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FAR BEYOND THE OFFICE: A MULTIFACETED ANALYSIS OF GAIT IN NEUROLOGICAL PATIENTS

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ABSTRACT

Introduction: The gait can be defined as a cyclic pattern, in the biped posture, which uses the lower limbs for propulsion of the body. In the field of Neurology, walking in the physical examination represents signs in the neurological evaluation, which assist in closing diagnoses. In the clinical environment, especially in the offices, the refinement of the gait evaluation is restricted to the experience of the clinician, because the space is often reduced, the time inadequate for evaluation. Few reports in the literature address this issue. **Objective:** To discuss the main points of the gait analysis of interest to neurologists in the office. **Methodology:** In this narrative review, 32 articles were raised and applied the eligibility criteria, 6 articles were selected. The evaluation of the walk at the doctor's office must respect criteria, because it can cause biases in the parameters of the walk and make the global analysis difficult. **Considerations:** Therefore, there is a need for further discussions within the office to better evaluate the gait parameters.

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INTRODUCTION

The march is configured as one of the most beautiful manifestations of the human movement. Objectively, we can define it as a cyclical pattern, in the bipedal posture, which uses the lower limbs to propel the body (Wren *et al.* 2011). In classical antiquity, walking is the object of study. The philosopher Aristotle made a description of human walking with an individual walking with a feather over his head (Tanaka *et al.*, 2006). Since then, the biological and physical variables of walking are investigated and described in literature.

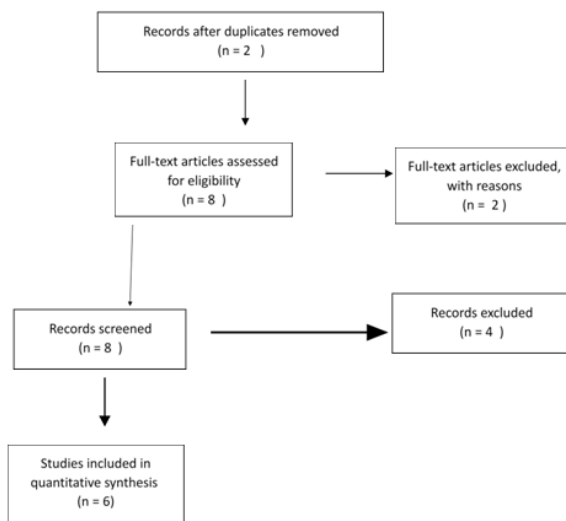
In the scope of biomechanics, the cadence of the step-pass, the speed, the articular angles of the lower limbs are harmonically combined for their full development (Silva *et al.* 2018). These aspects can be defined by the numerous manifestations that added together allow bipedal locomotion. Walking evaluation is a common intersection point for several health epistemes, especially physiotherapists, neurologists and orthopedists. This is true for the physiological gait with the dysfunctions caused by the most varied pathologies (Baker *et al.*, 2013). In the laboratory environment, the instruments are more and more accurate to analyze the kinetic variables such as: muscle strength, ground reaction forces; and the kinematics: step-by-step, joint angles (Baker *et al.*, 2016; Silva *et al.* 2018). In the clinical

environment, especially in offices, the refinement of gait evaluation is restricted to the experience of the clinician, because the space is often reduced, the time inadequate for evaluation, among others. These biases may neglect certain important aspects for a multifaceted analysis of gait disorders. Neurological marches form a chapter in the process of understanding walking disorders (Baker, 2018). Psychoemotional components, fear of falls, low functional independence are factors added to mechanical walking factors (Baker, 2018). As a result, clinicians need to pay attention to these aspects. However, the analysis of walking in an outpatient setting requires special attention. These are the appropriate physical spaces for a more detailed observation. Especially for a classification in the physical examination of the type of gait, the main causal factors to later trace the rehabilitation strategies. Thus, the objective of this work was to discuss the main points of the gait analysis of interest to neurologists, from the ambulatory and instrumental point of view.

METHODS

In this narrative review, the articles that discuss the ideal environment for the physical examination of the gait in Neurology were raised. Especially, the components that facilitate and make difficult the interpretation of the evaluation of neurological gait. The selected articles were from the last 10 years. The databases consulted were PUBMED, Scielo and Cochrane Database with the uniterms: neurological gait, gait evaluation, instrumentation. The search strategy followed the following order: gait analysis AND assessment AND instrumental. This review was performed according to PRISMA - Preferred Reporting Items for Systematic Reviews and Meta-Analyses (Moher et al 2009).

RESULTS



DISCUSSION

The physiological human gait is described by phases, subphases and with various phenomena of joint movements of the lower limb to enable human propulsion (Benedetti et al. 2017). In neurology, the physical examination of the gait is fundamental for the diagnosis of various diseases of the nervous system. However, the clinical environment, in particular, the office does not allow an ideal field for a complete examination of the gait. In the last three decades, gait studies have concentrated discussions on instruments and new techniques for recording gait (Taborri et al. 2016; Boutaayamou et al. 2015). Instruments such as electromyography, accelerometers, high-speed cameras, sensors, govern the research (Taborri et al. 2016). In the office, there is often no equipment available, and often high cost (Werman et al. 2019). Another issue in the evaluation of the march in the office is the reduced space that compromises more accurate

analysis of parameters such as step, cadence and other variables for characterization of pathological marches. Benedetti et al (2017) through the Italian consensus, to evaluate gait the clinician must: know biomechanics and neurophysiology of human movement; discriminate the advantages and disadvantages of different techniques for recording data. All recommendations are for laboratory environment and do not discuss the evaluation in the office. Nonnekes et al. (2020), Baker et al. (2016) put a minimum space of 10m to follow 10 cycles of walking. The human eye is sensitive to detect in the physical examination, but it is necessary to follow previous problems or compensatory strategies. Due to this fact, we should promote repetitions during walking in 10m. Thus, in the office the neurologist can commit biases of interpretation. Mainly, in the final description of the walk, or if it has associated patterns what can produce a mixed behavior in the space-time points of the walk. Thus, to optimize the functional evaluation of the neurological gait, the other functional components are potentialized when we have a multidisciplinary evaluation and, with an area of 10m. Disorders such as postural alterations, articular incongruities, tabasia, among others, can be interpreted in gait laboratories. Even if the clinicians have a lot of experience in the physical examination of walking. This reinforces the need

CONSIDERATIONS

In the physical examination of the neurological gait, the observation of the cycles, phases and subphase in a continuous way, is restricted for greater inferences, in the office. For this reason, there is a need for more discussions, in the office, to better evaluate the parameters of the gait. Mainly, in the observation of possible functional modifications linked to pathological gait.

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