

Criteria for the successful completion of medical dissertations - A multicenter study

Kriterien für den erfolgreichen Abschluss medizinischer Dissertationen – eine multizentrische Studie

Abstract

Objective: In order to acquire the academic title “doctor” in Germany, it is essential to complete a dissertation. A high number of publications at German universities are based on medical dissertations. The reasons why some dissertations are successfully accomplished and why some are not completed – despite far-reaching consequences – have been barely investigated to date.

Methods: 467 students in the ninth semester at five German universities participated in this study in 2003. A questionnaire (return rate 93.5%) was used, asking details about the circumstances of a current or completed dissertation (Group A), an abandoned doctoral project (Group B), or one which was never started (Group C).

Results: Students in Group A referred significantly more often to their supervisor as being essential for choosing the topic of their dissertation project. Furthermore, students in Group A worked together with other students in self-organized support groups to debate methodological questions. They also discussed their project more frequently with a statistician. Students in Group C gave “interference with undergraduate studies” and “no time” as the most common reasons for not starting a dissertation.

Conclusions: As the supervisor seems to play an important role for the successful completion of dissertations, universities should think about professional programs that would prepare supervisors for this educational task. Courses for doctoral candidates in scientific research methodology could also be a helpful tool toward successfully accomplishing a doctoral thesis or scientific projects in general.

Keywords: medical research, scientific work, medical dissertation, medical education

Zusammenfassung

Zielsetzung: Zum Erlangen des Titels „Doktor“ ist in Deutschland die Durchführung einer Dissertationsarbeit erforderlich. Ein bedeutender Anteil der Publikationsleistungen deutscher Fakultäten rekrutiert sich aus Ergebnissen medizinischer Dissertationen. Die Gründe für den Abbruch einer Dissertation bzw. für ihre erfolgreiche Durchführung sind bisher trotz der weitreichenden Konsequenzen nur unzureichend untersucht.

Methode: Mit Hilfe eines Fragebogens wurden 2003 insgesamt 467 Studierende im 9. Semester an fünf deutschen Universitäten untersucht (Rücklaufquote 93.5%). Untersuchte Inhalte betrafen eine aktuelle oder bereits fertig gestellte Doktorarbeit (Gruppe A), eine abgebrochene Doktorarbeit (Gruppe B) oder den Nicht-Beginn einer Doktorarbeit (Gruppe C).

Ergebnisse: Im Gruppenvergleich gaben Studierende der Gruppe A signifikant häufiger die „Person des Betreuers“ als wesentlich für die Wahl des Themas der Doktorarbeit an. Außerdem arbeiteten Studierende

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der Gruppe A signifikant häufiger mit anderen Studierenden in selbst organisierten Arbeitsgruppen zusammen, um sich gegenseitig bei methodischen Fragestellungen Hilfestellung zu geben. Die Studierenden der Gruppe A besprachen ihre Arbeit signifikant häufiger mit einem Statistiker. Für den Nicht-Beginn einer Arbeit gaben Studierende der Gruppe C die „Beeinträchtigung des Studiums durch die Dissertation“ und „keine Zeit“ als häufigste Gründe an.

Schlussfolgerung: Der Betreuer scheint eine Schlüsselfunktion für den erfolgreichen Abschluss einer Dissertation darzustellen, weswegen Universitäten über professionelle Weiterbildungsprogramme nachdenken sollten, um die Betreuer auf diese Aufgabe speziell vorzubereiten. Begleitende Kurse für Doktoranden in Forschungsmethodik könnten ebenfalls eine nützliche Methode sein, um wissenschaftliche Projekte oder medizinische Doktorarbeiten erfolgreich zu beenden.

Schlüsselwörter: medizinische Doktorarbeiten, medizinische Ausbildung, wissenschaftliches Arbeiten, medizinische Forschung

Introduction

In most countries physicians are called “doctor”. However, in Germany a physician is only allowed to put “Dr.” in front of his name if he has actually received a doctorate. In contrast to the situation in many European and overseas countries, medical students in Germany must conduct a research project and write a dissertation reviewed and graded by scientific experts in the respective field in order to obtain the title “doctor”. Contrary to other academic faculties in Germany, it is possible to start the doctoral dissertation during undergraduate medical training. After successful graduation from medical school, evaluation of the thesis, and an oral examination, the “Dr. med.” degree is awarded by the university.

Even though a dissertation is a prerequisite for acquiring the academic title “doctor”, it is not required to graduate, enter a residency, or practice medicine. The reasons why medical students want to obtain the degree “Dr. med.” are not known. However, if graduates want to pursue an academic career at a university hospital, usually only the successful accomplishment of a doctoral thesis will open up this career path. The German Council of Science and Humanities, the governmental agency responsible for nationwide research evaluation and scientific research activity, considers most medical dissertations to be merely on the level of final-degree papers in terms of complexity and scientific quality [1]. Critics of the current dissertation method call it “pseudo-scientific medical dissertation” and “publication without any effective scientific relevance” [2]. Yet studies have revealed that more than one-third of all publications from medical schools are based on dissertations [3], [4]. Two-thirds of medical faculty members consider medical research related to dissertations to be important for sustaining a qualitatively and quantitatively high output of publications. Therefore, medical students writing dissertations significantly contribute to Germany’s role as an important site within the global scientific landscape [5]. Successfully accomplished scientific research by students in other national or interna-

tional programs (doctorate or post-doctorate) have a similar impact.

In the winter semester 2007/2008, 78,000 students were registered at 36 German medical schools [6]. In the same year (2007), 6108 medical students completed their dissertation successfully, which is a rate of 47% [7]. Studies performed in the 1990s revealed that 17% of medical students had no intention of conducting a dissertation project during their undergraduate training [8], [9], and studies from three individual universities showed that 10–21% of all students abandoned at least one research project [4], [10], [11].

The reasons why some dissertations are successfully completed and why some are abandoned, and why there is a specific format for a structured scientific research project in general, are varied and have not been thoroughly analyzed thus far. In cases where a dissertation was accomplished successfully, the candidates had a positive view of the process in retrospect [12]. The new German Federal Medical Licensing Regulation from 2002 [13] does not require any courses for preparing a dissertation during medical undergraduate training. One study showed that 76% of the students assessed the preparation for scientific research at medical school as poor or nonexistent, while only 3% evaluated the preparation as good [11]. The students also mentioned poor supervision, methodological problems, difficulties with the topic, personal problems, or a lack of time and finances as reasons for abandoning a dissertation. 86% of doctoral candidates held poor supervision responsible for giving up on their dissertation project [11]. At the University of Würzburg, Germany, students still working on their dissertation assessed the supervision as hardly satisfying [14].

Regarding these data, further research seems to be necessary to investigate in more detail the reasons why students abandon their medical dissertation and to develop recommendations for promoting the successful completion of scientific research projects. On the one hand, this would enable students to achieve a relevant educational goal, i.e., an advanced degree; on the other hand, scientific research activity and its quality would

improve, which is one of the declared aims of the German Council of Science and Humanities. So far, data are only available from studies performed at individual universities as well as from students who are working on or have completed their dissertation [14], [15]. Whether these data are applicable to all German universities or to research projects in general is currently unknown.

The purpose of our study was to collect reliable data that would be helpful for drafting recommendations concerning good practice in the field of medical dissertations as an example for medical research projects. We included students from five representative German universities – those who abandoned their dissertation and those who were still continuing with their research project – and collected data on structure, content, and field of the respective dissertations. These data seem to be suitable for general recommendations.

Methods

We developed a questionnaire comprising one coversheet with general information about the study and 16 pages of questions from the following categories:

1. General questions about the students' attitudes toward scientific work, about the dissertation in general, and about the relevant personality traits of the supervisor and the doctoral candidate (8 questions)
2. Questions about the current or finished dissertation (Group A), e.g., type of project, reasons for choosing this project, accomplishment of individual project steps, expenditure of time for the project and influence on undergraduate studies, problems with the project, questions about supervision, and publication of the dissertations (36 questions)
3. This part asked about the first discontinued dissertation (Group B), the content of the questions being similar to Group A (37 questions)
4. Questions addressed to students without a dissertation project (Group C), inquiring about the reasons for not starting (2 questions)
5. General social background (6 questions)

We based the conceptual design of the questionnaire on research data regarding medical dissertations in Germany and on existing theoretical literature [12], [15], [16], [17]. The response options in this questionnaire included dichotomous answers, such as yes/no answers (e.g., did you start a dissertation during your undergraduate studies?), numeric answers (e.g., number of semesters), individual text (e.g., "reasons were: please specify"), and approval or refusal of a statement on a 6-point Likert scale (1 = I strongly agree, 2 = I agree, 3 = I somewhat agree, 4 = I somewhat disagree, 5 = I disagree, 6 = I strongly disagree).

Sample and Design

We handed out the questionnaires in 2003 to 467 students at the medical schools of five German universities (Berlin, Bochum, Düsseldorf, Essen, and Hamburg). The participating students were in their ninth semester (the total number for undergraduate training in Germany is twelve semesters) with one exception: in Bochum the students who participated were in their eighth semester. The testing took place during mandatory courses. Participation was anonymous and optional. The collected data were protected by the Data Protection Act. The vice deans of education and the directors of the departments agreed to this study. Return rates of questionnaires were between 85% and 99%. The data from all universities were combined, as a comparison of universities was not a focus of this study.

Statistical Analysis

For data evaluation we divided the students into three groups: Group A: students with an ongoing or completed dissertation, regardless of the fact that they may have abandoned a previous project. Group B: students with abandoned dissertation projects, regardless of the fact that they might have started a new one. Group C: students who had never started a dissertation. Data are presented as arithmetic means and frequency distributions. We used the chi-square-distribution test and the *t*-test as statistical tests for independent samples. We applied the non-parametric Mann-Whitney-U-Test to confirm the *t*-test results.

We combined all discontinued dissertations, even if a student started a new dissertation in the meantime. In this case, the students were part of both groups and were asked the respective questions. Nevertheless, we chose the *t*-test for independent samples because it reacts robustly to violations of its assumptions and is more conservative than the *t*-test for related samples. As we designed our study to collect data to generate hypotheses for further research in this field, we applied no Bonferroni correction to avoid an alpha error. We calculated the effect size when significant results appeared: 0.2 indicates small, 0.5 medium, and 0.8 large effects [18]. We used SPSS for all statistical analyses.

Results

The return rate of the questionnaires from the 467 students at the five universities was 93.5% ($n = 437$). 71% had started at least one dissertation and were still working on it (Group A), 15% had abandoned at least one dissertation (Group B), and 14% had never started a comparable project (Group C).

We found no significant group differences in how students searched for a dissertation project. In Group A, 51% of the projects included basic research (e.g., laboratory

work), followed by clinical research (36%), and empirical studies (11%); 2% were literature studies only.

The two main reasons why students in Group A started a dissertation were "interest in the topic" ($M = 2.18$, $SD = 1.17$) and "advantage for job applications" ($M = 2.48$, $SD = 1.65$), followed by "scientific methods" ($M = 2.71$, $SD = 1.33$), "learning how to do scientific work independently" ($M = 2.88$, $SD = 1.40$), "gain insight into research" ($M = 3.01$, $SD = 1.35$), "prestige" ($M = 3.04$, $SD = 1.50$), and "patients' prejudice against physicians with no doctorate" ($M = 3.32$, $SD = 1.65$), data not shown.

Irrespective of group status, the three main reasons for choosing a specific dissertation topic were: "interest in the specialty", "interest in the topic", and "better occupational opportunities" (all means < 3.0). The only significant difference between the groups was that students in Group A mentioned "the personality of the supervisor" as the reason for the choice of their project much more frequently (Group A: $M = 2.8$, Group B: $M = 3.8$; $p < 0.001$, $\epsilon = 0.67$) (see Figure 1).

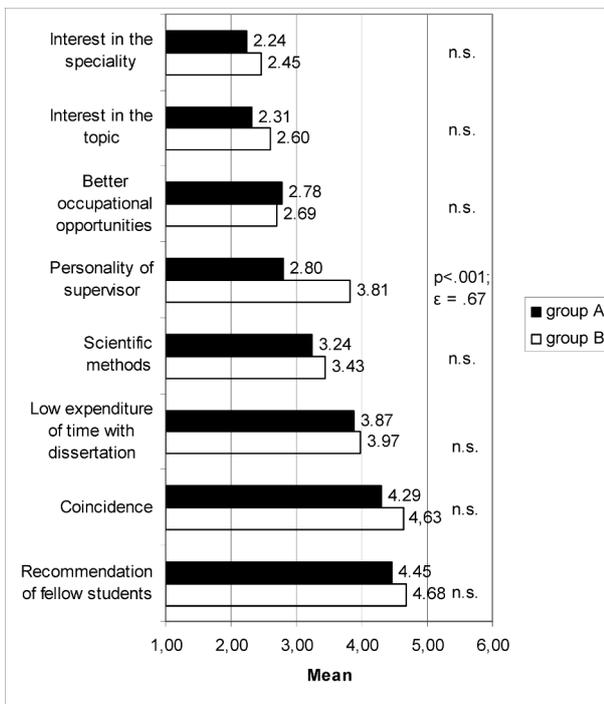
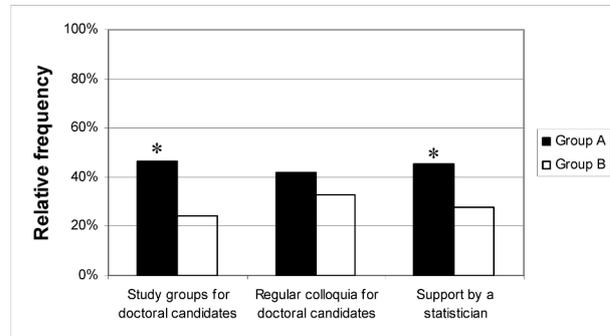


Figure 1: Students' reasons for starting their dissertation

Doctoral colloquia, i.e., academic meetings at which specialists deliver addresses on a particular topic and then answer questions relating to them or give technical advice, were offered neither to Group A (57.9%) nor to Group B (67.2%). 64.9% in Group A and 70.0% in Group B who had not had such colloquia stated that they would have wanted to participate in a colloquium had they been given the opportunity. Students in Group A (46.6%) affirmed the question "do you work with other doctoral candidates in study groups in which you give each other methodological support?" significantly more often than students in Group B (24.3%; $p < 0.01$).

Irrespective of group status, 57.5% of all dissertations were never discussed with a statistician (see Figure 2).

18.6% of the students did not know whether the project had been discussed with a statistician. 20.6% of Group A discussed their work with a statistician before starting the practical phase of the project, while in Group B only 6.6% did so. In total, significantly more dissertations from Group A were discussed with a statistician (45.4%) as compared to Group B (27.9%) ($p < 0.05$) (see Figure 2).



*significance in χ^2 -test group A versus group B

Figure 2: Doctoral candidates' participation in study groups and/or colloquia; support by a statistician

More than 50% of students from both groups (A = 49.7%; B = 56.5%; n.s.) had no clear work or time schedule for their project. If a schedule did exist, it was mainly the result of the supervisor's planning for the doctoral project (A = 69.2%, Group B = 77.7%). Only in a few cases did a schedule exist due to participation in a research group (A = 10.0%, B = 7.4%) or because the students were members of a singular research project (A = 20.7%, B = 14.8%). In cases where a schedule existed, it was followed by 47.2% of Group A but only by 14.7% of Group B.

With reference to self-management, only 23.7% of the students in Group B stated that they were able to manage time themselves ("could you manage the time you had for the experimental/empirical work of your dissertation by yourself?"). Significantly more students in Group A (44.9%) answered this question positively ($p < 0.001$). 54.3% of Group A and 41.0% of Group B (n.s.) agreed to the question "have there been any delays that were not caused by your studies?". In case of delays not related to their studies, students in Group B stressed "missing support" (Group A: $M = 4.05$, $SD = 1.97$, Group B: $M = 2.59$, $SD = 1.97$; $p < 0.001$), "flaws in the concept of the project" (Group A: $M = 4.16$, $SD = 1.90$, Group B: $M = 2.95$, $SD = 2.05$; $p < 0.001$), and "non-availability of the supervisor" (Group A: $M = 4.06$, $SD = 1.98$, Group B: $M = 3.21$, $SD = 2.78$; $P < 0.05$) significantly more than students in Group A. We found no significant group differences for the answers "too few patients" and "lack of material" (see Figure 3).

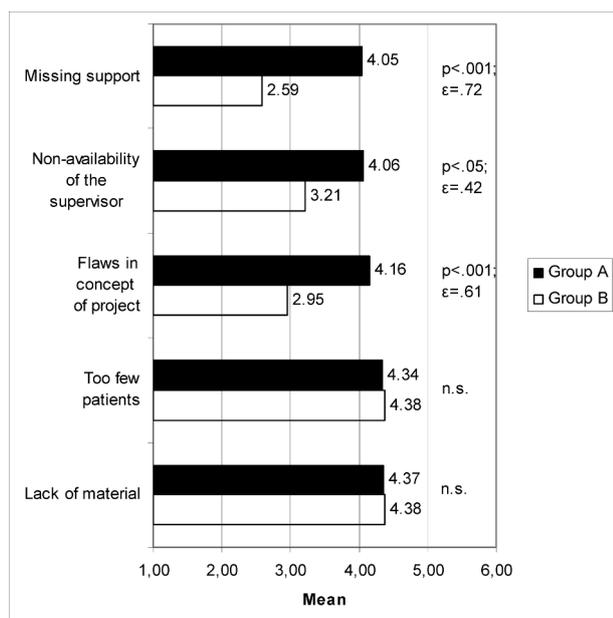


Figure 3: Reasons for difficulties or delays during the doctoral project

45.6% of the students in Group B held their supervisors responsible for their project's failure ($M = 2.5$, $SD = 1.59$) rather than blaming themselves ($M = 3.5$, $SD = 1.80$). The opposite was the case in only 14.0%. Another 35.1% stated that both parties were responsible, and 5.3% saw the responsibility neither in their supervisor nor in themselves. "Deficient tutoring by the supervisor" ($M = 2.9$, $SD = 1.95$) and an "oversized expenditure of time" ($M = 3.7$, $SD = 2.01$) were given as the main reasons for abandoning their dissertations.

Only 14.4% ($n = 63$) of all participating students had not started a dissertation at the time of this study. 53% of all students in Group C stated they had not yet started a dissertation because of not having found an appropriate topic thus far. 37% wanted to start a dissertation after completing their undergraduate training, and 10% stated no interest at all to do so. The latter group mostly claimed "adverse effects on their studies while working on a dissertation" ($M = 2.8$, $SD = 1.34$) and "no time" ($M = 2.8$, $SD = 1.60$) as reasons. The statement "a dissertation is not an additional qualification for medical work" also received some agreement ($M = 3.1$, $SD = 1.75$).

Discussion

Our study, conducted at five German universities, revealed that the most important reasons for choosing a dissertation research project are a personal interest in both the specialty related to the dissertation and the topic itself. Students with an ongoing dissertation (Group A) mentioned the supervisor significantly more frequently as a cause for not having discontinued their project. Asked for the reasons for abandoning their dissertation, 45% of the students in Group B held their supervisor responsible for the discontinuation, compared to only 14% who blamed themselves. Inadequate tutoring was also a major

reason for giving up on a dissertation. Our results coincide with those of studies at individual German universities, which also found that students considered inadequate tutoring as the main reason for not finishing a dissertation [10], [11], even though some of these studies relied only on a small number of participants [14]. Furthermore, in one of these studies, doctoral candidates who had successfully completed a dissertation assessed their supervisors considerably better regarding "time" and "support" [11]. Since the scientific research topic is usually something in which the supervisor specializes or has an active interest, and as adequate tutoring seems to have an important influence on the success or failure of a research project, universities should consider – especially with regard to publication output [5] – offering specific training to support supervisors in their tutoring function. In this context, attention should be drawn to the fact that the actual supervision has to be performed by the students' academic supervisors and not only by technical assistants [14].

Successful faculty development courses for university teachers have already been implemented at some German medical schools. Instruction courses for research supervisors of scientific projects have not been established in any German medical school thus far. Besides courses, structured dissertation contracts might also be helpful to ensure the success of doctoral candidates, since clear work schedules and timeframes were present in Group A significantly more often than in Group B. In another study, about 50% of doctoral candidates expressed a desire to have a dissertation contract [15].

More than 85% of the doctoral candidates worked in dissertation projects involving basic sciences or clinical studies. Both require in-depth knowledge of biostatistics, which is usually not acquired during undergraduate medical training [19]. Our study shows that 45.5% of students in Group A and only 27.9% in Group B discussed their project with a statistician. In total, only 57.5% of dissertations were supported by a statistician. While one reason for the group difference might be related to greater personal initiative of successful candidates, these data nevertheless seem to support the need for courses on how to properly perform scientific research [19]. Considering that biometric courses are usually very unpopular among medical students [20], medical schools need to find new means to support their students in doing scientific research if this is an educational goal of their undergraduate curriculum or other scientific research programs. It is unlikely that several weeks of problem-based EBM courses [21] or peer education workshops for preparation of medical dissertations [19] are sufficient to close this gap.

Regular working groups for the discussion of methodological questions also seem to support the successful completion of dissertations. Students in Group A participated significantly more frequently in such groups compared to students in Group B. Student feedback on a PhD program showed very good ratings for structured courses and supervision [22]. Both results suggest that method-

ological courses and embedding a dissertation into a structural framework support successful completion, which is relevant for any kind of scientific research program. Such courses could be integrated into the regular medical curriculum as mandatory electives for students working on a dissertation. Several German universities (e.g., Johannes-Gutenberg-University Mainz, University of Cologne) have meanwhile taken this approach in the form of voluntary courses.

A strength of our study lies in its large sample size and its design as a multicenter study including five representative German medical schools. The questionnaire, based on the literature, covers all relevant fields of influence regarding the realization of medical dissertations as an example for scientific research projects. However, some limitations have to be taken into account. The influence of specific personal traits (e.g., motivation, IQ, etc.) on the successful completion of a dissertation was not examined with our questionnaire. Furthermore, the perspective of supervisors on the successful realization of dissertation projects was not considered.

In summary, our data suggest that the handling of statistics and colloquia for doctoral candidates provide successful support for finishing a dissertation project. To improve supervisory support and structural quality for successful dissertations at German medical schools, we suggest implementing the following aspects, which are based on both research and the literature:

Structural recommendations for dissertations at medical schools:

1. Central announcement of dissertation projects, structured application procedure, acceptance of the project by the faculty before work is started
2. Contract between doctoral candidate and supervisor, including a rough time schedule and structural framework and covering rights and obligations of doctoral candidate and supervisor as part of the dissertation regulations of the faculty

Advanced training programs for doctoral candidates and supervisors:

1. Mandatory preparatory courses for doctoral candidates in basic knowledge of scientific research methods, statistics, and literature search
2. Continuous colloquia for doctoral candidates including scientific exchange and follow-up on project's progress
3. Advanced training for supervisors of the doctoral candidates including teaching techniques for scientific research and soft skills for mentoring

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Disclaimer

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Ethical approval

The ethics committee of the University Essen-Duisburg was asked for permission. As students participated in this study voluntarily and anonymously, the ethics committee stated that no special approval needed to be given.

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