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RELATIONSHIP BETWEEN SLEEP QUALITY, BODY PERCEPTION AND MOTOR AND SENSORY SYMPTOMS IN PEOPLE WITH RELAPSING - REMITTING MULTIPLE SCLEROSIS

RELAÇÃO ENTRE A QUALIDADE DO SONO, PERCEPÇÃO CORPORAL E OS SINTOMAS MOTORES E SENSITIVOS EM PESSOAS COM ESCLEROSE MÚLTIPLA REMITENTE-RECORRENTE

RELACIÓN ENTRE LA CALIDAD DEL SUEÑO, LA PERCEPCIÓN CORPORAL Y LOS SÍNTOMAS MOTORES Y SENSITIVOS EN PERSONAS CON ESCLEROSIS MÚLTIPLE RECIDIVANTE-REMITENTE

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ABSTRACT

Relapsing-remitting multiple sclerosis (RRMS) is an autoimmune neurological disease, where the immune system attacks the myelin sheath of the central nervous system, causing inflammation that impairs the transmission of nerve impulses. It is characterized by episodes of flare-ups with exacerbation of symptoms, such as fatigue, weakness in the lower and upper limbs, tremors and balance, difficulty walking, loss of vision, among others, followed by remissions with partial or complete recovery, which can last for months or years, during which the progression of the disease is minimal or absent. Insomnia or poor sleep quality can occur indirectly as a consequence of RRMS. That is, a secondary symptom that is caused by the presence of the specific symptoms of the disease and pseudo-outbreaks. Body Perception (PC) can be defined in two ways, such as Body Image (CI) and Body Schema (CE). HF is related to the psychic, emotional, cognitive, sociocultural, evolutionary, genetic and neuroscientific aspects, in relation to the expectation of the image of their body. The CS is the perspective that enables, through kinesthetic and proprioceptive mechanisms, the recognition of the anatomical body and the relationship it establishes with the environment and with the objects around it. In view of these definitions, the opportunity arose to relate sleep quality with body perception and symptomatological conditions. Thus, the objective of the study was to analyze the relationship between sleep quality and body perception, by the aspect of body schema and the symptomatological conditions of multiple sclerosis. Participants were 18 people, aged between 21 and 67 years, who were evaluated for sleep quality using the Pittsburgh questionnaire, body perception using the Askevold test, and symptoms through a structured interview. The results indicated that all participants with adequate sleep were classified as hyperschematic, while 67% of those who had inadequate sleep were classified as hyposchematic. In addition, individuals with inadequate sleep

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showed a balanced distribution between motor and sensory symptoms, while those with adequate sleep predominantly reported sensory symptoms. Fatigue was a relevant symptom in 67% of individuals with inadequate sleep. These findings suggest that sleep quality may be associated with body perception and symptom manifestation in RRMS, highlighting the importance of sleep-enhancing interventions for the management of this condition.

Keywords: Relapsing-Remitting Multiple Sclerosis. Sleep Quality. Body Perception.

RESUMO

A esclerose múltipla remitente-recorrente (EMRR) é uma doença neurológica autoimune, onde o sistema imunológico ataca a bainha de mielina do sistema nervoso central, causando inflamação que prejudica a transmissão dos impulsos nervosos. Caracteriza-se por episódios de surtos com exacerbação dos sintomas, como fadiga, fraqueza em membros inferiores e superiores, tremores e equilíbrio dificuldade para andar, perda de visão, entre outros, seguidos de remissões com recuperação parcial ou completa, que podem durar meses ou anos, durante os quais a progressão da doença é mínima ou ausente. A insônia ou baixa qualidade de sono pode ocorrer indiretamente como consequência da EMRR. Ou seja, um sintoma secundário que é acarretado pela presença dos sintomas específicos da doença e dos pseudo surtos. A Percepção Corporal (PC) pode ser definida de duas maneiras, como Imagem Corporal (IC) e Esquema Corporal (EC). A IC está relacionada ao aspecto psíquico, emocional, cognitivo, sociocultural, evolucionário, genético e neurocientífico, em relação a expectativa da imagem de seu corpo. O EC é a perspectiva que possibilita, por meio de mecanismos cinestésicos e proprioceptivos, o reconhecimento do corpo anatômico e da relação que este estabelece com o meio e com os objetos a sua volta. Diante destas definições, surgiu a oportunidade para relacionar a qualidade de sono com a percepção corporal e os quadros sintomatológicos. Sendo assim, o objetivo do estudo foi analisar a relação entre a qualidade do sono e a percepção corporal, pelo aspecto do esquema corporal e os quadros sintomatológicos da esclerose múltipla. Participaram 18 pessoas, entre 21 e 67 anos, que foram avaliados quanto à qualidade do sono pelo questionário de Pittsburgh, à percepção corporal pelo Teste de Askevold, e aos sintomas por meio de uma entrevista estruturada. Os resultados indicaram que todos os participantes com sono adequado foram classificados como hiperesquemáticos, enquanto 67% dos que apresentaram sono inadequado foram classificados como hipoesquemáticos. Além disso, indivíduos com sono inadequado mostraram uma distribuição equilibrada entre sintomas motores e sensitivos, enquanto aqueles com sono adequado relataram predominantemente sintomas sensitivos. A fadiga foi um sintoma relevante em 67% dos indivíduos com sono inadequado. Esses achados sugerem que a qualidade do sono pode estar associada à percepção corporal e à manifestação dos sintomas na EMRR, destacando a importância de intervenções que melhorem o sono para o manejo dessa condição.

Palavras-chave: Esclerose Múltipla Remitente-Recorrente. Qualidade de Sono. Percepção Corporal.

RESUMEN

La esclerosis múltiple remitente-recurrente (EMRR) es una enfermedad neurológica autoinmune en la que el sistema inmunitario ataca la vaina de mielina del sistema nervioso central, causando inflamación que dificulta la transmisión de los impulsos nerviosos. Se

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caracteriza por recaídas con exacerbación de síntomas como fatiga, debilidad en las extremidades superiores e inferiores, temblores y equilibrio, dificultad para caminar y pérdida de visión, entre otros, seguidas de remisiones con recuperación parcial o completa, que pueden durar meses o años, durante los cuales la progresión de la enfermedad es mínima o nula. El insomnio o la mala calidad del sueño pueden ocurrir indirectamente como consecuencia de la EMRR. En otras palabras, es un síntoma secundario causado por la presencia de síntomas específicos de la enfermedad y pseudorrecaídas. La Percepción Corporal (PC) se puede definir de dos maneras: Imagen Corporal (IC) y Esquema Corporal (EC). La percepción de la imagen corporal se relaciona con los aspectos psicológicos, emocionales, cognitivos, socioculturales, evolutivos, genéticos y neurocientíficos de las expectativas sobre la imagen corporal. La percepción de la imagen corporal es la perspectiva que posibilita, a través de mecanismos kinestésicos y propioceptivos, el reconocimiento del cuerpo anatómico y su relación con el entorno y los objetos circundantes. Dadas estas definiciones, surgió la oportunidad de relacionar la calidad del sueño con la percepción corporal y las presentaciones sintomáticas. Por lo tanto, el objetivo de este estudio fue analizar la relación entre la calidad del sueño y la percepción corporal, a través del esquema corporal y las presentaciones sintomáticas de la esclerosis múltiple. Los participantes fueron 18 individuos, con edades comprendidas entre 21 y 67 años, a quienes se les evaluó la calidad del sueño mediante el cuestionario de Pittsburgh, la percepción corporal mediante el Test de Askevold y los síntomas mediante una entrevista estructurada. Los resultados indicaron que todos los participantes con sueño adecuado fueron clasificados como hiperesquemáticos, mientras que el 67% de aquellos con sueño inadecuado fueron clasificados como hipoesquemáticos. Además, los individuos con sueño inadecuado mostraron una distribución equilibrada entre los síntomas motores y sensoriales, mientras que aquellos con sueño adecuado reportaron síntomas predominantemente sensoriales. La fatiga fue un síntoma relevante en el 67% de los individuos con sueño inadecuado. Estos hallazgos sugieren que la calidad del sueño podría estar asociada con la conciencia corporal y la manifestación de los síntomas en la EMRR, lo que resalta la importancia de las intervenciones que mejoran el sueño para el manejo de esta afección.

Palabras clave: Esclerosis Múltiple Remitente-Recurrente. Calidad del Sueño. Conciencia Corporal.

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1 INTRODUCTION

Multiple sclerosis is an autoimmune neurological disease, characterized by the immune system attacking the myelin sheath of the cells of the nervous system. The immune system recognizes it as an aggressive agent, causing areas of inflammation, where the nerve impulse does not pass with the same speed, and the same power that it normally would, and with this the symptoms of the disease begin, resulting from which brain or spinal cord area, these lesions appear (Murray, 2020).

Relapsing-remitting multiple sclerosis (RRMS) is a form of multiple sclerosis characterized by episodes of symptom exacerbation that correspond to flare-ups, followed by periods of partial or complete recovery called remissions. During flare-ups, new symptoms may appear or existing symptoms may worsen. Remissions can last for months or years, during which time disease progression is minimal or absent (Dobson; Giovannoni, 2019).

Sleep is an essential physiological need for human beings, playing a crucial role in the production and regulation of immune, hormonal, and metabolic processes (Lateef; Akintubosun, 2020). Sleep is an essential physiological state characterized by a reduction in consciousness, motor activity, and changes in brain activity. During sleep, the body and mind go through several stages, which include non-REM sleep (NREM) and REM sleep, rapid eye movement. These stages are cyclical and play vital roles in maintaining physical and mental health (Irwin, 2019).

Insomnia or poor sleep quality may be a secondary symptom of RRMS resulting from disease-specific symptoms and pseudoflares. That is, a secondary symptom that is caused by the presence of the specific symptoms of the disease and pseudo-outbreaks. Pseudo-outbreaks or false outbreaks are the temporary worsening of symptoms in the occurrence of fever or infections, extreme cold, heat, fatigue, physical exercise, dehydration, hormonal variations, and emotional stress (Filippi, 2018; Reich, Lucchinetti, Calabresi, 2018).

Body Perception (PC) refers to both Body Image (CI) and Body Schema (CE). CI is related to the psychic, emotional, cognitive, sociocultural, evolutionary, genetic and neuroscientific aspects, in relation to the expectation of body image, while CS refers to the anatomical recognition of the body and its relationship with the environment (Askevold, 1975; Le Bouch, 1988; Holmes; Spence, 2004; Freitas, 2004; Barros, 2005). In RRMS, when there is motor and sensory impairment, body perception can be significantly affected.

In view of these considerations, it is essential to investigate the relationship between sleep quality, body perception, and RRMS symptoms. This study proposes the hypothesis

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that sleep quality is positively associated with body perception and negatively correlated with symptom severity in individuals with Relapsing-Remitting Multiple Sclerosis. In other words, people with an adequate sleep quality will have a more positive body perception and report lower severity of motor and sensory symptoms compared to those who have an inadequate sleep quality.

Understanding how sleep quality influences body perception and symptomatology can provide important evidence for the development of more effective therapeutic interventions. Interventions aimed at improving sleep quality can not only alleviate the symptoms of RRMS, but also potentially slow the progression of the disease, contributing to a better quality of life for patients. Thus, this study seeks to fill a gap in the literature and provide a basis for new therapeutic approaches in the management of RRMS. In addition, the objective of the study was to analyze the relationship between sleep quality and body perception, by the aspect of body schema and the symptomatological conditions of multiple sclerosis.

2 METHOD

This is an exploratory-descriptive research with an approach that involved an investigative field research for a qualitative-quantitative analysis, which was submitted to the ethics and research committee of the University of Marília, which will follow the International and National Guidelines and Standards, specifically the resolutions n° 466/12, complementary to the National Health Council, with Opinion number: 6.157.820, CAAE: 70775423.9.0000.5496. The interviews and tests were carried out at the physiotherapy clinic of the University of Marília, in a reserved room, with minimization of external sounds.

Participants were 18 (eighteen) men and women, aged 21 to 67 years with E.M.R.R., selected by convenience. The inclusion criteria were to have a diagnosis of E.M.R.R., to sign the Informed Consent Form (ICF) and not to have associated neurological diagnoses, to remain in the bipedal posture and to have cognition to answer the questions.

The Pittsburgh questionnaire (PSQI) was applied to the participants, used to assess the subjective quality of sleep, being an instrument with previously established reliability and validity. The Pittsburgh Sleep Quality Index (PSQI) consists of 19 items, which are grouped into seven components, each scored on a scale of 0 to 3 (Buysse *et al.,* 1989). Data collection was carried out by a single researcher, and each interview was individual.

Body perception was assessed using the Askevold test, in which participants were positioned in front of a piece of paper fixed to the wall. The examiner touched the specific

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anatomical points on the participant, who referred to these respective points on the paper. At the end of the test, the Body Perception Index (CPI) of the measures evaluated was calculated. To perform the Askevold Test (1975), the participant remained in an orthostatic position in front of a sheet of Kraft paper (1.50m x 1.0m), fixed to the wall at a height of one palm above the participant's head. The participant's distance from the paper was determined by the length of the semi-flexed upper limb, so that his hand hit the paper.

The participants performed the test blindfolded and were instructed to imagine that they were in front of a mirror, visualizing themselves in it. Then, the anatomical points where they were touched by the examiner were marked with a demographic pencil, the first point being the apex of the head. At this point, the participants were instructed to perform an inspiratory apnea and project this point on the wall (paper). Then, the right and left Acromion-clavicular points were touched; Right and left waist curvature; and Greater right and left trochanters, and pointed these respective points on the wall with the blue felt-tip pen.

This procedure was performed three consecutive times, and then the participant was placed near the wall to mark the actual points with a red felt-tip pen. To avoid errors in the marking of the real points, the cervical region was stabilized with the support of the hand, preventing postural balance (Thurm, 2007). The measurements evaluated were: head height; shoulder width; waist width; and hip width. The area between the points marked by the individual represents the Perceived Area (AP) and the area between the points marked by the examiner represents the Real Area (RA) – Figure 7. At the end of the test, the Body Perception Index (CPI) of the measures evaluated was calculated, using the formula: AP (mean of the three attempts) divided by the RA, multiplied by 100 (AP / RA x 100) (Askevold, 1975).

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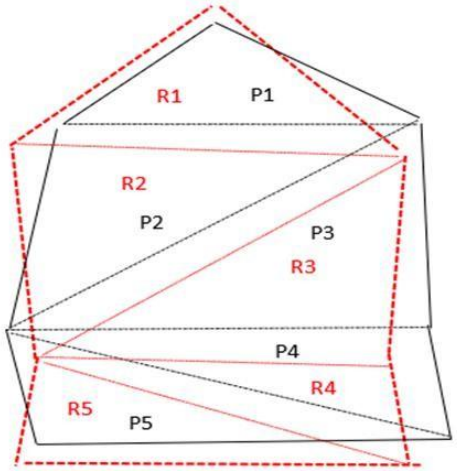
Figure 1

Illustration of the collection of dimensions for the Askevold test



Source: Prepared by the author (2025).

With a margin of error of 2%, subjects who perceived 98 to 102% of their body dimensions were considered adequate body perception; subjects who perceive values below 98% will be classified as Hyposchematic and those who perceive values above 102% will be considered Hyperschematic, according to Bonnier's Classification Table in 1905 (Molinari, 1995).

The method chosen for the symptomatological evaluation was a structured interview, with a script of 07 (seven) closed questions. The questions were inserted in free order in the interview, according to the interviewee's convenience. Some answers were extracted from excerpts from answers to other questions. The interview data were collected through recordings and verbal information.

The information extracted from the interview was: the type of symptom that led to the diagnosis, time since diagnosis or living with the disease, whether the participant is undergoing or has undergone any specific treatment for RRMS, occurrence of considerable impact on quality of life, physical, emotional and social aspects. Participants were divided between adequate sleep quality and inadequate sleep quality. Based on this division,

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individuals were counted according to their answers to assess whether or not there is a relationship between each topic of the interview and sleep quality. The analysis of the association between quantitative variables was explored using the Chi-square test. For the analyses, the Bioestat 5.3 software was used, and a significance level of 5% was adopted.

3 RESULTS

The age distribution of the participants was analyzed to verify the representativeness of the different age groups in the study. The sample consisted of 18 people, with ages ranging from 21 to 67 years. For a more detailed analysis, the sample was categorized into the following age groups:

Table 1

Categorization of samples by age group

Age group	Number of Participants	Percentage (%)
21-30 years	2	11,1%
31-40 years	3	16,7%
41-50 years old	7	38,9%
51-60 years	4	22,2%
61-70 years old	2	11,1%

Source: Prepared by the author (2025).

The study included 18 individuals, 83% (n = 15) female and aged 46.4 ± 12.0 years (minimum = 21 years, maximum = 67 years), 89% (n = 16) adults and 11% (n = 2) elderly. Quantitative variables were described as mean, standard deviation (SD), and minimum and maximum values. Qualitative variables were described by frequency distribution, absolute (n) and relative (%).

3.1 RELATIONSHIP BETWEEN BODY PERCEPTION AND SLEEP QUALITY

In the evaluation of sleep quality, scores were obtained from 16.0 ± 8.10 (minimum = 1 maximum = 28), with 17% (n = 3) presenting adequate sleep quality and 83% (n = 15) inadequate. The Askevold Index score was 85.7% ± 33.9% (minimum = 31.0%, maximum = 135.0%), with 44% (n = 8) of the participants classified as hyperschematic and 56% (n = 10) as hyposchematic. The study of the association between body perception and sleep quality in individuals with RRMS is presented in Table 2.

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Table 2

Association between body perception and the quality of sleep of the participants

Sleep quality	Body Schema		Total	p-value*
	Hyperschematic n (%)	Hyposchematic n (%)		
Proper	3 (100%)	0 (0%)	3	<0.0001
Inadequate	5 (33%)	10 (67%)	15	

Source: Prepared by the author (2025).

Participants who had adequate sleep quality had body perception as hyperschematic, while those who had inadequate sleep quality had a predominance of body perception as hyposchematic (67%). These two variables have a significant association ($p < 0.0001$).

3.2 RELATIONSHIP BETWEEN RRMS SYMPTOMS AND SLEEP QUALITY

The results of the interview were shown in Table 3.

Table 3

Results collected from the interview

N	Type of initial symptom	Time living with the disease	Has had or is undergoing treatment for RRMS	Most present or relevant symptoms	Needs support	Emotional impact	Social impact
1	sensitive	11 years	yes	fatigue	No	No	No
2	sensitive	20 years	yes	fatigue	No	No	No
3	Motor and Psychic	29 years	yes	trembling and balancing, difficulty walking	yes	yes	yes
4	sensitive	4 years	yes	has no symptoms	No	No	No
5	sensitive	1 years	yes	weakness in Upper limb and right leg	No	yes	No
6	engine	7 years	yes	MS and MI muscle weakness	yes	yes	yes
7	sensitive	13 years	yes	fatigue	No	No	No
8	sensitive	15 years	yes	fatigue, loss of side view	No	yes	No
9	sensitive	10 years	yes	fatigue and tingling in the non-	No	No	No

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10	sensitive	17 years	yes	urinary urgency and intestinal	No	No	No
11	engine	9 years	yes	Neuralgia intercostal, fadiga	No	yes	No
12	engine	12 years	yes	fatigue	No	No	No
13	sensitive	10 years	yes	fatigue	No	No	No
14	engine	9 years	yes	fatigue, weakness Lower limb	No	No	No
15	engine	20 years	yes	pain, fatigue, incontinence Urinary	No	No	No
16	engine	3 years	yes	imbalance	yes	yes	No
17	sensitive	2 years	yes	fatigue	No	No	No
18	sensitive	10 years	yes	urinary urgency	No	No	No

Source: Prepared by the author (2025).

3.2.1 Relationship between initial symptom and sleep quality

It was observed that 100% of the interviewees, with adequate sleep quality, discovered their disease after an episode of sensory symptoms. For respondents with inadequate sleep quality, both types of symptoms had equal weight. 46.7% had motor symptoms, 46.7% had sensory symptoms, and one case (6.7%) had both symptoms. The results comparing the type of initial symptom in relation to sleep quality are shown in Table 3.

Table 4

Analysis of the results of the types of initial symptoms at the discovery of the disease

Sleep quality	**Type of Initial Symptom**		
	Sensitive N (%)	**Engine N (%)**	**Both N (%)**
Proper	3 (100%)	0 (0%)	0 (0%)
Inadequate	7 (46,7%)	7 (46,7%)	1 (6,7%)

Source: Prepared by the author (2025).

3.2.2 Relationship between the time of living with the disease and the quality of sleep

The average time of living with the disease was 12.4 years, with a minimum of 1 year and a maximum of 29 years. Participants with adequate sleep quality had an equal proportion in the three intervals of time living with the disease evaluated. For participants with inadequate sleep quality, an increasing number was observed as a function of the time they had lived with the disease. 13.3% were up to 5 years old, 33.3% were between 6 and 10 years old and 53.3% had lived with the disease and inadequate sleep quality for more than

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10 years. Table 5 shows the distribution of individuals according to the length of time they had lived with the disease and the quality of sleep.

Table 5

Results of the time living with the disease and sleep quality

Sleep quality	Time with illness		
	Up to 5 years N (%)	From 6 to 10 years old N (%)	More than 10 years n (%)
Proper	1 (33,3%)	1 (33,3%)	1 (33,3%)
Inadequate	2 (13,3%)	5 (33,3%)	8 (53,3%)

Source: Prepared by the author (2025).

3.2.3 Relationship between having had or taking treatment for RRMS and sleep quality

As all participants underwent some type of specific drug treatment for RRMS, it was not possible to correlate with sleep quality from this isolated aspect, as shown in Table 6.

Table 6

Results for occurrence of RRMS treatment and sleep quality

Sleep quality	Has undergone or is undergoing specific treatment	
	Yes n (%)	No n (%)
Proper	3 (100%)	0
Inadequate	15 (100%)	0

Source: Prepared by the author (2025).

3.2.4 Most present symptoms and sleep quality

Fatigue was the most relevant symptom, with 11 occurrences among the 18 participants. Among them, 33.3% of participants with adequate sleep reported fatigue, while 66.7% of participants with inadequate sleep mentioned this symptom. Weakness in the lower limbs was reported by 4 participants, all of whom had inadequate sleep quality (26.7%). Urinary incontinence was mentioned by 3 participants, corresponding to 33% among those with adequate sleep and 13.3% among those with inadequate sleep. The symptoms of imbalance and weakness in the lower limbs each had 2 mentions, representing an incidence of 13.3%, both restricted to participants with inadequate sleep

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Symptoms of pain, evacuatory incontinence, intercostal neuralgia, paresthesia in the upper limbs, and tremor were reported only once each, exclusively by participants with inadequate sleep, with an occurrence of 6.7% each. The symptom related to vision was mentioned only once, by a participant with adequate sleep (33.3%). In addition, one participant with adequate sleep did not have relevant symptoms. Table 7 shows the distribution of the occurrences of the most relevant symptoms reported by the participants, organized according to sleep quality.

Table 7

Analysis of the results of the occurrence of symptoms by sleep quality

Symptom	Occurrences N	Percentage of incidence by sleep quality	
		Adequate (%)	Inadequate (%)
fatigue	11	33,3%	66,7%
MI weakness	4	0,0%	26,7%
urinary incontinence	3	33,3%	13,3%
imbalance	2	0,0%	13,3%
MS weakness	2	0,0%	13,3%
pain	1	0,0%	6,7%
bowel movement incontinence	1	0,0%	6,7%
neuralgia intercostal	1	0,0%	6,7%
MS paresthesia	1	0,0%	6,7%
tremor	1	0,0%	6,7%
vision	1	33,3%	0,0%

Source: Prepared by the author (2025).

3.2.5 Relationship between limitation or dependence for locomotion and sleep quality

Of the 15 individuals with inadequate sleep, 3 use some mobility support (20%) against 12 (80%) who do not use mobility support. Individuals with adequate sleep quality did not manifest the need for mobility support, as shown in Table 8.

Table 8

Relationship between dependence for locomotion and sleep quality

	Needs support

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Sleep quality	Yes n (%)	No n (%)
Proper	0	3 (100%)
Inadequate	3 (20%)	12 (80%)

Source: Prepared by the author (2025).

3.2.6 Relationship between the emotional impact of the disease and sleep quality

The proportion between people who had emotional impact and people who did not have emotional impact due to the disease, for sleep quality, is the same. Among people with impact, 5 out of 6 or 83% have inadequate sleep, as well as, among people who do not have emotional impact, 10 out of 12 or 83% have inadequate sleep. By sampling, it was not possible to identify a propensity to poor sleep quality for people who have emotional impact due to RRMS. Comparative data are shown in Table 9.

Table 9

Relationship between the emotional impact of RRMS and the relationship with sleep.

Sleep quality	Emotional impact	
	Yes n (%)	No n (%)
Proper	1 (33,3%)	2 (66,7%)
Inadequate	5 (33,3%)	10 (66,7%)

Source: Prepared by the author (2025).

3.2.7 Relationship between limitations of social activities and sleep quality

All interviewees who manifested an impact on their social activities due to the disease have inadequate sleep quality. Whereas, for individuals who did not have an impact on social activities, 13 out of 16 or 81% had inadequate sleep quality, as shown in Table 10.

Table 10

Relationship between impact on social activities and sleep quality

Sleep quality	Social impact	
	Yes n (%)	No n (%)
Proper	0	3 (100%)
Inadequate	2 (13,3%)	13 (86,7%)

Source: Prepared by the author (2025).

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4 DISCUSSION

According to the data from the research carried out, it is possible to infer that individuals with Relapsing-Remitting Multiple Sclerosis and with inadequate sleep quality tend to have a hyposchematic body perception. Individuals with RRMS and adequate sleep quality are expected to have hyperschematic body perception. During the research, some studies were found relating Body Image (CI) to sleep quality, but no studies were found relating Body Schema (CE) to sleep quality. Even so, none of the studies found dealt with specific populations, such as people with Multiple Sclerosis. According to Berti *et al,* (2007), the body schema (CE) is related to specific areas of the cerebral cortex, therefore, if these regions suffer neurological damage, this will cause a reorganization and expansion of the affected region, thus causing an alteration of the CE.

This aspect can be observed in the results of the Askevold tests, where the calculated indices were very far from the normal reference (100%) of the scale, minimum of 31.0% and maximum of 135.0%. None of the participants scored in the normal range, between 98% and 102%. Upon discovering the disease or having received the diagnosis of the disease, in individuals with RRMS and inadequate sleep quality, the complaint of motor symptoms occurred in 50% of the cases. However, individuals with RRMS and adequate sleep quality had only sensory symptoms. The longer the time of living with the disease, the proportion of people with inadequate sleep quality tends to increase.

In this research, it was not possible to assess whether sleep quality is affected by whether or not the individual has undergone specific treatment for multiple sclerosis, as all participants have undergone some type of treatment since the discovery of the disease. However, Toscano *et al,* 2022, indicates that MS patients being treated with Disease *Modifying Drug* (DMD) showed better sleep quality and lower level of disability, *Expanded Disability Status* (EDS). Their MS-related symptoms are treated, allowing them a better quality of sleep than a group of individuals who may have sleep disorders, other neurological diseases, clinical or non-clinical diseases, as well as diverse health habits, in addition to older people and a higher proportion of men, highlighting the higher risk of obstructive sleep apnea.

Regarding the most present symptoms that occur in individuals with adequate and also inadequate sleep, we have fatigue and urinary incontinence. Fatigue occurs more frequently in individuals with inadequate sleep quality (66.7% versus 33.3%) and urinary incontinence occurs more frequently in individuals with adequate sleep quality (33.3% versus 13.3%). The

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other symptoms occur in only one of the groups (adequate or inadequate sleep). In this case it is not possible to estimate a relationship.

Attarian *et al,* (2009), found similar data regarding the prevalence of fatigue and poor sleep quality. When they examined the sleep of 15 MS patients with fatigue, compared to 15 MS patients without fatigue. Twelve of the patients with MS fatigue had disrupted sleep or disrupted circadian rhythm (80%), compared to three in the group without fatigue. As one of the participants, with adequate sleep, did not report relevant symptoms, it is possible to suggest an extension research in individuals with adequate sleep and RRMS and the quantitative incidence of symptoms.

The data collected on the impact of the symptoms or limitations of the disease on the aspects of mobility support, emotional impact and impact on the social activities of the interviewees played a complementary role in understanding the results of sleep quality. A higher proportion of individuals with adequate sleep was noted, which has no need for locomotion and impact on social activities. The proportion of individuals who have or do not have an emotional impact is the same, regardless of sleep quality.

5 CONCLUSION

The study found a strong association between body perception and sleep quality in people with RRMS. The research showed that participants with adequate sleep were hyperschematic, while participants with inadequate sleep were hyposchematic. People with RRMS and inadequate sleep quality have a balanced predominance between initial motor and sensory symptoms. On the other hand, individuals with RRMS and adequate sleep quality report an initial symptom of the disease with a sensory characteristic. As time goes by to live with the disease, there is a tendency for more people to have inadequate sleep quality. Fatigue is a relevant symptom in most individuals with inadequate sleep.

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