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Special issue:
"Control of Gait and Posture: a tribute to Professor Lilian T. B. Gobbi"

Editorial: Control of Gait and Posture: a tribute to Professor Lilian T. B. Gobbi

Lucas Simieli[1] | Fabio A. Barbieri[1] | Victor S. Beretta[2]

[1] São Paulo State University (Unesp), School of Sciences, Department of Physical Education, Human Movement Research Laboratory (MOVI-LAB), Bauru, SP, Brazil
[2] São Paulo State University (Unesp), School of Technology and Sciences, Department of Physical Education, Presidente Prudente, SP, Brazil

Correspondence to: Lucas Simieli
email: lucassimieli@hotmail.com
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This special issue aims to pay tribute to Professor Lilian Gobbi by discussing the control of gait and posture. Given her extensive dedication to comprehending gait and posture control throughout her life, this issue delves into cutting-edge studies that explore various aspects related to these topics. These aspects encompass mobility and balance performance, kinematics, kinetics, muscle activity, and brain activity analysis under both normal and adaptive conditions. Within this special issue, an array of themes associated with gait and posture control is presented through ten dedicated articles, all of which are intended to honor Professor Lilian Gobbi. Among these, five studies investigated locomotion, while three studies closely examined postural control. Furthermore, two studies took on a dual-tasking, addressing both gait and posture contexts. We would also like to extend our gratitude to the reviewers and members of the editorial board for their invaluable expertise and unwavering dedication in ensuring the utmost quality of research presented in this editorial. The editors of this Special Issue are not only pleased with the contributions made to honor Professor Lilian Gobbi, but also view these contributions as a celebration of scientific collaboration and the significant strides we have taken in advancing our understanding of gait and posture.

Gait and balance are fundamental elements of human movement, playing a pivotal role in preserving functional independence and overall quality of life. The intricate complex nature of their behaviors necessitates not only the coordination of numerous muscles and joints but also the integration of multiple sensory inputs that guide movement control and influence adaptations [1]. However, the natural aging process and the emergence of neurodegenerative disorders significantly compromise gait and postural control. Aging entails a decline in various physiological systems, including the nervous system. A study conducted by Wittwer and colleagues [2] highlighted that irregularities in gait among older adults are closely associated with an increased risk of cognitive decline and dementia [2]. In light of the global aging population, comprehending age-related impairments in gait and postural control becomes imperative. Therefore, a comprehensive understanding of how these impairments impact motor control during walking and posture is crucial for designing innovative therapies and interventions that empower older individuals, both with and without movement disorders, to navigate their home and community environments safely and independently [1].

The global aging trend is expected to coincide with a rise in age-related neurological disorders. Parkinson's disease, a neurological disorder with a higher incidence among older individuals, progressively affects motor function. An emblematic symptom of Parkinson's disease is disrupted gait, characterized by shuffling steps, reduced arm swing, and a propensity to fall [3–5]. A study by Yogev-Seligmann et al. [6] exemplified that indicated that specific gait parameters in Parkinson's disease can predict the risk of falls, underscoring the potential of gait analysis as a clinical tool for fall prevention. Likewise, individuals with Multiple Sclerosis frequently confront gait irregularities such as weakness, spasticity, and compromised balance, all of which lead to impaired mobility [7]. Postural control and gait impairments are acknowledged as significant contributors to reduced quality of life among people with Multiple Sclerosis [8]. Investigating gait and posture within the context of these conditions can yield invaluable insights into disease progression and contribute to the formulation of targeted therapeutic interventions.

The goal of the special issue Control of Gait and Posture: a tribute to Professor Lilian T. B. Gobbi is to discuss the control of gait and posture to make a tribute to Professor Lilian Gobbi, who passed away in 2022. Lilian's research agenda profoundly contributed Lilian's extensive research endeavors significantly contributed to unraveling various facets of gait and postural control, particularly in individuals afflicted by Parkinson's disease. Her unwavering commitment to pioneering research domains and her steadfast dedication to upholding scientific excellence stand as a remarkable legacy for the upcoming generation of researchers [9]. Considering that much of her life was dedicated to unraveling the nuances of gait and posture control, the current special issue is designed to explore cutting-edge studies centered around these aspects. These include mobility and balance performance, kinematics, kinetics, muscle activity, and brain activity analysis, under both usual and adaptive conditions.

This special issue presents a diverse array of themes pertaining to gait and posture control, encompassed by ten articles that are dedicated to honoring Professor Lilian Gobbi. Among these contributions, five studies investigate locomotion, while three studies focus on the intricacies of postural control. Additionally, two studies undertake a comprehensive examination of both gait and posture contexts.

Considering that Parkinson's disease was Lilian's primary research interest during her career, four authors pored over their studies on Parkinson's disease theme. The effects of antiparkinsonian medication on the spatial-temporal gait parameters between freezers and non-freezers with Parkinson's disease were investigated by Oliveira et al. [10]. The authors showed different characteristics between freezers and non-freezers such as freezers used a higher dose of medication, tended to be in a more advanced stage of the disease, had the disease for a longer time, and impairments in spatiotemporal parameters: lower gait speed, step length, and stride length for freezers. However, despite the more significant gait impairments for freezers compared to non-freezers, the authors showed that medication improves gait similarly in both the freezers and non-freezers (i.e., increased gait speed, stride length, and step length). In the sequence, two authors investigated the mobility and postural behavior of Parkinson's disease subtypes: Postural Instability and Gait Difficulty vs. Tremor Dominant. First, Beretta and colleagues [11] investigated the effect of long-term locomotion and balance exercise on functional mobility considering the Parkinson's disease subtype. Both subtypes improved functional mobility performed with concomitant cognitive tasks and the lower limb functional strength after long-term (i.e., 16 weeks) locomotion and balance exercise program. However, the authors highlighted the increased effect on functional mobility mainly in Postural Instability and Gait Difficulty, which was explained due to the greater room for improvement of this subtype and exercise specificity. On the other hand, Freitas et al. [12] investigated if motor subtypes of Parkinson's disease impact the learning of motor tasks.

Contrary to Beretta et al. [11], the authors did not find differences between the subtypes for learning postural control skills. They can retain these skills in both the short and long term, even though the Postural Instability and Gait Difficulty exhibit inferior performance compared to the Tremor Dominant [12]. To finalize this first block of papers, Sirico and collaborators [13] analyzed the effects of social isolation due to the COVID-19 pandemic on gait parameters in people with Parkinson's disease. The authors found that people with Parkinson's disease decreased by 10% and 8.8% in stride length and 12.7% and 8.6% in stride velocity during self-selected gait velocity and fast gait velocity, respectively, after approximately 22 months of social isolation. However, changes in gait parameters were not associated with participant characteristics.

The second topic addressed in this Special Issue was how clinical tools can be used to discriminate deficits in gait and posture in older adults. Batistela et al. [14] examined the capability and accuracy of the Mini-BESTest for identifying fallers and non-fallers female older adults without neurological impairments and established the cutoff scores according to different age groups. The authors were able to demonstrate that the Mini-BESTest is a good and highly accurate tool for classifying fallers and non-fallers community-dwelling older Brazilian women in different age groups. This is an important finding because the Mini-BESTest application can help health professionals identify the main problems that can be addressed in an intervention program. In addition, the authors determined that the Mini-BESTest cutoff score to classify fallers and non-fallers female older adults score was 26 for 65-69 years old. and 24 for 70+ years old. Resende and colleagues [15] also showed that a clinical tool can be efficient in analyzing dynamic balance stability. The authors evaluated the correlation between completion times in these clinical tests and mediolateral balance stability measured through lower trunk accelerometry in older individuals. Their results suggest that completion time can be considered a predictor of dynamic balance in the Five Times Sit to Stand test. However, despite clinical tools being very important for clinicians, physiotherapists and physical education professionals, helping and facilitating diagnostic and evaluations, David [16] showed in her mini-review that although scales and clinical tests are important tools for assessing postural instability and walking performance, they can be insensitive to minor disabilities in people with motor disabilities, such as multiple sclerosis. Instrumented measurements, such as kinematics, kinetics, spatiotemporal gait parameters, and center of pressure, play an important role in detecting impairment and evaluating the effects of interventions in people with motor disabilities. Thus, objective measurements may be more suitable for tracking deficits in gait and postural balance in multiple sclerosis, contributing to the early detection of disease symptoms, and therefore allowing for the planning of effective interventions to control the speed of disease progression.

The third topic addressed in this Special Issue to honor Professor Lilian was dual tasking during walking and standing tasks. First, the effects of the obstacle characteristic on gait parameters were analyzed in older people with fear of falling. Magalhães and colleagues [17] found that the characteristics of the obstacle did not influence older people with fear of falling during walking through and obstacle avoidance. Although they adopt predictive and reactive compensatory adaptations in an attempt to make the task safer, these adaptations actually make the task more dangerous and increase the risk of stumbling and falling. On the other hand, Tessari and colleagues [18] showed that cognitive plus motor dual-tasking impairs both walking and postural control. The authors showed that young adults exhibited increased instability in postural control and mobility when using a smartphone simultaneously with a motor task. The extent of the impact varied depending on whether the individuals were walking or standing. While participants faced comparable risks when texting messages or talking on the phone while walking and standing, talking on the phone posed greater risks compared to texting and the no smartphone condition. These findings should not discourage individuals from using smartphones but should alert them about the risks involved if the device is used simultaneously with a walking or standing task.

To close this special issue, Dascal and colleagues [19] investigated the effect of balance training on postural control in older adults. The older adults underwent the motor intervention on the Boing balance board, which disturbed balance in the anterior-posterior and medial-lateral directions. The intervention consisted of 6 blocks of 10 trials, organized randomly, and lasted for 20 minutes with 1 minute of rest between each block. The authors suggested that the motor intervention may be associated with improved postural control, especially in the medial-lateral direction, indicating that motor practice using the Boing apparatus holds promise for enhancing postural control in older adults.

We extend our sincere gratitude to the reviewers and members of the editorial board for their invaluable expertise and unwavering dedication, which have played a pivotal role in ensuring the utmost quality of research presented in this editorial. Their meticulous assessment and insightful feedback have undeniably bolstered the scientific integrity of the studies encapsulated within.

The editors of this Special Issue find gratification in the contributions made to honor Professor Lilian Gobbi, viewing them not only as a tribute to her legacy but also as a celebration of the collaborative spirit inherent in scientific pursuits. Furthermore, these contributions stand as a testament to the strides we have achieved in comprehending the intricacies of gait and posture. May Professor Lilian Gobbi's fervor for knowledge and her profound impact on the scientific community continue to serve as an inspiration as we persistently endeavor to advance medical science, ultimately benefiting humanity at large.

"Lilian's research agenda profoundly contributed to understanding several aspects of gait and postural control in different populations, mainly in people with PD. Her commitment to cutting-edge research topics and her resolute dedication to excellence in science is a legacy for the coming generation of researchers" [9].

THANKS, LILIAN, FOR SO MUCH!

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