Year Report of the Institute of Medical Education Research Rotterdam (iMERR) 2017

Prof. Dr. W.W. van den Broek, director of Medical Education Erasmus MC

Introduction

In 2017, members of iMERR received several grants enabling them to pursue their research and to guide PhD students. As you can read below, several grant proposals are being initiated. Funding by the Erasmus MC of iMERR beginning this year has made it possible to keep on going.

In 2018, participation in several national and international networks will be our aim. As an Academic Center, we will need to look for collaborations within the Erasmus MC. On a national level, we participate in the Leiden-Delft-Erasmus Center for Education and Learning (LDE-CEL) and the Erasmus Educational Research group. Internationally, we are collaborating with several European countries.

Key words: medical education, continuing medical education, admission test college, clinical clerkship, internship and residency, problem-based learning, distance education, e-learning, clinical reasoning, minority recruitment.

Scientific Publications in International Journals

1. Alsma J, van Saase JLCM, Nanayakkara PWB, Schouten WEMI, Baten A, Bauer MP, et al. The Power of Flash Mob Research: Conducting a Nationwide Observational Clinical Study on Capillary Refill Time in a Single Day. Chest. 2017;151(5):1106-13.
2. Braun LT, Zwaan L, Kiesewetter J, Fischer MR, Schmidmaier R. Diagnostic errors by medical students: Results of a prospective qualitative study. BMC Medical Education. 2017;17(1).
3. Dankbaar MEW, Richters O, Kalkman CJ, Prins G, Ten Cate OTJ, Van Merrienboer JJG, et al. Comparative effectiveness of a serious game and an e-module to support patient safety knowledge and awareness. BMC Medical Education. 2017;17(1):1-10.
4. Dankbaar MEW, Roozeboom MB, Oprins EAPB, Rutten F, Van Merrienboer JJG, Van Saase JLCM, et al. Preparing Residents Effectively in Emergency Skills Training with a Serious Game. Simulation in Healthcare. 2017;12(1):9-16.
5. Doornekamp L, Stegers-Jager KM, Vlek OM, Klop T, Goeijenbier M, Gorp EVCM. Experience with a multinational, secondary school education module with a focus on prevention of virus infections. American Journal of Tropical Medicine and Hygiene. 2017;97(1):97-108.
6. Krage R, Zwaan L, Tjon Soei Len L, Kolenbrander MW, Van Groeningen D, Loer SA, et al. Relationship between non-technical skills and technical performance during cardiopulmonary resuscitation: Does stress have an influence? Emergency Medicine Journal. 2017;34(11):728-33.
7. De Leng WE, Stegers-Jager KM, Born MP, Frens MA, Themmen APN. Participation in a scientific pre-university program and medical students' interest in an academic career. BMC Medical Education. 2017;17(1).
8. De Leng WE, Stegers-Jager KM, Husbands A, Dowell JS, Born MP, Themmen APN. Scoring method of a Situational Judgment Test: influence on internal consistency reliability, adverse impact and correlation with personality? Advances in Health Sciences Education. 2017;22(2):243-65.

9. Linsen, A., Elshout, G., Pols, D., Zwaan, L., Mamede, S. Education in Clinical Reasoning: An Experimental Study on Strategies to Foster Novice Medical Students' Engagement in Learning Activities, Health Professions Education, 2017.
10. Mamede S, Van Gog T, Schuit SCE, Van Den Berge K, Van Daele PLA, Bueving H, et al. Why patients' disruptive behaviours impair diagnostic reasoning: A randomised experiment. BMJ Quality and Safety. 2017;26(1):13–8.
11. Mamede S, Schmidt HG. Reflection in medical diagnosis: A literature review. Health Professions Education 2017;3:15–25.
12. Montpetit-Tourangeau K, Dyer JO, Hudon A, Windsor M, Charlin B, Mamede S, et al. Fostering clinical reasoning in physiotherapy: Comparing the effects of concept map study and concept map completion after example study in novice and advanced learners. BMC Medical Education. 2017;17(1).
13. Norman GR, Monteiro SD, Sherbino J, Ilgen JS, Schmidt HG, Mamede S. The Causes of Errors in Clinical Reasoning: Cognitive Biases, Knowledge Deficits, and Dual Process Thinking. Academic Medicine. 2017;92(1):23–30.
14. Peixoto JM, Mamede S, de Faria RMD, Moura AS, Santos SME, Schmidt HG. Erratum to: The effect of self-explanation of pathophysiological mechanisms of diseases on medical students' diagnostic performance (Advances in Health Sciences Education, (2017), 22, 5, (1183–1197), 10.1007/s10459-017-9757-2). Advances in Health Sciences Education. 2017;22(5):1199.
15. Peixoto JM, Mamede S, de Faria RMD, Moura AS, Santos SME, Schmidt HG. The effect of self-explanation of pathophysiological mechanisms of diseases on medical students' diagnostic performance. Advances in Health Sciences Education. 2017;22(5):1183–97.
16. Rotgans JI, Schmidt HG. The relation between individual interest and knowledge acquisition. British Educational Research Journal. 2017;43(2):350–71.
17. Rotgans JI, Schmidt HG. Interest development: Arousing situational interest affects the growth trajectory of individual interest. Contemporary Educational Psychology. 2017;49:175–84.
18. Schmidt HG, Van Gog T, Ce Schuit S, Van Den Berge K, La Van Daele P, Bueving H, et al. Do patients' disruptive behaviours influence the accuracy of a doctor's diagnosis? A randomised experiment. BMJ Quality and Safety. 2017;26(1):19–23.
19. Schripsema NR, van Trigt AM, Lucieer SM, Wouters A, Croiset G, Themmen APN, et al. Participation and selection effects of a voluntary selection process. Adv Health Sci Educ Theory Pract. 2017;22(2):463–76.
20. Stegers-Jager KM, Cohen-Schotanus J, Themmen APN. The Four-Tier Continuum of Academic and Behavioral Support (4T-CABS) Model: An Integrated Model for Medical Student Success. Academic medicine : journal of the Association of American Medical Colleges. 2017;92(11):1525–30.
21. Stegers-Jager KM. Is it them or is it us? Unravelling ethnic disparities in undergraduate clinical performance. BMC Medicine 15 (1):190.
22. Tan CP, Van der Molen HT, Schmidt HG. A measure of professional identity development for professional education. Studies in Higher Education. 2017;42(8):1504–19.

23. Urlings-Strop LC, Themmen APN, Stegers-Jager KM. The relationship between extracurricular activities assessed during selection and during medical school and performance. Advances in Health Sciences Education. 2017;22(2):287-98.
24. Zwaan L, Monteiro S, Sherbino J, Ilgen J, Howey B, Norman G. Is bias in the eye of the beholder? A vignette study to assess recognition of cognitive biases in clinical case workups. BMJ Quality and Safety. 2017;26(2):104-10.
25. Zwaan, L., Kok, EM., Van der Gijp, A. Radiology education in the undergraduate curriculum: A radiology curriculum for medical students? Diagnosis, 2017; 4(3).

Grants

Dr. M. Dankbaar:

Consortium with Maastricht University, IJsfontein and VirtualMedSchool. PhD student in both centers. The amount of € 682.775 NWO/ NRO Human Capital Grant (Brain & Cognition): "Using real-time cognitive and non-cognitive indicators for regulation and self-regulation in game-based learning".

Dr. K. Stegers-Jager:

NWO-SGW, Veni, €250.000, project "Fatal first impressions? Unravelling biased decision-making in rater-based assessments".

AMEE, AMEE Research grant, £10.000 (€11.831), project "Unravelling ethnic disparities in rater-based assessments: effect of scoring method".

Dr. L. Zwaan:

Erasmus MC fellowship 'Thinking Fast or Slow, that's the question' 400.000 euros (of which 200.000 matching by iMERR).

Co-applicant: ZonMW grant Quality of Care 'Exchange of Experiences in the General Practitioners training: How can tutors enhance the value for residents?' Main applicant Pieter van den Berg, 300.000 euros.

Canadian Royal College Grant 'Should we teach about biases to reduce diagnostic error?' main applicant Geoff Norman (35.100 dollars).

Conference proceedings

- De Leng WE, Stegers-Jager KM, Born MPh, Themmen APN, Hybrid Development of an Integrity-Based Situational Judgment Test for Medical School Selection. In: Niessen ASM, De Leng WE, Stegers-Jager KM, Meijer RR. Current Developments in Selective Admission to Higher Education

in Europe. National Council on Measurement in Education NCME Conference; 2017 Apr 26-30; San Antonio, TX, USA.

- De Leng WE, Stegers-Jager KM, Born MPh, Themmen APN. Twenty-eight SJT scoring methods: influence on internal consistency reliability, adverse impact and correlation with personality. Developing and Researching the Economics and Mathematics of Selection DREAMS workshop; Jul 24-25; Sydney, Australia.
- De Leng WE, Stegers-Jager KM, Born MPh, Themmen APN. The influence and test characteristics on faking on a Situational Judgement Test for medical school selection. Rogano Meeting; 2017 Aug 31 Sep 1; Helsinki, Finland.
- De Leng WE, Stegers-Jager KM, Born MPh, Themmen APN. Faking on a Situational Judgement Test for medical school selection. 12th Dutch-Flemish Research Meeting on Personnel Recruitment and Selection Research; 2017 Oct 20; Ghent, Belgium.
- De Leng WE, Steger-Jager KM, Born MPh, Themmen APN. Faking op een Situational Judgement Test over de selectie van geneeskundestudenten. 45th NVMO conference; 2017 Nov 16-17; Egmond aan Zee, the Netherlands.
- Mamede S, Zwaan L, Linsen A, Domez M, Van den Broek W, Schmidt HG. Instructional approaches for the teaching of clinical reasoning: a randomized experiment, AMEE 2017, Hensinki, Finland, August 26-30.
- Kuhn J. Mamede S, Van den Berg P, Bindels PJE, Van Gog T. Teaching Reflective Reasoning in Medical Diagnostics. NVMO 2017, Egmond aan Zee, November 16-17.
- Kuhn J, Mamede S, Van den Berg P, Van Gog T. Critical Thinking in Medical Diagnosis: Structured Reflection Remedies Error and Fosters Learning. EARLI 2017, Tampere, Finland, August 29-September 2.
- Stegers-Jager KM, Kickert R, Meeuwisse M, Prinzie P, Arends LR (2017, August). The role of the assessment system in the relation between self-regulated learning, participation and performance. AMEE conference 2017, Helsinki, Finland.
- Stegers-Jager K (2017, April). Applicants' Ethnic and Social Background and Performance on Different Selection Criteria. Presentation as part of coordinated session on Current Developments in Selective Admission to Higher Education in Europe, NCME Annual Meeting, San Antonio, Texas, USA.
- Stegers-Jager K. Lessons learned from 15 years of non-grades-based selection for medical school. 12th Dutch-Flemish Research Meeting on Personnel Recruitment and Selection, Gent, Belgium. October 2017.
- Stegers-Jager K. Lessons learned from 15 years of non-grades-based selection for medical school. Keynote lecture at the InRESH meeting in August 2017 in Helsinki Finland.
- Stegers-Jager K. Dealing with diversity in medical education. Keynote lecture at CEL Innovation room, Rotterdam, the Netherlands. June 9th 2017.
- Gennissen L.M., Stegers-Jager K.M., Graaf J. de, Fluit CRMG, Hoog M. de. Looking at the selection of residents through a lens of diversity Lokke Gennissen. AMEE conference 2017, Helsinki, Finland.

- Gennissen L.M., Stegers-Jager K.M., Fluit CRMG, Graaf J. de, Hoog M. de. The challenges of a cross-cultural study. Rogano Meeting; 2017 Aug 31 - Sep 1; Helsinki, Finland.
- Gennissen L.M., Stegers-Jager K.M., Graaf J. de, Fluit C.R.M.G., Hoog M. de. Selectie van AIOS in de praktijk; vanuit een diversiteitsperspectief . NVMO 2017, Egmond aan zee, November 16-17.
- Gennissen L.M., Stegers-Jager K.M., Graaf J. de, Fluit C.R.M.G., Hoog M. de. Workshop Medische carrièrekeuze

Reports

Monitor zorggerelateerde schade 2015/2016: dossieronderzoek bij overleden patiënten in Nederlandse ziekenhuizen. M Langelaan, MA Broekens, MC de Bruijne, JF de Groot, MJ Moesker, PJ Porte, B Schutijser, R Singotani, M Smits, L Zwaan, C Wagner, 2017.

Ongoing PhD trajectories within the EUR

Situational Judgment Test (SJT) for the Selection into Medical School (Wendy de Leng, Msc)

Wendy started her PhD in April 2014 under the supervision of dr. Karen Stegers-Jager (co-promotor), prof. dr. Axel Themmen (1st promotor) and prof. dr. Marise Born (2nd promotor). Her PhD-project is focused on selection into medical school using a Situational Judgment Test (SJT). During the selection procedures of 2014 and 2015 an SJT originating from the UK was administered to the applicants at the Erasmus MC Medical School. This SJT – designed to measure integrity – aims at extending the range of constructs on which medical students are selected. In addition, an SJT displays lower ethnic and socioeconomic subgroup differences than traditional cognitive tests and can thereby increase the diversity of the medical student population.

The SJT was administered to a group of Subject Matter Experts (SMEs) in order to create a rational scoring key for converting the applicants' judgments into scores. Several of these rational scoring methods exist. The first study of this PhD project was focused on the comparison of these different scoring methods on the reliability of and ethnic subgroup differences in the SJT score.

Because of the overall low reliability of the integrity SJT as well as concerns with the realism of some of the scenarios, we started with the development of a new SJT to measure integrity. New scenarios were written based on a combination of critical incident interviews and established integrity-related theoretical models. This new SJT was administered during the selection orientation day in 2015 (i.e., coachingsdag) . In addition, several integrity-related measures were administered to examine the construct validity of the SJT. Construct validity of the SJT was sufficient and significantly stronger for the score based on items that describe undesirable responses than items that describe desirable responses. These results indicate that it may be promising to focus an SJT on the ability to recognize what one should not do.

For the third study of this PhD project, the same SJT was administered twice to the same group of applicants: once during a low-stakes situation (i.e. selection orientation day in 2016) and a second time during a high-stakes situation (i.e. selection testing day in 2017). The influence of social desirable responding on the SJT will be investigated by examining if applicants respond differently to the SJT when the stakes are higher.

Finally, in the fourth study of this PhD project, we will examine if the SJT scores obtained during the selection testing days of 2016 are able to predict professional behavior after one year of medical school.

Recruitment and selection for a future diverse medical workforce (Lokke Gennissen, MD)

Lokke Gennissen started her PhD in July 2014, under supervision of Karen Stegers-Jager, Matthijs de Hoog (Erasmus Medical Center), Lia Fluit and Jacqueline de Graaf (Radboud University Medical Center Nijmegen). In order to make a more fluent transition from undergraduate to postgraduate medical training and in that way pursuing an educational continuum a fast track program is introduced in the Netherlands.

The fast track program is a program for last year medical students, where they can already acquire competencies at the level of first year residents in training in their specialty of choice. These acquired competencies enable a reduction of the duration of postgraduate training. In the context of these recent changes this PhD trajectory is focused on the specialism choice of medical students and the recruitment and selection of the future medical specialists.

Recruitment and selection of medical residents are important actors in the medical workforce planning. In order to be able to maintain high quality health care, the aim of recruitment and selection of a future medical workforce should be to meet societal medical needs. Adequate selection provides society with an adequate number and equitable distribution of committed, competent doctors, who are satisfied with their job, across the different specialties. Two workforce issues might sooner or later interfere with this aim of delivering adequate health care for our society. The first of these issues is the medical specialty preference of medical students, which is not in line with the future need of society for medical specialists. Whereas society needs public health and elderly care doctors, medical graduates prefer pediatrics and surgery.

The second issue is the lack of sociocultural diversity in our current medical specialists and residents. Whereas student populations become more culturally and socially diverse due to the attention for widening access, the composition of residents and specialists is not changing at the same pace. Yet, our patient population is diversifying rapidly, and unfortunately patients of a sociocultural diverse background seem to receive a lesser quality of care. Diversifying our workforce might reverse these effects in several ways.

In our studies we shed light on specialty choice and selection of residents, trying to identify potential elements which we might be able to influence to intervene on the two workforce issues.

Clinical assessment methods and ethnic diversity of medical students (Chantal van Andel, MSc)

Chantal started her PhD in January 2017 under supervision of dr. Karen Stegers-Jager (co-promotor), prof. dr. Walter van den Broek (1st promotor) and prof. dr. Marise Born (2nd promotor). Her PhD-project aims to contribute to a more inclusive medical education setting, for instance by investigating curriculum changes, assessment methods and assessor bias.

This research is relevant given the societal benefits of a diverse medical workforce. Previous research at Erasmus MC Medical School has shown that ethnic majority students are more likely to receive higher grades as compared to ethnic minority students during their clerkships. A potential explanation for this can be found in subjectivity of clinical ratings, yet interventions to reduce unwanted sources of bias have been largely unsuccessful.

A broadly sampled assessment implies mixed assessments used by various assessors across multiple moments. This type of assessment is expected to reduce unwarranted variances, and could thereby mitigate ethnic disparities in clinical grades. This has been investigated and will be written up in her first paper. Her second paper will not focus on evaluation systems (global versus broadly sampled), but on scoring forms. Is an assessment tool such as a global rating scale (GRSs) more susceptible to ethnic bias as compared to a checklist?

GRSs and checklists are widely used assessment tools and both have their strengths and weaknesses. A weakness of the GRS, as opposed to a checklist, is that it is more susceptible for quick, first impressions. The first study will investigate to what extent rater-score variance due to differences in students' ethnicities is more likely to occur when a GRS is being used (as compared to a checklist).

This study will also test whether rater confidence (the extent to which a rater beliefs he/she made an accurate judgment) is associated with students' ethnicities and the assessment tool (GRS versus checklist) being used. Her third paper will investigate the effect of social networks of medical students on study performances.

Teaching Reflection Through Modelling As A Strategy To Counteract Diagnostic Mistakes In General Practice (Josepha Kuhn, MSc).

Josepha Kuhn started her PhD in 2016 under the supervision of Prof. dr Patrick Bindels (Department of General Practice, ErasmusMC), Prof. dr. Tamara van Gog (Utrecht University) and the co-supervision of Dr. Silvia Mamede (iMERR) and Dr. Pieter van den Berg (Department of General Practice, ErasmusMC). Her project explores ways to teach reflection as an approach to prevent possible flaws in diagnostic reasoning of general practitioners.

In a series of experiments and one quasi-experimental study with general practice residents, the project will (1) explore whether reflective reasoning can be taught, (2) compare the effectiveness of different instructional approaches for teaching reflective reasoning, and (3) investigate the effectiveness of the instructional approach by implementing it in the actual curriculum of the general practice training in the Erasmus MC.

Using real-time cognitive and non-cognitive indicators for regulation and self-regulation in game-based learning (Tjitske Faber, MD)

Tjitske started her PhD in september 2017, under supervision by Dr. Mary Dankbaar, Prof. dr. Walter van den Broek (Erasmus MC Medical Center), Dr. Jeroen Donkers and Prof. dr. Jeroen van Marrienboer (Maastricht University). Het PhD project focuses on finding indicators for learning professional and self-regulatory learning skills in serious games.

Serious games have the potential to teach complex cognitive skills in an engaging and flexible way. They often provide real-time feedback based on cognitive performance indicators. Measurement of non-cognitive (eye-movements, stress) and cognitive (cognitive load, game-data) process indicators might generate important information on learning processes, which can be used to improve the development of professional and self-regulated skills, using adaptive (computer-regulated) or self-regulated learning. Self-regulated skills are important 21st-century skills to enable continuous learning.

Caring for acutely ill patient is a demanding task that combines medical knowledge with procedural and non-technical skills. For the inexperienced young doctor or medical student, the task can be daunting. Proficiency in skills is often directly related to patient safety. Games have the potential to teach complex cognitive skills in an engaging, flexible and patient-safe way. The Erasmus MC developed a simulation game to train these complex cognitive skills: the abcdeSIM.

Previous research showed that incorporating this game in training is effective for doctors, but not for medical students. Students show high motivation and high cognitive load playing the game, however they do not spend more time studying. A potential explanation is that students are not able to self-regulate their learning effectively. In this research, we will investigate cognitive and non-cognitive process indicators which can generate information on learning processes, such as stress measurements and tracing of in-game behavior.

This information can be used to improve the development of professional and self-regulated skills, using adaptive (computer-regulated) or self-regulated learning. We will expand and redesign the game, exploring how the use of process indicators can improve learning. The influence of debriefing sessions guided by indicator's information will be explored. Finally, we will compare the effects of adaptive versus self-regulated learning in the game on learning professional and self-regulated skills in the short and long-term.

Challenge and Support: coaching for medical professionals (Lara Solms, MD)

Lara Solms started her PhD in December 2017 under supervision of Matthijs de Hoog, Anne de Pagter, Tim Theeboom (UvA) and Annelies van Vianen (UvA). This PhD project is initiated by the Erasmus MC and a joint venture of the Erasmus MC and the department of Work and Organizational Psychology.

The PhD thesis will be defended in the EUR. Aim of this PhD project is to investigate the effectiveness of coaching for medical specialists. Healthcare professionals experience a variety of stressors, such as time pressure, a high workload, and are the prime example for people work, where emotionally taxing patient interactions are on the daily agenda. Consequently, healthcare professionals are at a high risk to experience job strain and to develop stress-related illnesses. To attenuate that risk, coaching interventions are installed aiming to support the employee in the enhancement of demanding life experiences. At the same time, coaching fosters development and growth, supporting employees to attain goals in their personal and professional life. Although coaching is a popular management tool in organizations, little is known about its effectiveness and the specifics hereof.

In a controlled trial, we will follow a group of AIOS and medical specialists that have been engaged in the pilot project Challenge and Support – a 10-month-long coachingtraject offered to pediatricians at the Erasmus MC and Leiden MC. During this project, we will investigate coaching effectiveness as well as its working mechanisms. Particularly, we will investigate different indicators of coaching effectiveness, considering variables form stress and burnout to self-compassion and work engagement.

Based on the Job Demands-Resources Model, an influential model of burnout, we expect coaching to reduce symptoms of emotional exhaustion and to foster job engagement respectively. While this model has its focus on work demands and work resources, our research aims to incorporate the role of personal demands and personal resources in initiating behavior change. Hereby is coaching our intervention of choice that can help to equip people with the tools needed to maintain a balance between demands and resources.

During the course of the project, we will examine coaching beyond its effectiveness, investigating different coaching approaches, looking at the role of personality, as much as getting to the bottom of the working mechanisms, the working ingredients of coaching. Within this project, we will conduct field studies as well as experimental studies.

Ongoing PhD trajectories outside the EUR

The following external PhD projects have been ongoing under the supervision of Prof.dr. Henk Schmidt, with dr. Sílvia Mamede as co-supervisor:

- Dalal Al Qahtani, dentist, Medical College, King Saud bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia. Thesis theme: Contextual factors influencing physicians' diagnostic performance.
- Daniel de Castro, MD, internist-endocrinologist, Faculty of Medicine, University of the State of Ceará, Fortaleza, Brazil. Theme of the thesis: Instructional approaches to foster medical students' clinical reasoning.
- Elmi Badenhorst, psychologist, Faculty of Health Sciences, University of Cape Town, Cape Town, South Africa. Theme of the thesis: Students' misconceptions in medical education.
- Telma Kremer, psychologist, University of São Paulo, São Paulo, Brazil. Thesis theme: Students' emotions and learning in medical education.
- Shaikha Hamed Al-Aujan, dentist, King Saud bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia. Thesis theme: Expertise in clinical reasoning in dentistry.
- Lucy Victoria Rosby, medical doctor, Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore. Thesis theme: In search of System 1 versus System 2.
- Daniel Franci, medical doctor, Faculty of Medicine, UNICAMP, Brazil. Thesis theme: Multimedia learning in medical education: Point-of-care ultrasound in the teaching of clinical reasoning.
- Ligia Cayres Ribeiro, internist, Medical College, UNIFENAS, Belo Horizonte, Brazil. Thesis theme: The influence of reflection upon clinical experiences on medical students' learning process and outcomes.
- Ahmed Al Rumayyan, medical doctor, Medical College, King Saud bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia. Thesis theme: Theme: Teaching clinical reasoning: professionalism.

Projects

International

The iMERR clinical reasoning research group has collaborated with the following international partners in projects carried out or under development during 2017: Prof. dr. Geoff Norman and co-researchers from the McMaster University, Canada, leading to co-authored publications (one article published in Academic Medicine in Jan 2017, and a second article recently submitted, and a chapter in the Cambridge Handbook of Expertise, in press);

Prof. dr. Marco Carvalho and Prof.dr. Licio Velloso, from Faculty of Medicine, UNICAMP, Brazil, with whom a collaborative project has been submitted to the Nuffic-Capes 2017 Call for Proposals for joint research projects with Brazil (results to be published in March 2018).

Prof. Martin Fisher (Ludwig-Maximilians-University Munich), Prof. dr. Mathieu Nendaz (Geneva University), Dr. Wolf Hautz (Bern University), and Prof. dr. Charlotte Ringsted (Aarhus University Denmark) and respective co-researchers, with whom we have worked on the preparation of a project to be to be

submitted as an Innovative Training Network (ITN) application within the H2020 MARIE SKŁODOWSKA-CURIE Actions.

Researchers from the Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore (Dr. Jerome Rotgans, Dr. Naomi Low-Beer), with whom we obtained a grant for a pilot project on the use of functional near-infrared spectroscopy (fNIRS) in research on diagnostic reasoning. The pilot project was conducted throughout 2016 and resulted in a continued collaboration between the two research groups on two other studies in collaboration, leading to co-authored publications, presently in press.

Researchers from the Faculty of Medicine, Sherbrooke University, Canada (Dr. Martine Chamberland; Dr. Christina St-Onge), with whom a series of joint studies on the role of self-explanation in clinical teaching have been conducted, leading to co-authored articles submitted for publication.

National

Relation between biological and psychological stress and well-being, and academic performance (Karen Stegers-Jager & Andrea Woltman). This pilot study aims to investigate the relation between chronic psychological and biological stress levels and academic performance. Furthermore, both student-related factors as well as school-related factors will be studied that may influence stress levels, academic performance and students' well-being as defined by time use, including extracurricular activities, and (absence of) conflicts between life domains (study, family, work, leisure time).

Chronic psychological and biological stress levels, as measured by psychological stress questionnaires and hair cortisol concentrations respectively, and academic performance of the last medical student cohort entering before and the first cohort entering after the implementation of a strict academic dismissal policy will be compared. In this project we collaborate with the Section Endocrinology of the Department of Internal Medicine, and with the Section Pedagogical Sciences of the Faculty of Social Sciences of the EUR.

As part of the research project on instructional approaches for the teaching of reflective reasoning, a study was conducted in collaboration with the General Practice Department, ErasmusMC.

Collaboration (international/national)

Research group 'Dedicated Schakeljaar' (NFU/ all Dutch medical schools).

InReSH (International Network for Researchers in Selection into Healthcare).

Dutch Flemish network of Researchers in Personnel Recruitment and Selection.

The iMERR clinical reasoning research group (Laura Zwaan) collaborates with Dr. Hardeep Singh (Houston Veterans Affairs Center for Innovations in Quality, Effectiveness and Safety and Baylor College of Medicine, Houston, Texas) on several papers regarding measurement of diagnostic error. This resulted in

several papers .

iMERR (Laura Zwaan) and the general practice department of the Erasmus MC (Dr. Pieter van den Berg and Prof. Dr. Patrick Bindels) have submitted a research proposal on 'learning from mistakes' to ZonMw.

iMERR (Laura Zwaan) collaborates with the institute for Medical Education of the Ludwig-Maximilians-University, Munich, Germany (Prof. Martin Fisher, Dr. Jan Kiesewetter and Leah Braun, MSc). This resulted in one published paper.

iMERR (Laura Zwaan) collaborates with Dr. Wolf Hautz (Inseltelhospital (Bern) and Julianne Kämmer (Max Planck Institute Berlin). This resulted in one submitted manuscript.

Research reputation

Ad hoc reviewing In 2017, the iMERR researchers worked as ad hoc reviewers:

For the top medical education journals (Medical Education, Academic Medicine, Advances in Health Sciences Education and others) and general higher education journals (Studies in Higher Education, Learning and Instruction and others) and for manuscripts on medical education submitted to top medical journals (JAMA, BMJ, Annals of Internal Medicine and others).

For international medical education conferences (Association for Medical Education in EuropeAMEE conference), including grant reviewing.

Presentation in national and international conferences

Research conducted by the iMERR members and by internal and external PhD students was presented at the 2017 NVMO, AMEE and Ottawa conferences. The latter are the largest international medical education conferences. Presentation Mw. Dr. Karen Stegers-Jager tijdens Witte Jassen ceremonie VUmc Amsterdam over Diversiteit in medisch onderwijs.

Conference Organization

Mrs. Dr. Laura Zwaan is on the planning committee of the international Diagnostic Error in Medicine conference.

Mrs. Dr. Laura Zwaan is the co-chair of the European Diagnostic Error in Medicine conference in Bern (Switzerland) 30-31 August, 2018.

Mrs. Dr. Karen Stegers-Jager is on the planning committee of the yearly conference of the Netherlands Association for Medical Education (NVMO). She will host/chair the meeting in November 2019 in Rotterdam

Positions in professional society

Mrs. Dr. Laura Zwaan is the co-chair of the research committee of the Society to Improve Diagnosis in Medicine http://www.improvediagnosis.org/?page=Committees.

Mrs. Dr. Karen Stegers-Jager is member of the scientific committee of the NVMO.

Editorial Board

Mrs. Dr. Laura Zwaan is on the editorial board of Diagnosis. Dr. Walter van den Broek is on the editorial board of the Dutch Flemish Journal of Psychiatry and Current Drug Therapy. Dr. Silvia Mamede is on the editorial board of Health Professions Education.

Fellows

- Mrs. Dr. Silvia Mamede, MD, PhD, co-director of iMERR
- Prof. Dr. Ir. Axel Themmen, chair of the advisory board of iMERR
- Mrs. Dr. Karen Stegers-Jager, PhD, member advisory board iMERR
- Mrs. Dr. Andrea Woltman, PhD, member advisory board iMERR
- Prof Dr. Henk Schmidt, PhD, member advisory board iMERR
- Mrs. L. Zwaan, PhD, member advisory board iMERR

Associate members

- Jelmer Alsma, MD
- Prof. Dr. Patrick Bindels, MD, PhD
- Dr. Herman Bueving, MD, PhD
- Mrs. Mary Dankbaar
- Prof. Dr. Matthijs de Hoog, MD, PhD
- Mrs. Dr. Stephanie Klein Nagelvoort-Schuit, MD, PhD
- Prof. Dr. Els Berns, PhD

Honorary members

- Prof. Dr. Geoff Norman, PhD

Societal impact

Societal impact iMERR. Publicaties voor leken: Rijken S, De Leng, WE, Coppiëns, P. Belangrijk bij selectie: Adequate voorlichting en gelijke doorstroomkansen. Hoger Onderwijs Management. 2017;5:4-7.

Interviewed by David Robson, from Hodder and Stoughton (UK) and WW Norton (USA and Canada), about reflective practice, for the chapter on diagnostic errors in medicine in a popular science book about intelligence and decision making currently under development. (S. Mamede).

Reacties in de pers op patiëntveiligheid: Artikel in Magazine “Zelden één aanwijsbare reden voor een verkeerde diagnose” Alert Magazine, Juni 2017 (L. Zwaan).

Article in Newspaper: Interviewed by Trouw on second opinions ‘Second opinion niet per se beter dan de eerste’. Published February 13, 2017 (L.Zwaan).

Laura Zwaan was coauthor on a report on adverse events in Dutch hospitals. This report was a topic in all major newspapers and was the first item in the Dutch news on television the day the report came out.

Interviewed by David Robson, from Hodder and Stoughton (UK) and WW Norton (USA and Canada), about reflective practice, for the chapter on diagnostic errors in medicine in a popular science book about intelligence and decision making currently under development. (S. Mamede).

Selectie van scholieren voor opleiding Geneeskunde: Presentation at Wetenschapscafe, title “Hoe fataal is de eerste indruk?”, October 30th 2017, >70 visitors; this presentation led to a newspaper article in ‘Nederlands Dagblad’ on the same day entitled ‘De eerste indruk zegt lang niet alles’. (K. Stegers-Jager).

Geert Maarse. Is de universiteit een segregatiemachine? Erasmus Magazine. September 20th 2017. Interviewed on the research on ethnic disparities in medical school performance. (K. Stegers-de Jager)

Mrs.Dr. Mary Dankbaar, assistent professor and fellow of iMERR, MSc in Educational Science, PhD in Medical Education from the Erasmus University Rotterdam.

PhD guidance:

Tjitske Faber started her PhD in September 2017 under the guidance of dr. Mary Dankbaar (co-promotor), prof.dr.Walter van den Broek (promotor) en prof.dr.Jeroen van Merrienboer (promotor at Maastricht University, School of health professional Education).

Her PhD-project is focused on the design of game-based learning, and the role that cognitive indicators (game-data , cognitive load) and non-cognitive indicators (eye-movements, stress) may play for learning professional and self-regulated skills using games.

Laura Kranenburg started her PhD in 2012 under the guidance of dr. Mary Dankbaar (co-promotor) prof.dr.Mieke Hazes (promotor) and prof.dr. Walter van den Broek (promotor). Her PhD-project is focused on the effectiveness of e-learning and e-consultation for medical experts and the comparative effectiveness of online and face-to-face feedback for learning complex communicative skills.

Tahmina Nazari started her PhD in 2016 under the guidance of dr. Mary Dankbaar (co-promotor) and prof.dr. Johan Lange (promotor). Her PhD-project is on the effectiveness of the step-by-step method to train surgical procedures. In this newly proposed method a standardized structure is used for the description and demonstration of surgical procedures, using concise and unambiguous definitions to demarcate the steps and substeps in this procedure. In different studies, in collaboration with the Mayo clinic in the US and the LUMC in Leiden, the comparative effectiveness of the step-by-step method and continuous demonstration of surgical procedures are investigated.

Mrs. Dr. Karen Stegers-Jager, assistant professor and fellow of iMERR, MSc in Educational Science and Technology, PhD in Medical Education from the Erasmus University Rotterdam.

PhD guidance:

Louise Urlings-Strop, Erasmus MC, Rotterdam (together with Prof. Dr. Axel Themmen (Erasmus MC)), expected early 2018. Thesis theme: medical school selection

Wendy de Leng, Erasmus MC, Rotterdam (together with Prof. Dr. Axel Themmen (Erasmus MC) & Prof. Dr. Marise Born (EUR)), expected end 2018.

Lokke Gennissen, Erasmus MC, Rotterdam (together with Prof.dr. Matthijs de Hoog (Erasmus MC), Prof.dr. Jacqueline de Graaf & Dr. Lia Fluit (Radboudumc), expected mid 2018.

Rob Kickert, Faculty of Social Sciences, Erasmus University Rotterdam (together with Prof.dr. Peter Prinzie, Prof.dr. Lidia Arends & Dr. Marieke Meeuwisse (all EUR)), expected early 2020. Thesis theme: Academic performance, behavior and student characteristics under a renewed examination system.

Chantal van Andel, Erasmus MC, Rotterdam (together with Prof. Dr. Axel Themmen (Erasmus MC) & Prof. Dr. Marise Born (EUR)), expected early 2021.

Projects Relation between biological and psychological stress and well-being, and academic performance (Karen Stegers-Jager & Andrea Woltman). This pilot study aims to investigate the relation between chronic psychological and biological stress levels and academic performance.

Furthermore, both student-related factors as well as school-related factors will be studied that may influence stress levels, academic performance and students' well-being as defined by time use, including extracurricular activities, and (absence of) conflicts between life domains (study, family, work, leisure time).

Chronic psychological and biological stress levels, as measured by psychological stress questionnaires and hair cortisol concentrations respectively, and academic performance of the last medical student cohort entering before and the first cohort entering after the implementation of a strict academic dismissal policy will be compared.

In this project we collaborate with the Section Endocrinology of the Department of Internal Medicine, and with the Section Pedagogical Sciences of the Faculty of Social Sciences of the EUR.

Mrs. Dr. Laura Zwaan, psychologist, assistant professor and fellow at the institute for Medical Education Research Rotterdam.

PhD guidance:

Shaikha Hamed Al-Aujan, dentist, King Saud bin Abdul-Aziz University for Health Sciences, Riyadh, Saudi Arabia. Thesis theme: Expertise in clinical reasoning in dentistry.

Collaborations The iMERR clinical reasoning research group (Laura Zwaan) collaborates with the university of McMaster University, Canada, and the University of Washington (USA) on a project on cognitive biases in clinical reasoning. The data-gathering is currently ongoing. The project will result in a joint publication.

The iMERR clinical reasoning research group (Laura Zwaan) collaborates with Dr. Hardeep Singh (Houston Veterans Affairs Center for Innovations in Quality, Effectiveness and Safety and Baylor College of Medicine, Houston, Texas) on several papers regarding measurement of diagnostic error. This resulted in several papers .

iMERR (Laura Zwaan) and the general practice department of the Erasmus MC (Dr. Pieter van den Berg and Prof. Dr. Patrick Bindels) have submitted a research proposal on 'learning from mistakes' to ZonMw.

iMERR (Laura Zwaan) collaborates with the institute for Medical Education of the Ludwig-Maximilians-University, Munich, Germany (Prof. Martin Fisher, Dr. Jan Kiesewetter and leah Braun, MSc). This resulted in one published paper.

iMERR (Laura Zwaan) collaborates with Dr. Wolf Hautz (Inseltelhospital (Bern) and Julianne Kämmer (Max Planck Institute Berlin). This resulted in one submitted manuscript.

Conference organization Mrs. Dr. Laura Zwaan is on the planning committee of the international Diagnostic Error in Medicine conference in Boston (2017) and New Orleans (2018).Mrs. Dr. Laura Zwaan is the co-chair of the European Diagnostic Error in Medicine conference Bern, Switzerland (2018).

Positions in professional society Mrs. Dr. Laura Zwaan is the chair of the research committee of the Society to Improve Diagnosis in Medicine (http://www.improvediagnosis.org/?page=Committees) (She stepped down as the chair of January 1st 2018, she is still a member of the committee).

Editorial Board Mrs. Dr. Laura Zwaan is on the editorial board of Diagnosis.

Invited presentations:

- Staff day General practice department, Zwijndrecht (1 February 2017)
- Max Planck Institute for Human Development Berlin, Germany. (23 February 2017)
- Symposium PhD defense Anouk van der Gijp, Utrecht (19 September 2017)
- VA Houston/ Baylor college of Medicine, Houston, USA (11 July 2017)
- Patiënt Safety inspiration day, Erasmus MC, Rotterdam (14 November 2017)