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Fostering the scientific workforce: motivating students for research as a first step towards success? (0182)

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Introduction

It is critical to make advancements and evolve within every field of expertise. Scientific knowledge is important to make progress in most domains, as it could not only contribute to refining existing knowledge, but could help in creating new knowledge as well. Researchers are key in the process of developing knowledge and the translation of knowledge into practice. Thereby, researchers are essential for advancements within specific domains and life-long learning of professionals. This is reflected in the growing number of research courses and programmes that are provided during higher education, with the aim to stimulate active participation, challenge students, and promote engagement in research in the future (Havnaer et al., 2017; Healey et al., 2010; Scager et al., 2014).

Within the medical domain, research is needed to offer the best possible patient care. Physicians conducting research (i.e. physician-scientists) are indispensable for making advancements in medicine, as they can bridge the gap between science and practice. Physician-scientists can translate research outcomes into clinical practice and, for instance, contribute to the development of new or existing treatment methods. However, despite the well-known importance of physician-scientists, the medical field is facing a shortage of physician-scientists. A decline in interest in scientific careers combined with the aging of the current physician-scientist workforce is a serious problem (Chang and Ramnanan, 2015; Hall et al., 2017; Yin et al., 2017).

Previous studies indicated that student participation in research is related to future involvement in research (Chang and Ramnanan, 2015; Wolfson et al., 2017). Hence, motivating students for research during higher education could help to inspire students and cultivate the next generation of researchers (Chang and Ramnanan, 2015; Furtak et al., 2012). Many motivational theories describe antecedents of motivation for an activity. For instance, the Social Cognitive Theory identifies self-efficacy beliefs as related to motivation and the

Self-Determination Theory identifies autonomy, relatedness, and competence as three components that are fundamental to intrinsic motivation (e.g. being motivated for an activity out of interest or enjoyment). Consequently, previous studies focused on motivation as the key outcome measure (Burgoyne et al., 2010; Nel et al., 2014; Rosenkranz et al., 2015; Vereijken et al., 2018). The question however arises if students act upon their self-reported motivation and if it is justified to pose motivation for research as the key parameter of success. If the goal is to develop physician-scientists by stimulating students' motivation for research, it is important to establish that motivation for research leads to actual research participation. However, no previous studies within the medical education context had this aim.

Therefore, this study aims to examine if motivation for research is a first step towards success in fostering the physician-scientist workforce, by investigating if motivation for research among first-year medical students influences involvement in research, also after adjusting for gender, age, extracurricular high-school activities, self-efficacy, perceptions of research, and curiosity.

Methods

This prospective cohort study follows all medical students starting their medical bachelor's program in 2016 at Leiden University Medical Center (LUMC). We surveyed first-year medical students at the start of medical training. We composed a 7-point Likert type questionnaire consisting of 33 items ranging from 1 (totally disagree) to 7 (totally agree). We adjusted validated scales to make them applicable to the medical education setting with a focus on research activities.

Involvement in research was operationalized as the enrollment of students in the extracurricular research-based Honors program of the LUMC. Additionally, we used information from a questionnaire within the same cohort at the start of the second year to identify students who were voluntarily conducting research outside of the program. All students that indicated that they were conducting research, but were not enrolled in the Honors program, were approached by the first author to discuss their research activities. Thus, students were seen as 'involved in research' if they 1) enrolled in the research-based Honors program or 2) were identified as involved in voluntary research activities outside of the regular curriculum and the research-based Honors program.

Results

Out of the 316 approached students, 315 participated in the survey (99.7%). In total, 55 students (17.46%) were identified as involved in research: 50 enrolled in the research-based Honors program and five involved in voluntary research activities outside of the program. Intrinsically motivated first-year students were more often involved in research in their second year (OR=3.4, 95%CI=2.07-5.58). This effect remained significant after adjusting for gender, age, pre-university activities, self-efficacy, perceptions, and curiosity (OR=2.5 , 95%CI=1.34-4.76). Extrinsically motivated students were more often involved in research as well (OR=1.4, 95%CI=.96-2.1), however this effect was not significant after adjusting for gender, age, pre-university activities, self-efficacy, perceptions, and curiosity (OR=1.04, 95%CI=.67-1.63). Moreover, the effect of intrinsic motivation even remained significant after adjusting for extrinsic motivation (OR=3.4, 95%CI=2.01-5.7). The opposite is the case for the effect of extrinsic motivation, which was not significant after adjusting for intrinsic motivation (OR=1.01, 95%CI=.67-1.55).

Discussion

Intrinsic motivation for research at the start of medical training has a strong effect on research involvement in the second year, even after adjusting for multiple possible confounding factors. Extrinsic motivation influences research involvement on its own, but does not remain significant after adjusting for multiple possible confounders. Furthermore, the effect of intrinsic motivation remains highly significant after adjusting for extrinsic motivation, while the effect of extrinsic motivation loses significance after adjusting for intrinsic motivation.

Our findings are in line with the Self-Determination Theory, which emphasizes quality of motivation instead of quantity of motivation. SDT states that intrinsic motivation is of high quality and should be stimulated, as this improves academic performance and overall wellbeing (Ryan and Deci, 2000). Our results indicate a strong influence of intrinsic motivation and showed that extrinsic motivation alone does not contribute to research involvement on top of intrinsic motivation. This implies that intrinsic motivation should be stimulated in students in order to promote research involvement and could indeed be seen as a first step towards success to foster the scientific workforce.

References

Burgoyne, L. N., O'Flynn, S., & Boylan, G. B. (2010). Undergraduate medical research: the student perspective. *Medical Education Online, 15*(1), 5212.

Chang, Y. J., & Ramnanan, C. J. (2015). A Review of Literature on Medical Students and Scholarly Research: Experiences, Attitudes, and Outcomes. *Academic Medicine, 90*(8), 1162-1173. doi: 10.1097/acm.0000000000000702

Furtak, E. M., Seidel, T., Iverson, H., & Briggs, D. C. (2012). Experimental and Quasi-Experimental Studies of Inquiry-Based Science Teaching: A Meta-Analysis. *Review of Educational Research, 82*(3), 300-329. doi: 10.3102/0034654312457206

Hall, A. K., Mills, S. L., & Lund, P. K. (2017). Clinician–investigator training and the need to pilot new approaches to recruiting and retaining this workforce. *Academic Medicine, 92*(10), 1382.

Havnaer, A. G., Chen, A. J., & Greenberg, P. B. (2017). Scholarly concentration programs and medical student research productivity: a systematic review. *Perspect Med Educ, 6*(4), 216-226. doi: 10.1007/s40037-017-0328-2

Healey, M., Jordan, F., Pell, B., & Short, C. (2010). The research-teaching nexus: a case study of students' awareness, experiences and perceptions of research. *Innovations in Education and Teaching International, 47*(2), 235-246. doi: 10.1080/14703291003718968

Nel, D., Burman, R. J., Hoffman, R., & Randera-Rees, S. (2014). The attitudes of medical students to research. *Samj South African Medical Journal, 104*(1), 32-36. doi: 10.7196/samj.7058

Rosenkranz, S. K., Wang, S., & Hu, W. (2015). Motivating medical students to do research: a mixed methods study using Self-Determination Theory. *Bmc Medical Education, 15*(1), 95.

Ryan, R. M., & Deci, E. L. (2000). Self-determination Theory and the Facilitation of Intrinsic Motivation, Social Development, and Well-Being. *American Psychologist, 55*(1), 68-78.

Scager, K., Akkerman, S. F., Pilot, A., & Wubbels, T. (2014). Challenging high-ability students. *Studies in Higher Education, 39*(4), 659-679. doi: 10.1080/03075079.2012.743117

Vereijken, M. W. C., van der Rijst, R. M., van Driel, J. H., & Dekker, F. W. (2018). Student learning outcomes, perceptions and beliefs in the context of strengthening research integration into the first year of medical school. *Adv Health Sci Educ Theory Pract, 23*(2), 371-385. doi: 10.1007/s10459-017-9803-0

Wolfson, R. K., Alberson, K., McGinty, M., Schwanz, K., Dickins, K., & Arora, V. M. (2017). The Impact of a Scholarly Concentration Program on Student Interest in Career-Long Research: A Longitudinal Study. *Acad Med, 92*(8), 1196-1203. doi: 10.1097/ACM.0000000000001486

Yin, C., Steadman, P. E., Apramian, T., Zhou, T. E., Ishaque, A., Wang, X., . . . Warsi, N. (2017). Training the next generation of Canadian Clinician-Scientists: charting a path to success. *Clin Invest Med, 40*(2), E95-E101. doi: 10.25011/cim.v40i2.28200