

## Mind your step

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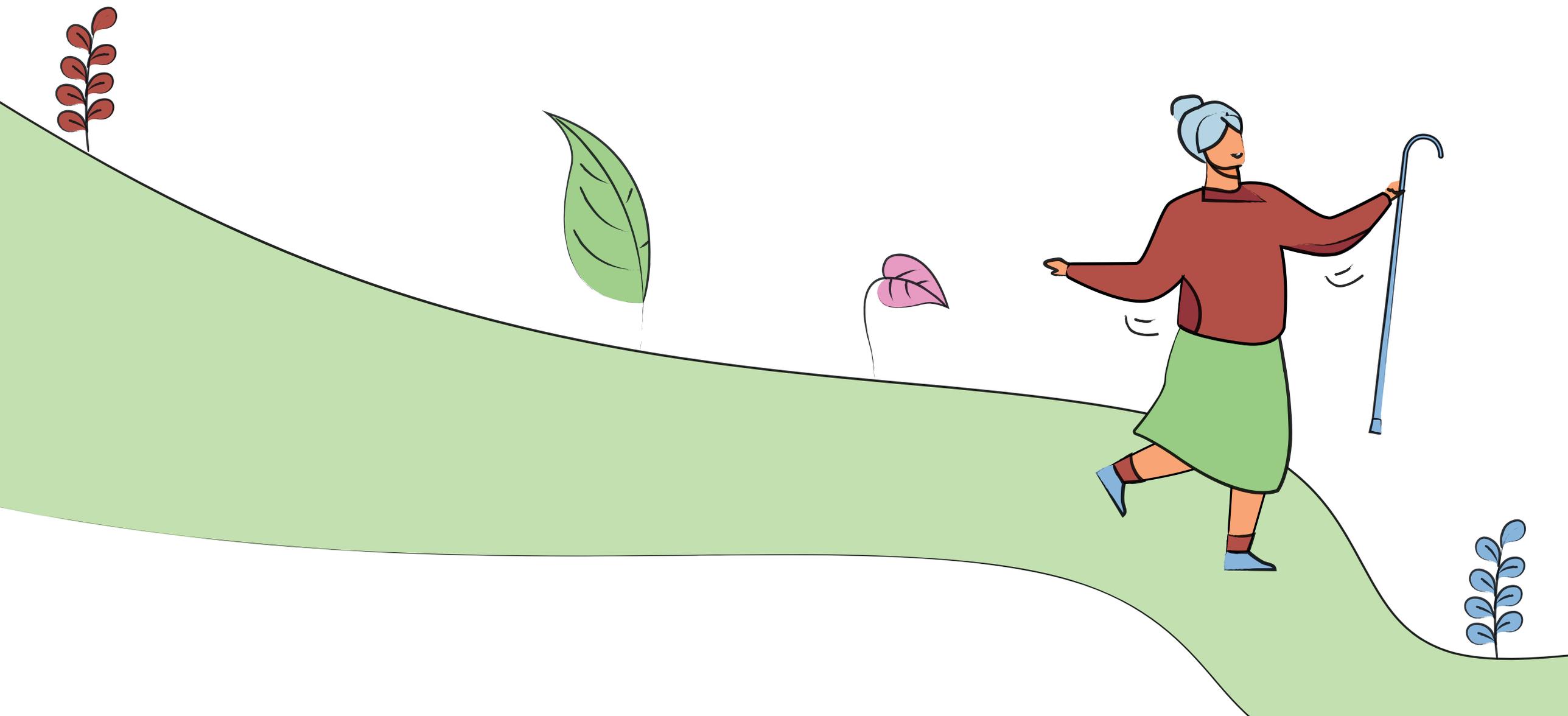
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# CHAPTER 9

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At the end of this PhD trajectory, it is important for me to reflect on the scientific and societal significance of my research projects and, most importantly, on their significance at the patient level. The present research was aimed at enhancing clinical work and improving patients' outcomes by identifying relevant parameters for the future development of a targeted therapy for fall risk.

The results of this thesis indicate that assessing hip abductor strength helps with understanding older persons' fall risks. The hip-abductor-strength assessment is feasible in older persons, shows good clinimetric properties and provides additional value to currently used fall risk evaluations and, thus, to fall risk prevention and rehabilitation programs. It evaluates complementary aspects of falls but is not yet measured systematically. Furthermore, currently used performance-based fall-risk assessments only show moderate ability to discriminate between fallers and non-fallers, and the setting where the tests will be performed strongly influences which tests can be recommended for clinical use.

### *Scientific and social relevance of this research*

Regarding the scientific relevance, this is the first project to investigate all hip muscle strength groups in the same study, subsequently confirming our hypotheses on the importance of hip abductor strength in discriminating between fallers and non-fallers. This is a highly relevant result considering the growing proportion of persons aged  $\geq 65$  years and the related need for actions to improve fall-risk detection and prevention. The systematic review showed that currently used fall-risk assessments only have moderate diagnostic accuracy, that single performance tests are less investigated than multidimensional fall-risk assessments and that the often-used multidimensional fall-risk assessments do not necessarily have a better ability to discriminate between fallers and non-fallers than single performance tests do. Regarding the good diagnostic accuracy of hip abductor strength, single performance tests should be investigated in greater detail, especially given that they usually do not take long to perform and give a good indication of what treatment should be targeted. For future research, this knowledge about the importance of hip abductor strength should encourage investigations into effective interventions with which to decrease the risk of falls among persons aged  $\geq 65$  years.

To increase the scientific impact, the results of this thesis have been presented at national and international conferences and published in scientific journals.

Due to the direct clinical applicability of our findings, the results are of interest for scientists, clinicians and teachers, for whom the relationship between hip abductor strength and mediolateral stability seems evident. The clinical value and scientific validation of the present findings facilitate their implementation into

clinical practice. To close the gap between research and practice, we presented the results by healthcare institution (e.g., at hospitals and nursing homes). In addition, we have started to integrate the results in continuing education classes on geriatrics at regional physiotherapy associations in Switzerland and at the University of Applied Sciences and Arts of Western Switzerland.

The interest of physiotherapists in our results and our exchanges with different clinicians encouraged us to evolve the measurement instrument and method. We aimed to develop a measurement procedure to measure hip abductor muscle strength in a functional standing and a closed chain position, using an instrument that is easy to transport and manipulate, and that should directly display the measured values without needing time-consuming post hoc data extraction. These are essential issues with which to guarantee the wide clinical use of our measurement instrument and thus to create a long-term impact on healthcare.

A prototype considering these needs was developed in collaboration with engineers at the Institute of Industrial Technologies and Sciences, University of Applied Sciences and Arts Western Switzerland. Funding applications were submitted for further development of our invention and to assess the reliability (inter and intra-rater) and criterion validity of the newly developed measure and procedure. (A multicenter study is currently ongoing.) An agreement was signed among the University of Geneva, the University Hospitals of Geneva and the University of Applied Sciences and Arts of Western Switzerland for the intellectual property as well as for first funding for patent submission. The patent for the new measurement instrument and procedure was filed at the European Patent Office in October 2020 (application and patent number 202000 13.9-1115). Discussions are currently underway with potential companies and commercial partners to develop the prototype further, submit the final patent and commercialize our measurement instrument. The commercialization of this new test procedure will be an important step for implementing hip abductor strength as an indicator of fall risk and adding it to a well-targeted prevention or rehabilitation intervention.

At the patient level, this dissertation contributes important information on a new, easy to use fall-risk assessment. Moreover, the explanations provided to assist clinicians in understanding how to use and interpret the diagnostic accuracy of the measurement instruments should improve the use of fall-risk assessments and result in earlier detection of older persons at risk of falls. The quality of life of the concerned persons will improve (or stay constant) because they will be able to stay independent for as long as possible during their daily life activities in their known surroundings and participate in social activities.

Socially, we underline that early detection of persons at risk of falls allows for better prevention of first and/or recurrent falls, which will impact societal and

economic concerns and enhance the use of human resources because treatments can be targeted better. In this thesis, we did not investigate the economic impact of improved fall-risk detection. However, falls have significant medical, societal and financial consequences and contribute to the huge economic costs for aging societies.

### *Valorization of the results for specific target groups and their perspectives of the future*

The most important group benefitting from the present results are patients aged  $\geq 65$  years. Both today and in the future, better-targeted fall-risk detection and tests with good diagnostic accuracy will help to recognize persons susceptible to falls and assist them in choosing interventions to decrease this risk. Individual goal setting by the patient, together with the healthcare professional, will help patients to maintain their actual state of independence and take an active part in their familiar and societal environment for as long as possible. Many organizations grouping older persons exist that can offer a wide variety of activities and courses. Knowledge among the coaches and leaders of the groups will allow the implementation and transfer of knowledge from healthcare professionals to persons aged  $\geq 65$  years and thereafter within the population of older persons itself.

Healthcare professionals are another large group that will benefit from the results of this dissertation. Better knowledge of the diagnostic accuracy of newly investigated and currently used fall-risk assessments will allow for well-targeted detection of persons at risk as well as interventions. However, in the future, it will be necessary to transfer the research findings to health care professionals in order to create inside knowledge that will allow caregivers to correctly interpret the test's diagnostic accuracy and results. This knowledge transfer will reinforce the clinical reasoning process together with the patient and help healthcare professionals to use the test results as a probability of fall risk, rather than a dichotomous yes or no value. The systematic review shows that fall risk detection should be a process between the health care professional and the concerned person that considers the results of several fall-risk assessment tests, the person's setting and personal goal setting and other information.

Researchers are another group benefitting from the insights the different projects described in this thesis. Our results are a nice starting point for future research projects investigating possible interventions including hip abductor strength and for further research on improving the ability to detect persons at risk of falls (with a focus on single but also multidimensional performance tests).

Therefore, the benefits of this dissertation concern a substantial percentage of persons aged  $\geq 65$  years, given that (over all settings) approximately 40% of the older population is at risk of falling, as well as healthcare professionals, researchers and thus society.

## CONCLUSION

The knowledge gained from the different projects comprising this PhD thesis will be beneficial for researchers, healthcare professionals, persons aged  $\geq 65$  years, caregivers and relatives of people who are at risk of falls. Therefore, it will have high scientific, societal and clinical impacts. We recommend assessing hip abductor strength for diagnostic purposes and encourage its assessment in daily clinical use.