

## GAIT PERFORMANCE IN INDIVIDUALS WITH HTLV-1: SYSTEMATIC REVIEW

Mateus Evangelista do Amparo Santana<sup>1</sup>, Livia Aguiar Pereira<sup>2</sup>,  
Rafael Monteiro<sup>3</sup>, Erika Pedreira Fonseca<sup>4</sup>

Corresponding author: Mateus Evangelista do Amparo Santana - mateusamparo@hotmail.com

<sup>1</sup>Physiotherapist, undergraduated at the Catholic University of Salvador. Salvador, Bahia, Brazil. <http://orcid.org/0000-0001-5432-2986>

<sup>2</sup>Physiotherapist, undergraduated at the Catholic University of Salvador. Salvador, Bahia, Brazil. <http://orcid.org/0000-0003-4574-4460>

<sup>3</sup>Physiotherapist, undergraduated at Physiotherapist, undergraduated at the Catholic University of Salvador. Salvador, Bahia, Brazil

<sup>4</sup>Physiotherapist, MSc in Health Technologies, Professor of the Catholic University of Salvador, Salvador, Bahia, Brazil  
<http://orcid.org/0000-0002-5572-0553>

**ABSTRACT** | HTLV-1 is frequently associated with myelopathy/tropical spastic paraparesis (HAM/TSP), which in turn brings several functional alterations to the individual, including changes in gait. **Objective:** To systematize the scientific findings on the temporo-spatial gait parameters in individuals with HTLV-1. **Methodology:** This is a systematic review of the scientific literature. The primary search of the articles was performed in the Pubmed, Scielo and Bireme databases, and observational studies were included that evaluated gait changes in individuals with HTLV-1. The search strategy was conducted by two researchers apart and the divergences resolved by consensus. **Results:** Firstly, it has found 40 studies and considering them, it was included two studies that investigated the changes in gait performance among the individuals with HTLV-1, within a total of 97 individuals. **Conclusion:** This systematic review identified changes in gait pattern among individuals with tropical spastic paraparesis/myelopathy associated to HTLV-1; functional changes in muscle groups of the lower limbs and slowing gait speed are among the main findings, but the lack of published work on the subject makes it difficult to access information. Therefore, it is suggested that new approaches be made for a better understanding of this topic.

**Keywords:** Gait; Human T-lymphotropic virus 1; Spinal cord diseases; Tropical spastic paraparesis.

## INTRODUCTION

Human T cell lymphotropic virus (HTLV) or T cell lymphotropic virus is a type of virus belonging to the retroviridae family<sup>1,2,3</sup>. Currently, the most endemic areas in the world are Japan, India, Oceania, Equatorial Africa, South and North America, but the prevalence of HTLV is variable<sup>4</sup>. In Brazil about 2.5 million individuals are infected, the highest attendance is in the North and Northeast regions<sup>5</sup>. HTLV-1 is often associated to tropical spastic myelopathy/paraparesis (HAM/TSP)<sup>6</sup>, which can lead to a number of changes, such as: weakness, spasticity in the lower limbs, deficits in maintaining swing and difficulty to perform the gait<sup>7</sup>.

Human gait means a recurrence of movements of the lower limbs that move the body forward while simultaneously maintaining it stable during the support<sup>8</sup>. In general, spasticity becomes the main limiting factor for the gait<sup>7</sup>. This is due to the general impairment of the hip and lower limb muscles, where there is a decrease in ambulation, swing dynamic and fatigue<sup>9</sup>.

In a research about two groups of individuals with multiple sclerosis (MS), which is also a demyelinating disease and can lead to changes in movement and disturbances in the gait<sup>10,11</sup>, such as HAM/TSP, a significant difference was observed between the speed and muscle activity of the lower limbs during the gait<sup>11</sup>. In another study about patients with myelopathy associated to HTLV-1, it was shown that an intense muscle weakness has a negative impact on quality of life (QOL), daily life activities (ADL) and ambulation<sup>12</sup>.

This study aims to understand the changes in temporospatial parameters during the gait in individuals with HTLV-1. These individuals are often related to functional repercussions, mainly in gait. Therefore, the informations of the current study will help to detect the main alterations of the gait pattern and may subsequently establish a treatment protocol in the gait of individuals with HTLV-1. The main goal of this study is to systematize the knowledge about the temporospatial gait parameters in individuals with HTLV-1 associated to HAM/TSP.

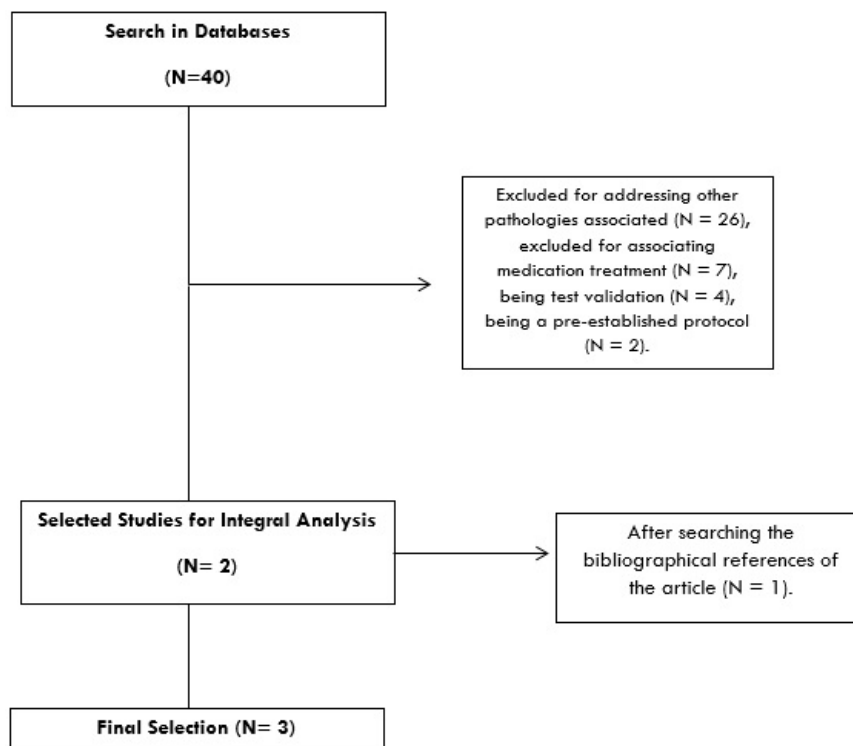
## METHODS

It is a systematic review of the literature in according to the methodology proposed by Cochrane Collaboration. The search for the articles was carried out in the databases Pubmed, Scielo and Bireme with the following descriptors: Gait; Human T-lymphotropic virus 1; spinal cord diseases; Tropical spastic paraparesis. through Boolean operators (AND and OR), without delimitation of time and language. The search was conducted by two independent researchers and the divergences resolved by consensus. We used the search strategy

“Gait AND (Human T-Lymphotropic virus 1 OR spinal cord diseases OR Tropical spastic paraparesis) AND (evaluation OR assessment)”.

After the initial search of articles, critical analysis of titles, analysis of abstracts and exclusion of duplicates, the references were consulted and the methods were reapplied, getting a final selection of articles. Description of the flowchart in table 1, shown below.

**Table 1.** Flowchart of Extraction and Data Collection



## ELIGIBILITY CRITERIA

Inclusion criteria were observational studies that investigated the gait in patients with spastic myelopathy/tropical spastic paraparesis associated to HTLV-1. It was excluded the studies of test validation, treatment protocol, drug treatment and studies associated to other pathologies.

## METHODOLOGICAL QUALITY ANALYSIS

For the evaluation of the methodological quality and risk of bias of the studies, the scale of Agency for Health Care Research and Quality (AHRQ) was used, modified and adapted by West et al<sup>13</sup>. This scale was designed to evaluate the quality of observational studies and are analyzed by the following components: Study questions, population, comparability of subjects for observational studies, exposure, outcome measures, statistical analysis, results, discussion and financial support. The studies were classified in each item of these as “low risk” when clearly described, “high risk” when not described and “uncertain risk” if it is not clearly described in the text. Methodological analysis is available in the table 2.

**Table 2.** Evaluation of the methodological quality of observational studies by the Agency for Healthcare Research and Quality (AHRQ).

Author / Year	Miyazaki et al / 2011	Franzoi e Araújo / 2007	Adonis et al., 2016
<b>Study Questions</b>	Low risk of vies	Low risk of vies	Low risk of vies
<b>Population</b>	Uncertain risk of bias	Uncertain risk of bias	Uncertain risk of bias

**Table 2.** Evaluation of the methodological quality of observational studies by the Agency for Healthcare Research and Quality (AHRQ). (continued)

Author / Year	Miyazaki et al / 2011	Franzoi e Araújo / 2007	Adonis et al., 2016
<b>Comparability of Topics for Observational Studies</b>	Low risk of vies	Low risk of vies	Uncertain risk of bias
<b>Exposure or Intervention</b>	Low risk of vies	Low risk of vies	Low risk of vies
<b>Measurement of Outcomes</b>	Uncertain risk of bias	Uncertain risk of bias	Low risk of vies
<b>Statistical analysis</b>	Low risk of vies	Low risk of vies	Low risk of vies
<b>Results</b>	Low risk of vies	Low risk of vies	Low risk of vies
<b>Discussion</b>	Low risk of vies	Low risk of vies	Low risk of vies
<b>Financial support</b>	Uncertain risk of bias	Uncertain risk of bias	Uncertain risk of bias

## RESULTS

It was found 40 studies, from which one was included after the analysis of the title and abstract, and one more was included after the search in the bibliographical references, 39 were excluded, 26 because they were describing other pathologies, 7 because they associated to drug treatment, 4 for being test validation and finally 2 for being a pre-established protocol. Therefore three studies were included for a methodological evaluation.

The studies are from 2007<sup>14</sup>, 2011<sup>15</sup> and 2016<sup>16</sup> studies were described in the English language with a total population of participants in 123 individuals. The studies presented low risk of bias in all items of the AHRQ, except in the description of the population, because none described how the sample was calculated. One study<sup>16</sup> did not use the comparative group and no study reports financial support.

## DISCUSSION

The studies included in this review verified that gait in individuals with HTLV-1 associated HAM / TSP presents with impairment, mainly in relation to speed<sup>14,15,16</sup>, cadence and stride length<sup>15</sup>. Most individuals use walking aids<sup>14</sup>. It was verified that

the use of these devices increases the gait speed of these individuals and that the lower speed, the greater the risk of falls<sup>16</sup>.

Studies<sup>14,15</sup> have found that gait in individuals with

HAM/TSP associated to HTLV-1 is directly related to the performance of muscle groups in MMII due to the functional reduction of the quadriceps, hamstring, knee extensors and plantar flexors; in addition to, the present individuals have lower march speed, step length and cadence<sup>15</sup>. Regarding the evaluation of the methodological quality among the included studies, the articles were classified as low risk of bias in almost all items of the AHRQ scale, but the items of measurement of the outcomes. This may be due to the inexistence of validated instruments to evaluate gait in this population.

The reduced muscle strength harms the gait performance and gradually interferes with the need for mobility aids, starting with one-sided support to the wheelchair<sup>12</sup>. In one of the studies, less than half of the affected individuals required mobility aids, observing that among the most frequently used on crutches and wheelchairs<sup>14</sup>, corroborating another study that examined 206 medical records of patients with HTLV-1 and found that 109 patients did not use mobility aids<sup>1</sup>. It was reported that gait velocity varies according to the type of gait aids used and community ambulators present higher gait speed<sup>16</sup>.

In one of the studies<sup>15</sup>, the knee flexor muscle strength had significantly deteriorated compared to knee extensors, positively correlating this change with some temporospatial parameters, suggesting that muscle weakness of this group is a peculiar symptom to HAM/TSP<sup>15</sup>. Contrasting with findings from another study<sup>14</sup>, a stronger correlation was reported between functional ambulation, knee extensors and ankle plantar flexors. This disagreement of the opinions among the selected studies can be traced due the fact that they present uncertain methodological quality regarding the measurement of the outcomes and financial support, making impossible the homogeneous information.

The quadriceps, hamstring and plantar flexors muscle groups have a stronger correlation with ambulation<sup>14,15</sup> being of fundamental importance in gait maintenance. The quadriceps muscle has a role in the response to the load and in the pre-swing phase, maintaining the progression of motion and stability<sup>14</sup>. It is noted that muscular strength gain exercises provide a positive improvement in swing and gait among patients with tropical spastic paraparesis<sup>17</sup>.

In a study carried out with ten participants, it was shown that muscle-strengthening programs in individuals with HTLV-1, result improvements in the functional measures of this population<sup>18</sup>.

One of the factors influencing walking is spasticity, which is commonly found in patients with HAM/TSP associated to HTLV-1. The greater the degree of spasticity, the greater dependence of gaiters<sup>14</sup>. Another factor that influences the gait performance of these individuals is low back pain<sup>1,14,15</sup>. There was a study<sup>14</sup> the authors found that low back pain was frequently a complaint in the group that had a dependent gait; opposing an another study<sup>15</sup> in which no significant evidence of low back pain was found in the observed group, but reports of painful complaints during orthostasis and ambulation were observed. This discrepancy can occurred because of the differences among the analyzed groups, so that individuals with a gait dependency may present more problems associated<sup>9,14</sup>.

Multiple sclerosis (MS) and demyelinating diseases as HAM/TSP, also brings repercussions in gait. In a study conducted with two groups: seven individuals with MS and seven healthy individuals, it was found that gait velocity, walk and cadence (steps by minute) in those who had MS were reduced<sup>11</sup>, corroborating with database from HAM/TPS studies associated to HTLV-1<sup>15</sup>. However, there is a disagreement in the findings of a study<sup>19</sup>, among the temporospatial and the kinematics of gait in 11 people with MS, and it was observed that population showed a higher rate of gait cadence. Another study<sup>20</sup> justifies the decrease in cadence, due to a greater postural instability and consequent insecurity in the gait of these people with MS. Other pathological manifestations commonly associated with the two described pathologies are: difficulty in balance, altered muscle tone, weakness and sphincter impairment<sup>21</sup>.

The current study presented as advantages: the possibility of gathering and synthesizing information about the subject addressed, besides the possibility of evaluating the methodological quality of the articles selected and contributing to the knowledge of the scientific community about the subject. As disadvantages, it is the small amount of studies in the literature on the subject matter, making the access difficult to get an information for the theoretical study of the document studied.

## CONCLUSION

This study evidenced that there is no gait pattern in individuals with HAM/TSP associated to HTLV-1 are commonly observed, such as movement in lower limb muscle activity, lower gait velocity and cadence. The methodological divergence of the studies did not allow equality among the articles addressed. It is suggested that new studies be carried out to allow a better understanding of the topic, since there are few published works on the subject.

## AUTHOR CONTRIBUTIONS

Santana MEA participated in the study design, data collection and analysis, results interpretation, and in the drafting of the final version. Fonseca EP conducted and oversaw all the research and writing. Pereira LA participated in the data collection. Monteiro R participated in the drafting of the final version of the paper.

## COMPETING INTERESTS

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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