# RELATIONSHIP AMONG PHYSICAL ACTIVITY LEVEL, BALANCE AND QUALITY OF LIFE IN INDIVIDUALS WITH HEMI PARESIS

Aline Braun[1]
Vanessa Herber[1]
Stella Maris Michaelsen[1]

1. Laboratory of Motor Control
– Center of Health and Sports
Sciences-CEFID – State University
of Santa Catarina-UDESC –
Florianópolis, SC, Brazil.

**Correspondência:**

Stella Maris Michaelsen
PPG Ciências do Movimento
Humano-CEFID/UDESC
Laboratório de Controle Motor-
Ladecom
Rua Pascoal Simone, 358, Coqueiros
88080-350 – Florianópolis, SC
E-mail: michaelsenstella@hotmail.com

## ABSTRACT

Introduction: Physical activity brings benefits to the neurological system, especially to motor and balance impairment, which are important deficits in individuals with sequels after a stroke. Objective: To assess the correlation between the level of physical activity and balance and with the quality of life of individuals with hemiparesis after a stroke. Method: 19 individuals (57.8 ± 14.1 years old) with chronic hemiparesis (44.1 ± 37.9 months) were involved in this study. The study evaluated the human activity profile (HAP), the balance confidence level (ABC), the functional balance (BERG) and quality of life (SSQOL). Data were submitted to analysis of Spearman's correlation coefficient. Results: HAP presented a positive strong correlation with the scores of functional balance (BERG; ρ = 0.73) and a moderated positive correlation with the scores of balance confidence (ABC; ρ = 0.64). Total HAP and the HAP set showed moderate positive correlation with the mobility (respectively ρ = 0.48 and ρ = 0.71), self-care (ρ = 0.48 and ρ = 0.65), upper limb function (ρ = 0.56 for both) and vision (ρ = 0.49 and ρ = 0.69) domains. Conclusion: The results of this study suggest that the more active the person is, the greater his/her balance and quality of life will be. Considering this, the development of physical activity programs for individuals with hemiparesis after strokes becomes extremely important.

**Keywords:** physical fitness, mobility, stroke.

## INTRODUCTION

A stroke is a syndrome of fast development with clinical signs and symptoms of cerebral function loss which lasts for over 24 hours causing motor, sensorial and cognitive sequelas[1]. A stroke is an important aggravation to health of the global population, being the main cause of death in Brazil and the commonest reason of neurological incapacity worldwide[2].

One of the sequelae of strokes is the hemiparesis, characterized by weakness in the contralateral hemibody to the injury, generally followed by sensorial, mental, perception and language alterations[1]. The stroke consequences are many and can reach the components of incapacity and functionality of the International Classification of Functionality (ICF) model: body structure and function and activity and participation[3]. However, its consequences extrapolate the individual domain, affecting also the Family and health assistance services[4].

Sedentarism adds to the risk for strokes, being the factor of highest prevalence in the population. Therefore, it is evident the importance to adopt an active lifestyle which canaid in controlling this risk factor. Many individuals who had a stroke remain sedentary and can have another stroke[5].

Physical inactivity and poor diet are risk factors which can be changed; however, besides the physical benefit, physical activity contributes to the emotional and social equilibrium[6]. In the psychological dimension, physical activity acts in the improvement of self--esteem, self-concept, body image, cognitive functions and socialization, besides decreasing stress, anxiety and medication consumption, directly influencing on quality of life (QOL)of the individuals[4].

One of the questions about the benefits of physical activity refers to its effect on the neurological system, especially on the motor deficiencies, mainly balance[7], being this deficit important in individuals after strokes, who present difficulties in keeping balance and risk of falls.

Falls present a great impacton the lives of individuals after a stroke, compromising the daily life activities and bringing psychological and psychological consequences.On one hand falls cause restriction of mobility, functional incapacity and social isolation and can reduce QOL; on the other hand, physical activity attenuates the functional losses and the risk of falls, promoting autonomy, which could reflect on QOL[8].

The study is justified by the importance to understand the relationships between the level of physical activity, balance and QOL in individuals after a stroke. It is known that low confidence in balance impacts on the health status perceived in this population[9]. Although it is assumed that improvement in balance has positive impact on QOL, the correlations between balance and QOL after strokes are not well-established[10]. It is also possible that inactivity is related to deficit in balance and contributes to sedentarism[11]. The studies found do not consider all factors mentioned above, being these changeable; the study is relevant because it can help in a subsequent discussion on the importance of physical activity and its relationships with balance and QOL in this population.

Thus the aim of this study was to assess the correlation between the level of physical activity, performance and confidence in balance

and QOL in individuals with hemiparesis after a stroke. Although the ICF also includes the personal and environmental factors, this study limits to evaluate two components: activity and participation.

## METHODS

The study is characterized as descriptive. The sample was composed of 19 individuals of both sexes, mean age of 57.8 years, with hemiparesis as a sequel of approximately 3.7 years (44.1 months) after the onset of a stroke (table 1). The participants were elected in an intentional non-probabilistic way. All the components of the Program of Health Attention to Patients with Stroke Sequelae and of the School Clinic of the Institution in the first semester of 2009 were invited. They should meet the following inclusion criteria: chronic hemiparesis (>six months after stroke), walking condition with or without use of auxiliary device and cognitive level sufficient to understand the evaluation instruments. The research was approved by the Ethics in Research with Humans Committee -CEPSH of the State University of Santa Catarina-UDESC, under the protocol 227/2008.

The data collection was performed through the following instruments: a) Berg's scale – evaluation instrument of functional balance which consists in the performance of 14 tasks of common activities in the daily life with progressive difficulty level. The tasks are punctuated from 0 to 4 (0 = incapacity to perform the activity and 4 = capacity to perform the activity with no difficulty). The maximum punctuation is 56 points and punctuation lower than 36 points means a risk of 100% of falls. The version used was translated and validated in Brazil, which presents good intra and interexaminer confidence (respectively, CCI of 0.99 and 0.98)[12]. b) Confidence in balance in specific activities scale-ABC – translation of the Activities-Specific Balance Confidence Scale. The individuals self-evaluate their confidence in balance in scores which range from 0 to 100%, during the performance of 16 activities and the punctuation occurs through the mean of the percentages presented in the questionnaire[13]; c) HAP (human activity profile) – questionnaire for evaluation of the functional level and physical activity, version translated and adapted to Portuguese with inner consistence of 0.91 and 0.98 for items and individuals, respectively. The questionnaire presents 94 activities graded according to the metabolic equivalent, including personal care, domestic tasks, commuting, social activities and leisure and physical exercises. The questionnaire presents three alternatives of responses: "still perform", "quit performing" and "never performed". The result presents two scores. The primary is subdivided in maximum activity score (MAS), corresponding to the last item that the individual is still able to perform, and adjusted activity score (AAS), subtracting from MAS the number of items which the individual has quitted. An advantage of the questionnaire is that the activities that the individual never performed are not punctuated in the general score of the test. The individuals are classified as impaired or inactive (scores < 53), moderately active (scores 53-74) or active (scores > 74)[14]; d) Quality of Life of Strok – version translated from the SSQOL (Stroke Specific Quality of Life) and adapted to Portuguese, presenting confidence coefficients of 0.92. The scale is composed of 49 items distributed in 12 domains, presenting three possibilities of responses developed in a scale Likert with score from 1 to 5: 1) concordance level with statements on its functionality, ranging from "strongly agree" to "strongly disagree"; 2) difficulty in performing a task, ranging

from "unable to perform the task" to "no difficulty"; 3) amount of help needed to perform specific tasks, ranging from "total help" to "no help needed". For each domain an option of response is used. The reference point for response corresponds to the week before the evaluation day. The individuals of the sample were divided in three levels of QOL: low (0-81), medium (82-163) and high (164-245)[15].

In order to avoid misinterpretations, the questionnaires were individually applied through an interview and by one examiner only.

In the statistical analysis, the data were characterized by mean and standard deviation. In order to verify the correlation between variables, the Spearman correlation coefficient where ρ ranged from −1 e 1 was used, and the closer it is to these extremes, the higher the association between variables will be, and the negative sign of the correlation means that the variables alter in an opposite way. The used classification for correlation was: < 0.49, weak; 0.50 to 0.69, moderate; and ≥ 0.70, strong. The tests were performed with the software SPSS version 17.0, adopting significance level of 0.05[16].

## RESULTS

The sample characteristics are presented in table 1.

The result obtained for balance indicates that the participants present good functional balance. The majority (74%) of the participants obtained score in the Berg's scale> 45. The result obtained by the ABC scale indicates that the individuals present medium confidence in balance during performance of specific activities. According to the HAP-AAS scores, 10 individuals (52.6% of the sample) were classified as impaired or inactive, eight (42.1%) as moderately active and only one was considered active (table 2).

Total QOL was high, considering all domains, where most of the sample (78.9%) presented total score >164, except for four participants who presented score < 148.

Table 3 presents the values of mean and standard deviation of the clinical tests separating the individuals in inactive and moderately active groups. The t test showed that there are significant differences between the groups for functional balance (p = 0.03) and for the QOL domains of mobility (p = 0.02) and function of upper limb (p = 0.04), but the total QOL score did not present significant difference between groups. The functional balance and the QOL domains of mobility and function of upper limb are higher in the moderately active group compared to the inactive group. Although the difference between groups for the confidence in balance values during activities (ABC) had been high (~29% higher for the moderately active group) the values presented only one tendency (p = 0.06) to be higher in this group.

The human activity profile measured by the HAP-AAS presented strong positive correlation for functional balance (p < 0.001) and moderate positive correlation for confidence in balance (p = 0.003). The HAP-MAS presented moderate correlation with functional balance (p < 0.001) and weak correlation with confidence in balance (p = 0.003). Total QOL and the items family role and mobility presented moderate correlations both with functional balance and with confidence in balance (table 4).

The HAP-MAS and the HAP-AAS presented positive correlation with the mobility (respectively, p = 0.04/p = 0.001), self-care (p = 0.04/p = 0.002), function of the upper limb (p = 0.01 for both)

**Table 1.** Sample characterization.

| Characteristics (n = 19) | Mean ± SD | % / interval |
|---|---|---|
| Sex (n) | 14 M | 73.7% |
| Age (years) | 57.8 ± 14.1 | 22-80 |
| Time after the stroke (months) | 44.1 ± 37.9 | 7-156 |
| Side affected (n) | 12 L | 63.1% |

n = number; SD = standard deviation; M = male; L = left.

**Table 2.** Results of the clinical tests.

| Type of measurement | Test | Mean | (SD) | Interval |
|---|---|---|---|---|
| **ICF-Activities** | | | | |
| Balance | BERG (56) | 45.8 | 14.7 | 10-56 |
| Confidence level | ABC (100) | 65.0 | 33.6 | 0.62-100 |
| Activity level | HAP-MAS | 71.0 | 12.1 | 31-86 |
| Activity level | HAP-AAS | 48.8 | 16.1 | 13-77 |
| **ICF-Participation** | | | | |
| Quality of life | SSQOL/total (245) | 192.9 | 38.6 | 113-234 |
| | SSQOL/energy(15) | 10.6 | 4.5 | 3-15 |
| | SSQOL/role familiar (15) | 10.3 | 4.1 | 3-15 |
| | SSQOL/speech (25) | 20.4 | 4.7 | 9-25 |
| | SSQOL/mobility (30) | 24.6 | 6.7 | 10-30 |
| | SSQOL/humor (25) | 20.5 | 5.1 | 10-25 |
| | SSQOL/personality(15) | 12.1 | 4.9 | 3-15 |
| | SSQOL/self-care (25) | 19.4 | 5.7 | 6-25 |
| | SSQOL/social role (25) | 18.8 | 6.2 | 5-25 |
| | SSQOL/memory (15) | 12.4 | 3.3 | 6-15 |
| | SSQOL/function-MS (25) | 18.5 | 5.5 | 5-24 |
| | SSQOL/vision (15) | 14.1 | 1.9 | 9-15 |
| | SSQOL/work (15) | 11.7 | 4.7 | 3-15 |

FIC = Classification of International Functionality; BERG = Berg's balance scale;; ABC = balance confidence during specific activity; HAP = human activity profile; MAS = maximum activity score; AAS = adjusted activity score; SSQOLstroke= stroke scale of quality of life; UL = upper limb.

**Table 3.** Results of the clinical tests, inactive subjects and moderately active subjects.

| Type of measurement | Test | Inactive Mean | (SD) | Moderately active Mean | (SD) |
|---|---|---|---|---|---|
| **ICF-Activities** | | | | | |
| Balance | BERG (56) | 38.9 | 17.8 | 53.4* | 1.7 |
| Confidence level | ABC (100) | 51.4 | 35.0 | 80.1 | 25.8 |
| Activity level | HAP-MAS | 64.1 | 12.8 | 78.7* | 4.7 |
| Activity level | HAP-AAS | 37.0 | 10.9 | 61.9* | 9 |
| **ICF-Participation** | | | | | |
| Quality of life | SSQOL/total (245) | 184.2 | 44.8 | 202.7 | 29.8 |
| | SSQOL/energy (15) | 10.3 | 4.6 | 11.0 | 4.6 |
| | SSQOL/Family role (15) | 9.7 | 3.7 | 11.0 | 4.6 |
| | SSQOL/speech (25) | 20.2 | 4.5 | 20.6 | 5.3 |
| | SSQOL/mobility(30) | 21.4 | 7.9 | 28.2* | 1.6 |
| | SSQOL/humor (25) | 21.4 | 5.3 | 19.4 | 4.9 |
| | SSQOL/personality (15) | 13.4 | 5.3 | 10.6 | 4.2 |
| | SSQOL/self-care (25) | 17.2 | 6.5 | 21.9 | 3.3 |
| | SSQOL/social role (25) | 18.5 | 6.4 | 19.2 | 6.4 |
| | SSQOL/memory (15) | 13.1 | 2.5 | 11.7 | 4.1 |
| | SSQOL/function-MS (25) | 16.1 | 6.3 | 21.1* | 2.8 |
| | SSQOL/vision (15) | 13.3 | 2.4 | 15.0 | 0.0 |
| | SSQOL/work (15) | 10.6 | 5.6 | 13.0 | 3.3 |

FIC = Functionality International Classification; SD = standard deviation; BERG = Berg's balance scale; ABC = confidence in balance during specific activity; HAP = human activity profile; MAS = maximum activity score; AAS = adjusted activity score; Stroke Specific Quality of Life = quality of life scale of stroke ;UL = upper limb.
* p< 0.5 indicating significant differences between the inactive and moderately active groups.

and vision domains (p = 0.03/p = 0.001). Except for the function of upper limbs, the values of correlation coefficient were higher for the HAP-AAS comparing to HAP-MAS; however, only the HAP--MAS presented moderate significant correlation (p = 0.03) with total QOL (table 4).

## DISCUSSION

This study assessed the correlation between level of physical activity, performance and confidence in balance and the QOL in individuals with hemiparesis after a stroke. The study also tried to analyze the correlations between the level of physical activity and the different QOL domains, being the instruments used classified according to the ICF incapacity and functionality model in the components of activity and participation.

The HAP presented significant correlation both with functional balance and with level of confidence of balance in the specific activities; both presented significant correlation with participation (SSQOL).

The strong correlation found between the HAP-AAS and functional balance is an indication that balance can be an important predictor both for activity and participation. In a study analyzing the predictors for participation after a stroke, it was demonstrated that the score for functional balance presented the highest correlation with the measurement of participation[17]. Moreover, decrease in punctuation of functional balance is associated with the risk of falls and can increase restriction of the individuals to participation. The individuals who had strokes suffer risk of important falls, regardless of age and time from injury [18]. Although we had not evaluated the self-report of falls or even fear of falls, the score of functional balance was strongly related to the level of confidence during activities performed both inside and outside home, giving indication that these individuals may restrict their activities for fear of falling.

In the sample, 74% of the individuals presented score between 54-46 on the Berg's scale, a level relatively associated with low risk of falls[19]. If we consider the cutoff point (45 points) to predict falls[12], the participants who presented scores below 45 points on the Berg's scale(26%) presented confidence level lower than 50% on the ABC scale. These individuals also presented the lowest level of physical activity (≤ 45 points) in the HAP-AAS.

In individuals with hemiparesis, both low performance in

**Table 4.** Correlations between level of physical activity, balance and QOL.

| | ICF Activity | | | |
| --- | --- | --- | --- | --- |
| | **BERG** | **ABC** | **HAP-MAS** | **HAP-AAS** |
| **ICF-Activity** | | | | |
| Balance | | | | |
| BERG | - | 0.88 | 0.67** | 0.73** |
| ABC | 0.88 | - | 0.49* | 0.64* |
| **ICF-Participation** | | | | |
| SSQOL/total | 0.56* | 0.67** | 0.50* | NS |
| SSQOL/energy | NS | 0.48* | NS | NS |
| SSQOL/family role | 0.53* | 0.59* | NS | NS |
| SSQOL/speech | NS | NS | NS | NS |
| SSQOL/mobility | 0.56* | 0.56* | 0.48* | 0.71** |
| SSQOL/humor | NS | NS | NS | NS |
| SSQOL/personality | NS | NS | NS | NS |
| SSQOL/self-care | 0.50 | NS | 0.48* | 0.65** |
| SSQOL/social role | NS | 0.59* | NS | NS |
| SSQOL/memory | NS | NS | NS | NS |
| SSQOL/function-MS | 0.51* | NS | 0.56* | 0.56** |
| SSQOL/vision | 0.47* | 0.48* | 0.49* | 0.69** |
| SSQOL/work | NS | 0.50* | NS | NS |

Magnitude of the correlations: rho < 0.49 (weak), ≥ 0.50 to< 0.69 (moderate) and ≥ 0.70 (strong).
Spearman coefficient; ** p < 0.01; * p < 0.05; NS = not significant. UL = upper limb.

functional balance and lack of confidence in balance may affect function and physical condition[10,11]. Moderate correlation between HAP-AASand confidence in balance may be an indication that in this population high confidence could also affect performance both of routine activities, which need for example the use of ladders, andactivities which require greater dislocation, such as crossing a parking lot and walking among people (items evaluated by the ABC).

The literature describes that the difficulty in changing from the sitting to the standing position will restrict ADLs such as standing and starting gait[20]. In the sub-acute phase after-stroke only 29% of the participants are able to stand to the orthostatic position[21]. Moreover, about 60% of the individuals with hemiparesis need some kind of help to climb stairs one year after the stroke, and, even after treatment, between 20-30% will present some difficulty in this task[22,23]. Since these activities are related to the level of balance and necessary to mobility inside and outside the house, activities aiming balance and improvement in confidence in balance could have an impact in QOL of this population.

In a recent study, moderate correlation between balance and social reintegration of an elderly population after a stroke was found[24], demonstrating that the elderly individuals are not satisfied with the reintegration in the community, especially for having a low level of balance and fear of falling. The present study demonstrated that the moderately active and inactive groups presented significant differences concerning functional balance, and the moderately active group points to better functional balance compared to the inactive group, indicating the influence of physical activity for better balance. It is necessary to focus on activities of dynamics balance in the rehabilitation programs after strokes, since there is astrong correlation between these factors and the limitations of these individuals[17].

The strong correlation between balance and QOL was also demonstrated in healthy elderly subjects.The low balance level is associated with decrease of QOL, affecting the physical health and general health perception domains[25]. In the present study, functional balance, besides presenting a moderate correlation with total QOL, it presented moderate correlation with other five QOL domains: family role, self-care, mobility, function of the upper limb and vision. Out of these, self-care and function of upper limb also presented correlation with HAP-MASand HAP-AAS. Good balance provides better mobility and stability for the ADLs to the individual[26]. The individuals with acute hemiparesis with higher balance deficit also present higher motor deficit and are more dependent in their ADLs than individuals who present better balance[27]. The correlation between balance and level of functional independence showed that the improvement in balance results in an important advance of capacity in independent walking[28].

The individuals with chronic hemiparesis may present lack of physical fitness due to the functional loss and reduced aerobic capacity compared to the healthy individuals[8]. The physical activity triggers motor alterations which attenuate the functional losses, leading to gain in the functional capacity with lower energetic expenditure in the ADLs[8,29].

Sedentary behavior is associated with increase of the risk of being affected by a stroke because there is a significant correlation between time for physical activity and leisure and decrease of strokes onset. This fact demonstrates that physical activity besides improving QOL also serves as prevention for future strokes[30].

Based on the results, it can be concluded that the level of physical activity presents significant correlation with functional balance and QOL in individuals with hemiparesis after a stroke. Functional balance presents significant correlation with QOL for the family role and mobility domains.

Therefore, as a complement to the treatment of recovery from the motor deficit, it is extremely important to develop programs of physical activity focused at individuals with hemiparesis after a stroke, especially chronic individuals.

The findings of this study limited to evaluate the correlation between the level of physical activity, balance and QOL in individuals with hemiparesis after a stroke. Thus, we end up suggesting that further investigation on the correlation between the level of physical activity, balance and QOL in regular programs of physical activity, before and after a period of activities should be conducted.

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