

**Perspectives on interdisciplinary posture and gait research from the ISPGR 2025 World Congress**

**Where do we stand and what are the next steps?**

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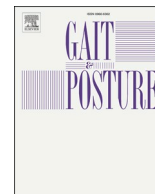
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## Perspectives on interdisciplinary posture and gait research from the ISPGR 2025 World Congress: Where do we stand and what are the next steps?

Since its inception, the International Society of Posture and Gait Research (ISPGR) has promoted close collaboration between researchers and clinicians, uniting basic science with clinical application. The ISPGR is a member-led organization supported by dedicated staff, with more than 500 members from over 20 countries. As the winners of the Emerging and Promising Scientist Awards at the 2025 World Congress, held from 29 June to 3 July in Maastricht, we were invited to share our highlights and our perspective on the future of posture and gait research. In this letter, we outline the history and development of the ISPGR, offer our perspective on this year's congress and the current state of the field, and look ahead to the future of posture and gait research.

Established in 1969 as the International Society of Posturography, the society initially focused on quantitative study of standing posture. Between 1969 and 1983, it played a central role in developing methodological consistency within the field. At the 1979 Amsterdam meeting, concerns about variation between laboratories prompted a movement toward greater standardization. By 1981 in Kyoto, force platforms had become the preferred measurement tool, and by 1983 in Houston the society had broadened its focus to include balance and gait control. This expansion was formally recognized in 1986 with a new name—the International Society for Postural and Gait Research—signalling the inclusion of gait in its remit. Through the late 1980s and 1990s, membership grew to over 300, reflecting an expanded scope that came to include neurophysiology, biomechanics, movement disorders, aging and development, rehabilitation and assistive technologies, computational modelling, motor learning, and measurement standardization. In the 2000s, the society increased its international reach by rotating congresses across continents, and in 2015 refined its title to the International Society of Posture and Gait Research. The 50th-anniversary congress, held in Edinburgh in 2019, celebrated the society's continual impact and welcomed around 700 participants, more than 40 % of whom were students or early-career researchers. The 2025 congress, with approximately 600 attendees from 34 countries, was themed 'Productive Interactions', placing special emphasis on building interdisciplinary connections across levels of analysis—from 'Muscles to Minds'—to drive discoveries in posture and gait research.

Across the 2025 World Congress, several key themes emerged from the keynotes and symposia (programme [1] and proceedings [2] available on the ISPGR website). To illustrate this, we highlight a subset of sessions that reflect the congress's interdisciplinary focus. Within the 'Muscles to Minds' theme, the opening keynote by Bas Bloem (Radboudumc) provided a clinical perspective on gait disturbances in Parkinson's disease across the entire disease spectrum, emphasizing their complexity and impact on daily life. In Keynote 2, Fabrisia Ambrosio (Harvard University) traced the journey from molecules to movement, showing how biochemical signatures of aging and exercise influence

physical function and adaptability. In keynote 3, Ole Kiehn (University of Copenhagen) examined brainstem circuits that orchestrate locomotion, with implications for understanding and treating gait disorders. Complementing these keynotes, several symposia — including Symposium 7 on real-world signatures of locomotion in aging and neurodegeneration, Symposium 10 on mobile brain-body imaging, and Symposium 14 on compensatory prefrontal mechanisms — examined how everyday movement patterns and neural processes jointly shape balance and gait. Together, these sessions underscored the congress's commitment to understanding movement as a whole-body phenomenon, spanning levels of analysis from muscles to minds.

As noted above, impact beyond academia has always been central to the society. At this year's congress, this goal was particularly evident in the focus on collaboration with non-scientists to ensure broader impact. In keynote 4, 'Paper or Product? How to Impact Society Through Wearables Research', Peter Shull (Shanghai Jiao Tong University) discussed how wearable technology can move beyond academic publications to create measurable improvements in mobility and health, and how collaboration with industry can support this. The YES/NO Debate on end-to-end patient and public involvement brought together Bas Bloem, Meghan Ambrens, Will Young and Morag Taylor to discuss the opportunities and challenges of fully integrating patients and the public throughout the research process. Symposium 5 on co-developing technology-enhanced training approaches presented examples of co-creation with end-users, emphasizing collaborative design and translation of technologies into usable interventions. Other presentations, such as Antoine Langeard's participatory evaluation of environmental fall-risk factors and Rosie Morris's co-designed app for falls reporting in Parkinson's disease, reinforced the theme of research that engages the public to bridge academic, clinical and societal relevance.

A final major theme across the congress concerned technological advances, including wearables, robotics, exergames, digital mobility, and virtual reality. Symposia 1, 2, 11 and 13 focused on intervention technologies, showcasing innovations in wearable devices, robotic systems, interactive exergames, vestibular stimulation and immersive tools to enhance rehabilitation, balance control and therapeutic engagement. Symposia 9 and 12 emphasized measurement and outcomes, focusing on how sensor data and digital mobility metrics can be translated into meaningful markers for disease progression, clinical assessment, and research evaluation. Symposium 3 on priorities for AI applications in fall-risk management addressed how to build expert consensus on AI-based fall-risk assessment and management. Finally, Symposium 16 on large-scale virtual reality systems demonstrated immersive technologies that can support both intervention and high-fidelity measurement. Together, these sessions underscored the field's growing integration of technology to measure and improve human movement in research and

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clinical contexts.

Although the ISPGR 2025 World Congress demonstrated tremendous progress across these core themes and other areas of posture and gait research, there are naturally many aspects that require further development. Here, we highlight two such areas.

The first, which emerged in several contexts during the congress, concerns to what we are comparing or striving towards when assessing or training specific populations, and whether the reference data, models or standards are representative of, realistic for, and desirable to the target population. These issues may arise, for example, in assistive robotics and prosthetics, when systems are optimized towards normative or ‘correct’ reference gait patterns (e.g., healthy or intact-limb kinematics), which may not fully reflect individual users’ preferences, comfort or functional needs [3]; in musculoskeletal modelling, when the target population differs in sex or age from the sample underpinning the model [4]; in artificial intelligence technologies trained on non-representative data and validated only in single-centre or laboratory settings, where performance may deteriorate when applied across centers [5,6]; or when researchers define new research questions or outcomes and consider how these relate to the priorities of patients, healthcare practitioners and other stakeholders (see Bowring, et al. [7] and Richmond, et al. [8] for examples of such studies). In terms of machine learning, real-world digital mobility sessions at the congress highlighted how difficult it can be to interpret real-world outcomes when contextual information and appropriate reference ranges are lacking. This points to emerging opportunities in large-scale real-world data: longitudinal datasets, rich digital mobility measures, and data-sharing practices that enable more robust methods and reference ranges [9]. We therefore recommend that the field proactively ensure that research goals and reference standards align more closely with what is representative, realistic and important for the populations in question.

The second area, which appeared more often than in previous congresses but still requires attention, is the translation of research into practice. In particular, topics such as cost-effectiveness and clinical or industrial uptake remained relatively uncommon. In part, this may be due to the need to engage and collaborate with experts from additional fields (e.g., health economists, clinical administration and insurance). One illustrative example came from Maaikje Gameren, who showed that while the Dutch ‘In Balance’ fall-prevention intervention did not statistically significantly reduce falls, it was cost-effective in a fall prevention context. As discussed above, we are positive about the ISPGR’s focus and success in interdisciplinary collaboration, but the field should not be complacent and must continue to work with other experts and industries to ensure that our science benefits the public.

In summary, the 2025 congress was motivating for us as emerging scientists, reinforcing both the progress made and the challenges that remain. We are excited for a more inclusive and translational future for the field, and we look ahead with enthusiasm to the 2027 World Congress in Kyoto.

## CRediT authorship contribution statement

**Christopher McCrum:** Conceptualization, Writing – original draft, Writing – review & editing. **Benjamin Filtjens:** Conceptualization, Writing – original draft, Writing – review & editing.

## Declaration of Competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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