

## University of Groningen

### Medical student selection

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CHAPTER

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**General discussion**



The main purpose of the research in this thesis was to find out whether a selection-based medical school admissions system should be preferred over a lottery-based system. The period in which the Netherlands transitioned from a lottery-based admissions system to selection provided us with the unique opportunity to compare study outcomes of students who were admitted based on either a top pre-university GPA, selection-acceptance, weighted lottery after selection-rejection, or weighted lottery without participation in selection. We addressed relations between the different processes and study performance in medical school as well as associations with personality. In addition, we studied whether the scenario settings in a situational judgement test were related to performance of different types of applicants. The unique context of the Dutch multi-process admissions system enabled us to cast new light on medical school selection effects.

## Main findings

The decentralised selection processes we studied were initially aimed at ranking applicants on their level of suitability for medical school and admit those with the highest levels. Selection-accepted students were therefore expected to do better in their medical studies than selection-rejected students. However, such a selection effect was barely visible in our data. The effect of participation in the voluntary process was more evident: students who had been admitted via the national lottery without first participating in the voluntary selection process showed the lowest performance on almost all pre-clinical outcome measures (*Chapter 2*). It should however be noted that even in this ‘low performing’ group, most students showed adequate performance and progressed through medical training without significant problems. The participation effect was likely related to the large amounts of time and effort that were required for participation in our selection process. However, it did not persist through time: after seven years of medical training, there were no participation-related performance differences in dropout, clinical clerkship performance or graduation rates (*Chapter 4*). Moreover, in the multi-site study that we performed to further examine participation and selection effects in the Dutch multi-process admissions system, the previously found effects could not be replicated. (*Chapter 3*) Selection and participation effects seem highly dependent on the institutional context in which the admissions processes are implemented.

Our study on personality among medical students indicated that the different admissions processes indirectly call upon different personality characteristics. The group that was admitted through the weighted lottery without having participated in the voluntary selection process scored lowest on Big-Five personality characteristics related to success in the medical profession. The selection-accepted group reported the most suitable personality profiles.

We found that in a situational judgement test (SJT), applicants with vocational interests that were in line with the SJT scenario settings performed better on those scenarios than applicants who were more interested in other fields within medicine. In addition, we found that graduate-entry students performed better in an SJT than undergraduate-entry applicants. Females and older applicants scored better on some of the scenarios as well (*Chapter 6*). These findings indicate that the choice for certain scenario settings in the design of an SJT likely influences selection outcomes.

## Methodological considerations

Some methodological issues should be taken into account when interpreting the results of the studies in this thesis. Firstly, the differences between students who were admitted to medical school via the different admissions processes were, though in some cases statistically significant, relatively small. Considering the uncertainties that are inherent to all medical school selection processes, such as bias,<sup>1-6</sup> limited predictive and criterion validity,<sup>7-10</sup> and reliability issues,<sup>11-15</sup>, the question remains whether the switch from national weighted lottery to selection-based admissions was a step forward. These issues are applicable to the research in this thesis as well. So far, it seems that the transition from lottery to selection for medical schools in the Netherlands was based on politics and applicants' perceived need for autonomy and influence on admissions decisions, rather than strong scientific evidence.

Secondly, all studies in this thesis were carried out in the Netherlands. Four of the five studies examined results regarding the four different admission groups that we had in the multi-process admissions system. This was a unique system, which provided us with a type of natural experiment that enabled us to draw conclusions about different admissions processes without restriction of range and without having to correct for time differences and institutional differences. However, this system was highly specific to the Dutch setting, decreasing the generalizability of the results to the international selection setting. It remains unclear whether the selection and participation effects we found in this thesis would be the same in settings where selection is not based on voluntary participation, and where there exists no national lottery. In admissions systems where participation in selection is the only way into medical school, the self-selection effect related to participation might be smaller, because some applicants who, in our system, belonged to the 'lottery-without-participation-group' would then choose to participate in selection instead of choosing a different career path.

A third consideration also regards generalizability; our multi-site study showed that selection and participation effects are influenced by the institutional context of the selection setting.<sup>16</sup> Effects of the different admissions processes differed between the universities we included in our studies (*Chapter 3*). As some of our studies were performed at a single institution, more research is needed to further examine the effects before our results are generalized to other institutional settings. Furthermore, the relations between different selection tools within the processes and later performance, and the relation of time-investment in a selection process with performance should be analysed. The participation effect that we found might partly be related to the amount of time and effort required for participation in a selection process.<sup>17</sup> This should be confirmed in further research.

A fourth methodological consideration concerns our study designs. In our analyses, we mostly examined group differences. Consequently, we did not calculate associations between selection scores and later performance, or correlations between scores on certain parts of the selection procedures and later performance. The design of our studies was suitable for the purpose of comparing the different selection processes and deciding whether or not the switch to selection is a step forward. However, the next step in analysing the data would be to calculate effects for the different measurements in the selection process, in order to pinpoint which elements in the process are responsible for the effects we found.

## Selection effect

There was little difference in performance between selection-accepted and selection-rejected students, implicating that the selection processes we studied did not differentiate effectively between suitable and less suitable applicants. However, our study on long term outcomes did indicate that the selection-accepted group had the lowest dropout rates and a relatively high percentage of students who opted for an academic career within medicine, though these differences did not reach statistical significance. These long-term effects could be relevant in the practical reality of medical schools, both professionally and economically. In a time where the diminishing workforce in academic medicine raises serious concerns,<sup>18,19</sup> a selection process through which a relatively high percentage of students with academic ambitions are admitted is of high value. The low dropout rates in the selection-accepted group are beneficial for both applicants and medical schools: in the selective medical school admission context, every student who drops out means a lost study place, which are scarce and heavily desired by many other suitable applicants.<sup>20</sup> However, also this effect should be interpreted with some caution: even in the lottery-admitted group, relatively few students drop out of medical school (*Chapter 3*).<sup>21-25</sup> This can probably be explained by the homogeneity in the applicant pool. In principle, all applicants should have the qualities required to develop themselves into a good physician, as they all meet the highly selective entry requirements for medical school.

## Participation effect

The study described in *Chapter 2* indicated that students who had participated in the voluntary multifaceted selection process performed better in medical school than lottery-admitted students who had not participated. One of the explanations for this effect is that past performance is the best predictor of future performance.<sup>20,24,26</sup> The medical profession is characterized by hard work and long days.<sup>27</sup> Applicants who work hard in the application process will likely also work hard in medical training, leading to better study outcomes. Motivation might be an important factor in this mechanism: highly and internally motivated applicants may be more likely to invest large amounts of time and effort in their application to medical school than applicants with lower, or mostly external, motivation. Research on strength and quality of motivation in selected students and students who were admitted through lottery or based on a top pre-university GPA indeed showed that selected students had the strongest motivation. However, no differences in quality of motivation were reported: selected students did not report higher autonomous (or internal) motivation than other students.<sup>28,29</sup>

Another plausible explanation for the better study outcomes among students who had participated in the selection process is that their decision to apply to medical school was well-informed. An efficient selection process strongly stimulates applicants to thoroughly inform themselves about what they are applying for, i.e. selection criteria, the specifics of the curriculum, life as a doctor in reality, and the medical field in general. When applicants are better informed about the future they are applying for and have thought about whether or not such a future is suitable for them, they will be better prepared for their studies and life as a medical professional.<sup>30,31</sup> This notion is supported by research on curriculum sample selection, where

the selection process is comparable to the educational setting for which candidates have applied. This type of selection showed a positive relation with later performance and seemed to induce self-selection of suitable applicants.<sup>21,32</sup> In curriculum sample selection, the predictor (i.e. scores in the curriculum sample) is strongly linked with the criterion (performance in medical school), which improves selection outcomes.<sup>33,34</sup>

## Fairness

In the design of medical school selection processes, one of the factors that needs to be considered is fairness. As simple as it sounds, fairness in selection settings is a complicated term, which can be looked at from many different angles.<sup>35</sup> One might argue that a fair selection process is a process in which all applicants have the same chances, regardless of their personal characteristics. Another might argue that a selection process is fair when applicants who are very suitable and motivated for the medical profession have better chances than applicants who are less suitable or motivated. A third point of view could be that fairness in selection means that the student population admitted through a certain process reflects the community it serves in terms of for example gender, ethnicity, and socio-economic status.<sup>36</sup>

Research on selection generally reports higher selection scores among female applicants compared to males, white applicants compared to applicants with other ethnicities, and applicants with a high socio-economic background compared to applicants with lower socio-economic status.<sup>6,37-41</sup> Fairness therefore already proves to be a fairly complicated subject. Yet, these considerations still ignore the perspective of medical schools and society.

The social accountability of medical schools entails that medical schools have the responsibility of providing the community with the needed professionals.<sup>42-45</sup> On a macro level, one might therefore argue that it is fair for medical schools to improve chances of admission for applicants who want to work in fields within medicine in which there is a (predicted) shortage of professionals, such as geriatric care or care for patients with chronic diseases. In a similar way, selection might be aimed at admitting students who are willing to work in rural areas, in order to compensate shortages in those regions.<sup>46,47</sup>

Prioritizing societal needs above equal chances for individual applicants would be a step towards more sustainable health care, as the patient population is rapidly changing: according to the United Nations, between 2015 and 2050, the population of people over 60 years old will grow by 56 percent.<sup>48</sup> In order to serve the society of the future, we need to start training more physicians with an interest in geriatrics. Prioritizing such applicants in selection would be one way to reach this goal. A different approach would be to change the way we train medical students: a recently published meta-analysis on the choice for a career in geriatrics concluded that although most students prefer to work with young patients and acute, curable diseases, interest in a career as geriatrician increases with exposure to this field.<sup>49</sup> Medical students should therefore be exposed to geriatrics in their medical training, in order to stimulate an interest in this patient group. Combined with the selection of applicants with an affinity with this type of patients, such a change in medical training should increase the output of geriatricians. Similar efforts should be made for other fields with a (predicted) shortage of physicians.

## Implications for practice

Our research has various implications for the practice of medical school selection. If a selection process is the instrument of choice for medical school admissions, the results support the implementation of a process which induces self-selection of suitable applicants through participation, rather than a process which aims to differentiate between the suitable and the less suitable. A selection process should stimulate applicants to invest large amounts of time and effort into assignments similar to the assignments students encounter in medical training. Applicants who work hard in such a curriculum sample selection process seem to put similar effort into subsequent medical training. Curriculum sample selection will enable applicants to practically experience the world of a medical student or physician and give them a better view on their choice for this field.

Secondly, medical schools need to invest in thoroughly informing their applicants about the future career they are applying for. This should be done via multiple channels: there should be thorough information available for prospective students about the practical reality of studying medicine and life as a physician. The information should include information about career perspectives, changes in the demographics of the patient pool, and advantages and disadvantages of a career in medicine. Applicants should for example be informed about the growing population of elderly patients,<sup>48</sup> the need for professionals in rural areas,<sup>46,47</sup> the shortages in academic medicine,<sup>18,19</sup> and the high prevalence of burnout and depression among medical students and professionals.<sup>50,51</sup> This information should stimulate the development of realistic expectations of a career in medicine. Thorough orientation on a future career in medicine should be rewarded in the selection process that is chosen.

The research in this thesis does not provide a strong argument for the switch to selection-based medical school admissions in the Netherlands. Yet, in the current legal system, all medical schools are forced to employ selection and we need to find a way to make this system as fair and effective as possible. The lack of a strong selection effect in our studies reflects an inability of the selection processes to distinguish between the most suitable applicants and less suitable applicants. Most of the selection-rejected students, and even lottery-admitted students who had not participated in the selection process, still moved through medical training successfully. Selecting the highest-performing applicants therefore does not seem to pay off as well as one might have hoped. A more sustainable aim of selection would be to select applicants with an interest in a career in fields within medicine where shortages are expected. Aiming to admit students with an interest in a career in for example geriatrics would probably meet the societal needs of the future better than aiming to admit as many high-performers as possible.

With regard to the system in the Netherlands, there is a very straight-forward and evidence-based instrument available for determining the ability of an applicant to successfully complete medical training: the national high school examinations. All pre-university schools in the Netherlands are strictly monitored and deliver graduates with a similar level of education. Moreover, 50% of the end grade for the high school examinations is determined by national examinations, which are the same for all high school examinees in the country. This is a neat measurement of academic skills that has proved to be predictive of performance in university and would make for a stable criterion for selection. All applicants who have passed these



examinations should theoretically be able to complete medical school. Medical schools could then consider adding a measure of 'non-academic qualities. Unfortunately, the use of national high school examination scores is currently impossible, because Dutch law dictates that selection for medical school has to take place in the period before the national examinations. This means that pre-university GPA can currently not be employed for selection purposes, which is a waste of a valid and reliable measure of academic performance. Sadly, this forces medical schools to select their prospective students based on measurements of single-occurrence performance that are not thoroughly validated. Hence, it is strongly recommended to adapt the judicial system to enable medical schools to incorporate pre-university GPA in their selection process.

A concluding recommendation would be that selection criteria should reflect assessment criteria for later performance. In order to facilitate this, there must be a clear view on the characteristics that are desired in an applicant. Only when a clear framework of the desired profile for the ideal candidate is available, an effective selection process can be designed.

## Conclusions

There is not enough evidence to support the preference for selection-based medical school admissions over lottery-based admissions. Performance differences between groups of students who were admitted based on lottery, selection or top pre-university performance were small, though in some cases statistically significant. Considering the biases that are inherent to most selection processes and the fact that the validity and reliability of most selection instruments that are currently used are not warranted, implementing selection instead of lottery does not improve the admissions system as much as one might have hoped.

Curriculum sample selection seems most promising for future admissions decisions. In addition to academic and possibly non-academic aptitude, admissions decisions should reflect future societal needs. It is recommended that the focus of medical school selection be expanded from applicant characteristics to societal change, in order to admit and train professionals that will be needed in the society of the future.

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