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S12-2: Assistive Robotics for Assessment of Motor Performance and Promotion of Physical Activity in Older Adults

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Purpose: As persons get older, their motor performance/fitness and levels of physical activity/mobility decline. However, maintenance of motor performance and sufficient levels of physical activity are critical for physical health, cognitive function, and quality of life, amongst other health outcomes. In recent years, assistive robotics, such as wearable or social robots, are increasingly being developed and examined as tools not only to provide assistance and support to older adults, but also to assess motor performance and promote physical activity.

Methods: We followed a multi-method approach by conducting literature-based research to examine the use of wearable robotics such as exoskeletons for lower limb motor performance assessment, and of social robots such as humanoid robots for motor (and cognitive) performance assessment and physical activity promotion/training. In addition, we also carry out small scale, laboratory-based studies to examine feasibility, acceptability, and effectiveness of robotic tools for the assessment and training of motor performance and physical activity in older adults.

Results: A growing number of studies provides evidence of a successful use of exoskeletons to assess motor performance in older adults, although many questions regarding design of the robot and the optimal assessment process remain unsolved. We postulate that exoskeleton-integrated sensors may be used to measure lower limb motor performance related to gait, posture, muscle strength, and proprioception, which are known to decline during ageing, and could augment widely-implemented standard clinical tests in the future. Several studies have also examined social robot-assisted physical activity in older adults, albeit mainly in seated positions and focused on the upper body, and reported promising findings on psychological outcomes such as participants' engagement and interaction with or acceptance towards the robots. Preliminary findings from laboratory-based research show that a lower limb exoskeleton does not appear to have a negative impact on static balance which is an important prerequisite for potential future application as motor performance assessment tool.

Conclusions: The presentation will provide practical insights into literature-based and experimental assistive robotics research projects related to active ageing, and discuss methodological considerations, as well as challenges and opportunities for the future.

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