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Dream Team–The Case of an Undergraduate Surgical Talent Development Project

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Abstract:

To be successful, a surgeon must master a variety of skills. To meet the high demand for surgical expertise, an extracurricular undergraduate project was launched. The extracurricular project consists of hands-on laparoscopic training and a mentorship programme. The project aims to find the best surgical talents among fourth-year medical students. The aim of the present paper is threefold: 1) to present the structure, i.e., the selection and training methods, of the Dream Team project; 2) to investigate the gender and grade distribution among the Dream Team students compared with their peers in medical school; and 3) to investigate the Dream Team students' evaluation of the project. Students (n=168) were satisfied with the 1-week course. This post-programme evaluation revealed a variation in satisfaction (n=68). The gender distribution on the Dream Team did not correlate with the gender distribution at the medical school. Dream Team students' grades showed variation, but generally matched the average grades obtained by medical school graduates. The 1-week extracurricular course increased students' interest in the surgical specialty. The role of the mentor was pivotal. Dream Team participants performed at an average level in medical school. Male students seemed to perform better in the laparoscopic tests.

Keywords: surgical education, talent development, expertise development, real setting exposure

Essentials:

- This study presents the selection and training methods of the surgical training project Dream Team and investigating the gender and grade distribution among the Dream Team students as compared to their peers in medical school.
- The project consists of a 1-week course and a 5-month mentorship programme in the real setting.
- The gender distribution of the Dream Team differs from medical school, as males tend to score higher than females.
- The participants are not solely high achievers and have a variation in grades.

1. Introduction

Recent years have seen a renewed discussion of issues related to surgeons' education and training. The traditional mentorship principle is being challenged by the increased use of laparoscopic technique, which has a longer learning curve than non-laparoscopic techniques due to its higher level of complexity. Simultaneously, residents are generally working fewer hours in the operation room (OR), productivity demands are rising in most hospitals, and patient safety issues and issues related to the medicolegal system are attracting increased attention (Danish Health and Medicines Authority, 2008).

As a consequence, several programmes for surgical training outside the OR have been devised, such as simulation training programmes (Shetty, Zevin, Grantcharov, Roberts, & Duffy, 2014). Furthermore, many countries have made competency-based education a mandatory part of their training programmes in medical schools (Krajewski, Filippa, Staff, Singh, & Kirton, 2013). The Halstedian mentorship-model that served for almost 100 years is as mentioned being challenged due to societal imperatives (Halsted, 1904). The century old Halstedian apprenticeship model is being replaced by an objective-driven model characterized by the maxim 'see one, deliberate many, do one' (Stefanidis et al., 2015). In the new maxim the concept of deliberate practice is being introduced to surgical training. This concept, by Ericsson and colleagues (1993), underlines intense deliberate proficiency-based training before performance as the way to expertise. A recent study suggest that deliberate practice leads to superior quality of performance in junior surgeons (Hashimoto et al., 2015). However, the optimal performance metrics and assessment tools for expertise in surgery is not present in the literature (Ericsson, 2011; Stefanidis et al., 2015). In addition, consensus is not found in the debate regarding the optimal institutional and organizational setup for surgical training and education (Alderson, 2010; Forbes, Fitzgerald, & Birch, 2006; Fysh, 2012; McGreevy, 2005; Thomas, 2008).

In Denmark, consultant surgeons from Aarhus University Hospital decided to meet the challenges related to the education and training of future surgeons by launching a surgical talent development project named Dream Team. The Dream Team project was established in 2009 with the aim of identifying medical students with the best qualifications for becoming laparoscopic surgeons. Several surgical educational programmes, such as the Fundamentals of Laparoscopic Skills (FLS) have set a standard for surgical laparoscopic performance of novice surgeons, and thereby creating an important possibility to certify surgeons (McCluney et al., 2007). Contrary, the Dream Team project's ambition is to improve education of surgeons at a younger age, while they are still at medical school, by stimulating their interest in the field of surgery, hence creating the possibility of early specialisation. Different from other programmes, the Dream Team project selects only the best students among those who meet the official criteria for inclusion in the project. In order to identify and select the best students the project uses surgical simulation training and validated tests.

The organising principles and composition of the Dream Team are inspired by Ericsson's concept of sustained deliberate practice. Deliberate practice is participation in effortful activities designed to optimize performance (Ericsson, Krampe, & Tesch-Romer, 1993). The need for deliberate practice and the long learning curve in laparoscopic surgery (De Win, Van Bruwaene, De Ridder, & Miserez, 2013) calls for early identification of the best laparoscopic talents, hence the making of the Dream Team project. The diversity of knowledge and skills required to become an expert surgeon demands the presence of a certain amount of latent intelligence in the potential candidate. But the student's "raw intelligence" required to become a surgical expert is not innate and it is obvious that expertise cannot be reached without the appropriate sustained practice. The importance of deliberate practice and extended professional experience is therefore often emphasised (Fysh, 2012).

In addition to the student's participation in effortful activities deliberate practice includes feedback from experts within the domain, tasks matching the competency level of the student, and an understanding of the long-term consequences (Ericsson, 2011). According to Ericsson, experts can be coaches or teachers who are trained in giving performance feedback to improve students' performance according to given tasks. Furthermore, the experts decide when transitions to more complex and challenging tasks are appropriate. It has been estimated that 10,000 hours of deliberate practice is necessary to reach expert level. Personal motivation is a necessary prerequisite to accomplish this amount of hours (Horn & Masunaga, 2006), so one of the experts' roles is to stimulate the student's personal motivation through including the student in authentic tasks and situations. In the Dream Team project the experts are experienced and passionate specialist surgeons. They teach and supervise the students in domain-specific tasks, and they provide individual feedback to the students. In addition, they act as mentors for the Dream Team students. Accordingly, the student's deliberate practice is inevitably linked to the experts' framing of the practice.

It is well established that a gender and grade difference exists within participation in extracurricular activities (Noldon & Sedlacek, 1998). A number of studies have investigated academic performance in medical school and surgical residency performance; results of these studies have not been uniform (Andriole, Jeffe, & Whelan, 2004; Mainthia, Tarpley, Davidson, & Tarpley, 2014). Gender issues is recognised as a key influence in a number of areas in medical education and females continue to be under-represented in the surgical specialties (Crolla & Bamforth, 2011). Within laparoscopic simulation and training some gender differences in performance is present in the literature. For example, in a study on gender and hand dominance on operative performance male completed the tasks in less time than females, but there was no statistical difference between the genders in the number of errors and unnecessary movements (Grantcharov, Bardram, Funch-Jensen, & Rosenberg, 2003). Other studies show that fewer females than males rated surgery as highly likely as a career (Boyle, Shulruf, & Poole, 2014; Coulston, Vollmer-Conna, & Malhi, 2012).

In relation to this the present study investigated the gender and grade distribution among the participants in the Dream Team project.

The aim of the present paper is threefold: 1) to present the structure, i.e., the selection and training methods, of the Dream Team project; 2) to investigate the gender and grade distribution among the Dream Team students compared with their peers in medical school; and 3) to investigate the Dream Team students' evaluation of the project.

1.1 The Structure of the Dream Team Project

The Dream Team project consists of two main elements. Step 1 is a 1-week extracurricular course aiming to train 20 medical students, and subsequently, selecting eight of the students for further training. Step 2 is a 5-month extracurricular mentorship programme intended to train the eight selected students. Summarizing, 180 medical students can apply to participate in the 1-week course. Of these, 20 applicants are selected and participate in the 1-week course and then, the best eight students proceed to the actual Dream Team. During the study-period 168 students have voluntarily participated in the 1-week extracurricular course, 55% of the students were females. From the 168 students, 66 were selected to the 5-month mentorship programme. Within the mentorship programme, 46% of these students were females. The assumed reason for the unequal division between female and male is that the participants in the 1-week course were volunteers and the selection to the mentorship programme depends on performance in the tests. These tests are described in section 1.1.2.

1.1.1 Step 1: 1-Week Extracurricular Course

The course took place during university vacation and was offered to 20 students, selected through written applications. The students were aware that only eight of the 20 students would be selected for the mentorship programme. The 1-week course was an introduction to the world of surgery with emphasis on laparoscopy. After a short 1-day introduction, the focus was hands-on training, including knot tying, training in a laparoscopic simulator (LapSim) and in black boxes (BB). The students practiced laparoscopy for three hours a day supervised by two consultant surgeons. The laparoscopic training was planned with increasingly difficult exercises, and the training was characterised by principles of deliberate practice. The students practiced in two groups of 10 members, one group in the morning and one group in the afternoon. At noon, there was a 1-hour overlap between the two groups in which they participated in a short theoretical presentation concerning technical aspects of laparoscopy.

On the fifth and last day of the course, the students participated in three different tests designed to identify students' ability to become future laparoscopic surgeons. The test consisted of the following parts:

1.1.2 LapSim Test

This 10-minute test consisted of as many trials as possible for one specific exercise ("Lift and Grasp"). The test was described and validated by Woodrum in 2006 (Woodrum et al., 2006). This test demands both hand-eye and hand-hand coordination at the same time. Woodrum and colleagues (2006) tested whether the LapSim could differentiate laparoscopic novices from trainees with greater experience and found that the LapSim has performance parameters that reliably differentiated between subjects with varying laparoscopic experience. However, some performance parameters did not differentiate between groups. As a consequence this present study only used one specific exercise ("Lift and Grasp"). This present study used time as the main parameter for this specific exercise as the validations from Woodrum and colleagues (2006) show that time differentiate level of expertise between laparoscopic performers in this exercise.

The total score of the test was the sum of the results of the completed trials.

1.1.3 Black Box Test (BB Test)

This test consisted of four different exercises with laparoscopic knot tying as the final exercise. A similar test was described by De Win and colleagues (De Win, Van Bruwaene, Allen, & De Ridder, 2013). It is well established that BB training improves basic laparoscopic performance (Clevin & Grantcharov, 2008; De Win, Van Bruwaene, Aggarwal, et al., 2013). The supervisor observed the students while they performed the exercises and gave a score on a 1-10 linear scale. This score was based on the validation from Clevin & Grantcharov (2008) and Campo et al. (2010) (Campo R, Reising C, Belle Y.V, Nassif J, O'Donovan P, Molinas C, 2010) demonstrating that box training can be a useful tool for training and evaluation of laparoscopic psychomotor skills. The amount of time spent for the different exercises was measured. The score was calculated by dividing the time spent on the exercise with the technical score. This was done separately for all exercises. The scores were then added. Thus, the lowest score was the best.

1.1.4 Mental Rotation Test (MRT)

This test was thoroughly described by Shepard and Metzler (Shepard et al., 1971). It consists of a three-dimensional figure and four stimulus figures. Two of the stimulus figures are rotated versions of the first figure, while the two others are not. One point is given if the correct figures are circled. The test consisted of 24 assignments and was performed in two sets of three minutes with all students in one group. The maximum score was 24 points. The test from Shepard and Metzler has been replicated and validated several times and it is well established that the test evaluate visuospatial

ability (Peters & Battista, 2008). In addition, it is known that visuospatial ability improves laparoscopic surgical performance (Ahlborg et al., 2011; Anastakis, Hamstra, & Matsumoto, 2000).

To calculate the final score, the project manager ranked the scores of each of the three tests, meaning the highest score in the LapSim test gave a rank of 1, the lowest score in the BB test gave a rank of 1 and the highest score in the MRT gave a rank of 1. The three ranked positions were then added to a final ranking score. The student with the lowest rank number scored best. All students earned a Dream Team diploma as a confirmation of their participation in the Dream Team 1-week course. The eight students with the best score were selected to participate in further training in the mentorship programme.

1.1.5 Step 2: The 5-Month Extracurricular Mentorship Programme

The mentorship programme took place in four departments at Aarhus University Hospital: Department of Urology, Department of Gynaecology, and two Departments of General Surgery. Each department hosted two of the eight selected students. The mentors were all specialists or consultants in their respective departments and functioned as the participants' supervisors and 'gatekeepers' in the departments. During the mentorship programme, the students participated in laparoscopic operations at least four hours every week for five months. During the first week, they observed the operations and were introduced to the working procedures and behaviours in the OR. After the first week, they were increasingly involved in the operations as assistants, aiming to attain skills to be able to perform a basic diagnostic laparoscopy at the end of the mentorship programme.

The mentors were responsible for introducing the students to the department and the OR and for the practical arrangements regarding participation in operations. An important aspect of this organisation was to keep a good equilibrium between the education of the surgical residents, the medical students in clerkship as well as the Dream Team students. Every three weeks, all the students in the Dream Team had afternoon sessions together. These sessions were organised as doughnut rounds (Fleiszer, Fleiszer, & Russell, 1997) focusing on laparoscopy practical exercises or surgery on pigs.

2. Materials and Methods

A total of 168 voluntary students participated during the 5-year study period. The design in the present study consisted of two parts. First, a questionnaire was administered and second, a database analysis was conducted to examine grades and gender distribution. A satisfaction questionnaire from 55 of 68 students in the Dream Team project was collected. Overall the instrument was highly reliable with Chronbach Alpha value of $\alpha = 0.88$. Additionally, determination of Kaiser-Meyer-Olkin (KMO) value (0.77) and Bartlett's of Sphericity ($X^2 = 219.63$) suggested that Exploratory Factor Analysis (EFA) was appropriate given our sample size-to-item ratio. An EFA with Maximum Likelihood estimation with varimax rotation resulted in a one-factor solution. Scores on individual items were averaged to produce an overall level of satisfaction and then were analyzed by an ANOVA (Bartlett's test for equal variances/Chi-square) and Kruskal-Wallis equality-of-populations rank test. Finally, the present study calculated performance on the MRT in relation to the gender of the participants. Two-sample t test with equal variances was used.

Performance scores on MRT were analysed using two-sample t test with equal variances. Database data were analysed using Excel. Analyses were performed with SPSS, Stata IC 13 and Excel.

2.1 Questionnaire

The students evaluated the 1-week course immediately after having participated in the course based on five questions on a Likert-scale from 1-10, where 10 being the highest possible score. This questionnaire was voluntary but all students completed it. The questions evaluated their surgical interest and participation in the 1-week course. At the end of the 5-month extracurricular mentorship programme period, another evaluation was done. This evaluation (the post-questionnaire) asked students to provide the number of operations they completed during the programme as well as to evaluate the cooperation with their supervisors and departments (see Table 1). Written evaluations were ranked on a 10-point Likert-scale ranging from very unsatisfying to very satisfying.

2.2 Database

During the 5-year study period, scores and information concerning the participants were collected. Aarhus University provided access to a database containing grades from 8927 exams from medical school during the study period. The grades from Dream Team participants were analysed and compared with the average population of medical students at Aarhus University. In order to compare the two populations, grades from the first three years of medical school were included, as the Dream Team participants was fourth-year medical students. Furthermore, the gender distribution of the two populations was compared.

The authors obtained permission from the Danish Data Protection Agency to use and combine the specific data

extracted from the specific sources for the purpose of this study as required by Danish law. As the grades of the participants were anonymous and not linked to their participation/selection in the project no further informed consent from the participants was needed. Data on medical school performance were extracted from the AU administrative databases in March 2015.

3. Results

3.1 The Quality of Dream Team Depends on Supervision and Inclusion in the Department

The results of the course-questionnaire showed that the evaluation of the 1-week course was highly positive. An important question concerned the value of the course compared to the time spent and here the average score was 9.6. This score was achieved despite the fact that the students were well aware that only the best (40%) continued onto the 5-month extracurricular mentorship programme. During the 1-week course, curiosity was encouraged and a positive but competitive environment was created and in general the students evaluated the 1-week course in a highly satisfactory manner (M= 8.3 to 9.6, SD = 0.769 to 1.341).

A total of 68 students participated in the 5-month mentorship programme. The post-questionnaire focused on the supervision and the department. 55 of the 68 (81%) participants completed the survey. The results show that the quality of the mentorship programme was satisfactory but highly context-dependent. Students' experiences vary across the four departments, especially with regards to supervision (the cooperation with the mentor) and inclusion in the department (see table 1). Kruskall Wallis test showed significant differences between the included departments. Students in department 1 on average $X^2(3,n = 20, M = 9.06, SD = .90)$ were more satisfied than their fellow student in departments 2 $X^2(3,n = 15, M = 6.86, SD = 1.68)$, 3 $X^2(3,n = 7, m = 6.67, SD = 1.81)$ or 4 $X^2(3,n = 13, M = 6.36, SD = 2.19)$.

Table 1. *M* and *SD* of Written Evaluation After the Dream Team Period. Divided in Departments.

	Dept. 1 (n = 20)	Dept. 2 (n = 15)	Dept. 3 (n = 7)	Dept. 4 (n = 13)
How was the introduction to the department?	M = 8.75 SD = 1.41	M = 6.13 SD = 2.77	M = 5.33 SD = 3.32	M = 7.45 SD = 2.58
Did you feel welcome in the OR?	M = 9.30 SD = 1.27	M = 7.27 SD = 2.34	M = 7.29 SD = 2.63	M = 7.17 SD = 2.62
How was your cooperation with your mentor?	M = 9.20 SD = 1.39	M = 5.50 SD = 3.18	M = 4.57 SD = 3.51	M = 4.69 SD = 2.56
Did you show enough personal initiative?	M = 8.40 SD = 1.64	M = 6.71 SD = 1.82	M = 7.00 SD = 1.73	M = 6.07 SD = 2.63
Did the course increase your interest in seeking a future surgical career?	M = 9.35 SD = 1.04	M = 8.60 SD = 2.13	M = 8.43 SD = 1.72	M = 7.23 SD = 2.39
Was the course worth the effort?	M = 9.00 SD = .85	M = 5.71 SD= 2.92	M = 6.14 SD = 3.38	M = 5.85 SD = 2.37
Would you recommend the course to fellow students?	M = 9.40 SD = .83	M = 8.60 SD = 1.92	M = 8.71 SD = 1.89	M = 7.77 SD = 2.01

3.2 Gender and Grades Distribution Differs from Medical School

In 2014, 487 students were admitted to the medical school at Aarhus University, distributed with 64% females and 36% males. In the Dream Team, 45% of the students were males. From the 168 students, 66 were selected to the 5-month mentorship programme. Within the mentorship programme, 54% of these students were males.

A two-sample t test revealed significant difference in MRT scores between genders, $t(108) = 4.15$, $p<.0001$. The highest possible score on this MRT is 24 points, and on average, the male students scored M = 15.2, SD = 4.09, 95CI = [14.0,16.3] and the females scored M = 11.4, SD = 5.27, 95CI = [10.0,12.8]. The MRT test was abandoned after the first six semesters due to this difference between genders.

During the first six semesters, the four best and the four average students were selected to the 5-month mentorship programme. This was done in order to evaluate the selection after the 1-week course. However, a similar test at the end of the 5-month mentorship programme revealed that students maintained their rank after the mentorship programme; hence the 8+0 selection was the most precise. Gender distribution according to different selection methods revealed that the males tended to score higher than the females, event though the MRT was abandoned. After the selection procedure was changed to only include the eight best students, this tendency was enhanced.

Compared to the average medical student, the Dream Team students performed equally well at medical school. Hence, members of the Dream Team were average students regarding grades (see Table 2).

Table 2. Distribution of Grades Among Participants and Medical Students

	Dream Team	Undergraduate medical student
M	7.51	7.52
SD	1.80	2.18
Min.	3.88	4.37
Max.	10.40	11.25
% passed	94.41%	89.48%
SD	0.50	0.47
Exams (n)	2276	8927

Grades are presented in original format. Translated to ECTS scale:

12 =A, 10 =B, 7=C, 4=D, 02=E, 00=Fx, -3=F.

4. Discussion

There are only limited data describing a surgical pre-graduate project aiming to find the best talents (Naylor, Hollett, Castellvi, Valentine, & Scott, 2010). However, a few studies, like the PicSOr, intended to predict future laparoscopic skills (Gallagher, Cowie, Crothers, Jordan-Black, & Satava, 2003). Some of these studies have devoted much attention to theoretical and simulation aspects, while the present study emphasised hands-on training and surgical work at the OR.

4.1 Variety of Participants

Even though the Dream Team was an extracurricular programme, it included a variety of medical school students whose grades differed. Participants in the present study were not exclusively high achievers and they were not recruited based on their medical school grades. On the other hand, students were volunteers and had to invest a week of their vacation to participate. The program was placed in the vacation as it is known that an interest in surgery and perceptual abilities influence early laparoscopic performance (Kolozsvari et al., 2011). As a consequence the number of participants included in this present study is 168 and not the possible maximum of 180 students. During the 5-year study period, the project has been conducted 9 times, which equal 180 students. However, the project emphasis motivation as a key factor in reaching expertise and all participants are therefore volunteers.

The MRT was abandoned after the first six semesters because it seemed to disfavour female students as compared to the BB test and the LapSim test. A gender-related difference with the MRT scores has been described in the literature (Peters, 2005). The effect of simulation training outside the OR has been widely analysed in the existing literature, but the results have not been uniform (Hogle, Widmann, Ude, Hardy, & Fowler, 2008; Larsen et al., 2009; Lynch, Aughwane, & Hammond, 2010). In the present study, males scored higher at both the BB test and the LapSim test, hence the gender difference does not seem to be only related to the use of the virtual simulators. We have no clear-cut explanation for this difference between female and male students.

4.2 Mentors and Exposure to the Real Setting

The role of the mentor was pivotal in students' education and training. It is well known that students participation in the OR and exposure to a role model create more interest in the field of surgery (Berman, Rosenthal, Curry, Evans, & Gusberg, 2008). Furthermore, the mentor and learning environment is an essential part of the deliberate practice concept (Ericsson, 2011). Our study shows that the students' average satisfaction differed between the four departments. Presumably, the differences resulted from the fact that the practical organisation of the departments and the way in which the surgeons' filled the role as mentor differed, and the fact that the availability of suitable laparoscopic operations varied due to patient flow and number of staff members.

Programmes providing medical students with surgical knowledge and stimulating their interest in a surgical career seem essential for developing excellent surgeons, especially with the need for early specialisation in mind (Naylor et al., 2010). The training of the Dream Team students took place in the OR; hence the students had the opportunity to get comfortable in the setting before they needed to perform. The students were not scheduled to cover duty and could assist as their skills allowed them to. Thus, the use of supervision provided the Dream Team student with preclinical training in the real and authentic setting, which can be seen as "sustained deliberate practice" (Ericsson, Nandagopal, & Roring, 2009) where the combination of analytic knowledge, experiential knowledge and technical skills was included. The technical skills were attained through actual participation during operations, while the analytical and experiential knowledge was provided during the mentors' competent feedback. Optimally, the Dream Team students should be guaranteed employment in a surgical department after graduation from medical school; however, this is a political decision.

5. Limitations and Perspectives

The study cannot conclude whether the project succeed in creating better surgeons, as the answer to this has a longer perspective than the 5-year study period. The supervisors revealed that the Dream Team students tended to outperform younger surgical residents in the OR; however, this present study has no data underpinning this.

Due to the Danish postgraduate system it might take three years before Dream Team students start their postgraduate surgical training. During this period, much skill and knowledge can be lost. We are changing the Dream Team project to minimize the absence of training during this long period. One could question the value and length of the 1-week course, but it is known that significant improvement in performance is seen after five hours of laparoscopic training (Scott et al., 2000). Furthermore, it is argued in the literature that some do not have the abilities to develop laparoscopic skills, in a predefined period of training (Grantcharov & Funch-Jensen, 2009). Hence, it seems reasonable to assess the learning curve and test scores of participating students.

Identification and selection of surgical talents could be a method to enable a faster and more progressive training of future surgeons. Within the international literature, talent identification and development of surgeons is an area receiving much attention (Bell, Fann, Morrison, & Lisk, 2011; Fysh, 2012; Quillin et al., 2012; Sutton, Vimalachandran, McFaul, Johnson, & McNally, 2013). In order to optimize the surgical education and training in the Dream Team project, future focus could be on motor skill learning and student motivation (Van Bruwaene et al., 2015). Experience from the domains of sports and aviation training systems could generate further inspiration (Cocks, Moulton, Luu, & Cil, 2014; Eidt, 2012; Kirkman, 2013; Tsuda, Scott, Doyle, & Jones, 2009). Finally, it is self-evident that early identification of a career path does not guarantee long-term happiness with the career path. Yet, early tracking and selection of interested and talented students seems beneficial in order get an introduction to the real setting and provide an opportunity to start early specialization and reach an expert-level.

6. Conclusion

Dream Team is an undergraduate surgical talent development project including 1-week extracurricular hands-on laparoscopic course followed by a 5-month extracurricular mentorship programme. This study shows that Dream Team participants generally performed at an average and not a high level in medical school. The gender distribution differed from medical school (more male students participated in the course) and male students seemed to perform better in the laparoscopic tests. The 1-week extracurricular course clearly increased students' interest in the surgical specialty, but the 5-months mentorship programme was highly context-dependent. Finally, the role of the mentor was pivotal in the students' education and training.

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