· Original article ·

Necessity of slit-lamp training during ophthalmology clerkships from the perspective of medical students

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引用:梁轩伟,邹玉仙,刘澍,等.从医学生视角看眼科见习期间裂隙灯训练的必要性.国际眼科杂志 2023;23(1):4-9

Foundation items: Fundamental Research Funds of the State Key Laboratory of Ophthalmology (No. 30306020240020219); Science and Technology Program of Guangzhou (No. 202102020736); National Natural Science Foundation of China (No. 82204532); Undergraduate Teaching Reform Research Project of Sun Yat-sen University in 2019 (No.Jiaowu2019285)

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Received: 2022-01-26 Accepted: 2022-09-19

从医学生视角看眼科见习期间裂隙灯训练的必要性

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基金项目:眼科学国家重点实验室专项经费(No. 30306020240020219);广州市科技计划项目(No. 202102020736);国家自然科学基金(No.82204532);中山大学本科教学改革研究项目[教务(2019)285 号]

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摘要

目的:基于医学生视角评估裂隙灯生物显微镜(以下简称“裂隙灯”)训练的必要性,对眼科见习期间的医学生裂隙灯训练达成共识。

方法:在中山大学 117 名 2017 级临床医学专业学生中,开展见习前后对照研究。所有医学生在眼科见习期间均接受裂隙灯训练。使用自行设计的问卷调查,评估学生对裂隙灯教学的个人认知、个人需求与建议,并对眼科见习前后学生在这些方面的得分进行比较。此外,通过眼科见习后的学生主观评价来评估裂隙灯训练的效果。每个条目评分采用 Likert 5 级评分法。采用 IBM SPSS 软件(版本 20.0;SPSS Inc.,Chicago,IL,USA)进行统计分析。

结果:共有 116 名(99.1%)医学生完成了调查。见习前的平均得分为 19.99±3.03 分,显示学生对裂隙灯用途的认知水平高;见习后的得分显著增加至 22.97±2.37 分($P<0.001$)。对于个人需求的平均得分,见习后高于见习前(24.62±3.15 *vs* 23.60±2.36,$P=0.009$)。此外,86.2%的学生见习后认为裂隙灯实操训练有助于显著改善见习质量。大于四分之三的被调查学生倾向于增加裂隙灯训练时间(见习前后分别为 76.7%和 77.6%)。

结论:在眼科见习中,医学生更偏好于裂隙灯训练实操;鉴于对改善见习质量的潜在作用,应在眼科见习中推荐该训练。

关键词:眼科见习;裂隙灯训练;医学教育;必要性;学生视角

Abstract

• AIM: To evaluate the necessity of slit-lamp biomicroscopy (referred to here as “slit-lamp”) training from the student's perspective and reach a consensus on slit-lamp training in medical students during ophthalmology clerkship.

• METHODS: A controlled before-after clerkship study was performed on 117 students of the class of 2017 enrolled in clinical medicine at Sun Yat-sen University. All

medical students underwent slit-lamp training during ophthalmology clerkship. We evaluated the students' cognition, perceived need and recommendations for slit-lamp teaching, using a self-completed questionnaire survey and compared the students' scores in these aspects before and after their ophthalmology clerkships. Additionally, the efficiency of slit-lamp training was evaluated by subjective student assessment after the ophthalmology clerkship. Each item was scored on a five-point Likert Scale. Statistical analysis was performed by IBM SPSS (Version 20.0; SPSS Inc., Chicago, IL, USA).

• RESULTS: A total of 116 (99.1%) medical students completed the survey. The average score before clerkship was 19.99±3.03, which indicated a high level of cognition regarding slit-lamp utility; However, this score significantly increased to 22.97±2.37 after clerkship (P<0.001). The average score regarding perceived need was also higher for post-clerkship students than for pre-clerkship students (24.62±3.15 *vs.* 23.60±2.36, P=0.009). Moreover, 86.2% of post-clerkship students reported that hands-on slit-lamp practice could help promote clerkship quality. More than three-quarters of the surveyed students tended to agree that slit-lamp practice time should be increased (76.7% and 77.6% before and after clerkship, respectively).

• CONCLUSION: A hands-on approach to slit-lamp training is more favored by medical students in ophthalmology clerkships, and this training should be recommended in ophthalmology clerkships given its potential usefulness for improving clerkship quality.

• KEYWORDS: ophthalmology clerkship; slit-lamp training; medical education; necessity; student perspective

DOI:10.3980/j.issn.1672-5123.2023.1.02

Citation: Liang XW, Zou YX, Liu S, *et al*. Necessity of slit-lamp training during ophthalmology clerkships from the perspective of medical students. *Guoji Yanke Zazhi*(*Int Eye Sci*) 2023;23(1):4-9

INTRODUCTION

Ophthalmology is a highly practical and specialized discipline, and ophthalmic education is a fundamental component of medical training. Essential skills and knowledge in ophthalmology are necessary for nonophthalmic doctors to help patients[1-2]. In the process of teaching ophthalmology, we have found that it is difficult for students to understand abstract knowledge, including anatomical structures and clinical signs[3]. However, the amount of time dedicated to teaching ophthalmology in medical school education is decreasing[4-6], and theoretical knowledge cannot be completely explained. Additionally, the inclusion of ophthalmologic studies in the curriculum varies among teaching institutes, and ophthalmic teaching methods and standards also vary[5,7]. Even more importantly, formal ophthalmology training is not available for medical students in some schools[8]. Clerkships help medical students not only enhance previous learning but also effectively integrate theoretical knowledge with clinical practice[9]. Therefore, ophthalmology clerkships are particularly important.

Additionally, slit-lamp biomicroscopy (referred to here as "slit-lamp") is an essential tool in ophthalmic examination and is important for the diagnosis of eye diseases. When developing an ophthalmology curriculum, it is important to consider the local needs of slit-lamp training[10].

In ophthalmic clerkships, most ophthalmic examinations are performed on specialized equipment[11]. The slit-lamp is the most commonly used equipment in clinical practice and can improve the intuitiveness and practicality of ophthalmology clerkship teaching, however, the slit-lamp training is not generally a part of ophthalmology clerkships of undergraduate medical students. With the help of a slit-lamp, medical students can utterly understand the ophthalmology knowledge that they have learned to gain a proper ophthalmologic education. However, it is difficult to master the hands-on skills required to operate slit-lamps[12-13]. For medical students with a large amount of ophthalmology content to be learned and limited learning hours[14], the necessity of slit-lamp training is increasingly appreciated but remains a controversial issue, and significant improvements in ophthalmology curriculum are required[15-16]. Therefore, this study investigated the necessity of hands-on practice for slit-lamp training during ophthalmology clerkships from the perspective of undergraduate medical students. This study assessed four aspects: personal cognition, perceived need, teaching effects, and teaching suggestions.

SUBJECTS/MATERIALS AND METHODS

A total of 117 clinical medicine (five-year) students participated in only 1-week clerkship at Zhongshan Ophthalmic Center, Sun Yat-sen University from December 2020 to January 2021. A controlled before-after study was performed, and the survey questionnaires were distributed before and after the clerkship.

Ethical Approval The Institutional Review Board at Zhongshan Ophthalmic Center, Sun Yat-sen University approved this study (No. 2021KYPJ084). Participants provided written informed consent and completed the survey. To further encourage participation and reduce bias, the students were not required to provide personal data.

Survey Methods Prior to slit-lamp training, all medical students were encouraged to prepare in several areas, including the basic anatomy of the eye, the structure and basic procedure of the slit lamp, and the clinical signs in the anterior segment of the eye. After performing the above prerequisite preparation, the students received hands-on slit-lamp training. The students practiced on each other. Moreover, the teacher selected the appropriate typical patients for students, and the students could communicate with the patients during slit-lamp examination.

This study adopted the Chinese version questionnaire survey method, and a questionnaire was used as the major research tool. In addition to personal information, the researcher-developed questionnaire collected information on 4 other

aspects: personal cognition, perceived need, training effectiveness and training suggestions. The questionnaire included a total of 31 items. Each item was scored on a five-point Likert Scale, where 5 = strongly agree, 4 = agree, 3 = neutral, 2 = disagree, and 1 = strongly disagree. The students completed a unified questionnaire at two time points, which were at the beginning (pre-instruction) and the conclusion (post-instruction) of the one-week clerkship. The post-instruction survey also included a student evaluation of the teaching effect, which was further classified as follows: no effect (1-2 points), neutral effect (3 points), and significant effect (4-5 points). More detailed information on the characteristics of the survey questionnaire, including the original Chinese survey and the English version, is provided in the Appendices.

Statistical Analysis The measurement data are expressed as the mean±standard deviation values, and the count data are expressed as the numbers and percentages of the group. All data were statistically processed with IBM SPSS Statistics 20.0 for Mac. The Mann-Whitney U test was used to compare differences in different data points that did not conform to a normal distribution or uniform variance. The Chi-square test or Fisher's exact test was used to compare categorical variables before and after clerkship. The correlations among the scores of all subscale items and the correlations of the total score of the subscale items with the score of the overall items were evaluated using Spearman's correlation coefficient. A P-value less than 0.05 indicated that the difference was statistically significant.

RESULTS

Demographic Data A total of 116 (99.1%) valid responses were obtained from 117 medical students; the respondents had an average age of 21.4±0.96 years. Of the respondents, 57 (49.1%) were males, and 59(50.9%) were females.

Personal cognition of slit-lamp usability before and after instruction Table 1 showed the average post- and pre-instruction scores on each item. The average score on the cognitive after the clerkship was significantly higher than before the clerkship (22.97±2.37 *vs.* 19.99±3.03, $P<0.001$). The scores on all cognition items were also significantly increased after the clerkship. Significant correlations were noted between the total score on the subscale items and the overall cognitive score ($P=0.001$, $r=0.317$ for pre-instruction; $P<0.001$, $r=0.583$ for post-instruction).

Perceived need for the slit-lamp training procedure before and after instruction As shown in Table 2, the average of the total perceived need score was significantly higher after the clerkship than before the clerkship (24.62±3.15 *vs.* 23.60±2.36, $P=0.009$). For items related to aid in understanding, the scores increased significantly after the clerkship (all $P<0.05$). Significant correlations were noted between the total score on the subscale items and the overall need score ($P<0.001$, $r=0.704$ for pre-instruction; $P<0.001$, $r=0.664$ for post-instruction).

Self-evaluation of effectiveness of slit-lamp training after instruction The survey results on training effectiveness were shown in Table 3. A total of 86.2% of students reported that hands-on slit-lamp practice could help to promote a significant improvement in clerkship quality, and this item had a significant correlation with other items related to the training effect (all $P<0.05$). Regarding the overall teaching of skills necessary to master the slit-lamp procedure, 56.1% of the students reported significant effectiveness. A significant correlation between the total score on the subscale items and the overall teaching effectiveness score was noted ($P<0.001$, $r=0.745$).

Suggestions for slit-lamp training before and after instruction As shown in Figure 1, both before and after the clerkship, a large percentage of the students responded "agree" or "strongly agree" to the need to increase the time allotted for slit-lamp training (76.7% and 77.6% at before and after instruction, respectively), and a large percentage responded "disagree" and "strongly disagree" to eliminating slit-lamp training (86.2% and 82.8% at before and after instruction, respectively). The response regarding the slit-lamp training test was relatively neutral.

DISCUSSION

In our study, the participating medical students had a high degree of enthusiasm and perceived need for hands-on slit-lamp training. Clerkship education is deliberately rooted in the clinical setting, a strategy that draws on the educational theories of cognitive apprenticeship, situational learning, and workplace learning. These theories rely on in-person clinical immersion experiences to facilitate students' learning and interactions with patients andprovider teams. Hands-on training can help students consolidate the theoretical knowledge that they have learned[17].

During ophthalmology clerkships, numerous materials, such as images and cases, are provided to help students gain a perceptual understanding of the content they are learning[18]. Ophthalmology knowledge is vast, abstract and difficult to understand. Medical students lack a relevant clinical background in ophthalmology; thus, most medical students often have low interest in the learning process and poor learning effects[19].

Traditional methods of ophthalmology clerkship training make the learning process difficult, but slit-lamp photography of the eye and digital camera real-time display can be rich teaching resources[20-21]. However, the exclusive use of images or video training courses cannot enable students to gain a personal perceptual understanding. Additionally, the training simulator cannot provide a complete replacement of the training on a real person[19]. Because of the lack of hands-on practice, students will become bored in clerkship training, leading to ineffective clerkship training.

However, practical skills require knowledge, familiarity with equipment, and hand-eye coordination[22]. Due to the time constraints in ophthalmology teaching, the challenges of traditional hands-on training are becoming increasingly

Table 1 Average of cognition scores on slit-lamp usability $\bar{x}\pm s$

Usability of the slit-lamp	Cognition scores		*P*
	Pre-instruction	Post-instruction	
Most commonly used equipment	4.26±0.85	4.69±0.58	<0.0001
Anterior segment examination	4.22±0.85	4.78±0.49	<0.0001
Show location of eye lesion	4.10±0.88	4.35±0.95	0.0031
Expanded function with the use of accessory devices	4.40±0.60	4.62±0.60	0.0015
Overall cognition	3.02±1.19	4.49±0.61	<0.0001

Table 2 Perceived need for mastery of the slit-lamp procedure $\bar{x}\pm s$

Perceived need for mastery of the procedure	Need scores		*P*
	Pre-instruction	Post-instruction	
Non-ophthalmologists should master the self-performed procedure	3.92±0.76	4.00±0.89	0.3277
The procedure cannot be replaced with slit-lamp images	3.68±0.87	3.47±1.15	0.3250
Helps understand the eye structure	4.28±0.60	4.53±0.58	0.0006
Helps understand eye signs	4.37±0.57	4.53±0.64	0.0102
Helps understand real-time teaching displays	4.39±0.54	4.58±0.55	0.0055
Overall perceived need	4.33±0.62	4.44±0.76	0.0434

Table 3 Self-evaluation of training effectiveness after clerkship

Effectiveness of training	Scoring option (*n*, %)				
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Mastery of knowledge of the instrument structure	0 (0)	4 (3.4)	20 (17.2)	59 (50.9)	33 (28.4)
Comfortable in using the slit-lamp for examination	4 (3.4)	34(29.3)	40 (34.5)	28 (24.1)	10 (8.6)
Skilled in using the slit-lamp for examination	4 (3.4)	29 (25.0)	40 (34.5)	30 (25.9)	13 (11.2)
Fluent in using the slit-lamp for examination	4 (3.4)	19 (16.4)	42 (36.2)	39 (33.6)	12 (10.3)
Move the slit-lamp left/right and up/down to exam the eye	3 (2.6)	6 (5.2)	20 (17.2)	54 (46.6)	33 (28.4)
Change the light filters	2 (1.7)	3 (2.6)	17 (14.7)	61 (52.6)	33 (28.4)
Adjust the width and height of the light beam	2 (1.7)	1 (0.9)	18 (15.5)	60 (51.7)	35 (30.2)
Confidently examine the eyelid	2 (1.7)	9 (7.8)	35 (30.2)	49 (42.2)	21 (18.1)
Confidently examine the conjunctiva	2 (1.7)	8 (6.9)	35 (30.2)	51 (44.0)	20 (17.2)
Confidently examine the cornea	2 (1.7)	8 (6.9)	32 (27.6)	52 (44.8)	22 (19.0)
Confidently examine the sclera	2 (1.7)	6 (5.2)	34 (29.3)	53 (45.7)	21 (18.1)
Confidently examine the anterior chamber	2 (1.7)	7 (6.0)	42 (36.2)	45 (38.8)	20 (17.2)
Confidently examine the iris	2 (1.7)	8 (6.9)	39 (33.6)	46 (39.7)	21 (18.1)
Confidently examine the lens	2 (1.7)	12 (10.3)	46 (39.7)	39 (33.6)	17 (14.7)
Improved the quality of the clerkship	1 (0.9)	1 (0.9)	14 (12.1)	56 (48.3)	44 (37.9)
Excellent effectiveness of overall training	2 (1.7)	10 (8.6)	39 (33.6)	46 (39.7)	19 (16.4)

difficult[23-24]. Previously, a randomized study of both nursing and medical students suggested that traditional hands-on training was superior to interactive virtual reality computer simulation[25], and the joy of learning could be further increased by practicing on a person[19]. Therefore, it is highly desirable to provide medical students with more opportunities for hands-on practice with slit-lamps.

In our study, the medical students practiced on each other, and this strategy provided hands-on experience with human subjects, serving as a bridge between theoretical cognition and actual manual skills. In addition, the practical training regimen did not involve a formal lecture. We demonstrated that there was a high degree of personal cognition of and perceived need for slit-lamp training among medical students; furthermore, cognition significantly improved after practical training[26]. Additionally, the students believed that the training would improve the quality of the ophthalmology clerkship. The ultimate goal of teaching ophthalmology is to increase medical students' knowledge and procedure graduates who are highly trained in eye examination skills[16].

Despite the development of modern medicine and the introduction of many new types of diagnostic equipment, the basic slit-lamp is still used as an ophthalmological tool to inspect the anterior segment of the eye[27]. Furthermore, the International Task Force on Ophthalmic Education of Medical Students strongly recommends that ophthalmology education not be limited to the formal classroom setting and that students be given the opportunity to observe common ophthalmic procedures, such as examination of the anterior segment with a slit-lamp[28]. As shown in our study, medical students need

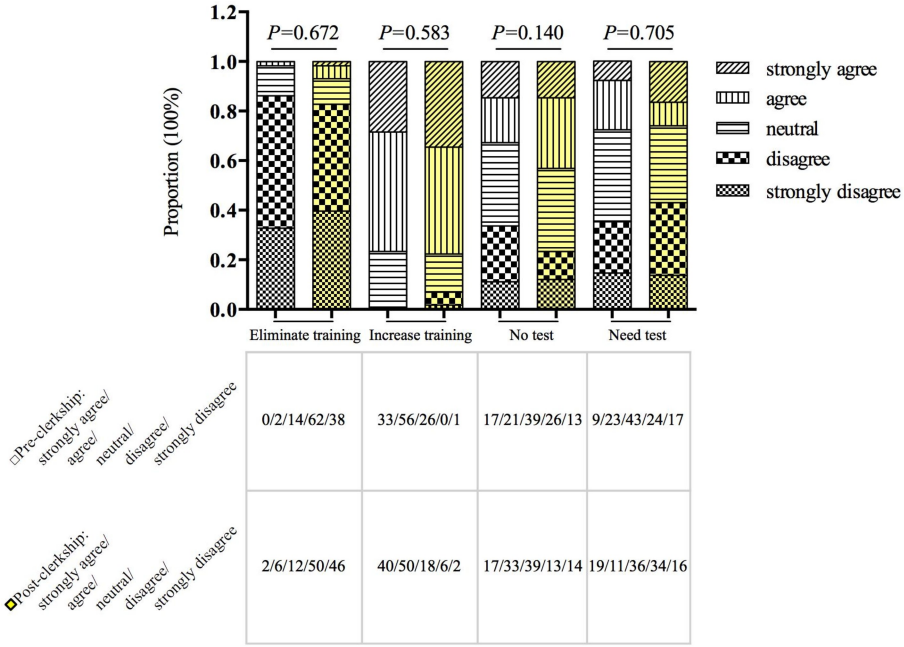

Figure 1 Suggestions for slit-lamp training before and after ophthalmology clerkship.

slit - lamp procedural training in their ophthalmology clerkships, and practical skills should be taught in a stepwise manner, including demonstration, deconstruction, explanation, and performance. These activities can stimulate the logical, linguistic, kinaesthetic, and interpersonal intelligence of students[12]. Therefore, slit-lamp training is beneficial to ophthalmic learning for medical students.

Previous study reported that a standardized patient interaction may have contributed to the students' inability to communicate empathy to the patient[29]. Therefore, in this study, the teacher selected the appropriate typical patients for medical students, and the students could communicate with the patients during slit-lamp examination. The students' feedback regarding slit-lamp training was positive. After the clerkship, 56.1% of the students had mastered slit-lamp skills as a whole. The students' cognition and perceived need for learning the slit-lamp procedure were significantly increased after the clerkship training than before clerkship training. A total of 86.2% of the students believed that slit-lamp training significantly improved the quality of clerkship teaching and would also help students to better grasp the theoretical knowledge provided during the ophthalmology clerkship. Therefore, hands-on slit-lamp training should be included in medical education curricula.

Most medical education programs do not require a rotation in ophthalmology or formal ophthalmologic training[8]; however, the results of our study indicated that our 1-week workshop resulted in confidence in slit-lamp procedural skills. General ophthalmic medical education is aimed at teaching examination techniques and ophthalmological principles suitable for primary care practice[30]. The respondents who completed the training were more likely to feel more confident after hands-on slit-lamp practice. However, the students also suggested the need for more hands-on training with the slit-lamp because the slit-lamp technique is reported to be difficult to master[12].

In conclusion, providing medical students with hands-on slit-lamp training is a challenge in medical education. We used a short pre- and post-clerkship questionnaire to evaluate the need for training and to collect suggestions from the students' perspectives. The students' perceived need for hands-on slit-lamp practice is obvious. This study demonstrated that the students reported satisfactory effectiveness of hands-on training on slit-lamps. Hands-on slit-lamp training has the potential to improve the teaching quality of ophthalmology clerkships, and slit-lamp practice should become routine in clinical ophthalmology clerkships.

Our study had several limitations. Our sample size was relatively small. The perceived need for hands-on training on slit-lamps was assessed at only one training center; thus, the sample might not be reflective of all medical students. In addition, there are no currently validated tools designed specifically to assess the value of slit-lamp training. Therefore, we selected a subjective pre- and post-training study design, and we did not use objective tests of knowledge. Future studies should also perform large-scale research on students' and teachers' perspectives at multiple centers.

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