

*Case Report***Classical ballet adapted for women with disc herniation in the lower back: case report***Ballet clássico adaptado para mulher com hérnia de disco na região lombar: um relato de caso*

**Lysia Barbosa Silva¹, Robson Chacon Castoldi^{1,3}, Henrique Izaías Marcelo¹,
Rômulo Araújo Fernandes^{2,3}, Everton Alex Carvalho Zanuto^{1,3}.**

Silva LB, Castoldi RC, Marcelo H.I, Fernandes RA, Zanuto EAC. Ballet clássico adaptado para mulher com hérnia de disco na região lombar: um relato de caso / *Classical ballet adapted for women with disc herniation in the lower back: case report*. Rev Med (São Paulo). 2022 May-June;101(3):e-184897.

ABSTRACT: *Introduction:* A herniated disc in the lower back is the most common diagnosis among degenerative alterations in the lumbar spine. Various forms of treatment for improvement of lumbar disc herniation, such as anti-inflammatories, physical therapy, acupuncture, antidepressants, morphine, and cognitive behavioral therapy. The physical exercise is an effective, inexpensive, and non-pharmacological tool. Although, there are still several barriers to accepting the use of specific physical exercises outside the clinical environment, such as dance and sports. *Objective:* This study aimed to analyze the contributions of classical ballet adapted to improve the clinical framework of lumbar disc herniation in a beginner student of classical ballet. *Method:* The case study composed for one script made by the evaluators was applied to an adult woman with 32 years old, who until that point had not practiced classical ballet. The exercises were performed twice a week (two hours for session) for a period of 13 weeks, totaling 26 sessions, giving a total exposure during the intervention of 52 hours. *Results:* The magnetic image obtained from medical reports after the intervention found that compared to the previous examination the disc herniation at level L4 – L5 was reduced in size. In addition, the visual analog pain scale (EVA) assessment pre intervention was maximum

pain and post intervention was no pain. The numeric pain scale rating (NPS) pre intervention was number 9 with pain, and post intervention, number 2 painless. The Faces Pain Scales (FPS) pre intervention had a factor of 6 with pain, and post-intervention factor 2, painless. *Conclusion:* It is possible to conclude that the present script made by the evaluators was sufficient for cause the of herniation reduction in the evaluated patient post intervention.

Keywords: Low back pain; Dance therapy; Exercise therapy; Pliability; Dancing; Physical therapy.

RESUMO: *Introdução:* A hérnia discal lombar é o diagnóstico mais comum dentre as alterações degenerativas da coluna lombar. Dentre diversas formas de prevenção e tratamento para hérnia de disco, estão anti-inflamatórios, fisioterapia, acupuntura, antidepressivos, morfina e psicoterapia. O exercício físico pode ser efetivo, de baixo custo e um meio não farmacológico no tratamento. No entanto, existem muitas barreiras para a aceitação no uso específico da atividade física fora do ambiente clínico, como a dança e o esporte. *Objetivo:* Esse estudo de caso teve como objetivo analisar as contribuições do ballet clássico adaptado para a melhoria do quadro clínico da hérnia de disco

1. Department of Physical Education. University of West Paulista – UNOESTE. ORCID: Silva LB – <https://orcid.org/0000-0001-7005-4889>; Castoldi RC - <https://orcid.org/0000-0002-4167-6790>; Marcelo HI - <https://orcid.org/0000-0003-4864-5812>. Email: - lysia_dance@hotmail.com, castoldi_rc@yahoo.com.br, henrique.izaiais99@gmail.com.

2. Department of Physical Education. Paulista State University – FCT/UNESP. <https://orcid.org/0000-0003-1576-8090>. Email: - romulo.a.fernandes@unesp.br

3. Postgraduate Program in Physiotherapy. Paulista State University – FCT/UNESP. <https://orcid.org/0000-0002-7558-1941>. Email: everton@unoeste.br

Correspondence: Henrique Izaías Marcelo. Rodovia Raposo Tavares, km 572 - Bairro Limoeiro. Presidente Prudente - SP – Brazil. CEP: 19067-175. E-mail: henrique.izaiais99@gmail.com

lombar. *Método:* O estudo de caso foi composto por um roteiro feito pelos avaliadores e utilizado em uma mulher com 32 anos de idade, sem experiência na prática do Ballet Clássico. Os exercícios tiveram duração de 13 semanas, realizadas duas vezes por semana (duas horas em cada sessão), totalizando 26 sessões e um total de 52 horas de intervenção. *Resultados:* Mediante aos laudos médicos de ressonância magnética obtida pós-intervenção, constatou-se que, em relação ao exame anterior, houve redução das dimensões da hérnia discal no nível L4-L5. Já a escala de avaliação de dor visual analógica (EVA) foi de “dor máxima” no período pré intervenção para “sem dor” no pós intervenção.

INTRODUCTION

Lumbar pain is a frequent musculoskeletal disorder (MSD) among adults, occurring between the ages of 30 and 50 years in both sexes, but with predominance in females^{1,2}. Social and cultural factors predispose women to a higher risk of presenting this outcome^{2,3}. Among lumbar pain with specific etiology, disc herniation stands out as the main injury, leading to the need to develop new approaches in order to combat this outcome⁴.

There are reports of various forms of treatment for improvement of lumbar disc herniation, such as anti-inflammatories, physical therapy, acupuncture, antidepressants, morphine, and cognitive behavioral therapy^{4,5}. Also, techniques such as transforaminal, interlaminar and percutaneous extrapedicular unilateral kyphoplasty, are effective in relieving pain and both present low complication rates in patients with lumbosacralgia due to disc herniation in both sexes^{5,6}.

However, transforaminal techniques appear to be more effective than interlaminar. In addition, percutaneous extrapedicular unilateral kyphoplasty is an effective treatment for multiple thoracolumbar vertebral fractures, being a less invasive method, in which different and multiple levels are treated at the same time during surgery⁶.

Although physical exercise is an effective, inexpensive, and non-pharmacological tool, there are still several barriers to accepting the use of specific physical exercises outside the clinical environment, such as dance and sports^{1,6}. According to Burton et al.⁷, programs of general physical exercises of low to moderate intensity are considered protective effects against low back pain, and can be applied in the treatments of MSD. Little is known about the interference of classical ballet as a means of treating non-specific low back pain, but based on studies, the skeletal muscle stretching, which is one of the main performed in classic ballet, has promoted decrease on the pain indices and increase on physical functional variables⁸. According to Hodges⁹, the best form of treatment for a herniated disc is the combination of neuroscience and biomechanics, which can lead to greater joint control and stabilization, reducing the mechanical irritation that leads to pain. In this way, classical ballet appears to be

A escala de dor visual numérica (EVN) pré intervenção foi estabelecida em 9 “com dor” e pós intervenção em 2 “sem dor”. A escala de dor de facial (EDF) pré intervenção foi estabelecida em fator 6 “com dor” e pós intervenção como fator 2 “sem dor”. *Conclusão:* É possível concluir que após realização do programa de Ballet Clássico adaptado foi possível observar a diminuição dos valores na escala de dor e na dimensão da hérnia de disco da paciente avaliada.

Palavras-chave: Dor lombar; Terapia através da dança; Terapia por exercício; Flexibilidade; Dança; Fisioterapia.

a relevant option to prevent and combat disc herniation, since it associates techniques of flexibility, stabilization, postural control, muscular strengthening, and the ludic effect of dance¹⁰.

Thus, the objective of this study was to analyze the contributions of classical ballet adapted to the improvement of the clinical framework of lumbar disc herniation in a beginner student in classical ballet practice.

METHODS

The proposed study used a case study to evaluate the influence of the intervention performed on the clinical framework of the student. Case studies represent a research strategy that consider the logic of planning, data collection techniques, and specific approaches, proposing the analysis of these variables.

Contact with the participant was made through the mediation of the school itself, which currently receives female students diagnosed with lumbar disc herniation. After the indication, the volunteer was invited to participate in the research.

It should be noted that the project was previously submitted to the Research Ethics Committee (REC), and after approval, and prior to the interventions, the participant was asked to sign a Free and Informed Consent Form, giving her authorization to participate and the future use of the data generated.

The volunteer underwent two evaluations, one at the beginning (before the intervention) and one at the end (after the intervention). In the period prior to the start of exercises (*baseline*), in a conversation with the researcher, the patient reported pessimism about her clinical condition, and reported limitations in her daily life activities and severe pain that disrupted her work. She also reported that she had tried pharmacological treatment and physiotherapy without success. Her doctor advised her to undergo surgery, but for the patient this was not an option and she reported that she would love to continue with ballet practice.

Pain Perception Test

To evaluate the pain perception of the volunteer, the following instruments were used: Analog visual pain scale (VAS)¹¹; Numeric pain scale (NPS)¹², and Face Pain

Scale (FPS)¹².

Flexibility evaluation

To evaluate the angle of flexibility, the student was placed in a position using the wall as a base, and a tape measure was used to measure angle of amplitude of the lower limbs (Figure 1).



Figure 1. Performance of the flexibility test.

Image Exams

The magnetic resonance images of the student with their respective reports prior to the intervention were compared with the images and reports after the intervention, which were already scheduled as part of a semi-annual follow-up of the patient's progress (medical recommendation).

Script made by the evaluators

The exercises included in the script aimed at physical development, altering the impact exercises and using exercises to stabilize the abdominal muscles, strengthen the posterior thigh muscles, stretching exercises and exercises to increase flexibility in the lower limbs, as well as an adapted classical ballet class.

The script made by the evaluators was applied to an adult woman with 32 years old, who until that point had not practiced classical ballet. The exercises were performed twice a week (two hours for session) for a period of 13 weeks, totaling 26 sessions, giving a total exposure during the intervention of 52 hours. In the first hour of the class specific exercises and exercises adapted to classical ballet were applied, and in the second hour, stretching exercises, flexibility, and abdominal strengthening.

Adaptations were made in relation to the impact exercises such as: sauté and echappé sauté, pose temps levé devant, and en arabesque.

Adapted classical ballet class



Figure 2. Image of the movement denominated Plié (A), Grand Plié (B), Tendu (C) and Jeté (D).

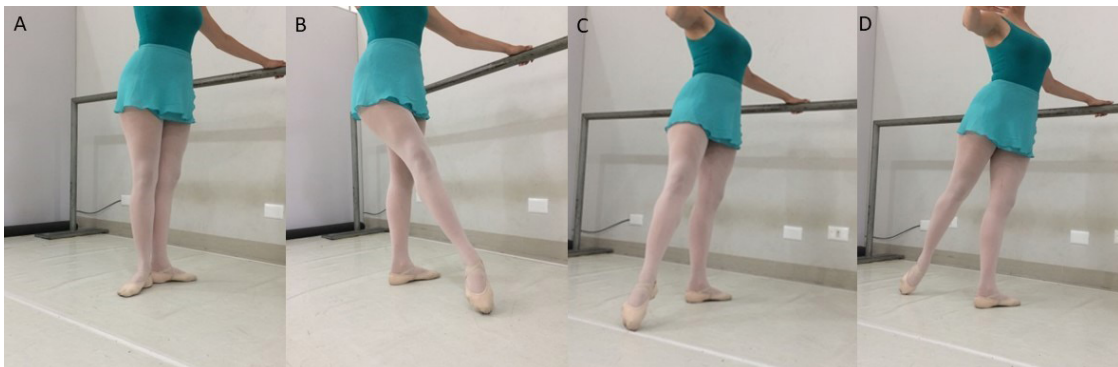


Figure 3. Image of the movement denominated Rond de Jambé.



Figure 4. Image of the movement denominated Battement Fondu (A), Grand Battement (B), Elevé (C), Sauté (D).



Figure 5. Image of the adapted movement denominated Sauté elevé (A), Echappé elevé (B), Echappé elevé (C), Pose Temps Levé en arabesque (D).



Figure 6. Image of the adapted movement denominated Pose temps levé en arabesque relevé (A), temps levé devant (B), temps levé devant relevé (C).

Script of movements performed

BAR	CENTER
<p>1) Warm-up = feet parallel, facing the bar. Introduction: 1-14= 13 half points alternating right and left 15 = First position of the feet 1-4 = Tendú devant with right leg, flex, point, close 5-8 = Repeat coté 1-4 = Repeat derrière 5-8 = Temps lié to the right 1-16 = Repeat to the left 1-16 = Suplesse in second to the right and left 1-4 = Releve in first position 5-8 = Balance</p>	<p>09) Pliés and grand Pliés: First position en face. 1-4= 2 demi-pliés with 1 port de bras 5-8= 1 grand plié with 1 port de bras 1-8= Repeat in the second position, rond de jambé with right leg to fourth position 1-4= 2 demi-pliés in fourth position 5-8 = Degagé with leg to fifth position 1-4= Repeat in fifth position 5-8 = Rond jambé to fourth position derrier 1-16= Repeat in fourth and fifth position with left leg, degagé to first position 1-8= 2 élevés with arms in first position 1-8= Repeat with arms in fifth position</p>
<p>2) Warm-up = feet parallel, facing the bar. Introduction: 1-14= 13 half points alternating right and left 15 = First position of the feet 1-4 = Tendú devant with right leg, flex, point, close 5-8 = Repeat coté 1-4 = Repeat derrière 5-8 = Temps lié to the right 1-16 = Repeat to the left 1-16 = Suplesse in second to the right and left 1-4 = Releve in first position 5-8 = Balance</p>	<p>10) Battements Tendus and Jetés en face in fifth position. 1-8 = 4 tendus devant with arms in third position opposition 1-8 = 4 tendus de cote with arms in second position 1-8 = 4 tendus derrière with arms in third position 1-8 = 4 tendus de cote with arms in second position Repeat in Jetes</p>
<p>3) Pliés: first position to the side of the bar. Introduction: 1-4 = Simple Port de Brás, Brás bas 1-4 = 2 demi-pliés with 1 port de bras 5-8 = 1 grand-plié with 1 port de brás 1-4 = 1 grand-plié 5-8 = degage de coté 1-16 = Repeat in second position, rond de jambé to fourth position 1-16 = Repeat in fourth position, closing in fifth position 1-16 = Repeat in sixth position, detourné 1-64 = Repeat all movements on the left</p>	<p>11) Estudo de Arabesques: Fifth Position Effacé. 1-2= Port de Brás to first position 3-4= First arabesque 5-6= Port de Brás to second position 7-8= Port de Brás to Bras bas 1-8= Repeat with degagé devant 1-16= Repeat in second arabesque 1-16= Repeat in third arabesque 1-48= Repeat all movement to the left side</p>
<p>3) Battement Tendú: fifth position to the side of the bar. Introduction: 1-4 = Simple Port de Brás 1-8 = 4 battement tendú devant 1-2 = 1 battement tendú de coté 3-4 = Close in plié 5-6 = maintain 7-8 = Stretch the knees 1-16 = Repeat 1-32 = Repeat all movements on the left</p>	<p>12) Sauté and echappé sauté: (Adapted: no jump) Fifth position. 1= plié 2= eleve 3= plié 4= stretch the knees 5-8= Repeat 1-8= Repeat in second position 1-16= Repeat to the left</p>
<p>4) Battement Jeté: fifth position to the side of the bar. Introduction: 1-4 = Simple Port de Brás 1-8 = 4 battement jetés devant Encroix, side.</p>	<p>13) Pose Temps Levé devant: (Adapted: no jump) 1-4= Prepare with degagé croisé devant and demibras 1= Temps levé grand battement devant at 45° with right leg with arms in first position 2 = Temps levé retiré with left leg with arms in second position 3-7 = Repeat following the diagonal 8 = Pose effacé derrière in demi bras At the beginning of the work with hands on the waist; subsequently arms in demibras or demi second.</p>

continue

BAR	CENTER
<p>5) Rond de Jambe: first position to the side of the bar. Introduction: 1-4 = Simple Port de Brás 1-8 = 4 rond de jambe endehors 1-8 = Repeat in reverse 1 = Plié 2 = Pose devant, arm in first position 3-4 = Rond to second position 5-6 = Leva derrière 7-8 = Close arm and leg 1-8 = Repeat in dedans 1-8 = Suplesses devant 1-8 = Cambre derrier 1-8 = Balance in first position</p>	<p>14) Pose Temps Levé en arabesque: (Adapted) 1-4= Prepare with degagé croisé derrière and demibras 1= Temps leve grand battement derrière at 45° with the left leg with arms in first arabesque 2 = Temps leve retiré with right leg and arms in first position 3-7 = Repeat following the diagonal 8 = Pose effacé derrière in demi bras At the beginning of the work with hands on the waist</p>
<p>6) Battement Fondu: fifth position to the side of the bar. Introduction: 1-2= Port de Brás 3-4 = Degagé de cote with the right leg 1-4 = 2 Battement fondu devant, leg at 30° 5-8 = 2 Battement fondu de coté 1-4 = 2 Battement fondu derrière 5-8 = 1 Battement fondu de coté, detourne 1-32 = Repeat all movement on the left side</p>	<p>15) Skip Change with arms in third position. 16) Reverência no Centro: Fifth position Croisé. 1-2 = Port de Brás to first position 3-4 = Port de Brás to second position 5-6 = Raise right arm to fifth position 7-8 = The arms move to first position 1-2 = The arms go to fifth position again 3-4 = Port de Brás to second position 6-8 = Port de Brás to demi-brás Reverence kneeling.</p>
<p>7) Grand Battement: Fifth position to the side of the bar. Introduction: 1-4 = Port de Brás to second position 1-8 = 4 Grand Battement devant 1-8 = 4 Grand Battement de coté 1-8 = 4 Grand Battement derriér 1-8 = 1 Grand Battement de coté, detourne 1-32 = Repeat all movements on the left side</p>	
<p>08) Relevés in 1st, 2nd, and 3rd positions: first position facing the bar. Introduction: 1-4 = Port de Bras to the bar 1 = Plié 2 = Relevé 3 = Plié 4 = Stretch the knees 5-8 = Repeat, degagé to the second position 1-8 = Repeat in the second position, degagé to the third position 1-8 = Repeat in the third position, degagé to the first position 1-8 = 8 Rise in first position 1-32 = Repeat all movement on the left side</p>	

RESULTS

Table 1 presents the characteristics of the student submitted to the intervention. Table 2 shows that the proposed script made by the evaluators obtained a satisfactory result regarding the participant’s flexibility and lower back pain. An increase in flexibility was observed in the post-intervention evaluation. In the same way, the student’s low back pain reduced considerably in the post-intervention moment.

Table 1. Characterization of the student.

Variables	Results
Age (years)	32
Weight (Kg)	53
Height (m)	1.58
Body Mass Index (Kg/m ²)	21.2

Table 2. Flexibility and pain, pre- and post-intervention.

Variables	Evaluations	
	Pre	Post
Flexibility (m)	1.23	1.75
VAS	Maximum pain	No pain
NPS	9	2
FPS	6	2

*VAS – visual analog scale; NPS – numerical pain scale; FPS – faces pain scale.

Figures 7 and 8 present a comparative analysis of the magnetic resonance imaging, evidencing the reduction in disc herniation and spinal canal invasion, demonstrating the therapeutic effectiveness of this intervention modality.



Figure 7. Pre-intervention. Lumbar disc herniation at the L4-L5 level. Sagittal section demonstrating invasion of the medullary canal of the hernia at level L4-L5.



Figure 8. Post-intervention. Lumbar disc herniation at the L4-L5 level. Sagittal section demonstrating the reduction in invasion of the medullary canal of the hernia at level L4-L5.

DISCUSSION

Medical professionals tend to opt for pharmacological therapies in the treatment of disc herniation, and when these do not work out positively, they opt for surgical procedures, relying on the advantages of reducing hospitalization time

and effective relief. In 75% of cases, this procedure is a surgical success without vascular complication or motor nerve injury, facilitating a reduction in incisional pain and early return to normal daily life activities, among other advantages¹³⁻¹⁶. However, it is known that physical exercise and dance can increase performance and physical function, which includes flexibility, muscle strength and other physical capabilities¹⁷.

It was verified that there was an increase in the flexibility of the volunteer, consistent with the study proposal. This finding corroborates with the literature and can be explained by the fact that the script used includes a broad range of movement through the flexibility work performed within classical ballet classes¹⁸.

Silva and Badaró¹⁹ believe that ballet practitioners, who gain flexibility, are able, through performing stretching, to carry out movements that require more coordination, being more harmonious, and consequently, are able to improve performance in their daily life activities.

For a workout of stretching exercises to be perfected, various warm-up techniques may be used, which bring benefits such as the ability to bear load, by recruiting a larger number of motor units. The Proprioceptive Neuromuscular Facilitation (PNF) technique seems to present good results for the improvement in flexibility of dancers, facilitating this improvement²⁰.

The results of this study also demonstrated a great reduction in pain from the initial evaluation (VAS: Maximum pain, NPS: 9, FPS: 6) to the final evaluation (VAS: No pain, NPS: 2, FPS: 2). It is known that physical exercises and dance have been shown to be interventions that improve the metabolic and functional profile of their practitioners²¹. Although, in general, clinicians indicate analgesics and anti-inflammatories for the control of pain caused by disc herniation⁵. However, physical exercise represents a low-cost non-pharmacological therapy which is effective in the prevention and treatment of low back pain^{2,3,9}.

A study by Kline et al.²² concluded that there is evidence to recommend strengthening exercises of the spine and abdomen associated with a general fitness program to reduce the incidence and duration of low back pain episodes. In this case, all these modalities of exercises were incorporated in the script of the present study, which could explain the success in the results obtained.

From the magnetic resonance examinations, the greatest finding of this study was verified, in which there was a reduction in the disc herniation between the L4-L5 lumbar vertebrae. Thus, the reduction in the spinal cord invasion after the intervention was verified, even without the use of any drug or surgical intervention.

Vialle et al.²³ found that supportive physiotherapy with analgesia and relaxation, using exercises, stretching, and electrical stimulation should be the first option for the treatment of disc herniation, and surgical intervention

should only be proposed when conservative treatment fails, or when there is an increase in neurological symptoms. Making a population inference from the results of the present study, disc hernia treatments should include physical exercises, based on patient preference, which, as suggested in the literature, include exercises such as flexibility, coordination, strengthening of the core region, and improvement in cardiovascular function.

Thus, the present study collaborates with the literature in using classical ballet exercises for the treatment of disc herniation. However, some caveats should be highlighted, such as the study characteristic (case study),

clinical framework of the volunteer, and intervention period. Future studies using different populations and interventions may contribute to the results found to date.

CONCLUSION

The adapted classical ballet script made by the evaluators presented by this study was effective in improving flexibility and pain and reducing the herniated disc in the evaluated patient, without the need for pharmacological therapies or surgical interventions.

Authors' participation: *Silva LB, Castoldi RC, Marcelo*

HI - Project development; *Silva LB, Marcelo HI* -intervention; *Silva LB; Marcelo HI* – writing; *Zanuto EAC, Fernandes RA, Marcelo HI* - elaboration of results; *Marcelo HI, Fernandes RA* - discussion and final analysis.

REFERENCES

1. Ferreira GD, Silva MC, Rombaldi AJ, Wrege ED, Siqueira FV, Hallal PC. Prevalência de dor nas costas e fatores associados em adultos do sul do Brasil: estudo de base populacional. *Rev Bras Fisioter.* 2011;15(1):31-6. Disponível em: <https://www.redalyc.org/pdf/2350/235019132009.pdf>
2. Almeida ICGB, Sá KN, Silva M, Baptista A, Matos MA, & Lessa I. Prevalência de dor lombar crônica na população da cidade de Salvador. *Rev Bras Ortop.* 2008;43(3):96-102. doi: <https://doi.org/10.1590/S0102-36162008000200007>
3. Zanuto EAC, Lima MCS, Araújo RGD, Silva EPD, Anzolin CC, Araújo MYC, Fernandes RA. Distúrbios do sono em adultos de uma cidade do Estado de São Paulo. *Rev Bras Epidemiol.* 2015;18(1):42-53. doi: <https://doi.org/10.1590/1980-5497201500010004>
4. Atlas SJ. Long-term disability and return to work among patients who have a herniated lumbar disc: the effect of disability compensation. *J Bone Joint Surg Am.* 2000;82(1):4-15. doi: 10.2106/00004623-200001000-00002.
5. Carvalho LB, Oyakawa A, Martins RS, Castro PCG, Ferreira LMN, Melo JSA, et al. Hérnia de disco lombar: tratamento. *Acta Fisiatr.* 2013;120(2):75-82. <https://www.revistas.usp.br/actafisiatrica/article/view/103762>
6. Jeong JK, Kim E, Yoon KS, Jeon JH, Kim YI, Lee H, Kwon O, Jung SY, Lee JH, Yang C, Kang JH, Han CH. Acupotomy versus Manual Acupuncture for the Treatment of Back and/or Leg Pain in Patients with Lumbar Disc Herniation: a Multicenter, Randomized, Controlled, Assessor-Blinded. *Clinical Trial. J Pain Res.* 2020;1(13):677-87. doi:10.2147/JPR.S234761 <https://doi.org/10.2147/JPR.S234761>
7. Burton AK, Balagué F, Cardon G, Eriksen HR, Henrotin Y, Lahad A, Leclerc A, Müller G, van der Beek AJ. Chapter 2. European guidelines for prevention in low back pain: November 2004. *Eur Spine J.* 2006;15(Suppl 2):S136-68. doi: 10.1007/s00586-006-1070-3
8. Quentin C, Bagheri R, Ugbole UC, Coudeyre E, Pélissier C, Descatha A, Menini T, Bouillon-Minois JB, Dutheil F. Effect of home exercise training in patients with nonspecific low-back pain: a systematic review and meta-analysis. *Int J Environ Res Public Health.* 2021 Aug 10;18(16):8430. doi: 10.3390/ijerph18168430.
9. Hodges PW. Core stability exercise in chronic low back pain. *Orthop Clin N Am.* 2003;34:245-54. doi: [https://doi.org/10.1016/S0030-5898\(03\)00003-8](https://doi.org/10.1016/S0030-5898(03)00003-8)
10. Monteiro HL, Grego LG. As lesões na dança: conceitos, sintomas, causa situacional e tratamento. *Motriz.* 2003;9(2):63-71. <http://www.rc.unesp.br/ib/efisica/motriz/09n2/Monteiro.pdf>
11. Ciena AP, Gatto R, Pacini VC, Picanço VV, Magno IMN, Loth EA. Influência da intensidade da dor sobre as respostas nas escalas unidimensionais de mensuração da dor em uma população de idosos e de adultos jovens. *Semina: Ciênc Biol Saúde.* 2008;29(2), 201-12. doi: <http://dx.doi.org/10.5433/1679-0367.2008v29n2p201>
12. Da Silva RL, Moreira DM, Fattah T, Da Conceição RS, Trombetta AP, Panata L, Giuliano LC. Pain assessment during transradial catheterization using the Visual Analogue Scale. *Rev Bras Cardiol Invasiva.* 2015;23(3):207-10. doi: <https://doi.org/10.1016/j.rbciev.2015.08.007>
13. Rodrigues LMR, da Rosa FWF, Ferreira RJR, Ueno F, Milani C. Cirurgia de hérnia de disco lombar em atleta de triathlon com monitoração neurofisiológica intraoperatória. *Einstein.* 2011;9(4). doi:10.1590/s1679-45082011rc1947
14. Machado Filho PV, Chueire AG. Tratamento cirúrgico das hérnias discais foraminais pela microdissectomia artroscópica. *Acta Ortop Bras.* 2004;12(2),84-90. doi: <http://dx.doi.org/10.1590/S1413-78522004000200003>
15. Rezende R, Júnior CJ, da Silva CK, de Barcellos Zanon I, Cardoso IM, Júnior JLB. Comparação da eficácia das técnicas transforaminal e interlaminar de bloqueio radicular feito no tratamento de hérnia de disco lombar. *Rev Bras Ortop.* 2015;50(2):220-5. doi: <https://doi.org/10.1016/j.rbo.2013.12.00>
16. Verdecia FD, Medina HM. Treatment of Thoracolumbar

- multiple fractures with minimally invasive surgery. *Coluna/Columna*. 2016;15(2):140-144. doi: <https://doi.org/10.1590/S1808-185120161502157641>
17. Rodrigues-Krause J, Krause M, Reischak-Oliveira A. Dancing for healthy aging: functional and metabolic perspectives. *Altern Ther Health Med*. 2019;25(1):44-63.
 18. Coelho CW, de Araújo CGS. Relação entre aumento da flexibilidade e facilitação na execução de ações cotidianas em adultos participantes de programa de exercício supervisionado. *Rev Bras Cineantropom Desempenho Hum*. 2000;2(1):31-41 <https://periodicos.ufsc.br/index.php/rbcdh/article/view/3943/16878>
 19. Silva AHD, Badaró AF. Influência do alongamento por facilitação neuromuscular proprioceptiva (FNP) na flexibilidade em bailarina. *Fisioter Mov*. 2007;20(4):109-115. <https://periodicos.pucpr.br/index.php/fisio/article/view/18965>
 20. Schiessl M, de Araújo Montoro Lima MC. Efeitos de diferentes tempos de alongamento na flexibilidade de bailarinas. *ConScientiae Saúde*. 2015;14(3). <https://www.redalyc.org/pdf/929/92943569014.pdf>
 21. Liu X, Shen, PL, Tsai, YS. Dance intervention effects on physical function in healthy older adults: a systematic review and meta-analysis. *Aging Clin Exp Res* 33:253–263 (2021). <https://doi.org/10.1007/s40520-019-01440-y>
 22. Kline JB, Kraus JR, Maher SF, Qu X. Core Strength Training Using a Combination of Home Exercises and a Dynamic Sling System for the Management of Low Back Pain in Pre-professional Ballet Dancers: A Case Series. *J Dance Med Sci*. 2013;17(1):24-33. doi: <https://doi.org/10.12678/1089-313X.17.1.24>
 23. Vialle LR, Vialle EN, Henao JES, Giraldo G. Hérnia discal lombar. *Rev Bras Ortop*. 2010;45(1):17-22. doi: <https://doi.org/10.1590/S0102-36162010000100004>

Received: April 27, 2021

Accepted: April 26, 2022