. Baumberger-Henry M. Cooperative learning and case study: does the combination improve students' perception of problem-solving and decision making skills?. *Nurse Educ Today*. 2005; **25**:238-246. <https://doi.org/10.1016/j.nedt.2005.01.010>
9. Renganathan L. A comparative study on effect of Jigsaw Puzzle Method among nursing students' academic level of performance at Oman Nursing Institute. *Indian J Appl Res*. 2013;**9**(3):180-183. <https://doi.org/10.15373/2249555X/SEPT2013/57>
10. Xu JH. Toolbox of teaching strategies in nurse education. *Chinese Nursing Research*. 2016;**3**(2):54-57. <https://doi.org/10.1016/j.cnre.2016.06.002>
11. Gordon CJ, Frotjold A, Fethney J, Green J, Hardy J, Maw M, Buckley T. The effectiveness of simulation-based blood pressure training in preregistration nursing students. *Simul. Healthc*. 2013;**8**(5):335-340. <https://doi.org/10.1097/SIH.0b013e3182a15fa7>
12. Lai CY, Wu CC. Using handhelds in a Jigsaw cooperative learning environment. *Journal of Computer Assisted Learning*. 2006;**22**:284-297. <https://doi.org/10.1111/j.1365-2729.2006.00176.x>
13. Charlier N, Van Der Stock L, Iserbyt P. Peer-assisted learning in cardiopulmonary resuscitation: the jigsaw model. *J. Emerg. Med*. 2016;**50**(1):67-73. <https://doi.org/10.1016/j.jemermed.2015.04.002>
14. McWilliams LA, Malecha A, Langford R, Clutter P. Comparisons of Cooperative-Based Versus Independent Learning While Using a Haptic Intravenous Simulator. *Clin Simul Nurs*. 2017;**13**(4):154-160. <https://doi.org/10.1016/j.ecns.2016.12.008>
15. Arslan A, Zengin R. The effect of cooperative learning method on the academic success of students on science teaching laboratory lesson. *International Journal of Education and Research*. 2015;**3**(12):41-52
16. Buhr GT, Heflin MT, White HK, Pinheiro SO. Using the jigsaw cooperative learning method to teach medical students about long-term and postacute care. *J Am Med Dir Assoc*. 2014;**15**(6):429-434. <https://doi.org/10.1016/j.jamda.2014.01.015>
17. Moral JM, Camps MR. Teaching research methods in nursing using Aronson's Jigsaw Technique. A cross-sectional survey of student satisfaction. *Nurse Educ Today*. 2016;**40**:78-83. <https://doi.org/10.1016/j.nedt.2016.02.017>
18. Gupta N, Pandey S., Anshu A. Innovative Anatomy assessment methods in COVID-19 Pandemic: statistical observations and students viewpoints. *Bangladesh Journal of Medical Science*. 2020; **19**:21-27 <https://doi.org/10.3329/bjms.v19i0.47831>
19. Yusof Mohd, Anum Yasmin. Challenges of E-Learning During Covid-19 Pandemic: An Experience of Educators And Students of Faculty of Medicine And Defense Health (FMDH), National Defense University Of Malaysia (NDUM). *Bangladesh Journal of Medical Science*. 2021;**20**(5):175-177. <https://doi.org/10.3329/bjms.v20i5.55420>
20. Yousuf R, Salam A. Teaching medical education during the era of COVID-19 pandemic: challenges and probable solutions. *Bangladesh Journal of Medical Science*. 2021;**20**(5):3-6. <https://doi.org/10.3329/bjms.v20i5.55394>