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Medical student selection

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CHAPTER

1

General introduction

The medical profession is attractive to many people. It offers a combination of high-level knowledge and skills, helping people, working with other professionals, good financial prospects and many other attractive job characteristics. Unsurprisingly, the annual number of people applying to medical schools worldwide largely exceeds the number of available seats.¹⁻³ This difference in supply and demand, combined with quality considerations and the fact that a career in medicine requires long and expensive training,^{4,5} leads to the need for selection at the entrance of medical schools.

When making decisions about who will be allowed to enter medical school and who will not, many factors need to be taken into consideration. The first that comes to mind is suitability: who has what it takes to become a good medical student and, subsequently, a good medical professional? This seemingly simple question, however, leads to more complicated questions, such as ‘what is a good doctor?’ or ‘how do you measure if an applicant is suitable for the medical profession?’ Many frameworks and profiles have been designed to describe the characteristics of a good doctor, of which one of the most widespread is the CanMEDS physician competency framework.⁶ In the CanMEDS framework, the intrinsic roles of Communicator, Collaborator, Leader, Health advocate, Scholar, and Professional are described as essential for a good medical professional.⁶ As this framework indicates, medical professionals are expected not only to have extensive knowledge of medicine, but also sufficient interpersonal and behavioural qualities.

The notion that a medical professional needs to possess more qualities than just medical expertise has translated to contemporary medical school selection processes. Traditionally, applicants were selected for medical school based on the assessment of mainly academic (or cognitive) variables, i.e. medical knowledge and/or academic aptitude. Applicants’ suitability for medical school used to be evaluated based on previous academic performance, or aptitude tests such as the Medical College Admission Test (MCAT),⁷⁻⁹ Biomedical Admission Test (BMAT)¹⁰ or UK Clinical Aptitude test (UKCAT).^{11,12} This makes sense, as previous academic achievement is the strongest and most consistent predictor of future performance¹³⁻¹⁶ and therefore remains an important evidence-based criterion in most medical school admissions processes. In 2005, however, a study was published on disciplinary action against physicians by medical boards and its relation with unprofessional behaviour in medical school.¹⁷ The results showed that disciplinary action was related to medical incompetence in only 6% of the cases that were studied. In no less than 74% of the studied cases, disciplinary action against physicians was taken because of unprofessional physician behaviour, such as substance abuse, unprofessional conduct, or negligence. The study also showed that unprofessional behaviour in physicians was strongly related to prior unprofessional behaviour in medical school, warranting sufficient attention for professional behaviour in medical training and in medical school selection.

Today, medical school admissions procedures often incorporate measures of skills in the social and behavioural spectrum, such as professionalism, ethical decision-making, communication, and collaboration. Though sufficient attention for such personal qualities in selection is a positive development, many of the instruments designed to measure such skills seem to be based at least partly on ‘gut feeling’.¹⁸ For example, the admissions interview, in which applicants are interviewed by a selection committee, while showing poor results in predicting later performance,^{15,19} is still widely used in medical school admissions. The same poor results

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in terms of predictive validity are reported for personal statements,^{5,16} emotional intelligence,¹⁶ and letters of reference.^{26,16,20} However, various studies aimed at improving medical school admissions processes have been conducted and promising results have been reported. Selection instruments such as the Multiple Mini-Interview (MMI)^{21,22} and Situational Judgement Tests (SJT)²³⁻²⁶ were shown to have incremental predictive validity for medical school performance and performance as a medical professional over measures of cognitive or academic ability. In an MMI, applicants rotate through a series of short interviews with a different evaluator at each station, rather than a longer interview with a committee of evaluators. The MMI therefore results in a large number of single-assessor evaluations of the same applicant. This process aims at minimizing the effects of context-specificity,²⁷ and at arriving at a semi-objective evaluation based on multiple subjective ratings.²¹ In an SJT, applicants judge responses to written or video-based situations in the professional context, and rate or rank them in order of professionalism or appropriateness. A combination of one of these measurements of 'non-academic' qualities with a measurement of academic qualities seems to optimize selection outcomes.

Internationally, applicants are generally admitted to medical school based on a selection process with a fixed set of selection criteria. In such a setting, selection and admission are synonyms. In the Netherlands however, between 1975 and 2001, seats in medical school were not allotted through selection, but through a national weighted lottery, in which chances of admission increased parallel to pre-university Grade Point Average (GPA).²⁸ After some time, the national lottery was criticized because applicants were only allowed to participate up to three times. In this system, even applicants who had performed extraordinarily well in pre-university education could be rejected three times, forcing them to choose a different future career. In response to the critique, a system was implemented in which applicants with a pre-university GPA of 8 or higher (on a scale where 1 is poor and 10 is excellent) had direct access to medical school. The minimum pre-university GPA for application to medical school is 5.5, and only around 5 percent of all pre-university graduates obtain a pre-university GPA of 8 or higher. Around 15 percent of medical school applicants belong to this group of top pre-university graduates. Applicants with lower pre-university GPAs enrolled in the weighted lottery. In 2001, this system was extended with a third admissions process, called decentralised selection, in which participation was voluntary. This new system enabled medical schools to select part of their students through a selection process that was designed specifically to select the most suitable applicants for the medical degree programme at their institute. Applicants who did not have a pre-university GPA of 8 or higher could choose to participate in the decentralised selection process, or to wait for the national lottery, which took place after the decentralised selection processes. Up to 50% of applicants were admitted to medical school through decentralised selection. This percentage slowly increased through the years. Today, all seats in Dutch medical schools are allotted through decentralised selection.

The multiple-process admissions system in the Netherlands provided us with a unique natural experiment, in which we were able to examine the effects of different admissions processes on student performance in a semi-controlled setting. As a result of the different admissions processes that were effective simultaneously, we could distinguish between four groups of students. Applicants with a pre-university GPA of 8 or higher were placed without

further assessment, other applicants were accepted in the decentralised selection process or admitted through the national weighted lottery. Students who were rejected in the decentralised selection process automatically enrolled in the weighted lottery. Therefore, the lottery-admitted group consisted of two groups: selection-rejected students and students who had not participated in the selection process. Most research in this thesis therefore concerns student outcomes of four admissions groups: direct admissions, selection-accepted admissions, selection-rejected lottery-admissions, and lottery-admissions.

The main question this thesis aims to answer is whether a selection-based medical school admissions system should be preferred over a lottery-based system. By distinguishing between the four groups of students, we could study the effects of admission based on previous academic performance or decentralised selection in comparison to an admissions process that is unique in the international selection setting: lottery. In most research on selection processes, associations between selection scores and later performance can only be calculated for students who were accepted, as there are no performance data available for students who were rejected. In our research setting, some of the applicants who were rejected in selection were subsequently admitted through the lottery, enabling us to study the effects of the selection process without this restriction of range. In addition to the studies we conducted on performance, we studied associations of the different admissions processes with personality scores, and the effect of applicant differences on performance on SJT scenarios in different health care settings.

In *Chapter 2*, we examined pre-clinical performance of students admitted through the four pathways at a single medical school in the Netherlands. In this study, we focused on three research questions. First, we wondered whether there were general differences between student outcomes in the four admission groups. Second, we wondered whether selection-accepted students outperformed selection-rejected students. Third, we assessed whether participation in the selection process was related to differences in student outcomes.

After conducting the first study, we wondered whether the effects we found would be generalizable to other Dutch medical schools in the same multi-process admissions system. We therefore elaborated on the findings of the first study in a second, multi-site study on pre-clinical performance of the four groups (*Chapter 3*). In addition to the data from the institute in the first study, we included data from two other medical schools in the Netherlands, where a different decentralised selection process was used. In this study, we aimed to find out whether the effects of the different admissions processes would be similar at different institutes, or differed between medical schools.

The main difference between the admissions processes in the Dutch system was that direct admission was based on academic criteria only, the lottery was based on chance (though weighted for previous academic performance), and the decentralised selection process not only included academic criteria, but also assessed interpersonal and behavioural qualities in applicants. As the pre-clinical phase of medical education is aimed mainly at gathering medical knowledge, performance differences between the four groups are likely more visible in the clinical phase, where 'non-academic' qualities are more important in performance assessments. Research in the field indeed indicates that the predictive validity of academic selection scores decreases with the shift to the clinical phase, whereas the predictive validity of so-called 'non-academic' criteria

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increases.^{16,29} We therefore conducted a third study, in which we examined student outcomes in the clinical phase of medical training (*Chapter 4*). In this study, we assessed long term study results of the four student groups, by examining clinical performance assessments, dropout rates, graduation rates, and percentages of students who enrolled in an MD/PhD trajectory.

The implicit assumption in any selection process is that applicants differ in their suitability for the job or academic programme they are applying for. By implementing a selection process, medical schools aim to differentiate between suitable and unsuitable (or less suitable) applicants, and offer seats in medical school to those applicants who fit a predefined profile best. In order to create such a predefined profile, it is necessary to define the characteristics that make an applicant suitable for the position. Much research has studied personality characteristics in relation to performance as a medical student and subsequently, as a physician. A personality framework often used in these studies is the Big Five factors of personality model, which distinguishes five factors with which each person's personality can be described: conscientiousness, extraversion, agreeableness, openness to experience, and neuroticism.³⁰ Of the five factors, conscientiousness relates to performance most strongly and consistently, both in medical school and in the medical profession.^{4,31-35} Additionally, extraversion and agreeableness have been shown to relate to better performance in the clinical and more social aspects of the medical workplace.³⁵ Neuroticism, which reflects the opposite of emotional stability, was found to be negatively related to performance, an effect that is often mediated by other factors such as stress or perfectionism.³⁶

In light of these relations between personality and performance, it seems relevant to incorporate measures of personality in medical school selection processes. However, the outcomes of personality questionnaires in a selection setting are unreliable, because applicants anticipate on the desirable profile and 'fake good' in order to increase their chances of admission.^{37,38} We wondered whether selection processes can be designed in such a way that they call upon suitable personality characteristics without directly assessing personality with a questionnaire. In *Chapter 5*, we therefore studied whether the four admissions groups differed in personality scores, and which of the admissions processes called upon desirable personality traits most.

In medical school admissions, a large pool of applicants usually goes through the same selection process. Though this applicant pool is often relatively homogeneous,¹⁶ there are of course differences between applicants and research on selection tools needs to address potential bias in an instrument. For example, age and gender are related to performance in many different selection processes. Male applicants generally score better in cognitively focused selection assignments, whereas female applicants tend to outperform males in more socially oriented selection tests.^{25,39,40} Additionally, younger applicants often perform better in selection than older applicants.^{40,41} These unanticipated effects of untargeted applicant characteristics are referred to as adverse impact. To date, little research has focused on adverse impact of applicant characteristics other than gender and age. In *Chapter 6*, we study a situational judgement (SJT) that was used as part of the non-cognitive assessment in the decentralised selection process. In the SJT, applicants judged behavioural responses to written scenarios placed in the medical context. Our study was aimed at exploring whether the setting of the scenarios would be related to performance differences between applicants with different personal characteristics.

More specifically, we examined whether a good fit between applicants' vocational interests and the scenario setting was related to better performance on that scenario. Additionally, we examined whether applicants with previous experience in the academic setting performed better in the SJT than applicants without this experience. Gender and age effects were also explored.

Chapter 7 provides a discussion of our findings and their implications for the practice of medical school selection. In addition, methodological considerations and recommendations for future research in the field are discussed.

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