CASE REPORT

Influence of virtual reality on pain, fatigue, functional capacity and quality of life in fibromyalgia: a case study

[1]Natália Barbosa Tossini, [2]Gabriella Regina Côrrea e Silva, [3]Marina Petrella, [2]Victor Eduardo Borges Soares, [4]Alexandre Brandão, [5]Paula Regina Mendes da Silva Serrão

ABSTRACT

Objective: The objective of this study was to evaluate the effect of Virtual Reality (VR) associated with physical exercises on quality of life, fatigue, pain levels, and functional capacity in a woman with Fibromyalgia. **Methods:** This is a case report that evaluated one patient diagnosed with FM before and after the intervention with VR associated with physical exercise. The evaluation scales used were: Fibromyalgia Impact Questionnaire, Health Assessment Questionnaire, Visual Analogue Scale for Pain, Pain Catastrophizing Scale, Fatigue Severity Scale and pressure pain threshold evaluation at 18 tender points with a digital pressure algometer. Treatment was conducted for 6 weeks, with 2 sessions per week, totaling 12 treatment sessions. **Results:** The study showed that treatment with VR promoted an improvement in the impact of FM in the volunteer's quality life, a decrease in catastrophic sensation of pain and a decrease in fatigue. It was also possible to notice an improvement in the pressure pain threshold at 16 tender points. **Conclusion:** A rehabilitation program for people with FM that involves VR combined with the practice of physical exercises contributed to the improvement of cognitive and physical aspects. The association of these two therapies was beneficial, since cognitive stimuli and the practice of a physical activity could promote improvements in function, fatigue, quality of life, and pain perception of these individuals.

Keywords: Virtual Reality Exposure Therapy, Quality of Life, Fatigue, Catastrophization

[1] Physiotherapist, Master Student at the Federal University of São Carlos – UFSCar.
[2] Undergraduate Student, Federal University of São Carlos – UFSCar.
[3] Physiotherapist, Doctorate Student at the Federal University of São Carlos – UFSCar.
[4] Post-graduation student, State University of Campinas – UNICAMP.
[5] Professor, Physiotherapy Professor, Federal University of São Carlos – UFSCar.

Mailing address:
Universidade Federal de São Carlos / Departamento de Fisioterapia
Profa. Dra. Paula Regina Mendes da Silva Serrão
Rodovia Washington Luiz, KM 235
São Carlos – SP
CEP 13565-905
E-mail: paula.serrao@ufscar.br

Received on September 22, 2017.
Accepted on March 3, 2018.

DOI: 10.5935/0104-7795.20170039

INTRODUCTION

Fibromyalgia (FM) is the second most common rheumatic disease of unknown etiology, with a prevalence of 2% to 8% in the population. Its main characteristic is the presence of chronic generalized musculoskeletal pain, fatigue, sleep disturbances, cognitive alterations and depression.[1] It mainly affects women aged 30-50 years,[1] commonly diagnosed according to the 2010 American College of Rheumatology (ACR) criteria.[2]

The existing literature shows that the generalized pain of these patients has neural origin, that is, they present an imbalance in the neurotransmitters of the central nervous system (CNS), leading to an amplification in the interpretation of pain, characterized by allodynia and hyperalgesia.[3]

As this is a persistent and debilitating disease, FM symptoms directly influence the activities of daily living (ADLs), work ability and the relationship with family, friends and employees, as well as their quality of life.[4,5] Therefore, FM treatments are mainly based on pain relief and quality of life with pharmacological or non-pharmacological methods.

Non-pharmacological methods include physical exercise, considered an effective strategy for the treatment of FM, despite the low adherence.[6] Some authors have inferred that this lack of commitment is caused by catastrophization pain, which contributes to the maintenance of chronic pain.[7] Hence, it is believed that pain catastrophization in patients with FM is more evident than in any other chronic rheumatologic diseases, which is a barrier to the reestablishment of the physical and psychological functioning of these patients.[8] Therefore, the development of alternative rehabilitation strategies seems to be important.

The use of Virtual Reality (VR) for rehabilitation and improvement in the level of physical activity has been highly explored, especially for preventing muscular alterations, providing motor and cognitive stimulation, as well as improvements in disability and quality of life.[9] Therefore, with VR, the individual presents an extra concentration in the activity that is being performed, moving in space and ignoring the "real world", interacting with virtual environments in an intuitive, physically active and essentially playful way.[10]

Since there is low adherence of patients with FM to physical exercise programs, and since VR is a means by which the individual ignores the "real world" and can perform movements with large muscle groups, individuals with FM could benefit from the use of this tool. Although recent studies show the positive effects of VR on the psychological aspects of subjects with FM,[6,7,8,9] it is important that more studies with this approach are carried out involving the assessment of pain, quality of life and functional aspects of this population.

OBJECTIVE

The objective of this study was to evaluate the effects of virtual reality associated with physical exercises in the quality of life, fatigue, pain levels, and functional capacity of a female patient with fibromyalgia.

CASE REPORT

V.A.R is a 42 years old patient, with 71 kg, 1.68 cm, born in São Carlos / SP (Brazil), diagnosed with Fibromyalgia, unemployed, non-smoker and non-alcoholic who uses medical drugs for systemic arterial hypertension (SAH). This patient reported no other associated rheumatologic diseases and did not perform physical activity in the last three months according to the Habitual Physical Activity Questionnaire (BAECKE). Prior to the evaluation and data collection, this study was approved by the Ethics Committee on Research in Human Beings of the Federal University of São Carlos under protocol number 1,451,333, and all the ethical criteria of the research were respected.

An initial evaluation was made to collect the anthropometric data and, after that, the volunteer responded to the Fibromyalgia Impact Questionnaire (FIQ), the Functional Capacity Questionnaire (FCQ), the Visual Analogue Scale for Pain, The Pain Catastrophizing Scale, Fatigue Severity Scale (FSS) and Pain Pressure Threshold Assessment on 18 tender points with a digital pressure algometer (ITO brand - Physiotherapy & Rehabilitation, Japanese model OE-220).

After the initial evaluation, the treatment was started with VR associated with the practice of physical exercises, for 6 weeks, with 2 sessions per week, a total of 12 treatment sessions. A re-evaluation was conducted at the end of the last session.

The applications of VR were developed in the Laboratory of Immersive, Interactive and Collaborative Visualization (LaVIIC) of the Department of Computation (DC) of UFSCar. Therefore, the applications used included Gesture's. This software was composed of three independent applications based on gesture recognition, that is, this free software was controlled by motor gestures of the upper limbs (UL) and lower limbs (LL). The applications were: i) Gesture Puzzle: a virtual Puzzle (UL); ii) Gesture Chair: a PacMan-like game (UL); iii) Gesture Maps: Controls Google Street View navigation in Google Maps (LL). Before the beginning of this procedure, the volunteer had familiarization sessions with the equipment and each of the applications.

Concomitantly with each VR application, the volunteer should perform physical exercises. Hence, associated with application iii), the volunteer performed a 10-minute stationary walk at a self-selected rate. After that, associated to the application ii), the volunteer controlled the PacMan with movements of the upper limbs and, after the end of the game, the volunteer performed a scale movement on the Swiss ball. Finally, associated to application i), the volunteer mounted the pieces of a puzzle using movements of the upper limbs associated with movements of lateral squat, climb in lateral and frontal step and lateral gait crossing the legs. All the applications were performed for 10 minutes associated with the exercises and, at the end of the session, stretches were made for the upper and lower limbs. Table 1 shows the questionnaire and VAS data that were answered before and after the proposed treatment with VR.

DISCUSSÃO

This Case Report showed that VR treatment promoted an improvement in the impact of FM in the volunteer's life, a decrease in The Pain Catastrophizing Scale score and a decrease in fatigue. It was also possible to notice an improvement in the pressure pain threshold at the 16 tender points, only the lower right cervical points and the higher right trochanter did not have their pain pressure threshold increased.

We emphasize that, according to the criteria of the 1990 ACR, in order to have a diagnosis of FM, it was necessary to feel palpation pain in 11 of 18 tender points, with an approximate pressure of 4 Kgf/cm^2.[11] Considering the volunteer of this case report, after the intervention of the exercise associated with VR, she had 14 pain points before the intervention and 8 pain points, what suggests an improvement in her pain pressure

Table 1. Results of VAS and the questionnaires before and after intervention

	Before	After
FIQ	64.18	53.27
FCQ	2	3
The Pain Catastrophizing Scale	43	38
FSS	60	25
VAS	1	3

FIQ, Fibromyalgia Impact Questionnaire; FCQ, Functional Capacity Questionnaire; FSS, Fatigue Severity Scale; VAS, visual analogue scale.

threshold. However, this would not exclude FM diagnosis since the current criteria consider the generalized pain index and the severity scale of the symptoms.[2]

Several studies evaluated the benefits of VR for the treatment of FM[10,12,13] and have concluded that the application of VR brings short- and long-term benefits in improving pain, improving disability and quality of life, corroborating with the results found in this study. However, these studies had as their primary outcome the effect of VR on memory, depression, and negative and positive emotional involvement, as well as coping skills, that is, the focus of VR was on the psychological and cognitive effects of the disease. In addition, none of these studies associated the VR protocol with physical exercise.

Although a direct influence of the treatment protocol on the pain of the volunteer assessed by the VAS was not observed, the impact over FM measured by the FIQ questionnaire was lower at the end of the intervention. According to Bennet et al.[5] individuals who score above 59 in the FIQ are considered severely affected, while those who score between 39-59 have moderate impairment. In the present study, the proposed treatment had a positive influence on the impact of FM in the volunteer's life, since it changed from a severely affected to a moderate affection, with changes mainly in the cleaning of the house and visiting friends / relatives, yielding a better quality of life.

In addition, the FCQ questionnaire showed that the use of VR added to physical exercise can be beneficial in improving fatigue, a clinical symptom that is reported by these patients. In this specific case, after the treatment sessions, the volunteer showed an improvement and did not present any more fatigue. This result can positively influence quality of life, since high fatigue scores are associated with worsening of sleep quality and pain intensity, with a cyclic and dysfunctional pattern of intensified pain and fatigue-related non-repairing sleep.[14]

The Pain Catastrophizing Scale questionnaire was also a variable with great improvement after treatment with VR, showing that the proposed treatment provides a well-being, changing the perception of pain of the volunteer. This may be considered a result of great importance, considering that one of the main reasons for the low adherence to treatment is the catastrophic pain.[8] In addition, Estévez-López[15] study showed that subjective physical function in women with FM is more affected than their objective function, and this is associated with high catastrophic pain results, that is, the greater the catastrophic pain, the greater the disagreement between subjective and objective physical function. Thus, the decrease in the Pain Catastrophizing Scale score shows that the proposed treatment could promote a positive feeling of ability to perform ADLs.

As a conclusion, a rehabilitation program for people with FM that involves VR added to the practice of physical exercises contributed to the improvement of the cognitive and physical aspects of the patient. The association of these two therapies was beneficial, since cognitive stimuli and the practice of a physical activity were able to promote improvement in the function, the fatigue, the quality of life and the perception of pain of these individuals. In this context, future, controlled and randomized studies are suggested to verify the efficacy of VR in the rehabilitation of women with fibromyalgia.

ACKNOWLEDGEMENTS

We acknowledge the financial support the second author received with the scholarship *Bolsa de Iniciação Científica do Programa de Apoio ao Docente Recém-Doutor – PADRD*, by the Federal University of São Carlos.

REFERENCES

1. Ericsson A, Mannerkorpi K. How to manage fatigue in fibromyalgia: nonpharmacological options. Pain Manag. 2016;6(4):331-8. DOI: http://dx.doi.org/10.2217/pmt-2016-0015
2. Wolfe F, Clauw DJ, Fitzcharles MA, Goldenberg DL, Hauser W, Katz RS, et al. Fibromyalgia criteria and severity scales for clinical and epidemiological studies: a modification of the ACR preliminary diagnostic criteria for fibromyalgia. J Rheumatol. 2011;38(6):1113-22. DOI: http://dx.doi.org/10.3899/jrheum.100594
3. Russell IJ, Larson AA. Neurophysiopathogenesis of fibromyalgia syndrome: a unified hypothesis. Rheum Dis Clin North Am. 2009;35(2):421-35. DOI: http://dx.doi.org/10.1016/j.rdc.2009.06.005
4. Arnold LM, Crofford LJ, Mease PJ, Burgess SM, Palmer SC, Abetz L, et al. Patient perspectives on the impact of fibromyalgia. Patient Educ Couns. 2008; 73(1):114-20. DOI: http://dx.doi.org/10.1016/j.pec.2008.06.005
5. Bennett RM, Bushmakin AG, Cappelleri JC, Zlateva G, Sadosky AB. Minimal clinically important difference in the fibromyalgia impact questionnaire. J Rheumatol. 2009;36(6):1304-11. DOI: http://dx.doi.org/10.3899/jrheum.081090
6. Morris LD, Grimmer-Somers KA, Spottiswoode B, Louw QA. Virtual reality exposure therapy as treatment for pain catastrophizing in fibromyalgia patients: proof-of-concept study (Study Protocol). BMC Musculoskelet Disord. 2011;12(1):85. DOI: http://dx.doi.org/10.1186/1471-2474-12-85
7. Morris LD, Louw QA, Grimmer KA, Meintjes E. Targeting pain catastrophization in patients with fibromyalgia using virtual reality exposure therapy: a proof-of-concept study. J Phys Ther Sci. 2015;27(11):3461-7. DOI: http://dx.doi.org/10.1589/jpts.27.3461
8. Cánovas R, León I, Roldán MD, Astur R, Cimadevilla JM. Virtual reality tasks disclose spatial memory alterations in Fibromyalgia. Rheumatology. 2009; 48(10):1273-8. DOI: http://dx.doi.org/10.1093/rheumatology/kep218
9. Collado-Mateo D, Dominguez-Muñoz FJ, Adsuar JC, Merellano-Navarro E, Gusi N. Exergames for women with fibromyalgia: a randomised controlled trial to evaluate the effects on mobility skills, balance and fear of falling. Peer J. 2017;5:e3211.
10. Garcia-Palacios A, Herrero R, Vizcaíno Y, Belmonte MA, Castilla D, Molinari G, et al. Integrating virtual reality with activity management for the treatment of fibromyalgia: acceptability and preliminary efficacy. Clin J Pain. 2015;31(6):564-72. DOI: http://dx.doi.org/10.1097/AJP.0000000000000196
11. Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. Arthritis Rheum. 1990;33(2):160-72. DOI: http://dx.doi.org/10.1002/art.1780330203

12. Herrero R, García-Palacios A, Castilla D, Molinari G, Botella C. Virtual reality for the induction of positive emotions in the treatment of fibromyalgia: a pilot study over acceptability, satisfaction, and the effect of virtual reality on mood. Cyberpsychol Behav Soc Netw. 2014;17(6):379-84. DOI: http://dx.doi.org/10.1089/cyber.2014.0052
13. Ramachandran VS, Seckel EL. Using mirror visual feedback and virtual reality to treat fibromyalgia. Med Hypotheses. 2010;75(6):495-6. DOI: http://dx.doi.org/10.1016/j.mehy.2010.07.003
14. Nicassio PM, Moxham EG, Schuman CE, Gevirtz RN. The contribution of pain, reported sleep quality, and depressive symptoms to fatigue in fibromyalgia. Pain. 2002;100(3):271-9. PMID: 12467998 DOI: http://dx.doi.org/10.1016/S0304-3959(02)00300-7
15. Estévez-López F, Álvarez-Gallardo IC, Segura-Jiménez V, Soriano-Maldonado A, Borges-Cosic M, Pulido-Martos M, et al. The discordance between subjectively and objectively measured physical function in women with fibromyalgia: association with catastrophizing and self-efficacy cognitions. The al-Ándalus project. Disabil Rehabil. 2018;40(3):329-37.