Summary

SUMMARY

Worldwide places in medical school are scarce and medical education and training are expensive for providers and learners. Therefore, medical schools aim to offer the places available only to those applicants with the highest probability of successful medical training and subsequent career. To reach this goal, medical schools have developed several selection procedures, including interviews, admission tests and other measures of personal competencies (Kreiter & Axelson, 2013), although the evidence that these procedures indeed do deliver better achieving students (Salvatori, 2001; Siu & Reiter, 2009), let alone better professional doctors (Papadakis, Teherani, et al., 2005) is limited. Uniquely in the Netherlands, to downsize the applicant pool, selection was organised nationally based on a lottery that is weighted for academic attainment. Whereas traditionally the focus in selection has been on academic indicators, there is increasingly more attention for non-academic attributes that are considered important for success in clinical practice (Patterson, Knight, et al., 2016). As with all selection tools, it is critical to explore the reliability and validity of approaches to selecting for non-academic, or personal qualities.

Current research about selection procedures used throughout the world and over the years indicates that these methods do not deliver the desired results (DeVaul, Jervey, et al., 1987; Papadakis, Teherani, et al., 2005; Stegers-Jager, Themmen, et al., 2015). There was no evidence for the existence of methods that might select students who would perform better in medical school (Norman, 2004). However, in the absence of a selection system of proven efficacy, a lottery system should not be accepted as a valid solution. Both the lottery and the unproven procedures have been described as unfair to medical school applicants, as neither includes any truly objective criteria for predicting future performance (Zwick, 2006). The Dutch situation in which access to medical school was granted by lottery and the possibility to select up to 50% of the students by a selection procedure provided a unique opportunity to form a control group of randomly admitted students to compare with those selected. We used this dual system to develop an evidence-based selection procedure addressing non-academic (i.e. motivation) as well as academic skills. The former evaluated motivation through the determination of candidate active involvement in extracurricular activities, the latter by tests concerning the study skills of candidates in a medical school context.

The local selection procedure at Erasmus MC Medical School consists of two steps. In the first step, applicants are assessed according to the quality and quantity of extracurricular activities before application in one or more of the following five cat-

egories: (1) activities in health care, (2) activities in management and organisation, (3) activities related to the development of a (individual) talent e.g. for music, sports or science; (4) (extracurricular) academic education; and (5) additional subjects during pre-university education. In the second, academic step, applicants take five tests on a medical subject preceded by informative classes. These locally developed tests focus on the subjects logical reasoning, scientific thinking, epidemiology and pathology, anatomy and mathematics.

MAIN FINDINGS

The objective of the study presented in *Chapter 2* was to use controlled techniques to determine whether a combination of selection steps, based on the assessment of academic and non-academic abilities, would lead to the admission of students whose achievement in medical school would turn out to surpass that of students who had been selected by weighted lottery. We introduced our two-step selection method. In the first, non-academic step participants were assessed according to the quality and extent of their extracurricular activities before application, while the second, academic step consisted of a series of five tests on a medical subject representative of assessments in the first year of medical school. Four consecutive cohorts were admitted partly by selection and partly by lottery. All cohorts in this study had a minimum follow-up of 2 years and two had a follow up of 4 years. The main outcome was that the relative risk for dropping out of medical school was 2.6 times lower in selected students than in controls admitted by lottery. Grossly there were no significant differences between the percentages of students who performed optimally (i.e., those obtaining the maximum of 60 credits each year) in either group. The differences we observed in student achievement could not be explained by the pre-admission characteristics 'gender' and 'pre-university GPA (pu-GPA)'. Selected students were 4 months older, which is significant although thought not clinically relevant.

Since this dropout rate was reduced by this selection procedure, we questioned whether the selected students also outperformed the lottery admitted students in the clinical phase. Therefore, the aim of the study presented in *Chapter 3* was to compare the performance of selected and lottery admitted students in the clinical phase. The overall risk for dropout before the start of the clerkships declined, however it remained twice as low in the selected group compared to the lottery admitted group.

After at least 5.5 years of study, almost three quarter of the students completed at least five clerkships. This mean grade of five clerkships turned out to correlate very well to mean grade of all clerkships, indicating that the former achievement could be considered representative for overall clinical achievement. Therefore, mean grades of selected and lottery-admitted students in the four (yearly) cohorts on the first five discipline specific clerkships and on all 10 discipline-specific clerkships in the first two cohorts were evaluated. Those selected obtained a higher mean grade than the lottery admitted students on the first five as well as all 10 clerkships. The probability of achieving a grade of ≥ 8.0 was 1.5 times greater for selected students than for lottery-admitted students. Of notice is the absence of difference in pre-university Grade Point Average between both groups at any stage between the start of medical school and graduation after the completion of clerkships. Therefore, the observed difference in clinical achievement between the selected and lottery admitted groups appears to be related to the selection of students before admission.

To assess the relative importance of both steps in explaining the differences in student performance found between selected students and their lottery admitted controls the study reported in *Chapter 4* was conducted. We investigated the relative contribution of the first non-academic and second academic selection step to the differences found in student performance during medical school. It was shown that the observed difference in dropout rate between this groups partly already existed before the start of the selection procedure (i.e. self-selection) and partly can be attributed to selection of participants based on academic criteria in the second, academic selection step. The significantly higher clinical GPA was related to non-academic student characteristics as indicated by the quality and quantity of participation in extracurricular activities before admission to medical school.

The aim of the study presented in *Chapter 5* was to examine whether students who were selected based on their pre-university Extra Curricular Activities (puECAs) persisted in their ECAs during medical school (msECAs) and whether this persistent participation in msECAs explains their better achievement in the clinical phase. Thereby supporting the choice of using puECAs as a non-academic selection tool in medical school selection procedures. It turned out that persistent activities of students selected on extracurricular activities apparently favours their better clinical achievement. Selected students not only participate more often in extracurricular activities during medical school than lottery-admitted students, their participation is also not associated with their pu-GPA, whereas lottery-admitted students only participate if they have a high pu-GPA. Also, participation in extracurricular activities is associated with higher clerkship grades for selected students but not

for lottery-admitted students. Thereby supporting the choice of using puECAs as a non-academic selection tool in medical school selection procedures.

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