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The Influence of Modified Anatomical Jendral Playing Cards in Improving Medical Student Learning Outcomes

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ABSTRACT

Introduction: Human anatomy is a basic and challenging medical science studying the normal structure of the human body and its relationship with other body structures. However, the current anatomy learning methods must continue to be developed to make them better. This research aims to see the effect of modified anatomy Jendral playing cards on the results of the anatomical response of the musculoskeletal system in medical students.

Method: This research was carried out at the Faculty of Medicine, Universitas Negeri Gorontalo, on 31 first-year pre-clinical medical students consisting of 7 men and 24 women with an average age of 18 years. The research design used is *a pre-experiment method* with *one group pretest-posttest design* where respondents will be given an intervention by playing Modified Jenderal Anatomy Playing Cards. Analysis of this research data used the Wilcoxon Test.

Results: There was an increase in quiz results from 8.00 ± 12.00 (median ±*interquartile range*) to 36.00 ± 24.00 (median ±*interquartile range*), as well as the p-*value* of 0.000 (p-*value* ≤0.05).

Conclusion: Playing modified anatomical jendral playing cards influences the results of medical students' Anatomy of Musculoskeletal System Practical Response Assessment. Medical teachers will use the present learning media innovation in activities reviewing anatomy practicum and using pictures Cadaver, which will be assessed to improve medical students' learning outcomes.

Key words: Anatomy assessment results, anatomy cards, learning media, medical students

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Introduction

Human anatomy is a basic medical science that studies the normal structure of the human body and its relationships with other body structures.[1] Anatomy is also the basis for studying the physiology of the human body as well as abnormal changes in the human body or what is called pathophysiology, which can trigger disease.[2] Without understanding anatomy and physiology, students cannot carry out a good and correct physical examination to reach a clinical diagnosis of the patient. Research conducted at the Faculty of Medicine, Islamic University of Indonesia found that 81 out of 85 students with a percentage of 95.29% realized that remembering the anatomical structure of organs related to certain diseases, strengthens understanding of related diseases.[3]

Anatomy is a basic science which is considered difficult to learn and memorize the terms. Research carried out in *Florida Gulf Coast University* shows that out of a total of 1328 students who took anatomy and physiology I courses, only 982 students were able to take all four of the four exams in this course. Meanwhile, in the Anatomy and Physiology II courses, only 586 out of 643 students were able to take all the exams in these courses.[4] Previous research data from the results of the anatomy practicum exam at the Faculty of Medicine, University of Lampung, was that only 38 people (25.3%) out of 112 people (74.7%) of respondents were declared to have passed the anatomy practicum exam.[5] Another research conducted at the Indonesian Christian University with a sample of 110 students in semesters 1, 2 and 3 who were interested in studying anatomy, after comparing the student learning outcomes obtained from studying anatomy, 50% of students did not meet graduation standards.[6]

Applying *games* in the teaching and learning process can make it easier for students to understand learning concepts. This is in line with the challenges of medical education in the 5.0 era, which requires innovation in learning by utilizing the latest technological developments.[7,8] The research results show that the use *game* can improve students' logical abilities and understanding of learning material. Additionally, use *game* in learning can also increase students' motivation and interest in learning.[9] Research conducted on medical students in *University of Otago, New Zealand* (n=300); *Manipal University, India* (n=72); *Khon Kaen University, Thailand*(n=274), by providing learning media in the form of *Anatomy Board Game* Showing feedback from players, it was found that this game was fun (95%), interested in this game (81%) and found it helpful in learning anatomy (97%).[10]

From the results of initial observations on two first year students of the Faculty of Medicine, Gorontalo State University (FK UNG), the student explained that anatomy is a

science that requires a lot of memorization, especially on the topic of Osteology and there is a lot of material that must be memorized while they are still in the adjustment stage medical. According to the student, the time given to study anatomy is not commensurate with the teaching material that students must study and lecture learning still seems less enjoyable because it is focused on *power point* lecturer. Based on the description above, researchers are interested in making a General Anatomy Modification game*Playing Cards* to make it easier for students to study anatomical material on musculoskeletal topics. Therefore, researchers conducted research to see the effect of playing General's Anatomy Modification*Playing Cards* Regarding the results of the anatomical response of the musculoskeletal system in medical students.

Methods

This research was carried out in August-September 2023 at FK UNG. This type of research is a *pre-experiment method* with *one group pretest-posttest design*. The study's population comprised students from the 2023 FK UNG academic class, totalling 69 individuals. A minimum sample size was determined based on the guidelines proposed by Roscoe (1975), which suggest that an adequate sample size should be at most 30 but not surpass 500 participants for empirical research.[11] In the study, the researchers initially recruited a sample size of 32 participants. However, one participant could not participate in the study during the research.

The independent variable in this research is playing Generals Anatomy Modification *Playing Cards* and the dependent variable in this study is the result of the anatomical response of the musculoskeletal system. Generals Anatomy Modification Playing Cards contain anatomical pictures and questions on the cards (Figure 1). The game was played after *pretest* given and before it was carried out *posttest*. The efficacy of utilizing a general anatomy game as a pedagogical tool in enhancing students' understanding of the musculoskeletal system was evaluated by comparing test scores before and after the intervention. The assessment comprised 25 questions, each associated with an anatomical image. Correct responses were awarded four points, while incorrect answers received zero points (Figure 2).

The collected data was subsequently subjected to both univariate and bivariate statistical analyses using the statistical package for social sciences (SPSS) software (IBM, USA). For the univariate analysis, the central tendency and dispersion of the data were characterized by the median and the interquartile range (IQR), respectively. In the case of

bivariate analysis, the Wilcoxon signed-rank test was employed to assess the statistical significance of differences between paired observations.

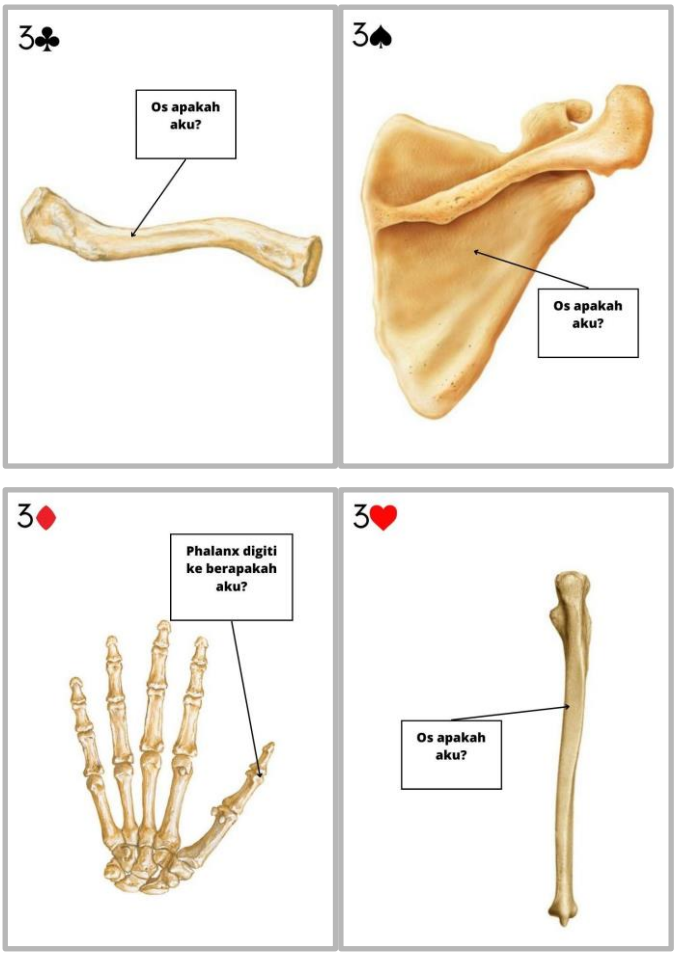

Figure 1. Design of modified anatomy playing cards

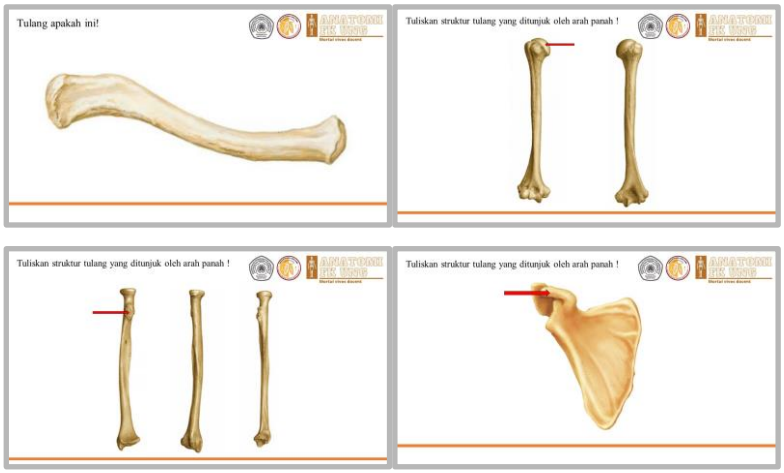

Figure 2. Design of pretest and posttest questions

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Results

In Table 1, out of a total of 31 respondents, there were 7 (22.58%) male respondents and 24 (74.40%) female respondents. And out of a total of 31 respondents, there were 2 people (6.45%) aged 17 years, 20 people (64.52%) aged 18 years, 7 people (22.58%) aged 19 years and 2 people (6.45%) respondents were 20 years old.

Table 1. Distribution of respondents by gender and age

Characteristics	Frequency	Percentage(%)
Gender		
Male	7	22.58
Female	24	74.40
Age		
17	2	6.45
18	20	64.52
19	7	22.58
20	2	6.45

In Table 2, the data analysis reveals a significant improvement from the pretest to the posttest results. Specifically, the median score escalates from 8.00 in the pretest to 36.00 in the posttest. Additionally, the interquartile range (IQR), which measures the spread of the middle 50% of the data, widened from 12.00 in the pretest to 24.00 in the posttest, indicating a more excellent dispersion in the posttest scores. The Wilcoxon signed-rank test, a non-parametric statistical test used to compare paired samples, yielded a significance (sig.) value of 0.000. This indicates a statistically significant difference between the pretest and posttest results, underscoring the impact of the intervention or treatment administered between the two testing periods.

Table 2. Comparison between pretest and post-test score following the intervention

	Median	IQR	p-value
Pretest	8.00	12.00	0.000*
Posttest	36.00	24.00	

*Wilcoxon test

Discussion

Based on data analysis of the response results before being presented by General Anatomy Modifications*Playing Cards* The median value was 8.00 and the IQR value was 12.00. This could be because human anatomy is a branch of basic science that is relatively new to students, especially the language used is Latin. Research conducted by Chairad, 2018, analyzed the difficulties of learning anatomy among students. The results generally showed

that students had many problems in using the language of human anatomy.[12] This research was carried out when students had not been exposed to anatomical material at all with the aim of minimizing bias in the research. However, due to the density of students' lecture schedules, research was carried out while students were still undergoing biomedical block 1 on biochemistry and histology topics, so students tended to focus on the walking block and the difficulties and obstacles in participating in research. According to Jeff Comer, a psychologist from *California Southern University* explains that humans cannot do work independently *multitasking*, but rather formed to do work collectively *mono-tasking*. This is in accordance with research conducted on law students in *Germane University* to see that *multitasking* has high negative effects as well as low positive effects compared to *monotasking* with research results showing that the nature *multitasking* tend to have high negative effects and low positive effects.[13] Apart from that, students still have difficulty studying anatomy because they have not received the right method for learning, such as playing Modified Generals Anatomy *Playing Cards*. The best method for studying anatomy is cadaver prosection, but prosection *Cadaver* many have disadvantages, including a lot of time required, limitations *Cadaver*, as well as strict ethical issues in procurement procedures *Cadaver*.[14]

The median score following exposure to the General Anatomy Modification game Playing *Cards* was 36.00 (IQR 24.00). Results *posttest* students tend to increase. If we look at each game group, which consists of 8 groups and each group consists of 4 players, except for 1 group which only consists of 3 players, there is an increase in results for all players except 1 person who gets the same results.*pretest* and *posttest*. Players who get the same result between *pretest* & *posttest* is a member of a group that has a complete formation of 4 people and does not make any irregularities or skip the playing process so that the cause of the results not increasing is the respondent's internal factors. This increase in response results was caused by students having been exposed to the Modified General's Anatomy learning media *Playing Cards* in learning, with the method of learning while playing or what is called*Game Based Learning* making it easier for students to re-study and memorize human body anatomy terms. According to Winata in Sukmawati, 2022 method*Game Based Learning* can make it easier for students to understand the material presented because this method can increase student motivation, so that participants are enthusiastic about learning, besides that students feel challenged and happy because they can collaborate with friends.[15] Modified Generals Anatomy Game*Playing Cards* applies the learning method by students playing directly in groups consisting of 4 players. With this concept, students can carry out learning

methods by doing or in educational terms what is called *learning by doing* to encourage progress in student learning outcomes. John in Robani, 2021 explains that in the learning process, students or learners must feel what is being learned and do it directly in the original situation. This is in line with Hamalik's statement in Robani, 2021, explaining that it will be more effective if the learning process is directed at the process of working or carrying out certain tasks that are linear to the topic.[16] Apart from that, General Anatomy Modification*Playing Cards* It also allows students who cannot answer questions in the game to tend to remember the material they have not been able to answer. This is in line with one *human behavior* which was discovered by Bluma Zeigarnik, namely*Zeigarnik effect*. *Zeigarnik effect* states that work interruptions or tasks that have not been actively completed can replay information in our minds that causes special tension periodically so that we will continue to think about the work until it can be completed.[17]

The increase in response results among respondents was because respondents were given treatment in the form of learning media in the form of modified anatomy cards*Playing Cards.* Learning media has been proven to provide good results in the learning process, this is in accordance with research conducted by Wati and Valzon on medical students at Abdurrab University to see the effectiveness of various anatomy learning media, whether based on text, video or a combination of text and video. This research shows that learning media is effectively used in the learning process, especially text and video-based anatomy learning media.[18] Currently, game-based learning methods or what are called game-based learning methods have also been developed*Game Based Learning* (GBL). One of the studies conducted to assess the effectiveness of GBL was research conducted by Aini, 2018 on class .2%.[19] Anatomical cards were developed by Rahmasari at the Faculty of Medicine, Muhammadiyah University of Yogyakarta to see student learning outcomes before and after the active learning process using Dental Anatomy cards (KABANOGI) which provide improved results.*pretest* the *posttest* namely 66.69% to 77.12%.[20] Learn anatomy based on how to play Generals Anatomy Modification*Playing Cards* namely by practicing in groups, in other words involving players to do directly something that is currently being studied so that there is an increase in the knowledge of the respondents. Another research was conducted at Gorontalo State University to determine student perceptions of usage *digital illustrators* in histology practicum, which was applied directly by the practitioner, the result was that this method helped the histology practicum learning.[21] This is in accordance with one of Bloom's Taxonomies, namely the psychomotor aspect where respondents implement the theoretical knowledge they learn into real actualization. According to this theory,

respondents who have comprehensive theoretical knowledge are able to implement the theory well.[22]

Apart from previous research which supports that the use of learning media in the form of games can improve learning outcomes, respondents in this study also provided feedback that they felt helped in the learning process because of General Anatomy Modification.*Playing Cards* It is packaged in a simple and educational way and they feel happy playing these cards because it provides motivation to learn by encouraging them to compete with their gaming group friends. In accordance with the results that researchers got from playing Generals Anatomy Modification*Playing Cards* improve the results of the anatomical response of the musculoskeletal system of FK UNG students. Modified Generals Anatomy Game*Playing Cards* applies a learning method using card games and is played in groups, so that several aspects are influenced by the players, namely the desire to win the game, motivation to learn, and the tendency to remember easily because they learn by doing it directly.

The limitation of this research is that this research only used one group of students and did not use a control group, namely a group that was not given treatment, so the researchers did not have comparative data to see the accuracy of the results obtained.

Conclusion

There is an influence of playing General Anatomy Modification*Playing Cards* on the results of the anatomical response of the musculoskeletal system of FK UNG students. It is hoped that this learning media will be used in activities *review* anatomy practicum and using pictures *Cadaver* which will be tested to be more appropriate to the learning achievements of Medical Students.

Conflicts of Interest

Nothing to declare.

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