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The effect of playing video games on laparoscopic surgical skills**ID Murat Baki Yildirim, ID Mehmet Berksun Tutan, ID Ramazan Topcu, ID Murat Bulut Ozkan, ID Ibrahim Tayfun Sahiner***Hitit University, Faculty of Medicine, Department of General Surgery, Corum, Turkey*

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**Abstract**

In this study, it was aimed to reveal whether playing video games had a positive effect on laparoscopic surgical skills. A retrospective analysis was performed on the data of the patients, who underwent laparoscopic cholecystectomy between 01.08.2016 and 01.02.2021. Patients were divided into two groups as patients, who underwent laparoscopic cholecystectomy performed by surgeons who did not play video games (Group I), and patients, who underwent laparoscopic cholecystectomy performed by surgeons who played video games (Group II). The groups were compared in terms of demographic data, ASA scores, duration of surgery, length of stay in the hospital and intraoperative complications. In the study, 449 patients were included in Group I, and 595 patients were included in Group II, after the exclusion criteria were applied. It was observed that there was no significant difference between the two groups in terms of demographic data, ASA scores and intraoperative complications. The mean duration of surgeries performed by surgeons who did not play video games (Group I) was 49.39 ± 18.05 minutes, and the mean duration of surgeries performed by surgeons who played video games (Group II) were found to be 46.74 ± 17.50 minutes, with statistically significance ($p=0.01$). Playing video game regularly has a positive effect in terms of ability and speed of laparoscopy. Besides, it is considered to be encouraging in terms of advanced laparoscopic surgical interventions.

Keywords: Laparoscopy, skills, video games, surgeon**Introduction**

Video games attract individuals of all ages, and they are generally used for entertainment purposes. The number of people playing video games has been increasing day by day. A study conducted in Korea demonstrated that about 20% of the population played video games regularly every day.[1] The health effects of video games are still a matter of debate. Many articles have emphasized that playing video games for long periods of time has negative effects on health.[2] Furthermore, it has been highlighted that it can cause social aggression and early obesity in children due to the sedentary lifestyle.[3–5] However, video games can be used to attribute positive features to the individuals. Video games specially developed for education are used in many fields. In addition, video games can be used for training purposes in order to improve hand-eye coordination. [6,7] Laparoscopic surgery is currently used as the gold standard for many surgeries. Majority of

the operations consist of laparoscopic operations within the daily practice of a surgeon. Whether playing video games has a positive effect on laparoscopic surgery is still controversial. Some studies have demonstrated that surgeons, who play video games, are more successful, while some studies have found that previous game playing experience has no effect on laparoscopic skills.[8–10] The aim of this study was to reveal the relationship between surgeons, who played video games, and the surgeons, who did not play video games, in terms of the duration of laparoscopic surgeries.

Materials and Methods

A retrospective analysis was performed on the patients, who underwent laparoscopic cholecystectomy at Hitit University, Faculty of Medicine, Training and Research Hospital between 01.08.2016 and 01.02.2021. Before the study, ethical approval was obtained from the Hitit University Non-Interventional Clinical Research Ethics Committee with the number 2021-66. Information on age, gender, body mass index, American Society of Anesthesiologists score (ASA), duration of surgery, surgical technique and postoperative complications were obtained from the databank of the hospital. Patients over the age of 18, who had undergone laparoscopic cholecystectomy procedure by general surgeons between 35-45 years of age, and who had no medical

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history of cholecystitis attack, were included in the study. Exclusion criteria included; the patients under the age of 18, patients with a previous episode of cholecystitis or acute pancreatitis, patients who had undergone endoscopic retrograde cholangiopancreatography, patients with cholecystectomies and cholecystectomy under 35 years of age or over 45 years of age, patients with a history of laparotomy, and the surgical operations performed by the researchers. It was observed that 2257 patients had undergone laparoscopic cholecystectomy in the database between the dates specified. After the exclusion criteria were applied, 1044 patients were included in the study. (Flow Chart) Patients are divided into two groups according to the physicians performing the procedure. The first group included patients operated on by surgeons, who had never played video games, while the second group was operated on by surgeons, who played video games (All genre of 3D games that can be played with a game console or computer) regularly for an average of 2 hours a day. The groups were evaluated in terms of demographic data, ASA scores, duration of operation, length of stay and complications of the patients. The time from the first incision to the last stitch was measured while calculating the duration of the surgery.

Statistical method

Categorical variables such as gender, ASA scores and number of complications were expressed as numbers and percentages. The numerical variables in the study, which were the age, duration of surgery and duration of stay in the hospital after the operation, were reported as mean $\pm$ standard deviation, and median in brackets. These numerical data were evaluated using the Shapiro-Wilks test in order to determine their distribution. The difference between the groups in terms of age, duration of surgery, and duration of stay

in the hospital after the operation was determined by using the Mann Whitney U test. Comparisons between categorical variables such as gender, ASA scores and number of complications were performed using the Chi-square and Fisher's exact tests. Statistical significance level was accepted as $p < 0.05$. All statistical analyses were performed using IBM SPSS Statistics for Windows software. (Version 26; IBM Corp., Armonk, NY, USA).

Results

The demographic data of the groups were presented in Table 1. There was no statistically significant difference between the surgeries performed by the surgeons, who played video games, and the surgeons, who did not play video games, in terms of gender distribution, mean age, and ASA group distributions ($p = 0.562$; $p = 0.777$; $p = 0.364$, respectively; Chi-square test for distribution and ASA distribution; Mann-Whitney U Test for comparison of mean ages).

The mean duration of surgeries performed by surgeons, who did not play video games (Group I), was 49.39 ± 18.05 minutes, and the mean duration of surgeries performed by surgeons, who played video games (Group II), was found to be 46.74 ± 17.50 minutes, with statistical significance ($p = 0.01$, Mann-Whitney U Test). Duration of stay in the hospital during the post-operative period was 1.98 ± 1.22 days and 1.66 ± 0.94 days, for the groups of surgeons, who played and did not play video games, respectively, and with statistical significance ($p = 0.0001$, Mann-Whitney U test). Along with the complication rates were found to be lower in surgeons, who did not play games (0.4% vs 0.8%), no statistically significant difference was observed between the complication rates of the two groups ($p = 0.439$, Fisher's exact test).

Table 1. Comparison between the groups

		Whole group (n= 1044)		
		Non-Gamer Surgeons (Grup I) (n= 449)	Gamer Surgeons (Grup II) (n= 595)	Statistical Significance
Gender (%)	Male	106 (23.6%)	151 (25.4%)	$p = 0.511$
	Female	343 (76.4%)	444 (74.6%)	
Age (years)		51.30 ± 14.24	51.01 ± 14.01	$p = 0.777$
ASA (%)	I	84 (19.7%)	131 (23.7%)	$p = 0.364$
	II	274 (64.2%)	326 (59.1%)	
	III	67 (15.7%)	91 (16.5%)	
	IV	2 (0.5%)	4 (0.7%)	
Duration of surgery (minutes)		49.39 ± 18.05	46.74 ± 17.50	$p = 0.01$
Length of Hospital Stay (days)		1.66 ± 0.94 (1)	1.98 ± 1.22 (2)	$p = 0.0001$
Complication (%)		2 (0.4%)	5(0.8%)	$p = 0.439$

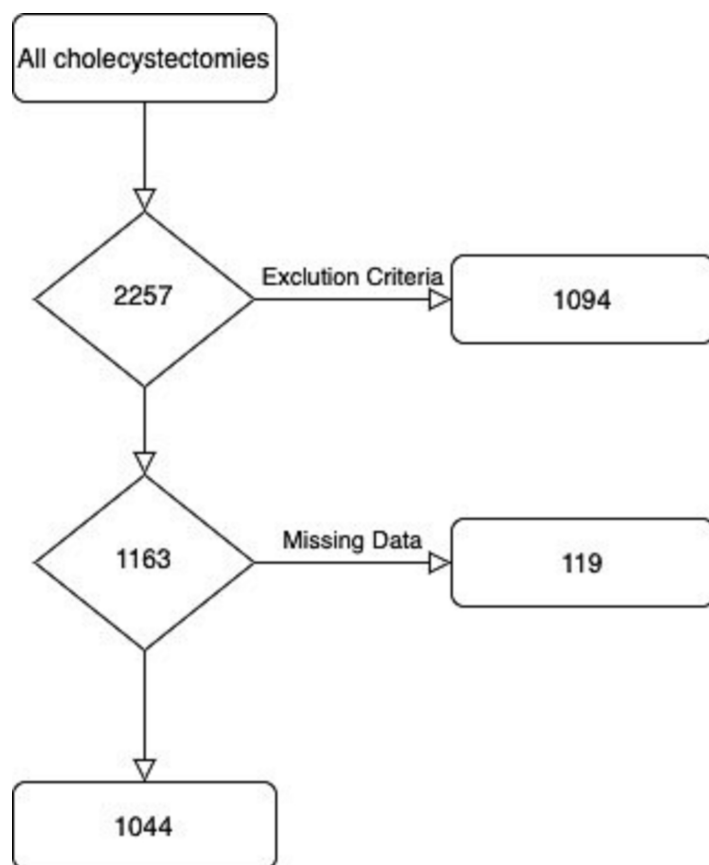


Figure 1. Flow chart

Discussion

Today, laparoscopic and minimally invasive surgery have increasingly been used in many surgeries. It has even become the gold standard for some surgeries such as cholecystectomy [11]. Hence, learning about laparoscopic surgeries take an important place in surgical training. However, the learning curves of laparoscopic procedures take longer compared to the open surgery [12]. Laparoscopic surgery requires a very different skill set compared to the open surgery. One of the cornerstones of laparoscopic surgery is the interpretation of the surgeon regarding two-dimensional organs in three dimensions using the monitor. Moreover, tactile feedback is more pronounced in open surgery compared to the laparoscopic surgery. The interpretation of two-dimensional objects as three-dimensional and the combination of tactile feedback with images differ from person to person; therefore, the susceptibility of surgical candidates to laparoscopic surgery varies [13]. Some talents are inherited, however, it is possible to develop skills in later periods as well. In other words, the innate laparoscopic skills of a surgeon varies according to parameters such as the speed of visual information processing, stability of the upper extremity, and isometric strength. Repetitive practices, practices under the supervision of an instructor, and practice on models are effective in improving surgical skills [14–16].

Hand and eye coordination plays an important role in laparoscopic surgery. Virtual reality programs are implemented in some surgical training centers in order to improve this coordination [17]. Many studies have demonstrated that playing video games improves

hand-eye coordination and timing [18–20]. This study sought the answers to the question, "Are surgeons, who play video games, more prone to laparoscopic surgery than the surgeons, who do not play video games?" Although there are publications stating that playing video games negatively affects cognitive development, could it be a part of laparoscopic surgery training?

In this study, the completion time of laparoscopic cholecystectomy was compared for surgeons between 35-45 years of age, who received the same surgical training. This age group was selected due to the significant effect of age on hand-eye coordination [21]. Cholecystectomy was selected as the laparoscopic procedure due to the fact that it was the current standard of education in every clinic that provided general surgery training. When the surgeons, who played video games for an average of 2 hours a day, were compared to the surgeons, who did not play video games, there was no statistically significant difference in terms of age, gender and American Anesthesiology Association Score (ASA); however, the duration of surgeries performed by the surgeons, who played video games, was found to be significantly lower. No similar studies have been found in the literature; however, there are studies demonstrating that playing games has a positive effect on laparoscopic surgical skills [7,9,22]. Nonetheless, surgical progress was evaluated in these studies by providing that the subjects played video games for a limited period of time. In our study, the surgeons in the game-playing group that participated in the study were surgeons who played video games for an average of 2 hours a day for at least 5 years. Repetition and duration are important factors in developing a skill. Repeated video game playing behavior for a certain period of time has been observed to cause a decrease in the duration of laparoscopic cholecystectomy.

Another variable that allow us to determine the laparoscopic surgery skills is the development of intraoperative complications. Studies have demonstrated that surgeons, who play video games, make less surgical mistakes in virtual reality applications [23]. On the other hand, contrary to the literature, no significant difference was found between the two groups in terms of intraoperative complications in this study. Factors such as previous cholecystitis attacks, anatomical variations and previous surgery play a role in the development of intraoperative complications in addition to the surgeon [24]. Despite the fact that patients with a medical history of cholecystitis attack and surgery were excluded from the study, it is not possible to comment in terms of anatomical variations.

Although it was not mentioned in the statistical data of the study, it was observed that the group of surgeons, who did not play video games, performed only cholecystectomy procedure laparoscopically, while the surgeons, who played video games, also performed advanced laparoscopic procedures. In other words, playing video games can assist the surgeon in performing complex laparoscopic procedures.

Playing video games not only improves hand-eye coordination, but also helps the three-dimensional perception of objects seen in two dimensions; therefore, it is important for the surgeon to perceive the objects in the accurate size and position in terms of robotic surgery. Hence, it was observed that surgical research assistants, who were trained with virtual reality applications, made fewer mistakes.

Conclusion

It has been observed that playing video games significantly reduces the duration of surgery in laparoscopic cholecystectomies. It has been demonstrated that surgeons, who play video games, improve themselves in advanced laparoscopic surgical procedures. Playing video games is considered to be the facilitating factor within this improvement. Nonetheless, similar studies should be performed in other to demonstrate that playing video games improve the laparoscopic skills of the surgeon in laparoscopic procedures.

Conflict of interests

The authors declare that they have no competing interests.

Financial Disclosure

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Ethical approval

Ethical approval was obtained from the Hitit University, Non-Invasive Clinical Research Ethics Committee with the number 2021-66.

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