

Effect of miofascial massage on pain on proprioception of women after modified radical mastectomy

Efeito da massagem miofascial sobre a dor e a propriocepção pós-mastectomia radical

Débora Sanfelice Zanon, Ana Carla Piovesan, Melissa Medeiros Braz, Sara Teresinha Corazza, Hedioneia Maria Foletto Pivetta

<http://dx.doi.org/10.11606/issn.2238-6149.v28i1p115-121>

Zanon DS, Piovesan AC, Braz MM, Corazza ST, Pivetta HMF. Effect of miofascial massage on pain on proprioception of women after modified radical mastectomy. Rev Ter Ocup Univ São Paulo. 2017 Jan.-Apr.;28(1):115-21.

ABSTRACT *Introduction:* breast cancer, among malignant neoplasms, has been responsible for the highest mortality rates in the world. Several problems can be related to the surgery, such as pain and changes in sensitivity, which are responsible for a higher myofascial strain that reduces the amplitude of movements – being directly related to proprioception. *Objectives:* to analyze the acute effect of an indirect management of the connective tissue on the pain and proprioception of women subjected to modified radical mastectomy. *Method:* this research is of the quasi-experimental type, with pre- and post-test, with a sample composed of women aged between 40 and 72 years. The following assessments were performed: socio-demographic questionnaire; Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire; pain analog scale and a kinesimeter for the proprioception assessment. After this, the women underwent myofascial massage. In the data analysis, we conducted the Shapiro-Wilk test for normality. For symmetric data, we used paired T-test, and the Wilcoxon for asymmetric data. *Results:* 12 women participated in the research. The results showed a reduction in the averages, which were not statistically significant in relation to pain and proprioception, and to indirect pre- and post-management of the connective tissue. *Conclusion:* we found no improvement in pain and proprioception after myofascial massage in mastectomized women.

KEYWORDS: Mastectomy; Radical; Proprioception; Women's health; Massage.

Zanon DS, Piovesan AC, Braz MM, Corazza ST, Pivetta HMF. Efeito da massagem miofascial sobre a dor e a propriocepção pós-mastectomia radical. Rev Ter Ocup Univ São Paulo. 2017 jan.-abr.;28(1):115-21.

RESUMO: *Introdução:* o câncer de mama, dentre as neoplasias malignas, tem sido o responsável pelos maiores índices de mortalidade no mundo. Diversos problemas podem estar relacionados à cirurgia, como a dor e as alterações na sensibilidade, os quais são responsáveis por uma maior tensão miofascial, que leva à diminuição na amplitude dos movimentos, estando diretamente relacionados à propriocepção. *Objetivos:* analisar o efeito agudo da abordagem indireta no tecido conjuntivo sobre a dor e a propriocepção de mulheres submetidas à mastectomia radical modificada. *Método:* a pesquisa é do tipo quase experimental com pré e pós-teste, composta por mulheres com idades entre 40 e 72 anos. Foram realizadas as seguintes avaliações: questionário sociodemográfico; questionário *Disabilities of the Arm, Shoulder and Hand*; Escala Analógica da dor e cinesímetro para a avaliação da propriocepção. Após, as mulheres foram submetidas à aplicação da massagem miofascial. Para a análise dos dados, foi realizado o teste de normalidade de Shapiro-Wilk, sendo que nos dados simétricos, foi utilizado o Teste T Pareado, e nos dados assimétricos, foi utilizado o teste Wilcoxon. *Resultados:* participaram da pesquisa 12 mulheres. Os resultados demonstraram que houve redução nas médias, o qual, estatisticamente, não foram significativos em relação à dor e à propriocepção, pré e pós-abordagem indireta do tecido conjuntivo. *Conclusão:* concluiu-se que não houve melhora da dor e propriocepção após massagem miofascial em mulheres mastectomizadas.

DESCRITORES: Mastectomia radical; Propriocepção; Saúde da mulher; Massagem.

Article based on a Specialization Monograph in the Physical-Motor Rehabilitation Course at Universidade Federal de Santa Maria.
1. Universidade Federal de Santa Maria. E-mails: debora.s.z.2012@hotmail.com, aninhapiovesan@yahoo.com.br, melissabraz@hotmail.com, saratcorazza@gmail.com, hedioneia@yahoo.com.br
Corresponding address: Hedioneia Maria Foletto Pivetta. Av. Roraima, 1000. Cidade Universitária. Bairro Camobi. Santa Maria, RS. CEP: 97.105-900.

INTRODUCTION

The incidence of cancer is increasing in the last decades, and currently it is a health problem worldwide. The World Health Organization (WHO)¹ estimated that, for 2030, we will have 27 million cases of cancer in the world.

Cancer is defined as a disease caused by exacerbated and uncontrolled abnormal cell divisions that have morphological and functional changes, with the ability of invading tissues and regional structures, which may lead to death². Breast cancer is the most common tumor among women with high incidence rate and mortality³.

As therapeutic approach, the surgery is often the main choice to try to eradicate the tumor. Modified radical mastectomy is the most common type of mastectomy – the breast is totally removed, with axillary lymph node dissection and can be classified as “Patey mastectomy”, when the pectoralis major muscle is preserved, or as “Madden mastectomy”, when both pectoralis muscles are preserved⁴.

This treatment is associated with the emergence of several functional changes, sequelae and complications, such as asymmetrical stance; vascular and lymphatic diseases; adhesions on the chest wall; abnormal alignment of the shoulder blades, as a result of a sudden change in body weight, in the adjacent body side, next to the breast removal, and shoulder movement limitation. Moreover, sensitivity changes in parts of the arm and axilla, and miofascial⁵ retraction are also reported.

One of the complications that may occur is a change in proprioception. This term is related to the perception of the segment in space, as well as the position, speed, distance and direction of the movement to be carried out. Thus, proprioception is the ability to recognize the body's spatial location, its position and orientation, the force exerted by muscles and the position of each part of the body in relation to the others, without using the vision^{6,7}.

In turn, proprioceptors are structures present in the joints, muscles, ligaments and tendons. They are responsible for transmitting to the central nervous system all kinds of information related to the spatial organization of the segments, that is, the biomechanical relationship of articular tissues, which can influence the muscle tone, postural balance and articular stability^{6,7}.

Thus, we can presume that the ability of interpreting information from the upper limb is directly influenced by miofascial strain resulting from the procedures in the

hemithorax affected by breast cancer, which decreases the quality of movement, since it is directly related to proprioception.

Myofascia is a specific type of deep fascia attached to the muscle tissue. Myofascial massage focuses on the miofascial unit, including the muscle, connective tissue and neuromuscular junction. This type of massage is a feature low-cost manual therapy and very effective for neuromusculoskeletal changes. One of its modalities is the indirect management of the connective tissue – using only smooth movements for the miofascial release –, which is useful for treating acute pain and inflammation areas⁸.

Postural compensation patterns and decreased elasticity (reduction of motion range by muscle shortening) – associated with the upper limb lines of anatomy trains – lead to various types of disorders involving the shoulder, arm and hand, and are commonly related to the fact that the shoulders are protracted, retracted, elevated or internally rotated⁹. In the case of mastectomized women, important functional changes appear in the upper limb (on the area where surgery was made), especially regarding the restriction of motion range, pain and changes in the sensitivity.

Considering these aspects, rehabilitation plays a fundamental role in this stage of a woman's life, as it aims to restore functional activity of the affected member, besides comprising a set of therapeutic physical possibilities that may reduce recovery time, with faster return to everyday activities. Multidisciplinary activities for the upper limb rehabilitation must begin as early as possible, assisting the social reintegration of women and contributing to a fast recovery and improving their quality of life¹⁰.

Based on the above considerations, the objective of this study was to evaluate the acute effect of indirect management of the connective tissue on the pain and proprioception of unilateral modified radical mastectomy.

MATERIAL AND METHODS

This is a quasi-experimental study with quantitative approach, with pre- and post-test, with no control group, approved by the Research Ethics Committee (RES) from Universidade Federal de Santa Maria (UFSM), RS, under the protocol number 512,084. All participants signed the Informed Consent Form at the time of data collection.

The research population was women subjected to unilateral modified radical mastectomy, aged between 35 and 59 years, and, for convenience, the sample

consisted of 20 women who agreed to participate in the study. However, 8 were excluded because they did not feel pain during the pre-test time, totaling a sample of 12 women. In addition to pain, we adopted the following exclusion criteria: women who have undergone another type of breast surgery, other than the modified radical mastectomy; those who were under radio or chemotherapy treatment; difficulty in understanding in the test and in the response to the research instrument. Women with severe impairment in the motion joint range that impeded the use of the data collection instrument (kinesimeter) were also excluded.

The sample was obtained from the Physical Therapy Outpatient Clinic at *Hospital Universitário de Santa Maria*, Rio Grande do Sul. The participants were referred to an Occupational Health Reference Centers (CEREST) – for its availability – and were evaluated. CEREST (Downtown region) is a reference in Occupational Health for the 4th Regional Health Office, which comprises 31 cities in the region. The unit develops activities related to undergraduate and graduate courses from the university (UFSM), being an area that integrates teaching and services. The clinic provides treatment for women's breast cancer.

Data collection was performed in 2015, through a sociodemographic questionnaire prepared by the researchers, which aimed to characterize the sample regarding age, body mass index (BMI), marital status, education and reproductive data. Subsequently, the Disabilities of the Arm, Shoulder and Hand (DASH)¹¹ questionnaire was applied to assess the upper limb functionality. This instrument had 30 self-applicable questions and two optional modules to evaluate the symptoms and the physical, social and psychological functions. It was designed to be used in patients with disorders in any upper limb joint. This study used the first 30 questions and the optional module for work activities (including housework). For the data collection, we also applied the Visual Analog Scale (VAS) to assess pain, which consisted of a straight line numbered from zero to ten, where zero means absence of pain and ten the worst pain imaginable.

To assess proprioception, a kinesimeter was used (Figure 1), according to the Paixão's protocol^{6,12,7} – it is an instrument for measuring the extent of movements (0° to 180° degrees): the volunteer was told to make internal and external rotations with the shoulder until certain angle so the researcher could evaluate proprioception. The analysis of proprioception was performed with the patient comfortably sat down in front of a table on which

rested the instrument. The patient's trunk remained supported by the chair, and the upper limb (the part mastectomized), in the supine position, was placed on the equipment. Then, the patients were blindfolded to avoid any visual perception of the motion. At this stage, the researchers showed the three predetermined positions in which the motion should be carried out: 90°, 45° and 105° degrees, respectively.



Figure 1 – Kinesimeter: instrument to evaluate the proprioception of upper limbs, according to the Paixão's Protocol (photo taken by the researchers)

On every angle, the examiner kept the patient's upper limb for about 10 seconds so she could realize her member positioning. The same procedure was repeated for the 3 angles described and then they returned to the initial position (0°). At this stage, the test of active mode started – the patient moved the mobile arm until the angles she believed to represent those required by the research (45°, 90° and 105° degrees). The result was the error, that is, degrees lacking or exceeding the exact point of the given angles. The proprioception assessment was carried out based on the average of three repetitions, that is, the questionnaire was applied by one researcher and kinesimeter by other one to minimize biases.

After the evaluation, the patients were subjected to indirect management of the connective tissue, since these techniques focus on the myofascial network as a whole. Myofascial network is the one formed by the connective tissue, an unit that extends throughout the body – any movement or maneuver applied in a segment produces effects at distance⁸.

The indirect myofascial massage consists in releasing myofascia through soft movements of the connective tissue. In fact, body-balancing movements, agitation or mild traction on a specific segment. We used three techniques: Rocking, Jostling and Flopping⁸. The Rocking maneuver involves passive balancing movements – lateral or circular, or combinations of these –, moving

the member up and down through vibrations produced by the therapist and transmitted to the patient's whole body. Jostling is a type of vibration produced by fast and continued rhythmic movements generated by the therapist, which are transmitted to the patient's body as shaking movement. In turn, Flopping consists of oscillations, agitations in lateral direction – the patient's member is moved and controlled on the table⁸.

These three maneuvers were applied for approximately 15 minutes, in an evaluation pre- and post-myofascial massage. The woman has been placed in the dorsal decubitus position on the stretcher with her head resting on a pillow.

For statistical analysis we used the Shapiro-Wilk normality test. Data deemed as asymmetric were logarithmically transformed aiming at symmetry, which allowed more reliable statistical tests.

For the pre- and post-analysis of symmetric data, we used the paired t-test. For comparison with asymmetric data, the Wilcoxon test was used. The significance level adopted was $p \leq 0.05$.

RESULTS

The women who participated in the study were white, with an average age of 55.83 (± 9.34) years, with average BMI of 25.72 (± 2.52) kg/cm². Table 1 presents marital status, schooling and reproductive data, such as number of pregnancies, age at the first pregnancy, age of menarche and menopause, the upper limb functionality of women subjected to unilateral modified radical mastectomy.

The postoperative average time was 28.08 (± 24.90) months. All women underwent adjuvant treatments, such as chemotherapy, radiotherapy and hormone therapy. All of them reported symptoms of menopause, after starting the complementary breast cancer treatment.

The unilateral mastectomy (right side of the body) prevailed – 9 (75%) cases, as well as the dominant upper limb of these women was also the right one, that is, most of them was right-handed. Concerning rehabilitation, the women reported physical therapy treatment, with average time of 7.58 (± 10.33) months, and 2 of them had not undergone any rehabilitation treatment until the time of the evaluation.

The assessment of proprioception with the kinesiometer in the pre-test presented average error = 14.69°, and in the post-test the value was 11.38°. In the pain assessment by VAS, we identified that in the pre-test the average was 3.33, while in the post-test it was 2.66

(Table 2). However, despite the reduction of the averages, there was no statistically significant results.

Table 1 – Marital status, schooling, reproductive data and functionality of the shoulder of women subjected to unilateral modified radical mastectomy

Variables	n (%)	
MARITAL STATUS		
Single	1 (8.33)	
Married	10 (83.33)	
Divorced	1 (8.33)	
SCHOOLING		
Elementary School Some	3 (25)	
Some High School	1 (8.33)	
High School	6 (50)	
College Degree	2 (16.66)	
Variables	Average	SD
REPRODUCTIVE DATA		
Number of pregnancies	2.66	± 1.15
Age at the first pregnancy	22.33	± 3.47
Age of menarche	11.91	± 1.16
Age of menopause	47.83	± 5.49
FUNCTIONALITY		
DASH1	22.15	± 14.99
DASH3	30.18	± 21.77
Total DASH	26.16	± 17.28

Values expressed in n, average and standard deviation (SD).

Table 2 – Assessment of pain and proprioception before and after indirect myofascial maneuver

Variables	Pre-	Post-	P
Proprioception	14.69° (± 6.89)	11.38° (± 8.00)	0.258
Pain	3.33 (± 2.60)	2.66 (± 2.30)	0.072

Values expressed in average and standard deviation (SD).

DISCUSSION

The study participants were white women (100%), and 83.33% were married with an average age of 55.83 years (± 9.34). The average BMI of the participants was 25.72 (± 2.52) kg/cm² – this value means overweight. According to the Brazilian National Cancer Institute, obesity and overweight are considered behavioral factors and are risk factors for the development of breast cancer¹³. Regarding schooling, 6 of the participants (50%) had finished high school and 3 (25%) had some primary school.

For reproductive data of the women in this study, the average age of menarche was 11.91 (\pm 1.16) years, and for menopause, 47.83 (\pm 5.49) years.

The average age at the first pregnancy was 22.33 (\pm 3.47) years, while the average number of children was 2.66 (\pm 1.15). Concerning the age at the first pregnancy, 94.4% of them had the first child before their 30s. In regard to adjuvant treatments, such as radiotherapy, chemotherapy and hormone therapy, all participating women underwent one or more treatments.

In relation to the time after surgery for the treatment of breast cancer, the average was 28.08 (\pm 26.90) months, and the surgery on the right side of the body prevailed, with 9 (75%) cases. In a study carried out with 121 women who underwent surgery to remove the cancer, the post-surgery time was up to 24 months, totaling 67.7% of the sample; 33.3% more than 24 months and the affected side was the right side of the body, with 52.1%¹⁴. The time of physiotherapeutic treatment of our participants was 7.58 (\pm 10.33) months, i.e., a shorter period if compared to the study mentioned.

Although the current literature does not indicate an instrument to evaluate functionality in the population with breast cancer¹⁵, DASH has been often used to evaluate the upper limb disorders resulting from therapeutic management¹⁶.

In our study, the average functionality (by DASH, the first 30 questions and the optional module concerning labor activities) was 26.16 (\pm 17.28). In a similar study that evaluated functionality of women with breast cancer through DASH (Juiz de Fora, Minas Gerais, Brazil), the average functionality was 21.09 (\pm 19.56), suggesting improvement in the upper limb¹⁴. According to Cheng et al.¹⁷ and Orfale et al.¹¹, a high score (100) indicates severe dysfunction, and a low score (0) means no dysfunction at all. The data provided by DASH were not statistically significant, but the participants, according to these authors, had a low score, i.e., little functional impairment in the upper limb.

Barbosa¹⁴ reports that the upper limb functionality, through DASH, showed that 34.7% depended on the pain variable. In the study mentioned, pain was also evaluated before and after the indirect management of the connective tissue, in which the pre-treatment pain had an average of 3.33 (\pm 2.60) and post-treatment of 2.66 (\pm 2.30) in VAS. However, this reduction was not statistically significant, and we found no correlation with any of the other variables investigated. The intensity of pain in the women evaluated in this study was light

because most of them had undergone surgery over a year ago and, at the same time, physiotherapeutic treatment.

Another reason may be related to the technique application in a single moment, because fascia is the basic component of the musculoskeletal system, and in normal circumstances, must be flexible and sliding. However, in cases of trauma, inflammation, surgery, and stress, there are restrictions and fascial adhesions, which make it more solid and contract its fibers, generating pressure on sensitive areas and thus pain and movement constraints⁹ that require longitudinal treatments.

Indirect movements in the connective tissue are focused on bringing comfort to critical areas, since Jostling, Rocking and the Flopping may relax the muscles⁸ relieving the pain. This also may have influence on proprioception assessment. When their upper limbs were more relaxed and feeling less pain, the participants had a better perception on their body, upper limb position in space, and this may indicate an improvement in terms of pain and proprioception after myofascial massage.

In a study¹⁸ carried out in Presidente Prudente, São Paulo, Brazil, which evaluated the effect of manual therapy (the maneuvers were not specified by the authors) on mastectomized patients feeling pain in the shoulder girdle and cervical spine muscles, there was a pain decrease in all the 19 patients evaluated. In the aforementioned study, the average pain intensity reported at the beginning was 6.6 (analog scale of pain, from 0 to 10), and at the end of the first session was reduced to 4.6. The patients reported pain intensity decreased by 2 points in relation to the pain felt before treatment. During the sessions, a decrease in pain was observed – the participants reported pain intensity of 3.4 and, at the end of the last session, 1.37. In the aforementioned study, the authors concluded that manual therapy was effective to reduce myofascial pain in mastectomized patients, contributing to improve the quality of life of them¹⁸.

The proprioception assessment presented the following results: pre-maneuver average absolute error = 14.69° (\pm 6.89), and after maneuver = 11.38° (\pm 8.00). We can infer that the lower the absolute error, the better the individual's proprioceptive performance and, consequently, an improvement in proprioception⁶. This is essential to motions and an important source of sensory information to orientate individuals regarding positions and sensations. Statistically, the differences in the angles of absolute error were not significant; however, the results expressed in the averages revealed differences before and after maneuvers, showing an improvement in the

proprioception of participants after indirect management of the connective tissue.

In this sense, several groups of mechanoreceptors can be highly encouraged to increase proprioception of different musculoskeletal structures^{19,20}. Cutaneous mechanoreceptors can be stimulated by dynamic events on the skin, such as massage, friction or vibration and by rhythmic or oscillatory movements²⁰. This confirms the fact that indirect management of the connective tissue in the women who participated in our research stimulated mechanoreceptors, because they had a better performance regarding movements and sensory information (giving the individual the notion about positions and sensations, i.e., improving proprioception after maneuver).

A study that analyzed the upper limbs proprioception of 8 women who performed specific exercises in a swimming pool⁶ also found no statistically significant difference, corroborating the results of our research. Our study showed lower proprioception averages for the upper limb in relation to the aforementioned

research, which denoted the low proprioception level of the subjects analyzed in our article.

Some similar results were found in another study, in which the upper limbs proprioception of older adults who performed water exercises was observed – the average was 11.30° in Group 1 (59-69 years), and 12.95° in Group 2 (70-84 years). In that study, the authors concluded that the more advanced is the age, the greater is the motor loss, and, consequently, the proprioception²¹.

CONCLUSION

We found no significant difference before and after the indirect management of the connective tissue regarding pain and proprioception of women submitted to modified radical mastectomy. This may have occurred due to the small sample used, the short-time maneuver or the application of only one technique. We have not so far found in the literature similar studies that would allow the comparison with the findings of our study.

REFERENCES

1. Instituto Nacional do Câncer (INCA). Estimativa 2012: incidência de câncer no Brasil [citado 15 jun. 2015]. Available from: <http://www.inca.gov.br/estimativa/2012/index.asp?ID=2>.
2. Silva SED, Vasconcelos EV, Santana ME, Rodrigues ILA, Leite TV, Santos LMS, et al. Representações sociais de mulheres mastectomizadas e suas implicações para o autocuidado. Rev Bras Enf. 2010;5(6):727-34. <http://dx.doi.org/10.1590/S0034-71672010000500006>.
3. Barbosa JAN, Amorin MHC, Zandonade E, Delaplane ML. Avaliação da postura corporal em mulheres com câncer de mama. Rev Bras Ginecol Obstet. 2013;35(5):215-20. Available from: <http://www.scielo.br/pdf/rbgo/v35n5/05.pdf>.
4. Brasil. Ministério da Saúde. Secretaria de Atenção à Saúde. Protocolos clínicos e diretrizes terapêuticas em oncologia. Brasília; 2014 [citado 19 jan. 2017]. Available from: http://bvsms.saude.gov.br/bvs/publicacoes/protocolos_clinicos_diretrizes_terapeuticas_oncologia.pdf.
5. Cezar K, Nascimento APC. Qualidade de vida de pacientes pós-mastectomizadas em reabilitação oncológica. J Health Sc. 2014;16(1):29-32. <http://dx.doi.org/10.17921/2447-8938.2014v16n1p%25p>.
6. Antes DL, Katzer JI, Corazza ST. Coordenação motora fina e propriocepção de idosas praticantes de hidroginástica. RBCEH, 2008;5(2):24-32. <http://dx.doi.org/10.5335/rbceh.2012.109>.
7. Deshpande N, Connelly DM, Culham EG, Costigan PA. Reliability and validity of ankle proprioceptive measures. Arch Phys Med Rehabil. 2003;84:883-9. [http://dx.doi.org/10.1016/S0003-9993\(03\)00016-9](http://dx.doi.org/10.1016/S0003-9993(03)00016-9)
8. Dixon MW. Massagem miofascial. fisioterapia prática. Rio de Janeiro: Guanabara-Koogan; 2007. (Série Physio).
9. Myers TW. Trilhos Anatômicos: meridianos miofasciais para terapeutas manuais e do movimento. 3a ed. São Paulo: Manole; 2017.
10. Giacon FP, Peixoto BO, Kamonesky DH, Sampaio Neto, LF. Efeitos do tratamento fisioterapêutico no pós-operatório de câncer de mama na força muscular e amplitude de movimento de ombro. J Health Sci Inst. 2013;31(3):316-9. Available from: https://www.unip.br/comunicacao/publicacoes/ics/edicoes/2013/03_jul-set/V31_n3_2013_p316a319.pdf.
11. Orfale AG, Araujo PMP, Ferraz MB, Natour J. Translation into Brazilian Portuguese, Cultural Adaptation and Evaluation of the Reliability of the Disabilities of the Arm, Shoulder and

- Hand Questionnaire. Braz J Med Biol Res. 2005;38(2):293-302. <http://dx.doi.org/10.1590/S0100-879X2005000200018>.
12. Paixão JS. Efeitos do plano motor na aquisição, retenção e transferência de uma destreza motora fechada [Dissertação]. Santa Maria: Universidade Federal de Santa Maria; 1981.
 13. Instituto Nacional de Câncer José Alencar Gomes da Silva (INCA). Coordenação Geral de Ações Estratégicas. Coordenação de Prevenção e Vigilância. Estimativa 2016: incidência de câncer no Brasil. Rio de Janeiro; 2015 [citado 19 jan. 2017]. Available from: http://www2.inca.gov.br/wps/wcm/connect/acoes_programas/site/home/nobrasil/programa_controle_cancer_mama/fatores_risco.
 14. Barbosa PA. Avaliação da qualidade de vida e impacto funcional em mulheres com câncer de mama pós-intervenção cirúrgica na cidade de Juiz de Fora, Minas Gerais [Dissertação]. Juiz de Fora: Universidade Federal de Juiz de Fora; 2014. Available from: <http://www.ufjf.br/pgsaudecoletiva/files/2014/02/Disserta%C3%A7%C3%A3o-Priscila-Almeida-Barbosa.pdf>.
 15. Carvalho FN, Koifman RJ, Bergmann A. Classificação Internacional de Funcionalidade, Incapacidade e Saúde em Mulheres com Câncer de Mama: proposta de instrumentos para mensuração. Cad Saúde Pública(Rio de Janeiro). 2013;29(6):1083-93. <http://dx.doi.org/10.1590/S0102-311X2013000600005>.
 16. Institute for Work and Health. The DASH and Quick DASH disabilities of the arm, shoulder, & hand. Toronto; 2012. (The DASH and Quick DASH e-bulletin) [cited 2017 Jan 18]. Available from: http://www.dash.iwh.on.ca/sites/dash/files/dash_e-bulletin_2013_summer.pdf.
 17. Cheng HMS. Disabilities of the Arm, Shoulder, and Hand - DASH: análise da estrutura fatorial da versão adaptada para o português [Dissertação]. Belo Horizonte: Escola de Educação Física, Fisioterapia e Terapia Ocupacional, Universidade Federal de Minas Gerais; 2006. Available from: <http://www.eeffto.ufmg.br/eeffto/DATA/defesas/20150825160626.pdf>.
 18. Pancioni GC, Carmo EM, Pereira RS, Gomes PRL. Efeito da terapia manual em pacientes mastectomizadas com dor nos músculos da cintura escapular e cervical. Ter Man. 2010;38(8):305-13.
 19. Lederman E. Fundamentos da terapia manual. Fisiologia, neurologia e psicologia. São Paulo: Manole; 2001.
 20. Drews R, Cardozo PL, Corazza ST, Flôres FS. Análise do desempenho motor de escolares praticantes de futsal e voleibol. motricidade. 2013;9(3):105-16. [http://dx.doi.org/10.6063/motricidade.9\(3\).1123](http://dx.doi.org/10.6063/motricidade.9(3).1123).
 21. Corazza ST, Pereira FÉ, Villis JMC. Propriocepção e a familiarização no meio líquido. Rev Digital - Buenos Aires. 2005;10(82) [citado 18 jan. 2017]. Available from: <http://www.efdeportes.com/efd82/propio.htm>.

Received: 01.21.16

Accepted: 01.24.17