Research Square

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Do mobile video games contribute to improving laparoscopic surgical skills of medical students? A randomized controlled simulation-based study

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Abstract

Background:

Laparoscopic learning curve requires the development of visuospatial, motor, and coordination skills. People practice such abilities while playing video games many times daily. Prior studies have shown that conventional video games can improve laparoscopic performance. Despite the increasing popularity of mobile games, their potential for laparoscopic training was not studied enough yet. This study aimed to evaluate the impact of mobile games on the laparoscopic simulation performance of medical students and to investigate their potential application as a supportive tool in surgical education.

Methods:

We investigated the impact of mobile gaming on laparoscopic simulation performance among medical students. Thirty students with no prior surgical or simulation experience were randomly assigned to gamer and control groups. Both groups received initial training using the Simbionix LAP Mentor™ laparoscopic simulator and completed a baseline assessment. Over three weeks, the gamer group was instructed to play selected mobile games (DATA WING™ and Aim Lab Mobile™), while the control group did not engage in any gaming activity. After the intervention period, both groups were reassessed using the same simulation tasks. Performance was measured through accuracy scores and task completion times across three simulation modules: hand-eye coordination, suture placement, and two-handed maneuvers.

Results:

Following the three-week intervention, the gamer group showed a significant reduction in task completion times for hand-eye coordination and suture placement simulations, whereas accuracy scores remained unchanged. The control group showed no significant improvements except for a moderate increase in bimanual maneuver accuracy. Comparisons between groups showed that the gamer group performed significantly faster after the gaming period.

Conclusion:

The player group showed improved time efficiency in laparoscopic simulation tasks. While accuracy scores did not show significant changes, shorter task durations suggest that mobile games could serve as a valuable, low-cost, and accessible complement to learning procedures for laparoscopy.

Trial Registration:

ClinicalTrials.gov, NCT07744399, registered retrospectively on 25 July 2026.

Introduction

Laparoscopy has become an essential part of modern surgical practice. This minimally invasive technique uses smaller incisions than traditional open surgeries, resulting in less postoperative pain, shorter hospital stays, and faster recovery for patients. It also reduces complications such as infection, blood loss, and scar

formation. These benefits not only improve clinical outcomes but also enhance patient satisfaction and reduce the financial burden on healthcare systems. Consequently, the preference for laparoscopic surgery has been growing, and surgical practices are gradually evolving toward more advanced technological approaches, such as robot-assisted surgery[1–4].

The shift toward minimally invasive surgery has introduced new challenges for surgeons. Learning laparoscopy requires enhanced visuospatial skills, coordination, depth perception, and refined hand-eye coordination, compared with traditional open surgery, and the learning curve can vary among individuals. To ease these challenges and help people learn safely and effectively, various training methods (such as simulation systems, instructional videos, skill labs, and organized hands-on courses) are being used more often[5,6].

Recently, the integration of advanced technologies such as augmented reality (AR) and virtual reality (VR) has expanded the scope and capabilities of surgical training environments. These technologies enable learners to engage in interactive, high-fidelity simulations that replicate real-world anatomical and procedural complexity. In the near future, artificial intelligence (AI) and machine learning algorithms are expected to play an increasingly prominent role in surgical education and performance assessment. These technologies may help personalize training pathways, predict learning outcomes, and provide real-time feedback, ultimately enhancing both the efficiency and precision of laparoscopic skill development[7]. In recent years, in addition to these educational tools, there has been increasing evidence that video games can also contribute to laparoscopic skill development. Various studies have indicated that video games improve cognitive and behavioral skills such as attention span, reaction speed, motor coordination, and visual-spatial processing; it has been suggested that these competencies are also reflected in surgical performance. Findings regarding medical students and surgeon candidates performing better with video games have been revealed, especially in studies conducted with console and computer-based games[8–13].

The aim of this study is to examine the effect of mobile gaming on the laparoscopic performance of medical students and to contribute to the existing body of literature by building on previous findings from conventional video game research, with the intention of exploring whether mobile games may offer similar benefits in surgical education.

Methods

30 medical students (first, second, and third-year students) were included in this study. These participants had no prior experience in real or virtual/simulated surgical training, nor did they possess any surgical experience. The study protocol was approved by the Marmara University School of Medicine Clinical Researches Ethics Committee (Prot. No. : 09.2023.312), and conducted in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments. The study was retrospectively registered at ClinicalTrials.gov (Identifier No.: NCT07744399). Prior to participation, all students were provided with detailed information regarding the purpose and procedures of the study. Electronic informed consent to participate was obtained from all participants prior to enrollment through the study questionnaire. Participation was voluntary, and participants were free to withdraw from the study at any time without consequences. Only volunteer students who provided informed consent were included in the study.

Randomization was performed using a computer-generated random number sequence, created by an investigator not involved in participant recruitment or outcome assessment, in order to minimize selection bias. Allocation concealment was ensured through the use of sequentially numbered, opaque, sealed envelopes, which were opened only after each participant's baseline data had been recorded and immediately before the intervention. Simple randomization was used, with no restrictions placed on group size beyond the constraint imposed by simple 1:1 allocation. Given the nature of the intervention, blinding of participants to their group assignment was not feasible; however, the investigators evaluating laparoscopic performance on the simulation device were blinded to group allocation to reduce the risk of assessment bias.

Furthermore, the students reported playing mobile games for fewer than 3 hours per week prior to the study. The selection criteria were verified using a questionnaire completed by the students before the study began, and volunteer participants were then selected based on their responses. The selected students were randomly divided into two groups of fifteen: the “control group” and the “gamer group”.

Both groups received a one-hour training session led by the responsible researchers using the Simbionix LAP Mentor™ laparoscopic simulation device. The training covered suture placement, 2-handed maneuvers (grasping, transporting, placing, etc.), and eye-hand coordination exercises. All participants were instructed to perform the simulations after the training and a baseline assessment including task completion time (in seconds) and performance scores (as percentages) were collected from the processor.

A 3-week study period was defined. During this period, participants in the “control group” were instructed to avoid playing mobile games. Students in the “gamer group”, on the other hand, were asked to play selected mobile games for at least 30 minutes per day over three weeks. The games used in the study were DATA WING™ (Dan Vogt) and Aim Lab Mobile™ (State Space Labs, Inc.), both available on all mobile platforms. At the end of the 3 weeks, all participants were re-instructed to use the laparoscopic stimulation device, and data were re-collected.

Pre- and post-intervention performance data were compared. Normality was assessed using the Shapiro-Wilk test, which indicated a non-normal distribution in both groups ($p < 0.05$). The ROUT method was applied to exclude outliers before each statistical analysis. Comparisons between independent groups were analyzed using the Mann–Whitney U test, while paired comparisons were conducted using the Wilcoxon Signed-Rank test. A p-value less than 0.05 was considered statistically significant. Statistical analyses and graphical representations were performed using IBM SPSS Statistics for Windows (IBM Corp. Released 2020, Version 27.0. Armonk, NY: IBM Corp.) and GraphPad Prism (version 10.0.0 for Windows, GraphPad Software, Boston, Massachusetts, USA).

Results

A total of 47 medical students were assessed for eligibility. Seventeen students were excluded because of previous clinical or surgical experience (n = 10), prior mobile gaming of ≥ 3 hours per week (n = 6), or declining to participate (n = 1). The remaining 30 participants were randomly assigned to the mobile gaming group (n = 15) or the control group (n = 15). All randomized participants completed the study and were included in the analysis. Participant enrollment, allocation, follow-up, and analysis are presented in Fig. 1.

Baseline Assessment

Following the training sessions, no statistically significant differences were observed between the control and gamer groups in the initial measurements taken before the three-week gaming period. This lack of significant difference indicated the absence of bias and confirmed baseline homogeneity.

Within-Group Comparisons

Control Group:

Within the control group, a statistically significant improvement was found only in the bimanual maneuvers accuracy rate after the gaming period (Md = 89% vs. 78%; W = 3.50, z=-2.190, p = 0.027). No significant changes were observed in accuracy rate or completion time for eye-hand coordination or suture placement exercises (Table 1).

Gamer Group:

The gamer group showed significant decreases in task completion time for both hand-eye coordination (Md = 56s vs. 45s; W = 73, z=-2.667, p = 0.005) and suture placement (Md = 187.5s vs. 82s; W = 78, z=-3.059, p < 0.001) (Figs. 2 and 3). However, no significant improvements were observed in accuracy scores (Table 2).

Group Comparisons (Post-gaming period):

Post-intervention comparisons between the control and gamer groups showed no significant differences in accuracy across any task. However, the gamer group completed both the hand-eye coordination (Md = 59s vs. 45s; U = 35.50, z = -2.635, p = 0.006) and suture placement (Md = 124s vs. 82s; U = 43.50, z = -2.270, p = 0.023) tasks significantly faster than the control group. No statistically significant difference in task duration was observed between groups for the bimanual maneuvers task (Table 3; Figs. 4 and 5).

Discussion

Nowadays, the use of mobile devices has increased significantly, and digital habits have largely shifted toward mobile platforms. Today, games are played not only on desktop computers or gaming consoles but also on smartphones, and this practice has become a routine part of daily life. This shift has raised the question of whether mobile games, like conventional video games, might also contribute to the development of surgical skills. This widespread accessibility and frequent interaction have raised questions about the potential cognitive and psychomotor benefits of mobile games, similar to those demonstrated in studies involving conventional video gaming platforms[12,14,15]. As mobile gaming continues to expand its influence in digital entertainment, its possible role in enhancing skills relevant to surgical training, such as visuospatial ability and hand-eye coordination, warrants further investigation.

We investigated the impact of mobile gaming on laparoscopic simulation performance among medical students. The findings indicate that baseline laparoscopic performance levels between the gamer and control groups were statistically similar before the gaming period, suggesting that randomization was effective and

that both groups were homogeneous in terms of their initial laparoscopic skill levels. Distinct patterns of improvement emerged over the three-week gaming period.

Students in the gaming group showed significant improvements in task completion time across both hand-eye coordination and suture placement simulations. The results suggest that regular engagement with mobile games may enhance critical skills in laparoscopic practice, including visuospatial processing, attentional focus, 2-dimensional approach, motor responsiveness, and reaction time. These findings align with previous studies reporting improvements in laparoscopic performance after video game interventions[8,9,16,17].

Compared with the control group, the gamer group performed significantly faster than the control group in both the hand-eye coordination and suture placement tasks during the post-gaming period. These findings support the hypothesis that mobile gaming, even in short daily sessions, may serve as a complementary tool in laparoscopy training by enhancing procedural speed without compromising performance accuracy.

Within the control group, there was also a significant increase in performance scores for 2-handed maneuvers; however, this improvement was not accompanied by a reduction in task completion time. This may suggest that while repetition alone can enhance coordination and accuracy, time efficiency appears to benefit more from interactive digital experiences that mimic dynamic, high-stakes environments, such as mobile games.

Previous studies in the literature have established a consensus that playing video games on conventional or mobile devices improves speed and reduces the time required to complete specific tasks in laparoscopic and robotic surgery simulators[8,9,14,16,18]. However, there is no standardized or widely accepted validation regarding the selection of games, training durations, or the impact of prior gaming experience. Similarly, there is no consensus on simulation methods or device preferences for measuring laparoscopic proficiency. Consequently, many studies have been conducted with different methodologies by their researchers' own designs. While some of these investigations reported improvements in accuracy and motion economy, others found no statistically significant differences between control and gamer groups[8,9,14,16,18]. To obtain more robust and reliable evidence, future research should be done with standard game selection and simulation protocols, supported by large-scale, randomized controlled prospective studies.

Despite observed improvements in task duration among the gamer group, there were no significant changes in performance scores across any of the simulation tasks. Both mobile games used in this study (DATA WING™ and Aim Lab Mobile™) featured time-limited gameplay rather than focusing on winning scores in stage completion tasks. This highlights a potential limitation of mobile games, suggesting that such interventions may be more effective at enhancing speed-related parameters than accuracy or technique. These findings may explain why the significant improvements in task duration within the gamer group were not matched by substantial gains in simulation accuracy. The discrepancy between significantly reduced completion times and unchanged accuracy scores indicates that mobile games may boost speed but not necessarily precision, potentially due to how these games reward progression. Future studies may benefit from collecting in-game performance data and conducting correlation analyses between in-game success and simulation performance in larger cohorts. However, no significant differences were observed between

the groups in 2-handed maneuver tasks in terms of time or success rate, possibly because the specific motor complexity and bilateral coordination demands of these tasks may not be sufficiently replicated by the selected mobile games.

The effectiveness of video games in enhancing surgical skills has been extensively studied, and their positive impact is well-established in the literature. Therefore, this study contributes to the expanding body of research on the impact of video games on laparoscopic skill development, with a key distinction: whereas previous research predominantly utilized conventional gaming consoles (e.g., PlayStation, Xbox) and desktop-based video games[8,17,19], the present study specifically evaluated the effects of mobile games. In the contemporary era, there has been a remarkable increase in the accessibility and widespread daily use of mobile devices across diverse populations, including medical students[15,20]. The present findings may extend the benefits of video gaming technology to mobile platforms, reflecting a more modern and accessible trend.

This trend is further supported by prior work, including the study by Chalhoub et al. (2018), which demonstrated the potential of smartphone games to enhance fine motor skills in medical students. Our study further supports the utility of mobile-based gaming in laparoscopic training. While their study reported improvements in general psychomotor performance and laparoscopic skills after smartphone gameplay, our findings extend this evidence by specifically linking mobile games to enhanced efficiency in laparoscopic simulation tasks, particularly in timing[14].

Given the growing accessibility of mobile gaming platforms, this study offers a novel perspective on surgical education. If specific mobile games can improve task efficiency in laparoscopic simulation, there may be merit in designing medically oriented mobile applications that are both educational and gamified. Integrating laparoscopic principles into mobile game environments could provide students and surgical trainees with low-cost, on-demand training tools that align with their daily digital habits. As prior work has emphasized, the gamification of medical education is a promising frontier that enhances motivation, engagement, and learning outcomes[21,22].

Limitations

This study has several limitations that should be considered when interpreting the findings. It was conducted at a single center with a relatively small sample size of medical students, which may limit the generalizability of the results to other educational settings and student groups. Although randomization resulted in comparable baseline performance between the study groups, the sample size may have reduced the ability to detect smaller but potentially meaningful differences in performance outcomes, especially in accuracy-based scores. In addition, the intervention period was limited to three weeks, and therefore the long-term effects of mobile gaming on laparoscopic skill acquisition and retention could not be evaluated.

Another important limitation relates to the intervention itself. Two mobile games were selected, and these games primarily demonstrated rapid visual processing, reaction time, and hand-eye coordination skills. Different mobile games may produce different effects on laparoscopic performance, and no standardized mobile gaming protocol currently exists for surgical training. Furthermore, participants' in-game performances were not recorded; therefore, it was not possible to determine whether higher achievement

within the games was associated with greater improvements in laparoscopic simulation performance. Although simulation-based assessments provide an objective and standardized environment for evaluating psychomotor skills, improvements observed in a simulator cannot be directly translated into operative performance in real clinical settings. Future multicenter studies involving larger cohorts, longer intervention periods, standardized gaming protocols, and performance outcomes are warranted to clarify the educational value of mobile gaming in laparoscopic training.

Conclusion

This study shows that short, daily use of mobile games can improve specific aspects of laparoscopic performance, primarily by helping students complete tasks such as hand-eye coordination and suture placement more quickly. Although accuracy scores did not change, the faster completion times suggest that mobile games could be a useful, low-cost, and easily accessible addition to standard surgical training. Mobile games alone may not be sufficient to fully develop surgical skills, but they can still serve as a helpful and motivating supplement, especially for improving time-related performance in laparoscopic tasks. More studies with larger groups, longer training periods, and diverse game types are needed to better understand how mobile games support laparoscopic learning and how in-game performance correlates with actual surgical abilities.

Declarations

Ethics approval and consent to participate

The study protocol was approved by the Marmara University School of Medicine Clinical Researches Ethics Committee (Prot. No.: 09.2023.312) and conducted in accordance with the ethical principles of the Declaration of Helsinki and its subsequent amendments. The study was retrospectively registered at ClinicalTrials.gov (Identifier No.: NCT07744399).

Participation was voluntary, and all participants were informed about the purpose of the study, the study procedures, the confidentiality of the collected data, and their right to withdraw from the study at any time without any consequences. Electronic informed consent was obtained from all participants before the study. The selection criteria were verified using a questionnaire completed by the students before the study began, and volunteer participants were then selected based on their responses.

Consent for Publications

Not applicable. There are no personal data or images included in this manuscript.

Availability of Data

The data that were obtained from the findings of the study are available from the corresponding author upon reasonable request.

Disclosure

Tayfun Akmercan, Ahmet Akmercan, Rohat Eşidir, Emre Akkuş, Emin Arda Tekirgöl, Uğur Can Polat, Emin Danacı, Mustafa Ümit Uğurlu declare there are no conflicts of personal or financial interest.

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CRediT Authorship Contribution Statement

Tayfun Akmercan: Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Resources, Validation, Writing – original draft, Writing – review and editing

Ahmet Akmercan: Data curation, Formal analysis, Investigation, Validation, Writing – original draft

Rohat Eşidir: Investigation, Methodology, Resources, Writing – original draft

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Emin Arda Tekirgöl: Investigation, Methodology, Resources, Writing – original draft

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Emin Danacı: Investigation, Methodology, Resources, Writing – original draft

M. Ümit Uğurlu: Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project Administration, Resources, Supervision, Validation, Writing – original draft, Writing – review and editing

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References

1. Buia A, Stockhausen F, Hanisch E. Laparoscopic surgery: A qualified systematic review. *World J Methodol*. 2015;5(4):238. doi:10.5662/wjm.v5.i4.238
2. Li Z, Zhao Q, Bai B, Ji G, Liu Y. Enhanced Recovery After Surgery Programs for Laparoscopic Abdominal Surgery: A Systematic Review and Meta-analysis. *World J Surg*. 2018;42(11):1. doi:https://doi.org/10.1007/s00268-018-4656-0
3. Crawshaw BP, Chien HL, Augestad KM, Delaney CP. Effect of Laparoscopic Surgery on Health Care Utilization and Costs in Patients Who Undergo Colectomy. *JAMA Surg*. 2015;150(5):410-415. doi:10.1001/jamasurg.2014.3171

4. Antoniou SA, Antoniou GA, Antoniou AI, Granderath FA. Past, present, and future of minimally invasive abdominal surgery. *Journal of the Society of Laparoendoscopic Surgeons*. 2015;19(3). doi:10.4293/JSLS.2015.00052
5. Ackermann J, Baumann J, Pape J, et al. Factors influencing surgical performance and learning progress in minimally invasive surgery – results of an interdisciplinary multicenter study. *International Journal of Surgery*. 2023;109(10). https://journals.lww.com/international-journal-of-surgery/fulltext/2023/10000/factors_influencing_surgical_performance_and.11.aspx
6. von Bechtolsheim F, Petzsch S, Schmidt S, et al. Does practice make perfect? Laparoscopic training mainly improves motion efficiency: a prospective trial. *Updates Surg*. 2023;75(5):1103-1115. doi:10.1007/s13304-023-01511-w
7. Shahrezaei A, Sohani M, Taherkhani S, Zarghami SY. The impact of surgical simulation and training technologies on general surgery education. *BMC Med Educ*. 2024;24(1):1297. doi:10.1186/s12909-024-06299-w
8. Rosser JC, Lynch PJ, Cuddihy L, Gentile DA, Klonsky J, Merrell R. The impact of video games on training surgeons in the 21st century. *Archives of Surgery*. 2007;142(2):181-186. doi:10.1001/archsurg.142.2.181
9. Jalink MB, Goris J, Heineman E, Pierie J, ten Cate Hoedemaker H. The effects of video games on laparoscopic simulator skills. *Am J Surg*. 2014;208(1):151-156. doi:doi:10.1016/j.amjsurg.2013.11.006.
10. Datta R, Chon SH, Dratsch T, et al. Are gamers better laparoscopic surgeons? Impact of gaming skills on laparoscopic performance in “Generation Y” students. *PLoS One*. 2020;15(8):e0232341-. https://doi.org/10.1371/journal.pone.0232341
11. Harrington CM, Chaitanya V, Dicker P, Traynor O, Kavanagh DO. Playing to your skills: a randomised controlled trial evaluating a dedicated video game for minimally invasive surgery. *Surg Endosc*. 2018;32(9):3813-3821. doi:10.1007/s00464-018-6107-2
12. Bediou B, Adams DM, Mayer RE, Tipton E, Green CS, Bavelier D. Meta-analysis of action video game impact on perceptual, attentional, and cognitive skills. *Psychol Bull*. 2018;144(1). doi:10.1037/bul0000130
13. Keleş HO, Omurtag A. Video game experience affects performance, cognitive load, and brain activity in laparoscopic surgery training. *Turk J Surg*. 2023;39(2):95-101. doi:10.47717/turkjsurg.2023.5674
14. Chalhoub M, Khazzaka A, Sarkis R, Sleiman Z. The role of smartphone game applications in improving laparoscopic skills. *Adv Med Educ Pract*. 2018;9:541-547. doi:10.2147/AMEP.S162619
15. Izquierdo-Condoy JS, Arias-Intriago M, Nati-Castillo HA, et al. Exploring smartphone use and its applicability in academic training of medical students in Latin America: a multicenter cross-sectional study. *BMC Med Educ*. 2024;24(1):1401. doi:10.1186/s12909-024-06334-w
16. Kennedy AM, Boyle E, Traynor O, Walsh T, Hill ADK. Video gaming enhances psychomotor skills but not visuospatial and perceptual abilities in surgical trainees. *J Surg Educ*. 2011;68(6):414-420. doi:10.1016/j.jsurg.2011.03.009
17. Schlickum MK, Hedman L, Enochsson L, Kjellin A, Felländer-Tsai L. Systematic video game training in surgical novices improves performance in virtual reality endoscopic surgical simulators: A prospective randomized study. *World J Surg*. 2009;33(11):2360-2367. doi:10.1007/s00268-009-0173-0

18. Gupta A, Lawendy B, Goldenberg MG, Grober E, Lee JY, Perlis N. Can video games enhance surgical skills acquisition for medical students? A systematic review. *Surgery (United States)*. 2021;169(4). doi:10.1016/j.surg.2020.11.034
19. Bokhari R, Bollman-McGregor J, Kahoi K, Smith M, Feinstein A, Ferrara J. A randomized controlled trial to evaluate the role of video game play in laparoscopic skills training. *Surg Endosc*. 2010;24(2):364-370. doi:10.1007/s00464-009-0579-4
20. Statista Research Department. Number of smartphone users worldwide from 2014 to 2029. July 9, 2025. Accessed February 1, 2026. https://www.statista.com/forecasts/1143723/smartphone-users-in-the-world
21. Gentry S V, Gauthier A, Ehrstrom BL, et al. Serious gaming and gamification education in health professions: Systematic review. *J Med Internet Res*. 2019;21(3). doi:10.2196/12994
22. Ricciardi F, De Paolis LT. A comprehensive review of serious games in health professions. *International Journal of Computer Games Technology*. Published online 2014. doi:10.1155/2014/787968

Tables

Table 1. Comparative results of control group after three-week gaming period

Measurement		Session	Wilcoxon Signed-Rank Test					Sig.
			Median	Number of pairs [a]	W [b]	Z	r [c]	(2-tailed)
Eye & Hand Coordination Exercise	Time (s)	Before	63.00	15	68.5	-0.483	0.12	0.649
		After	59.00					
	Accuracy (%)	Before	91.00	11	38	-0.445	0.13	0.351
		After	83.00					
2-handed Maneuvers	Time (s)	Before	153.00	15	82	-1.250	0.32	0.229
		After	120.00					
	Accuracy (%)	Before	78.00	9	3.5	-2.190	***0.73****	***0.027****
		After	89.00					
Suture Placement	Time (s)	Before	149.00	13	50	-0.315	0.09	0.774
		After	115.00					
	Accuracy (%)	Before	75.00	10	36	-0.866	0.27	0.416
		After	63.00					

[a] Tied values were ignored. [b] Based on negative sum of ranks, [c] Rank-biserial correlation calculated from |Z|.

Table 2. Comparative results of player group after three-week gaming period

Measurement		Session	Wilcoxon Signed-Rank Test					Sig.
			Median	Number of pairs [a]	W [b]	Z	r [c]	(2-tailed)
Eye & Hand Coordination Exercise	Time (s)	Before	56.00	12	73	-2.667	***0.77***	***0.005 *****
		After	45.00					
	Accuracy (%)	Before	89.00	12	44	-0.392	0.11	0.718
		After	90.00					
2-handed Maneuvers	Time (s)	Before	141.00	15	60	0	0	1.000
		After	142.00					
	Accuracy (%)	Before	89.00	9	13.5	-1.066	0.36	0.398
		After	100.00					
Suture Placement	Time (s)	Before	187.50	12	78	-3.059	***0.88***	***<0.001 ******
		After	82.00					
	Accuracy (%)	Before	75.00	11	26.5	-0.578	0.17	0.598
		After	67.00					

[a] Tied values were ignored. [b] Based on negative sum of ranks. [c] Rank-biserial correlation calculated from |Z|.

Table 3. Intergroup comparisons of control and player students, after three-week gaming period

Measurements		Session	Mann-Whitney U Test						Sig.
			N [a]	Mean of Ranks	Median	U [b]	Z	r [c]	(2-tailed)
Eye & Hand Coordination Exercise	Time (s)	Control	15	17.63	59.00	35.50	-2.635	***0.51***	***0.006****
		Player	12	9.458	45.00				
	Accuracy (%)	Control	15	16.87	83.00	92.00	-0.865	0.16	0.398
		Player	15	14.13	90.00				
2-handed Maneuvers	Time (s)	Control	15	14.97	120.0	104.50	-0.332	0.06	0.752
		Player	15	16.03	142.0				
	Accuracy (%)	Control	15	13.93	89.00	89.00	-0.772	0.14	0.531
		Player	14	16.14	100.0				
Suture Placement	Time (s)	Control	15	17.10	124.0	43.50	-2.270	***0.44***	***0.023****
		Player	12	10.13	82.00				
	Accuracy (%)	Control	15	65.40	63.00	103.50	-0.389	0.07	0.715
		Player	15	65.87	67.00				

[a] Number of students, [b] U statistic value=min(U_1,U_2). [c] Rank-biserial correlation calculated from |Z|.

Figures

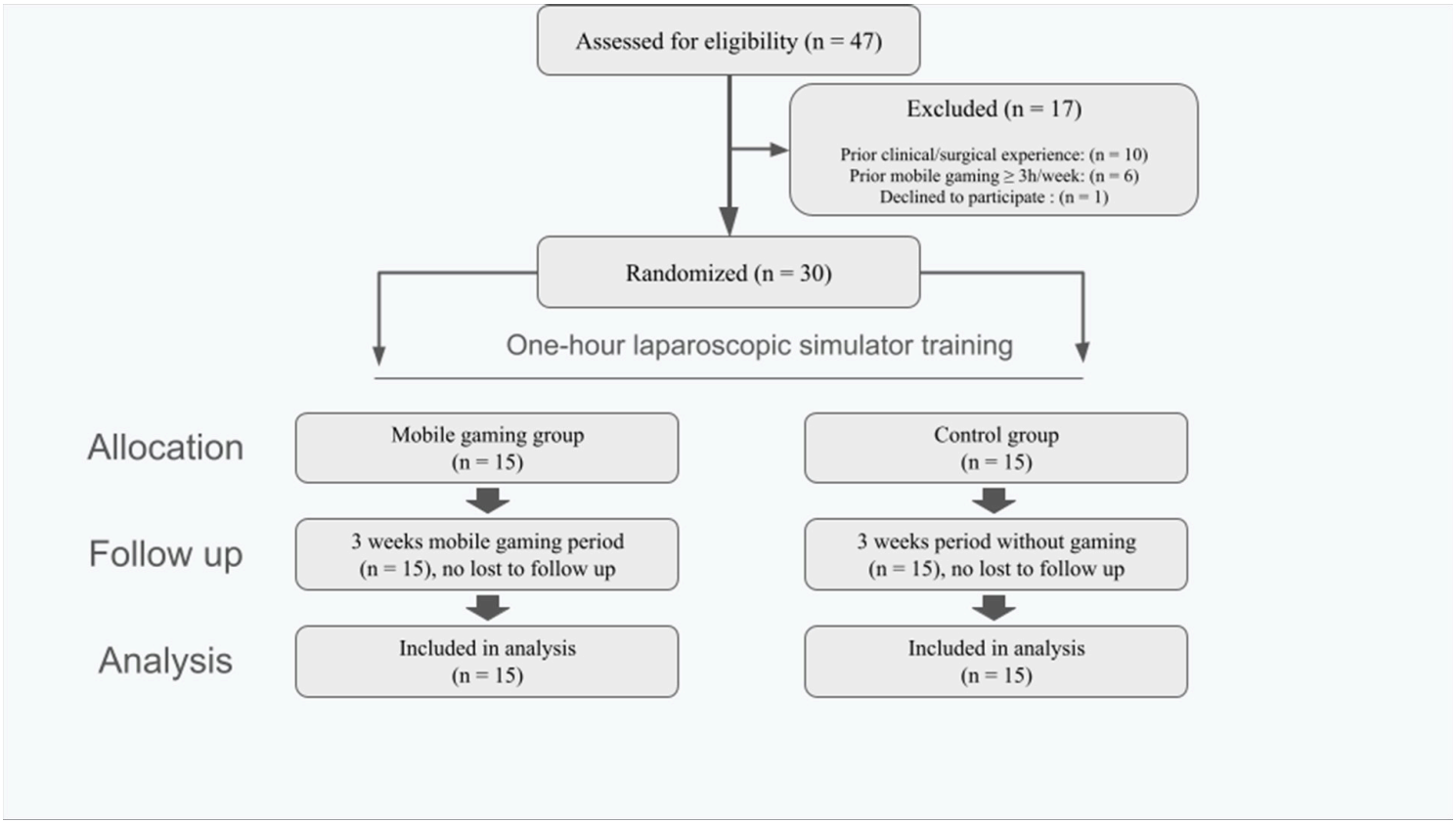


Figure 1

CONSORT flow diagram of participant enrollment, randomization, follow-up, and analysis.

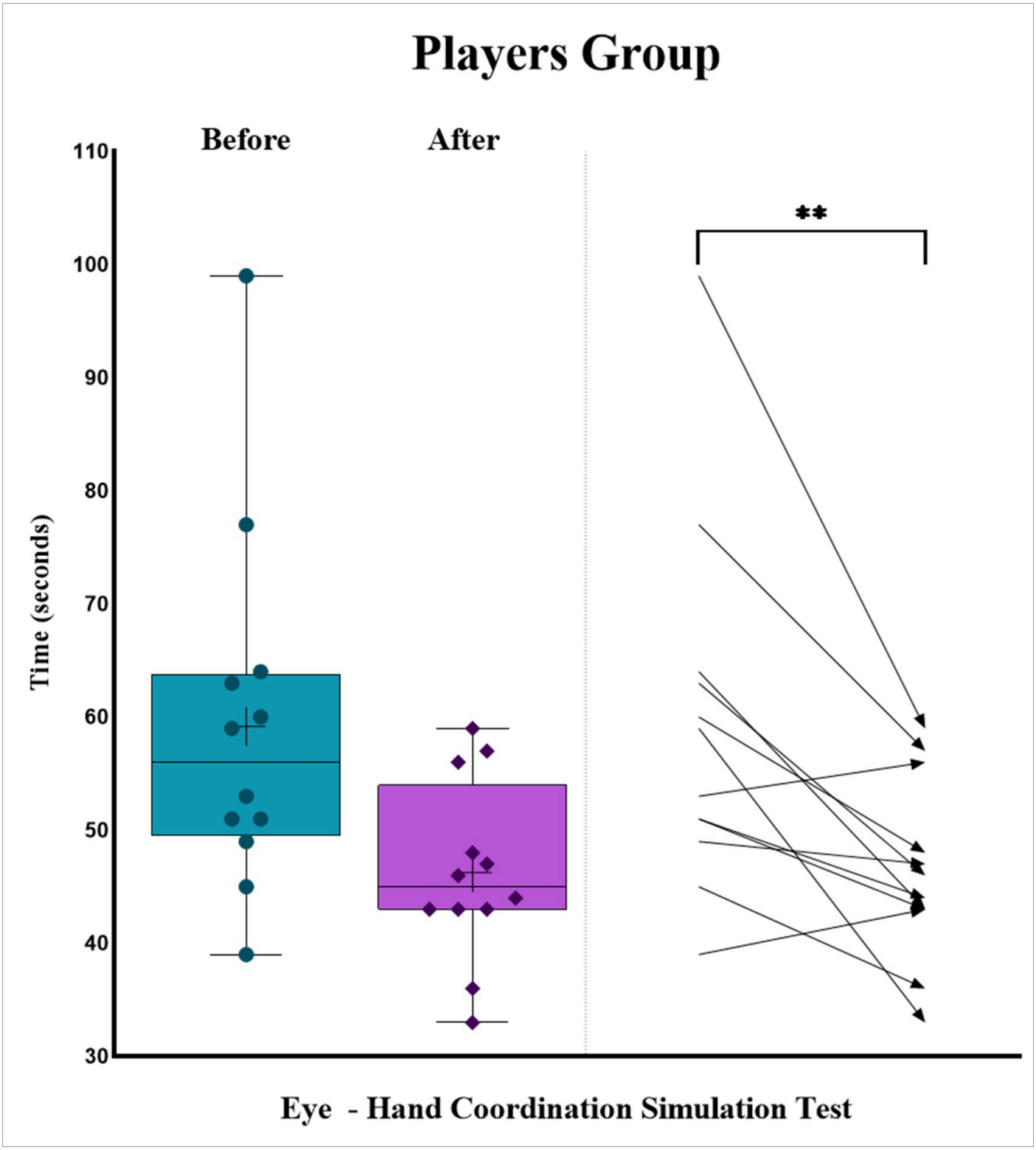


Figure 2

Time changes in the players group for eye-hand coordination simulation test, **p<0.01

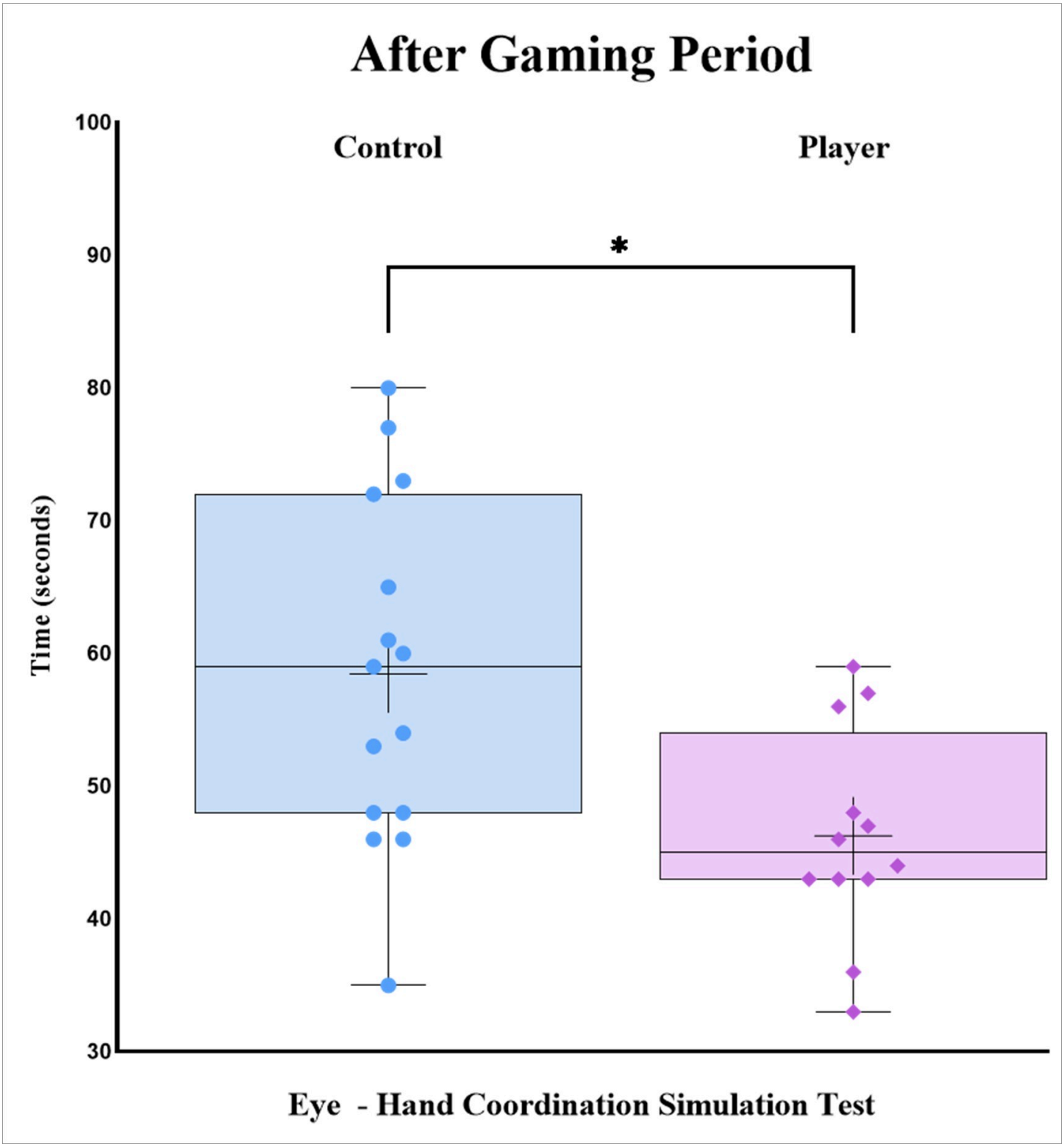


Figure 3

Time comparisons for eye-hand coordination task between control and player groups after three-weeks gaming period, *p<0.05

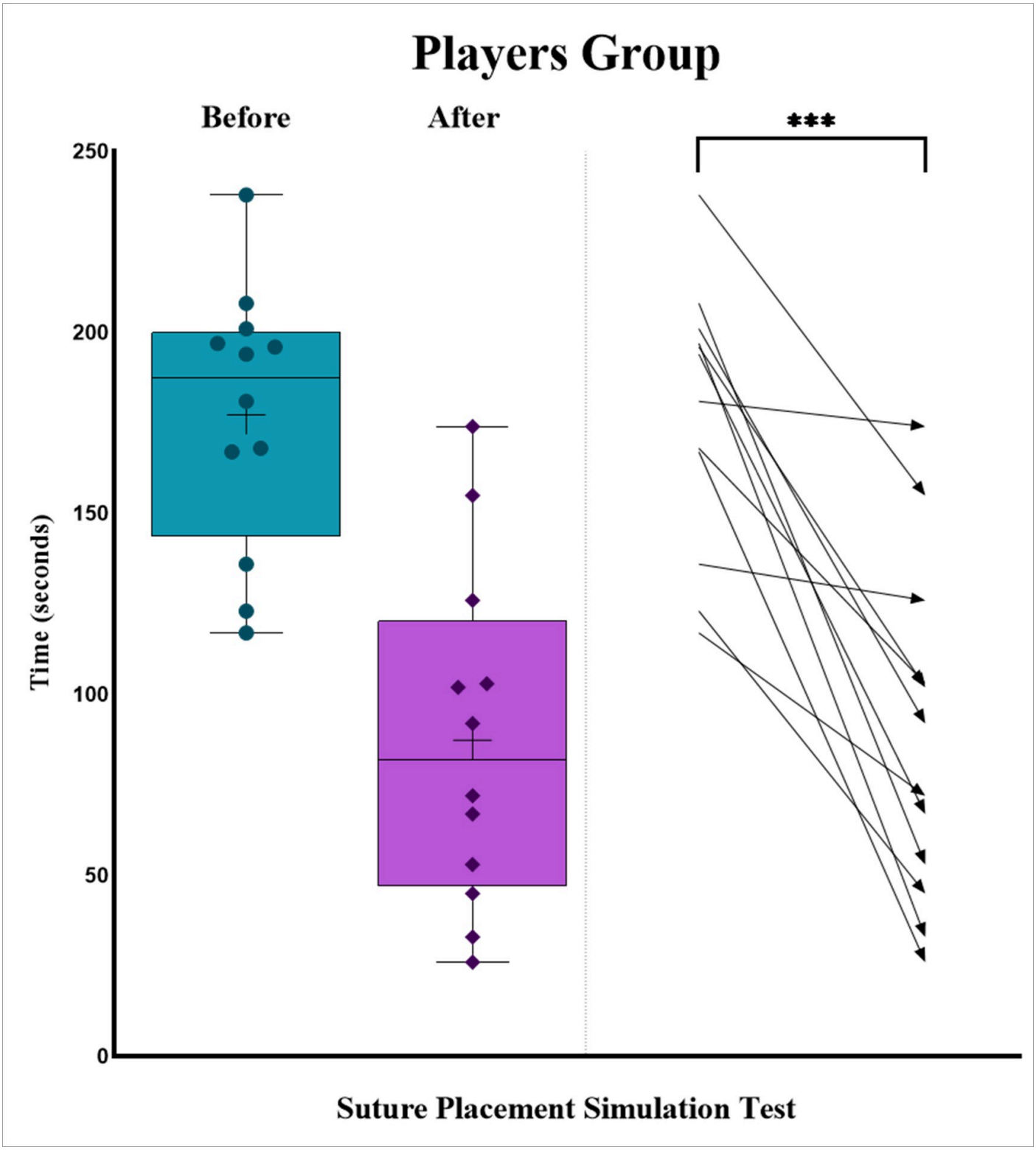


Figure 4

Time changes in the players group for suture placement simulation test, ***p<0.001

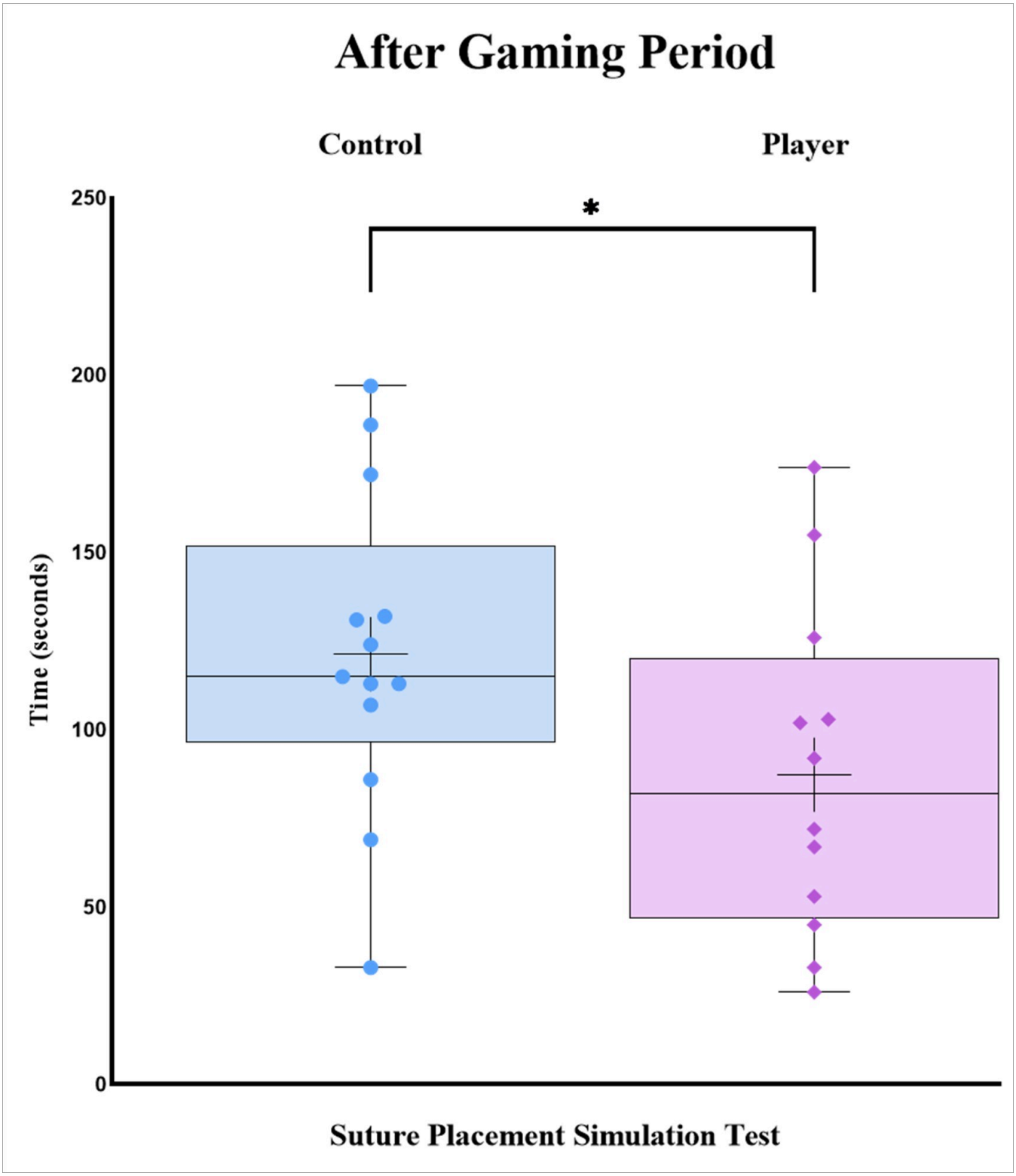


Figure 5

Time comparisons for suture placement task between control and player groups after three-weeks gaming period, *p<0.05

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryFile1ParticipantEligibilityQuestionnaire.docx